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Effect of piles on the design of the raft foundation

Malavika L.M.[1], Balakumar V.[2] and Chandrasekaran S.S.[3]
[1]*Graduate Student, VIT, Vellore, Tamil Nadu, India.*
[2]*Senior Consultant, Simplex Infrastructures Limited, Chennai, Tamil Nadu, India.*
[3]*Professor and Head, Department of Structural and Geotechnical Engineering, VIT, Vellore, TN, India.*

ABSTRACT
The combined raft, soil and pile foundation system has reached a high level of familiarity and is now being used to support a large number of structures. When the bearing capacity of the raft foundation is acceptable but the settlement value exceeds the permissible limit, raft-soil system is reinforced with piles to reduce settlement. Here, piles act as settlement reducers to the raft-soil foundation system.

Different researchers have studied the effect of varying pile, raft and soil parameters on the settlement response and load-sharing behavior of the raft and piles in a combined raft, soil and pile foundation system but less attention has been paid to the stress response behavior of the raft. As this aspect is considered to be important from economics of raft design, a study has been performed to understand the stress response of the raft on the introduction of piles. The stress response of the raft for varying load conditions, Ec/Es ratios, thicknesses of raft and diameters of pile have been studied by performing numerical analyses on the foundation system supporting a moderately loaded 12-storeyed real-time commercial structure located in Chennai, India. An attempt has been made to study the applicability of Equivalent Pier concept. The above analyses were performed for two different layouts of piles. The behavior of the stress and settlement responses of the raft reinforced with piles was compared with unpiled raft. Staad-Pro V8i and Ansys 16.0 have been used for the study and this paper presents observations and discussions from the study.

1 INTRODUCTION

Exponential growth in infrastructure development has forced the designers to accept any ground condition irrespective of its nature. The foundation system must satisfy the serviceability and ultimate limit state conditions and also be viable economically in spite of the ground conditions. The economics of the raft design lies in designing the foundation such that the factor of safety against bearing capacity failure is at the minimum specified value and the total settlement is less than the permanent settlement.

Rafts are designed for the required bearing capacity, however, when the bearing capacity of the raft foundation is acceptable but the settlement values exceed beyond the permissible limits, the raft-soil system is reinforced with piles to reduce settlement (Zeavert, 1957). Here, piles act as settlement reducers to the raft-soil foundation system.

Extensive research had been performed by various researchers to understand the settlement reduction in raft on introduction of piles (Poulos, 1994a, b). Various raft, soil and pile parameters that affect the settlement response and the load-sharing behavior of the raft and piles in a combined raft, soil and pile foundation system had been also studied extensively. However, very little research has been performed to study the effect of introducing piles on the raft stress response and bending moment. Therefore, it becomes a necessity to study the behavior of raft stresses on the introduction of piles in a raft-soil foundation system for an effective and economical design since the economy of a foundation lies in both optimum pile layout and provisions in raft.

2 OBJECTIVE

The main objective of this study is to determine the effect of reinforcing the raft-soil system with piles on the raft stresses and bending moment.

3 METHODOLOGY

In the present study, a twelve-storied commercial building resting on a raft-soil foundation system reinforced with piles has been adopted. The structure was analyzed in Staad-Pro to obtain the column reactions. These column reactions act at the base of the structure. The linear soil-structure interaction analysis of the combined raft-soil and pile foundation system was performed using Ansys Workbench 16.0.

The behavior of the raft stress and settlement response were studied by plotting graphs and contours for four different conditions obtained by varying parameters like Young's modulus of soil (Es), Pile diameter (D), Raft thickness (t) and type of loading. The above analyses were performed for two different pile layouts. The stress response for the pile reinforced raft was compared with unpiled raft. An attempt was made to study the applicability of Equivalent Pier concept (Balakumar et al, 2013 a). Effort was made to know if there was any variation in the raft stress response.

3.1 Structural Analysis

The shape of the twelve-storied commercial building is irregular with a width of 27.38m and a length of 41.2m along the largest span. The building lies on a raft – soil foundation system reinforced with piles. The dimensions

of the raft are same as the shape of the building. Figures 1 and 2 represent the floor plan and the structural frame of the twelve-storied building. Table 1 presents the dimensions of the building components.

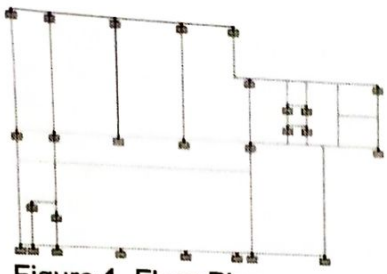

Figure 1. Floor Plan

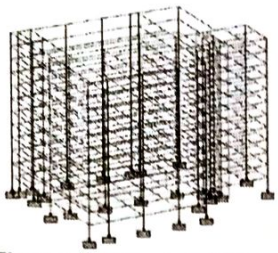

Figure 2 Structural Frame

Table 1. Physical properties of model

Specification	Value(mm)
Slab thickness	200
Size of beams along lateral direction	800 x 750
Size of beams along transverse direction	450 x 600
Size of columns	800 x 800
Outer wall thickness	230
Inner wall thickness	230
Storey height	3750
Number of storeys	12

The framed model is subjected to a combination of Dead load (D.L.) and Live load (L.L.). Three dimensional analysis has been performed to obtain the support reactions. These reactions obtained at the base of the structure act as the structural load on the foundation.

3.2 Numerical Analysis

In the case of Staad-Pro, it is a known fact that geotechnical problems cannot be handled. Although some approximations can be done, the applications are very limited like preliminary analysis of retaining walls which is conforming to beam elements. Since the soil cannot be modelled, Ansys was chosen to do the soil-structure interaction studies. The physical and material properties of the combined foundation system are mentioned in tables 2 and 3 respectively.

Table 2. Physical properties of raft, piles and soil

Property	Raft	Piles	Soil
Material	M25 concrete	M25 concrete	Medium dense sand
Shape	Irregular	Circular	Cube
Depth	1m	24m	68.45m
Width	27.38m	0.9m	82.14m

Table 3. Material properties of raft, piles and soil

Property	Raft	Piles	Soil
Material	Concrete	Concrete	Sand
Compressive strength (kN/m^2)	27579	27579	-
Elastic modulus (Pa)	3x10^{10}	3x10^{10}	3x10^6
Density (kN/m^3)	22.54	22.54	15.5
Poisson ratio	0.18	0.18	0.3
Shear angle	-	-	33^0

The pile length of 0.8 times the least dimension of the raft (B) was chosen since it is the optimum limit beyond which the piles do not possess additional bearing capacity (Cooke 1986, Balakumar 2008). Figures 3 and 4 show the individual raft and pile models respectively.

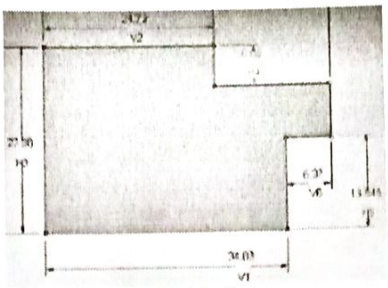

Figure 3. Raft

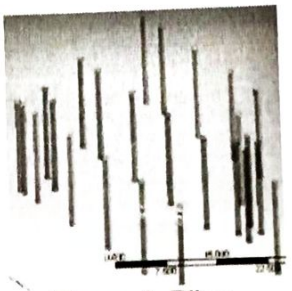

Figure 4. Piles

In the case of unpiled raft, the depth of the soil block is taken as 2.5 times B and the length and width of the soil block as 3 times B as shown in figure 5.1. This is due to the reason that the impact of the raft does not exceed these limits in the surrounding soil (Balakumar, 2008). Figure 5.2 represents the raft reinforced with piles in the raft-soil system wherein the depth of the soil is taken equal to the length of the piles to provide contact between the tip of the piles and the bottom of the soil surface.

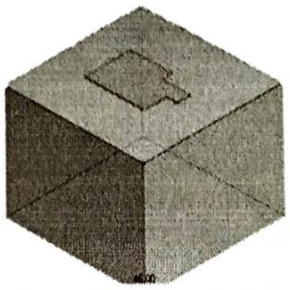

Figure 5.1 Unpiled Raft

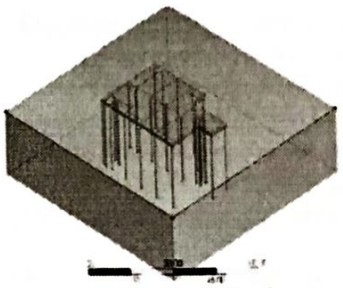

Figure 5.2. Piled Raft

Perfect contact is provided between raft – soil, raft – piles and piles – soil. (Balakumar, 2008). The accuracy of the analysis depends upon meshing and continuity of the elements in the nodes. Hence, in generation of mesh, extreme care was taken to ensure identical mesh refinement patterns for different analytical cases under comparison. A 2 meter uniform quadrilateral mesh was provided throughout the entire foundation system.

Fixed boundary conditions are provided at the bottom surface and along the four edges of the soil block. (Balakumar, 2008). The fixity conditions act as bounding limits to the soil. The loads are imposed on the raft and the settlement and stress values are obtained after the analysis. The values thus obtained at each node along the orthogonal directions of the raft at the center and the edge are used in plotting the graphs.

3.2.1 Type of loading

The column loads at the base of the structure were given as two different types of input for soil-structure interaction analysis in Ansys Workbench. They are:

- Concentrated loads
- Equivalent uniformly distributed load of 157.766kN/m2

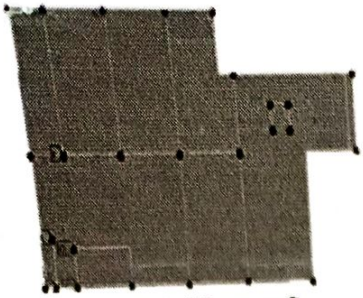

Figure 6.1. PL on raft

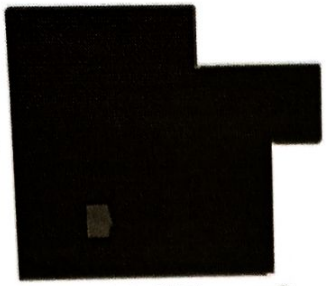

Figure 6.2. UDL on raft

Figures 6.1 and 6.2 show the type of loading imposed on raft. Initially, the unpiled raft (Case – A) was subjected to concentrated load as well as equivalent UDL for Ec/Es ratios of 10,000, 2,000, 1,500, 1,200, 1,000 and 100.

Later, the piles were introduced below the raft in two different layouts, one layout with piles below the position of the columns under the raft (Case – B) and the other layout with piles located in between the position of the columns under the raft (Case – C). Figures 7.1 and 7.2 represent the pile layout under the raft for both the cases.

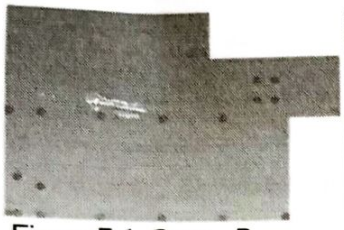

Figure 7.1. Case - B

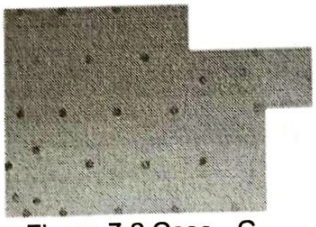

Figure 7.2 Case - C

Table 4 presents a comparison for the maximum settlement between cases A, B and C subjected to PL and UDL respectively. It can be seen that the total settlement exceeds the permissible limits in all cases except for one case where there is an extreme reduction in the maximum settlement in the unpiled raft when the Ec/Es ratio is equal 100. This is because the Ec/Es ratio equal to 100 indicates a very dense and stiffer soil condition. Such a stiffer and denser soil possesses a very high bearing capacity and hence the raft-soil foundation system in such dense soil shows less settlement. Designing the raft for such maximum settlement values will make the design uneconomical. This necessitates the introduction of settlement-reducing piles.

Table 4. Comparison – Settlement - Cases A, B and C

Ec/Es	Maximum settlement under PL (mm)			Maximum settlement under UDL (mm)		
	Case A	Case B	Case C	Case A	Case B	Case C
10,000	1347.0	1079.3	1028.7	1160.8	694.0	694.4
2,000	309.0	356.1	356.7	255.0	166.3	167.1
1,500	297.0	294.0	266.7	194.2	132.7	132.3
1,200	192.9	253.9	228.0	158.0	111.9	111.4
1,000	300.7	225.6	200.6	131.9	97.3	96.7
100	20.3	50.8	49.8	138	13.6	5.9

It was observed from table 4 that the introduction of piles in the raft-soil system has reduced the total settlement to about 25-45% on an average. This validates the purpose of the addition of piles as settlement-reducers to the raft-soil foundation system. It can be seen from table 4 that the settlement reduction is maximum for Ec/Es equal to 10,000 and it decreases with an increase in Ec/Es ratio. This is because piles are fully fractionized when Ec/Es is equal to 10,000 but as the Ec/Es ratio decreases, the soil becomes denser and the capacity of the piles to turn into friction piles reduces. (Cooke, 1986).

A considerable difference was observed in the settlement contour pattern under PL and UDL conditions for all the three cases. This is because of the variation in the type of loading. In the case of raft – soil foundation system subjected to PL, the contact pressure varies due to variation in loads and hence the settlement profile also varies accordingly as seen in figure 8.1.

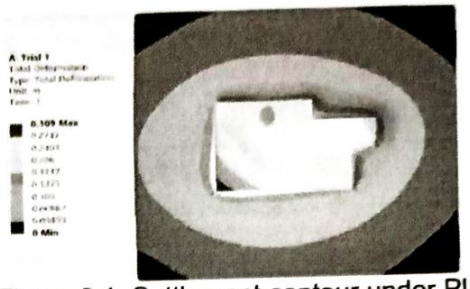

Figure 8.1. Settlement contour under PL

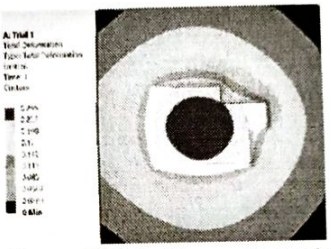

Figure 8.2 Settlement contour-UDL

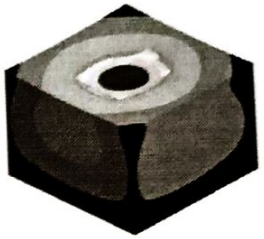

Figure 8.3 3D view

In the case of UDL, there is uniform contact pressure distribution throughout the area of the raft due to the uniformity in loading. This resulted in a more uniform settlement contour as seen in figure 8.2. Figure 8.3 indicates that the effect of raft settlement is negligible at the bottom and at the edge of the soil which justifies that the impact of the raft is limiting in the soil as discussed in section 3.2.

Figures 9.1 and 9.2 represent the settlement and section settlement contours in a combined raft, soil and pile foundation system under UDL for case B. It can be seen from the figures 8.2 and 9.1 that the settlement pattern remains identical but vary in magnitude.

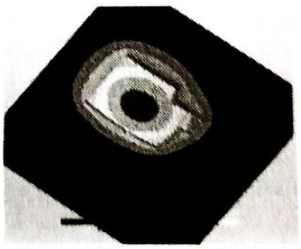

Figure 9.1 Case B

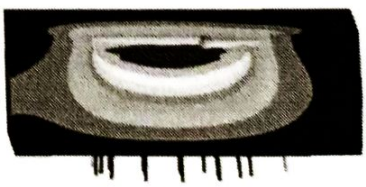

Figure 9.2 Section contour

Figure 9.2 show the settlement contour along the depth of the foundation. The maximum settlement occurs at the center as well as the tip of the piles. This denotes the transfer of the load to the surrounding soil trough the tip of the piles from the center portion of the raft.

The settlement of the raft along the orthogonal grids were obtained and graphs have been plotted to present a comparison for the settlement in Cases A, B and C when subjected to PL and UDL. Figures 10.1 and 10.2 present a comparison between cases A and B for the raft

settlement along the transverse grid when subjected to PL and UDL for a ratio of Ec/Es equal to 2,000.

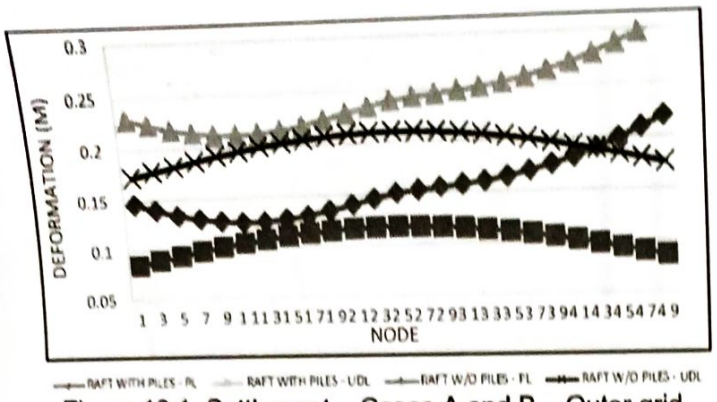

Figure 10.1. Settlement – Cases A and B – Outer grid

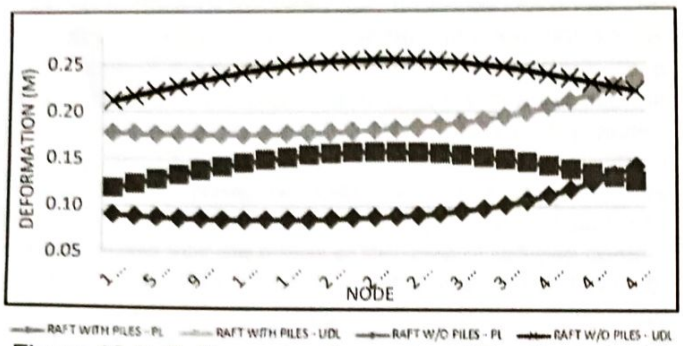

Figure 10.2. Settlement – Cases A and B – Central grid

It can be observed from the figures 10.1 and 10.2 that the settlement pattern for unpiled raft and piled raft subjected to PL and UDL are similar respectively but the raft reinforced with piles exhibited much lesser settlement compared to unpiled raft. This validates that the piles act as settlement-reducers in raft-soil system.

It can be seen from the above settlement graphs that the settlement trend curve for foundation system subjected to UDL showed a concave profile with maximum settlement at the center reflecting the nature of the raft mainly flexible raft. But under the same condition, when the load is considered as PL, the outer and central grids show a reversal in shape due to their dependence on the individual column load. Similar graphs were plotted for all other cases for different Ec/Es ratios and it was observed that the raft settlement response remained same but varied in magnitude. It was observed that the deformation reduced from 45-55% at the edges and 40 - 45% at the center of the raft on introduction of piles.

Table 5.1 Maximum stress under PL

Ec/Es	Maximum stress under PL (Pa)		
	Case A	Case B	Case C
10,000	11.28×10^7	11.24×10^7	11.28×10^7
2,000	11.29×10^7	11.21×10^7	11.29×10^7
1,500	11.29×10^7	11.25×10^7	11.29×10^7
1,200	11.29×10^7	11.25×10^7	11.29×10^7
1,000	11.28×10^7	11.25×10^7	11.29×10^7
100	11.29×10^7	11.25×10^7	11.29×10^7

Similar to settlement profile, table 5.1 presents a comparison between the maximum stress values of the combined foundation system subjected to PL and UDL for different Ec/Es ratios. It can be seen from tables 5.1 and 5.2 that the maximum stress value remained same for unpiled rafts subjected to PL for all the Ec/Es ratios whereas the maximum stress value varied for unpiled rafts subjected to UDL. In the case of foundation system subjected to PL, the stresses were concentrated in the raft area subjected to high concentrated loads whereas under UDL, the stresses were redistribute throughout the entire area of the raft due to uniformity in the distribution of loads. It can also be seen that the maximum stress value decreased with a decrease in the Ec/Es ratio. As the Ec/Es ratio decreases, the soil becomes denser leading to less deformation and eventually lesser stresses in the raft.

Table 5.2 Maximum stress under UDL

Ec/Es	Maximum stress under UDL (Pa)		
	Case A	Case B	Case C
10,000	2.91×10^7	3.39×10^7	2.65×10^7
2,000	1.21×10^7	1.43×10^7	1.28×10^7
1,500	0.99×10^7	1.05×10^7	1.06×10^7
1,200	0.85×10^7	0.89×10^7	0.90×10^7
1,000	0.74×10^7	0.77×10^7	0.77×10^7
100	0.12×10^7	0.13×10^7	0.12×10^7

Similar to the raft settlement response, a variation in the stress contours of unpiled rafts subjected to PL was observed. Figures 11.1 and 11.2 represent the stress contours in the unpiled raft-soil foundation subjected to UDL for Ec/Es ratio equal to 2,000.

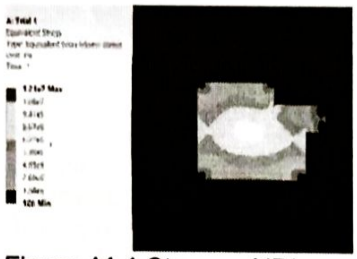

Figure 11.1 Stress – UDL

Figure 11.2 Stress in soil

From the figure 11.1, it can be observed that the raft stresses are concentrated more at the center portion of the raft and are negligible at the edges. Since the settlement is more at the center of the raft, the stresses are highly concentrated at the center. This trend in stress variation is similar to the settlement response of the unpiled raft when subjected to UDL as seen in figure 9.1. It can be seen from figure 11.2 that the stresses in the soil are negligible.

The stress contours at the section of the unpiled raft were obtained to study the stress pattern along the depth of the foundation. The stresses in the soil were negligible for all the three cases as discussed previously.

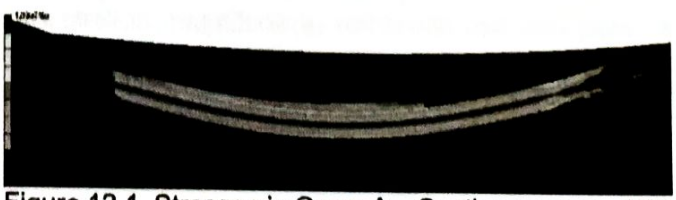

Figure 12.1. Stresses in Case A – Section contour - UDL

It can be seen from figure 16.1 that the raft stress is minimum at the center and maximum at the top and bottom of the unpiled raft under UDL. The raft design can

therefore be optimized accordingly with respect to raft stress and settlement behavior.

The variation in stresses means that the Bending Moment (B.M.) and Shear Force (S.F.) will also vary along the raft area. Hence it becomes important to study the stress response behavior of the raft from the view of the economics of the raft.

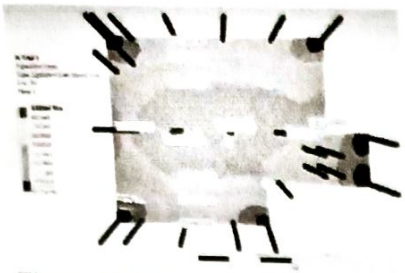

Figure 12.2 Stress -raft bottom

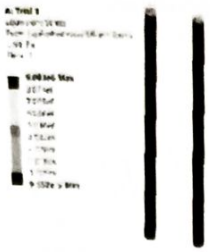

Figure 12.3 Stress - piles

Figure 12.2 represents the stress variation at the bottom surface of the piled raft. It can be observed that the stress varies uniformly along both the orthogonal directions of the surface of the raft. Similar stress trend was observed in Cases B and C but with a variation in magnitude under PL and UDL for different Ec/Es ratios.

Figures 13.1, 13.2 and 13.3 represent the stress in piles. It was observed that the stress in piles was minimum in all cases as seen in figure 12.3. It can also be observed that the stress at the area of raft-pile contact is maximum. This is due to the transfer of raft stress to the piles. The stress in the piles is maximum at the head and it reduces with an increasing depth in the piles as indicated in figure 13.1. Variation of stress indicates a variation in the B.M. and shear forces. Hence, the reinforcement in the raft can be optimized by designing it in areas of higher stresses leading to an economical design.

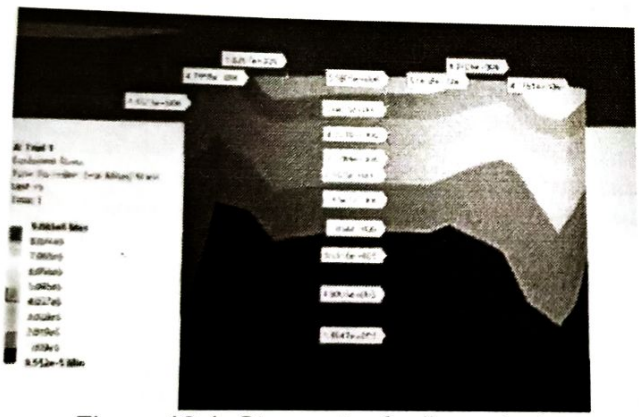

Figure 13.1. Stress at raft-pile contact

Figure 13.2 Stress-Pile head

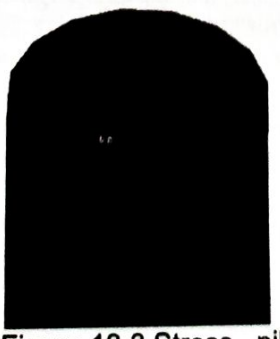

Figure 13.3 Stress - pile tip

Further, it was observed that the stress was concentrated more at the center of the pile head and varied along the surface of the pile as seen in figure 13.2. The stress at the tip of the pile was negligible as seen in figure 13.3. Therefore, the pile design can also be optimized accordingly.

Graphs have been plotted for raft stresses at the bottom surface in cases A, B and C and a comparison has been made between them to study the raft stress behavior. Figures 14.1 and 14.2 present a comparison between the unpiled and piled raft stresses at the bottom surface area of the raft for Ec/Es equal to 2,000.

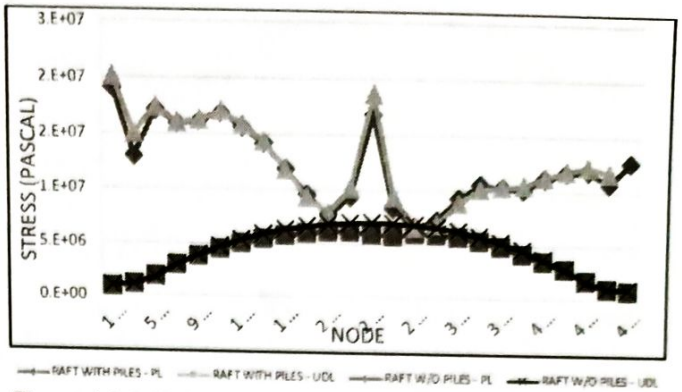

Figure 14.1. Raft stresses – Transverse axis - Outer grid

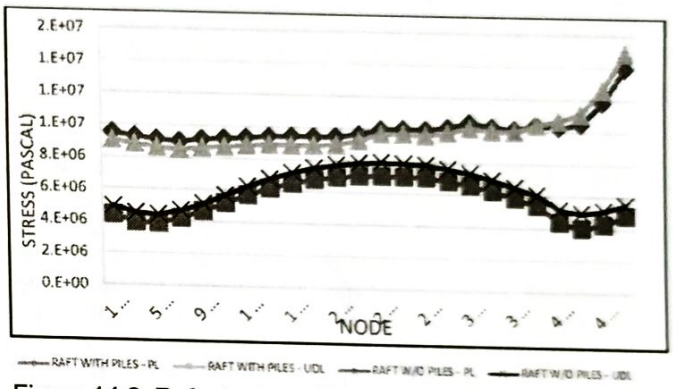

Figure 14.2. Raft stresses–Transverse axis - Central grid

It was observed from the stress response graphs of the raft that the stress pattern although remains similar in trend under UDL, the stress pattern has a pronounced variation particularly in the case of outer grids. This is mainly due to the varying magnitude of the column load. The upper peaks in the stress trend curves under PL reflect the concentration of raft stresses at the pile locations. The transfer of stresses from the raft to the piles occur here as mentioned previously. The lower peaks reflects the raft in between the piles. In the present structure, columns are very widely spaced, therefore, the stress pattern under the PL follows the same pattern.

Similar graphs were plotted for all other cases for different Ec/Es ratios and it was observed that the stress pattern remained same but with a variation in magnitude. It was observed that the stress value reduced from 7 - 15% at the edges and 10 - 20% at the center of the raft due to the introduction of piles in the raft.

Thus, it can be concluded that the method of applying loads influences the displacement and stress patterns. It was observed that the displacement and stress patterns were identical for all the three cases with a pronounced reduction in magnitude in raft reinforced with piles i.e. cases B and C. The raft and pile design can be optimized efficiently by studying the settlement and stress responses of the raft and the piles.

3.2.2 Variation in Ec/Es

In the present case, numerical analyses were performed on an unpiled raft of thickness 1m located at a depth of 3m from the ground surface. Retaining wall was considered around the raft. A pressure of 111276 Pa was obtained by deducting the surcharge pressure at 3m depth. Numerical analyses were repeated for cases B and C and the results were compared to study the raft behavior. In the analysis, the Ec value was kept constant as $3x10^7 kN/m^2$ whereas the Es value was varied. The raft, pile and soil properties were adopted as mentioned in tables 2 and 3.

Table 6. Comparison - Stress - Cases A, B and C

Ec/Es	Maximum stress under a load of 111276Pa (Pa)		
	Case A	Case B	Case C
10,000	2.45×10^7	2.39×10^7	1.80×10^7
2,000	0.95×10^7	0.90×10^7	0.90×10^7
1,500	0.80×10^7	0.74×10^7	0.74×10^7
1,200	0.69×10^7	0.63×10^7	0.63×10^7
1,000	0.57×10^7	0.54×10^7	0.54×10^7
100	0.08×10^7	0.09×10^7	0.08×10^7

From the above table, it can be seen that the stress reduces on the introduction of piles for both the pile layouts. It was observed that the stress contour trend remained similar to unpiled and piled rafts under UDL in section 3.2.1 but with a slight variation in magnitude. For the present case, the settlement value for Ec/Es ratio equal to 2,000 satisfies the permissible limits. Hence, the ratio of Ec/Es equal to 2,000 had been adopted in the further studies.

Graphs were plotted similar to section 3.2.1 and comparison was made. It was observed that the trend for the settlement and stress responses of the raft varied along a concave profile which was similar to the previous observations but with a variation in magnitude. It was observed that the settlement reduced from 45 – 55% at the edges and 40 – 45% at the center of the raft on the introduction of piles. Similar results were observed for all the other grids under all cases.

Figures 15.2 and 15.2 represent the stress response of the raft for cases A and B when Ec/Es is equal to 2,000. The raft stresses were obtained at the raft-soil contact surface but on the raft surface. The pattern of stress distribution with piles obtained after analysis was similar to the results published by Balakumar, V (2017). The slight variation in the stress trend curves is due to the non-uniform spacing of piles in figures 15.2 and 15.2.

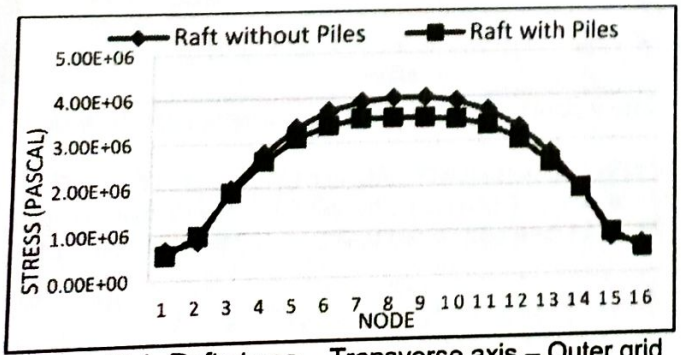

Figure 15.1. Raft stress – Transverse axis – Outer grid

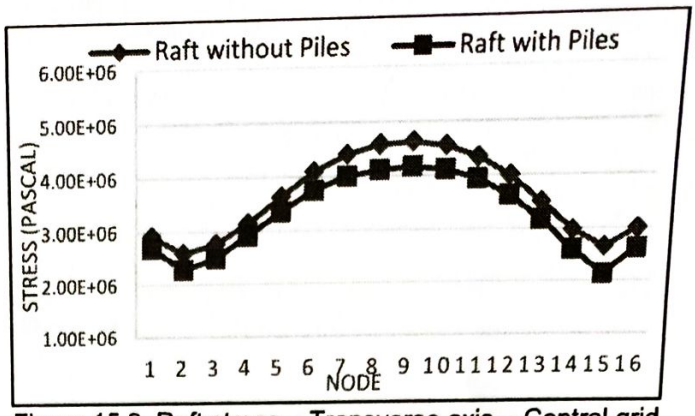

Figure 15.2. Raft stress – Transverse axis – Central grid

It was observed from the calculations that the stress value reduced about 7-15% at the edges and 10-20% at the center of the raft due to the introduction of the piles for both the layouts. At the raft edges, the variation in stress was marginally less compared to the center. This variation is mainly due to the edge being free and not restrained by retaining walls in actual analysis.

3.3.3 Variation of D/t when pile diameter is constant

In the present case, the numerical analyses were performed on the combined raft, soil and pile foundation system for four D/t ratios where D is the diameter of the pile and t is the thickness of the raft. The diameter of the piles was kept constant as 0.9m and the raft thickness was varied. The raft was located at a depth of 3m from the ground surface and the piles of length 24m were modelled under the raft beneath the location of the columns. The soil was modelled as a block of medium dense sand condition. A constant Ec/Es ratio of 2,000 was adopted to perform all the analyses under the present case where Ec was equal to $3x10^{10}$ N/m² and Es equal to $1.5x10^7$ kN/m². The results obtained from various analyses of conditions A, B and C were compared with each other.

It was observed that the introduction of piles reduced the settlement for about 23 - 37%. It was also observed that the reduction in the overall settlement increased with an increase in the raft thickness (Poulos, H.G., 1998, 2001) for a constant pile diameter.

Table 7. Comparison - Stress – Cases A, B and C

D/t	D (mm)	t (mm)	Maximum Stress(Pa)		
			Case A	Case B	Case C
1.2	900	750	0.90×10^7	0.89×10^7	0.89×10^7
1.0	900	900	0.94×10^7	0.92×10^7	0.92×10^7
0.9	900	1000	0.95×10^7	0.90×10^7	0.90×10^7
0.8	900	1125	0.94×10^7	0.86×10^7	0.86×10^7

Table 7 presents a comparison between the maximum stresses for cases A, B and C. It was observed that there was no much variation between the maximum stress values for Cases B and C when the pile diameter was kept constant. It was observed that the settlement and stress trend was similar to section 3.3.1 for all the D/t ratios but with a variation in magnitude. It was observed that the deformation reduced for about 45 - 55% at the edges and 40 - 45% at the center of the raft on introduction of piles.

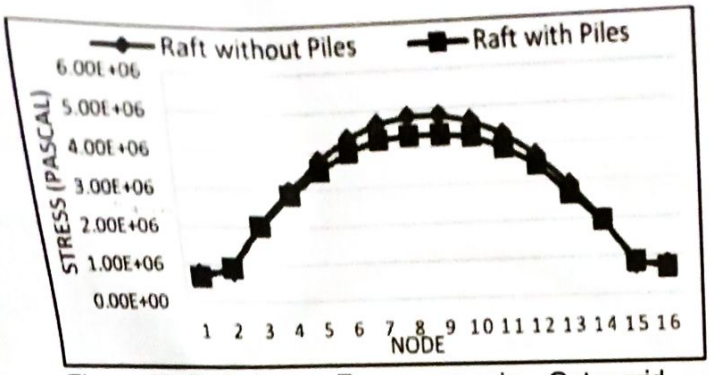

Figure 16. Raft stress – Transverse axis – Outer grid

Graphs were plotted to compare the raft stress response for cases A, B and C. Figure 4.1 represents the stress response behavior of the raft respectively for a D/t ratio of 1.2. The stress value reduced from 7 – 15% at the edges and 10 – 20% at the center of the raft due to the introduction of piles. Similar trend was observed in all the other cases.

3.3.4 Variation of D/t when raft thickness is constant

In the present case, the numerical analyses were performed similar to section 3.3.3 but here, raft thickness of 1m was adopted and kept constant whereas the pile diameter was varied.

Table 8. Comparison - Maximum stress

D/t	D (mm)	t (mm)	Maximum stress (Pa)		
			Case A	Case B	Case C
2.00	2000	1000	0.85×10^7	0.76×10^7	1.42×10^7
1.75	1750	1000	0.85×10^7	0.81×10^7	0.72×10^7
1.5	1500	1000	0.85×10^7	0.83×10^7	0.79×10^7
1.2	1200	1000	0.85×10^7	0.85×10^7	0.86×10^7
1.0	1000	1000	0.85×10^7	0.90×10^7	0.90×10^7
0.8	800	1000	0.85×10^7	0.91×10^7	0.93×10^7

It can be observed from the table that the stresses in the raft under cases B and C increases as the pile diameter decreases for a constant raft thickness. For D/t ratios less than 1.2 i.e. when the pile diameter is less than the raft thickness, there is an increase in the raft stresses. It was observed that the settlement and stress trend was similar to section 3.3.1 for all the D/t ratios but with a variation in magnitude. The graph representing the stress response behavior of the raft was also similar in pattern but varied in magnitude as seen in figure 17.

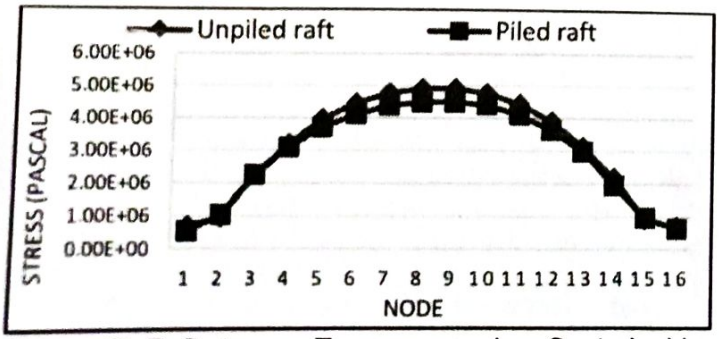

Figure 17. Raft stress – Transverse axis – Central grid

Figure 17 represents the stress response behavior of the raft respectively for a D/t ratio equal to 1.2. The stress value reduced from 7 – 15% at the edges and 10 – 20% at the center of the raft due to the introduction of piles. Similar trend was observed in all the other cases.

3.3.5 Equivalent pier analysis

A special case of equivalent pier system has been analyzed to study its applicability and influence on the behavior of raft deformation and stresses. Three equivalent pier analyses have been performed by adopting a raft of thickness 1m located at a depth of 3m from the ground surface. Equivalent piles of length 24m were modelled under the raft surrounded by medium dense sandy soil. Ec/Es ratio of 2,000 has been adopted for the analyses.

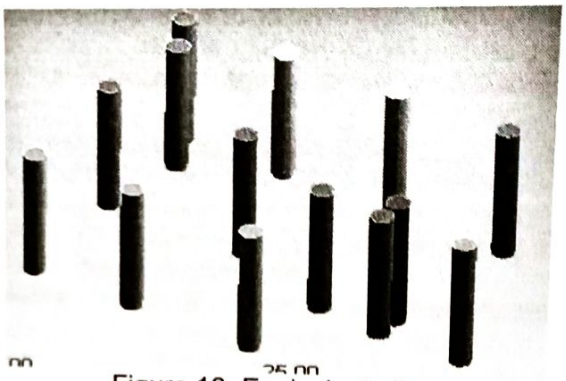

Figure 18. Equivalent piles

Tables 9.1 and 9.2 present a comparison for the maximum settlement and stresses in a raft between the cases of unpiled raft, raft reinforced with piles below the position of columns and raft reinforced with equivalent piles below the columns.

Table 9.1 Comparison - Maximum deformation

D (m)	t (m)	D_{equ} (m)	Maximum Deformation (mm)			
			Case B	Equivalent Case B	Case C	Equivalent Case C
1.5	1	2.1	119.13	118.48	117.95	119.19
1.2	1	1.8	118.97	118.20	118.01	119.08
1.0	1	1.4	118.81	118.81	117.93	118.87

Table 9.2 Comparison - Maximum stress

D (m)	t m	D_{equ} (m)	Maximum stress (Pa)			
			Case B	Equivalent Case B	Case C	Equivalent Case C
1.5	1	2.1	0.83×10^7	0.83×10^7	0.79×10^7	0.77×10^7
1.2	1	1.8	0.85×10^7	0.84×10^7	0.86×10^7	0.86×10^7
1.0	1	1.4	0.90×10^7	0.90×10^7	0.90×10^7	0.89×10^7

It was observed from tables 9.1 and 9.2 that the maximum settlement and stress values reduced on the introduction of equivalent piles in the raft when compared to unpiled raft. Also, the settlement and stress values showed a very negligible variation in the cases between raft reinforced with regular piles and raft reinforced with equivalent pier for the two different pile layouts. The settlement and stress trend contours and magnitude also remained similar for the above two cases.

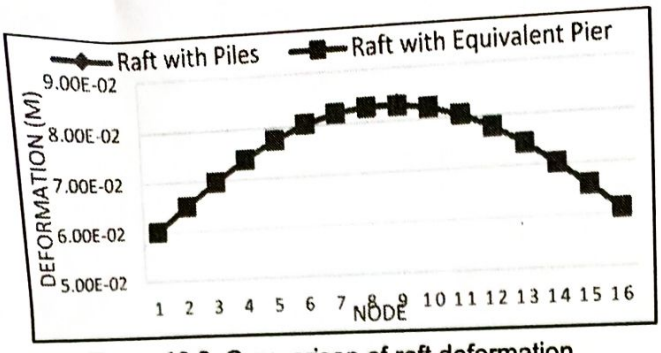

Figure 19.2. Comparison of raft deformation

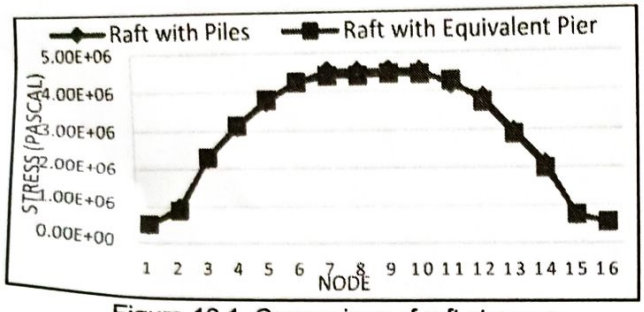

Figure 19.1. Comparison of raft stresses

From figures 19.1 and 19.2, it was observed that the settlement and stress response pattern of the raft remained similar to other cases. It was observed that the variation in stresses and deformation between equivalent pier and piles was only about 2 - 5%. Thus, it can be concluded that equivalent piles can be used in the combined raft, pile and soil foundation system based on their availability.

4 CONCLUSION

It was observed that the trend of settlement and stress variation in unpiled raft and piled raft for different layouts of piles was identical but with a variation in magnitude. The deformation reduced from 45-55% at the edges and 40-45% at the center of the raft and the stress value reduced from 7 –15% at the edges and 10 –20% at the center of the raft on an average due to the introduction of piles.

The load on the piles located at the center of the raft was much higher than the piles positioned at other locations in the raft. The raft contact stresses obtained from the numerical analyses show uniform distribution except at the edges and pile locations. The stress distribution obtained from the numerical analysis indicated that the shaft stress is higher near the pile head and reduces towards the pile tip. The high stress at pile head was due to the transfer of raft stresses to the piles. It was also observed from the analyses that the tip stresses in piles were lesser than the head stresses indicating that the shaft friction was fully mobilized and the piles were dominantly friction piles. Also the mobilization of higher raft stress as the load increased and low pile tip stress at the final settlement confirms the behavior of the pile group as settlement reducer (Cooke, 1986).

It was observed from the present study that the introduction of the piles not only reduced the raft settlement but also the stress level. Consequent to the reduction in stresses, the bending moment and the shear forces also get reduced. Thus, the study of raft stresses and bending moment along with the raft settlement leads to a better and effective design of the raft.

The variation in stresses and deformation between equivalent pier and general piles was only about 2 -5%. Hence, equivalent pier system can also be used effectively based on requirement.

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Model studies for Vellar river training project in Tamilnadu

SURESH P K[1] , PANNEER SELVAM D[2], PRABAKAR C[3], PONRJ V [4]

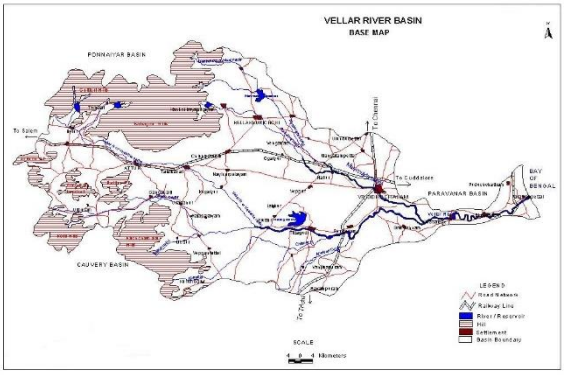
[1] Head,Research, Centre of Excellence for Change, Chepak, Chennai India, ***Email:*** *sureshpk2000@gmail.com*
[2,3 4]Public Works Deptr, Water Resources dept, , Chennai, Tamilnadu, India ***Email:*** *dpselvam1960@gmail.com*

Abstract (Times New Roman – 10 Font-Bold-Italic): *The Vellar river basin is located in the Northern part of Tamil Nadu State in South India, between the latitudes 11^0 13' N – 12^0 00' N and longitudes 78^0 13' E – 79^0 47' E. The total area of the basin is 7520.87 Sq. Km. The total length of the river is about 150 km. The river Vellar emanates on the southern slope of Kalvarayan hills in Salem Dist. and drains into Bay of Bengal near Parangipettai (Port-O-Nova) in Chidambaram taluk of Cuddalore District. In the lower reaches the river is meandering resulting in heavy erosions due very high discharge during north east monsoon rainfall resulting loss of agricultural lands and roads. Initial field surveys were conducted for actual field information. Using the data, HECRAS-1D and Mike 21 numerical modeling studies were performed. Based on the studies vulnerable locations were identified and initial river training works were designed and experimentally verified through physical modeling techniques and finalized. The details of numerical and physical model studies and finalized remedial measures are detailed in the paper.*
Keywords*: Physical model, spur, flood discharge*

1. Introduction:

The Vellar river originates in the Kalrayan hills of Salem district in the reserve forest area at of Salem in Salem District and drains into Bay of Bengal near Parangipettai (Port-O-Nova) in Chidambaram taluk of Cuddalore District.The Vellar river basin is located in the Northern part of Tamil Nadu State in South India, between the latitudes 11^0 13' N – 12^0 00' N and longitudes 78^0 13' E – 79^0 47' E. The total area of the basin is 7520.87 Sq. Km. The total length of the river is about 150 km (Fig 1). The river Vellar is having 6 tributaries. In the lower plain river takes meandering course . During the flash floods of north east monsoon the river causes very heavy erosions resulting heavy damages to cultivable lands and bridges. Hence, the affected people represented to the Government to safeguard their villages from the damages, dwellings units, agricultural land, live stocks and their properties by forming flood banks, construction of spurs and retaining walls. The government of India has also sanctioned the schemes under flood management program by forming flood banks, construction of spurs and retaining walls.

The total area of the basin is 7520.87 Sq. Km. The total length of the river is about 150 km (Fig 2 & 3). The lower meandering reach of river for a length of about 80km is in Cuddalore district.The average rainfall of the district is 134cm. Nearly 70% of rainfall is during north east monsoon



.During the flash floods of north east monsoon the river causes very heavy erosion at locations where river is meandering resulting heavy damages to cultivable lands and bridges. TV Puthur is one such agriculture village located along the meandering stretch which has undergone heavy damage resulting erosion of agriculture land. The area is active in agriculture and hence necessary representations were made by the locals for suitable protection works. Subsequently the project proposals were made and protection works were sanctioned under flood management program of Government of India.

Fig 2 Vellar river course

Fig 3 Location of TV Puthur

2 Methodology

Field visit was made and initial site investigations were carriedout. With the available data it was decided to use various modelling approach. In the present situation one dimensional modelling, two dimensional modelling and physical modelling studies were carried out.

2.1 One dimensional modelling

In order to assess the existing hydraulic conditions of the field, numerical model studies were made. For the present study the U.S. Army Corps of Engineers' River Analysis System (HEC-RAS) software is used. This software is developed by the Hydrologic Engineering Center (HEC-2008), which is a division of the Institute for Water Resources (IWR), U.S. Army Corps of Engineers. HEC-RAS allows users to perform one-dimensional steady and unsteady flow calculations (HEC, 2002). In a HEC-RAS steady state simulation, water surface profiles are computed from one cross-section to the next by solving the standard step iterative procedure to solve the energy equation. The energy equation is intended to calculate water surface profiles for steady gradually varied flow.The input are geometric, flow and boundary data. The geometric data consisting of cross section and chainages were keyed in after making a base map of the study area. The flow data adopted was the maximum value as suggested by the field engineers. The upstream and downstream slopes were given as boundary conditions. With the above flow data and the boundary conditions, results are obtained by running the HEC-RAS model for different scenarios. The results of the same are obtained for the steady state flow conditions. The maximum value of discharge of 3596 cumecs was adopted. The results of HECRAS study indicate that there is a need to redesign the existing banks since the waterway is insufficient for the design discharge (Fig 4) resulting overflowing .

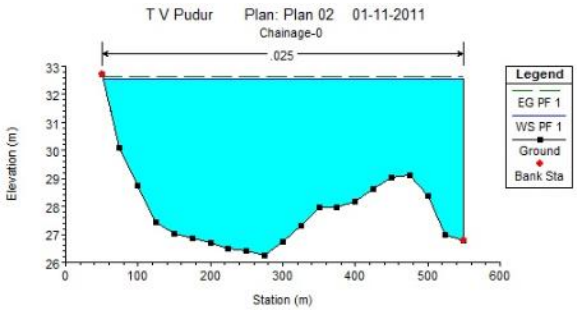


Fig 4 HEC-RAS result

2.2 Two dimensional model studies

MIKE 21 HD is the basic computational hydrodynamic module of the entire MIKE 21 system (DHI 2001) providing the hydrodynamic basis for other MIKE 21 modules. The modelling system is based on the numerical solution of the two/three-dimensional incompressible. Reynolds averaged Navier-Stokes equations. The model consists of continuity, momentum, temperature, salinity and density equations and it is closed by a turbulent closure scheme. The input to the model is hydrographic details of river, discharges at the open boundaries. The output includes velocity contours and water levels...The river bed contours are detailed in Fig 5 and this is used as input for Mike21 software. The study indicate eddy formation with high velocity on the right side bank. It was proposed to strengthen the river banks by providing spurs.Then the studies were performed with spurs on the right side of bank and then flow pattern observations with spurs placed at locations suggested by field engineers were studied. The lengths are adopted as discussed in Technical report of CBIP (1971, 1987). The spurs with an angle of 22^0 from normal to the bank of 30m length facing upstream found to be effective in reducing velocity adjacent to right bank (Fig 6 & 7).

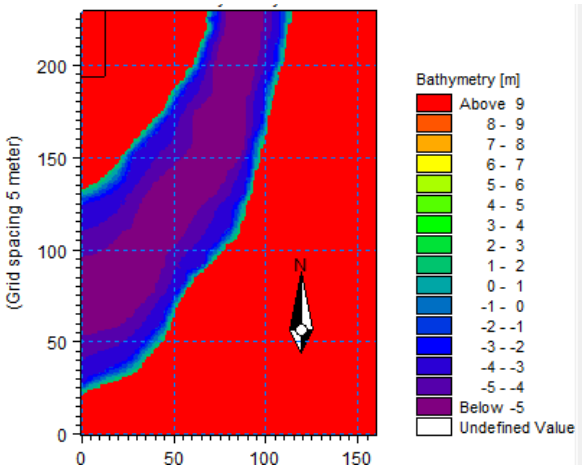


Fig 5 Details of river hydrography

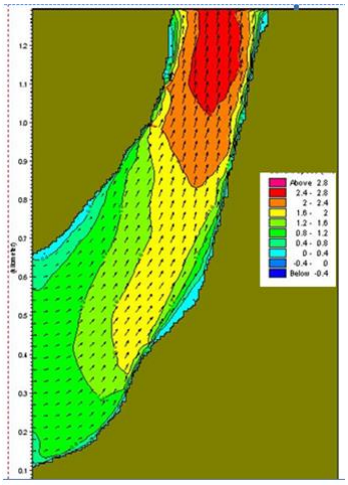


Fig 6 Mike 21 result for existing bed

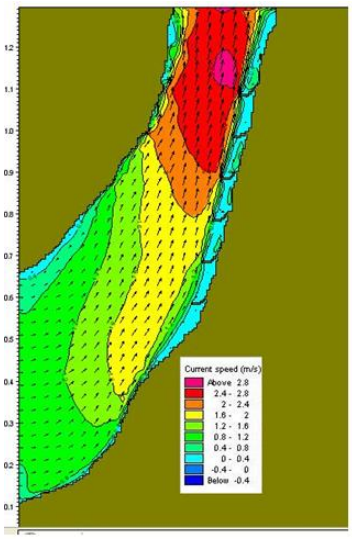


Fig 7 Mike 21 result with spurs

2.3 Findings of numerical model studies

The site TV Puthur is under heavy erosion. The Right bank is found to be highly vulnerable to erosion. The presence of shoals in the river diverts the flow creating erosion. The numerical experiments with HECRAS indicates that insufficient water way to carry the quantum of flood values suggested and needs a redesign of the section with a top level (Fig 4) by providing a free board of 1.8m. The 2D studies with Mike 21 suggest that about 1km of length of river right bank is vulnerable to erosion due to high eddy formation (Fig 5 to 7). Hence based on the discussion with field engineers, it is proposed to raise the bank height and to introduce six repelling spurs on the right bank.

3 Remedial measures

The remedial measures proposed in the form of revised bund level and repelling spurs The bund level and location of the spurs as finalized are tabulated below. The length of groin is of 30m length . The orientation angle is 25^0 deg from normal to the bank facing upstream side. This data is used for finalising the performance using physical model technique.

Table 1: *Input data*

Chainage (m)	Top level (m)
42910	35.270
43020	35.200
43120	35.100
43210	35.070
43320	34.970
43410	34.870

4 Physical model studies

Physical model studies were carried out to study the performance of river training spurs proposed from Mike21 model studies and top level of the banks were revised based on HECRAS model studies with a free board of 1.80m. A comprehensive mobile bed, geometrically distorted physical river model, with a horizontal scale of 1:500 and vertical scale of 1:100, and the representing affected site of Vellar River at TV Puthur with the proposed spur location was constructed. Model discharge of the river was allowed through 'V' notch. Necessary gauge wells have been constructed for measuring the water levels as done for other reaches of Vellar (IHH Poondi-1995)

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4.1 Mobile bed setup

In the model, bed of the river has been properly simulated. The effective size of the sand particles were arrived based the tractive force in the field. From this, utilizing the roughness index, model sediment size was calculated based on Shield stress criteria and found to be 0.6 mm. Accordingly corresponding mesh was utilized to get the 0.6 mm diameter sand materials. The mobile bed was formed utilizing the above sieved sand particles. The completed model is shown in Fig. 8 & 9.

Fig 8 Dry mobile bed model

Fig 9 Running mobile bed model

Fig 10 Comprehensive model view

5 Results and discussion

The spurs provided on the Right bank deflects the flow current concentrate to the central portion of the river. Eddy formations observed near the toe of the spurs, for which suitable toe protection is to be provided to avoid local scour. Slight modifications of orientation angles were made with the initial value obtained from 2D Mike 21 model studies in consultation with field engineers. Accretion of sand is noticed between the spurs. This imparts a good bank protection. The trial model photos of the TV Puthur is shown vide (Fig 8 to 10).

6 Conclusions and recommendation

The inferences on the model run with sufficient number of trials account to the effective functioning of the Repelling. Repelling Spurs of length 30m having an angle of 22^{o} were provided. The performance also seemed to be satisfactory.

Thus, it is concluded that the model study ascertains the functioning of the spurs and the flow pattern in the river course is found to be satisfactory. Necessary protective measures must be provided at the toe of each spurs to avoid scour.

7. Acknowledgements

The authors acknowledge the services of field engineers Balamurugan, Tilakam and Palanikumar for collection of field data and suggestions during the course of model studies

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BEHAVIOUR OF PILED RAFT- IMPORTANCE OF OBSERVATIONAL STUDY

V.Balakumar, Senior consultant, simplex infrastructures Limited, Chennai
vb_kumar2002@yahoo.com

Abhirami.B. Research scholar, College of engineering, Guindy, Anna University,
abhirami1002@gmail.com

ABSTRACT:

Piled raft foundation system is an intelligent geotechnical concept, developed towards reducing the settlement of the raft and the footings by providing pile elements below the raft or footings, as the case maybe. Although a large volume of works has been done on the behaviour of piled rafts by observational studies, the effect of construction methodologies such as deep excavations, the installation methodologies used for piling etc appear to have not been covered adequately. This paper discusses the effect of deep excavations, pile installation techniques and the effect of adding structural elements, based on the data available from published literatures. Based on this study, the performance of the piled raft monitored by the author has been revisited and the results of such a study are discussed.

KEYWORDS: Piled raft, ANSYS, Compressible layer

INTRODUCTION

The basic difference between the traditionally designed raft supported on piles and the piled raft is that, the traditionally designed pile group supported raft does not distinguish between the bearing capacity problem and the settlement problem. Cunha et al., (2018), has defined the piled raft foundation system, as a pile group, in which the raft connecting the pile heads positively contributes to the overall foundation behaviour. Hence ignoring the presence of the raft, and its contribution in transferring the load to the competent ground cannot be justified from engineering principles. When the ground has adequate bearing capacity, but settlement alone is a problem, in providing a large group of piles, the number of piles is governed by the geometry of the foundation. This leads to an uneconomical design with a very high factor of safety, not justifiable from an engineering point of view to reduce the settlement.

LIMITATIONS OF ANALYSES

The analyses of piled raft is essentially a three dimensional process and warrants the use of sophisticated computational tools, namely an appropriate software and a compatible hardware for the initial and final design. An overview of the literature confirms that even by adopting most rigorous methods of analyses, the results relating to the load sharing show wide variations as established by Russo and Viggiani (1997). Irrespective of the nature of the software, the accuracy of the results depends upon the accuracy with which the in-situ parameters have been evaluated. However, the evaluation of in situ subsoil properties is the most difficult part for almost all geotechnical problems; more so in the pile foundations as the properties are influenced to a significant extent by the methods of pile installations. Further the application of the superstructure load is time dependent and so the rate of settlement and the friction mobilised, which is governed by the properties of the soil surrounding the pile shaft. Franke (1991) had pointed out that the development of shaft stress from tip to top is caused by the movement of piles, the soil in between the pile group, and the raft; hence the movement of the system as a whole is very important, which depends upon the in-situ soil properties after the completion of the pile installation and the rate of loading.

OBJECTIVE OF THIS STUDY

Even though the design of pile group is complex matter, the design of the constituent elements of piled raft in all the stages before execution, is carried out based on the parameters obtained from the tests on "undisturbed samples" extracted from the boreholes, during the soil investigation. Standard empirical correlations between N-Values and the elastic modulus (E_s), which is one of the most important parameters, are used in practice in the design of piled raft. Such an analysis and design may not take into account the effect of construction procedure and the field issues into account. This is a matter of concern when some variations occur between the observed and computed results. This is mainly because of the variability in the behaviour of piles due to many random factors. It also depends upon the post construction behaviour of the single pile and the pile group. In the recent past the use of large diameter bored piles, whose design methods are settlement based has created a further limitation in the form of installation effects on the properties of the soil. An interesting feature to note is that in the pre-construction design stage, the design of the un-piled raft and the piled raft is processed based on the parameters obtained under undisturbed conditions of the sub soil strata or from standard correlations. It appears that many of the field issues, that alter the parameters used in the design, have not been recognised in the post construction evaluation.

Keeping all the above limitations in mind the paper attempts to study some of the important factors, that can affect the interaction behaviour of the constituent elements. Hence there appears to be a need for a revisit on the analyses using the parameters evaluated after the pile installation. Also, a well suited in situ testing procedure which will evaluate the parameters needed is suggested.

FIELD ISSUES

The behaviour of piled rafts is a three-dimensional interaction problem, and the interaction takes place gradually, as the construction progresses. The progressive increase in the applied loading is also time dependent, with a probable variation in the sequence. In that process the surrounding soil is susceptible for disturbance, remoulding, densification etc. Hence it is quite possible that there can be variations between theoretically predicted and the observed values. The probability of such variations becoming detrimental has to be anticipated. Such anticipation in the design of the foundation system for Burj Dubai (Poulos 2008) resulted in the increase of pile length, and the pile termination was done in a layer close to the gipsyferrous sandstone layer. There was a possibility of a potential long term degradation of the engineering properties that can reduce the capacity of the pile.

In spite of detailed investigations of several high-rise buildings having been carried out in various places, (Katzenbach et al., 2000), Burg Dubai, (Poulos,2008), structures like 13 storeyed hospital, 45 storeyed apartments (Yamashita et al., 2015), not so many case histories exist on the monitoring the load sharing between the raft and the piles, as well as the settlements. Monitoring the behaviour of the piled raft under construction is an essential feature, considering the issues that are construction process based. This is because, the condition of measurements in the case of a load test on a single pile and the pile group of piled rafts are different and the measurements and monitoring has to be done as construction progresses. Measurements have to be taken during construction and after construction also.

Effect of Excavation

The effect of excavation will be pronounced when a structure has multiple basements and is the general trend in the construction of tall structures nowadays. More specifically when the ground is very soft the performance of the pile group and the raft get affected by the over- consolidation caused by the excavation on the stiffness and the ultimate capacity of the raft and the pile group. Renato et

al., (2020), in their study has pointed out that settlement distribution and the load sharing between the pile and the raft are influenced by factors like, excavation process, time between end of excavation and casting of the raft, time of construction and so on.

Sales et al., (2010) has pointed out that when deep excavations are involved, such excavation reduces the soil stress, and the reloading of the soil should be taken into account. Sales et al. (2010) allowed the influence of the variation of the stress level on the piled raft behaviour in a complex manner, introducing the excavation sequence (stepwise) in the numerical analyses through what has been called as a "compensated" piled raft analysis. The reduction in the soil stress due to excavation and the reloading results in the reduction in the piled raft settlement than the uncompensated one. It has been established that the foundation system would be more economical when the excavation effect is taken into account, the raft becomes more effective, and the combined use of piles and compensation via excavation leads to a combined foundation system that will provide a superior performance, to that of an uncompensated piled-raft.

However, this stress reduction causes an over-consolidation effects reducing its compressibility. In-situ tests such as SPT or CPT conducted from the existing ground level cannot predict the soil behaviour at the construction stage, as the reloading parameters are required. The downward soil movement will induce compressive stress on the upper part of the pile. Combined with the possible locked in tensile stress due to the excavation process, there will be a redistribution of the stress along the pile shaft, and such redistribution may change with time. The settlement measurements can commence before casting of the raft or after casting the raft. Between these two processes there can be a difference of several millimetres in the measured settlements. The water table can influence the load sharing between the raft and the pile. The simplified approach using Plaxis 2D settlement analyses for a raft over an equivalent pier seems to be a useful but approximate method, that can be used in the analyses of large piled raft. In addition, understanding of the construction steps and measuring system play a very important role. The sequence of excavation, pile installation and the reloading by the structure affect the load distribution. If the piles are installed before excavation, locked in tensile stresses can get generated and this changes the pile stiffness, especially during the beginning of construction. This aspect needs further study.

Ibañez et al. (2014) considered the effect of the excavation with a more simplified procedure, simply by correcting the effective original stresses of the ground to the relief stress/reloading caused by both the extracted soil during excavation and the self-weight of the raft cast. However, the above considerations have to be simplified to a large extent for any numerical analysis. But such simplifications may not lead to perfect simulations of the real phenomena, but they can considerably improve the settlement pattern predicted by the numerical simulations, although parameters like geotechnical variability etc cannot be modelled.

Effect of pile installation

In the analyses of single pile and pile group, it is always assumed that the soil surrounding the pile is homogeneous and that the installation of piles has no effects on the deformation properties of the soil. However, it is well known that the method of installation may have profound influence on the soil and the subsequent performance of the pile and the pile group. When the displacement (driven) piles are installed in the cohesive strata, the driving has two major effects, namely, the remoulding of the soil around the pile and the creation of excess pore water pressure. This can stiffen the soil around the pile in the case of soft clay but a softer zone in the case of stiff clay. In the case of bored cast in situ piles in clay, the pile installation generally tends to the formation of soft a zone of the soil surrounding the pile. For driven piles in sand severe compaction of sand occurs in the vicinity of the pile tip. In all the

cases the effect of installation of the pile is to create a zone of the soil around the pile which has the strength and deformation characteristics different from the soil mass in general or what has been obtained from the soil investigation report

DeMello (1968) had presented some investigation on the results of the extent of disturbance around the pile during driving. In spite of the conflicting results, it appears that the extent of remoulding varies from 100% at the pile soil interface to almost zero, at about 1.5 to two times the diameter from the pile surface. Although such a variation has not been quantified, on the basis of certain correlations between the pile soil adhesion C_a and the undrained cohesion $C_{u,}$ it appears that the C_a/C_u can be as high as 1.5 for very soft clay and as low as 0.2 for stiff clay. Bored piles, in the case of clay soften the clay during the installation and reduces the C_a to about 0.45 $C_{u.}$ In the case of sand, according to researchers like Meyerhoff (1959), for a loose sand, the disturbed zone extends for 3 to 4 times the pile diameter from the side of the pile, and 2.5 to 3.5 times the diameter below the tip. In the case of medium sand, the extent of disturbance is larger, and is 4.5 to 5.5 times the diameter from the sides of the pile, and 3 to 4.5 times below the tip. The effect of compaction of sand been found to enhance the penetration resistance of the sand by a factor of around 8 due to driving. This increase in the penetration resistance corresponds to roughly a tenfold strength increase and presumably the deformation modulus of the sand also. The final recommendation is that in the theoretical solution for a pile in a homogeneous soil with an equivalent Young's modulus may be considered. In the case of detailed analyses for settlement distribution in the soil near the pile, it is essential to take into account the non-homogeneous nature of the strata arising out of pile installation.

Unusual behaviour

Yanghoon Roh et al.,(2015) had monitored the performance of a piled raft (it is a piled footing) supporting a 41.4 m tall concrete and steel framed composite structure. The foundation system comprised of 3,.06m square footing supported on piles. The soil profile as in Fig 1 at the test site comprised of 3.0m thick fill followed by weathered residual soil layer with N-Value ranging from 18 to 40 upto 11.0m depth. Weathered soft rock layer was found at 6.1m, 7.4m , and 8.9 to 12m. Shallow foundations could not have been provided, keeping the height and the nature of the loading. The authors have reported a lot of variations in the soil profile with further variations between what has been reported and what was observed.

Figure 2 presents the three piled rafts installed at the edge of the building, and the central one was meant for monitoring. It comprised of 5 piles of 23 m length with 1m socketing in the weathered rock. The piles were tubular piles, 0.508m outer diameter with a wall thickness of 0.014m spaced at 0.9m c/c. The piles were installed in a pre-bored holes of 0.65m diameter with the annular space between the outer face of the pile and the inner face of the bore was grouted. The piles were instrumented and monitored for a period of 350 days,including post construction monitoring,that was done to study the long term performance of the foundation.The piles were spaced at 0.9m c/c and socketed into the weathered rock for a depth of 1m. The initial design assumption was that the system would be piled footings (addressed as piled raft). Later a design modification was done for the sake of seismic enhancement. The addition was strip pedestals 1m wide and 0.3m thick. Fig 4 presents the loading sequence with time and Fig 5. presents the load settlement curve. It appears that the measured load transfer curves of the piles showed a contradicting trend, namely an increase in the shaft stress as in and Fig 5 with depth in the upper zone. While the raft load was increasing, when the load reached around 4MN , it started decreasing , which was unusual as the load capacity of the piles of piled raft increased even at a smaller settlement than that of the raft which would have mobilised later with

further increase in the settlement. Although the strip pedestals were not designed to take any load, they would have transferred some loa,d when they came into contact with the ground, as the loading increased in steps.

It was found that various factors affected the measured load-carrying behaviour of the piled raft, including those that were not identified and considered in the design. The measured load-transfer curves of the piles showed an increase in axial load with depth within the upper soil zone, which was different from those assumed in the design and commonly observed from axially loaded piles. Factors that contributed to such unusual load-carrying behavior were the subsoil-layer condition, design modification, and the unplanned addition of strip pedestals. Pile loads continuously increased throughout the entire settlement range, while raft loads increased and then decreased slightly, after a certain settlement range. This was somewhat unusual as the load capacity of piles for a piled raft is mobilized earlier at smaller settlement than that of raft that is mobilized later with further increase in settlement due to the size difference of raft and piles. It is also noted that the proportion of load carried by piles is quite low.

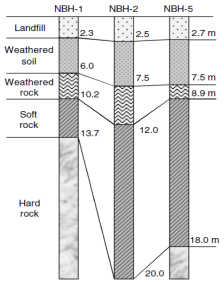

Fig 1 Soil profile at test site Yanghoon Roh et al.(2015

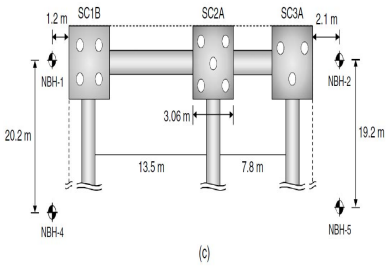

Fig 2 Schematic layout of piled rafts, Yanghoon Roh et al.,(2015)

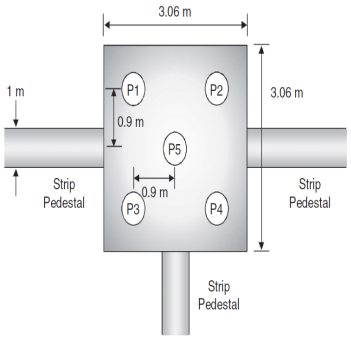

Fig 3 Configuration of test piled raft- Geometry of test piled raft, Yanghoon Roh et al.(2015)

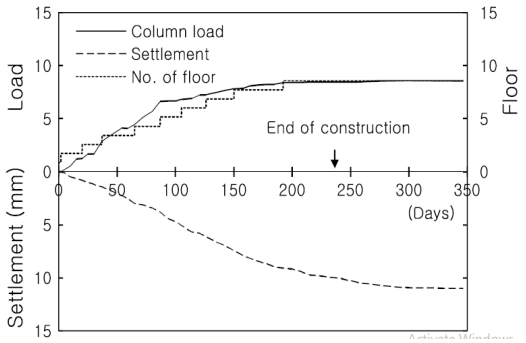

Fig 4 Measured total load on piled raft Vs Time. Yanghoon Roh et al.,(2015)

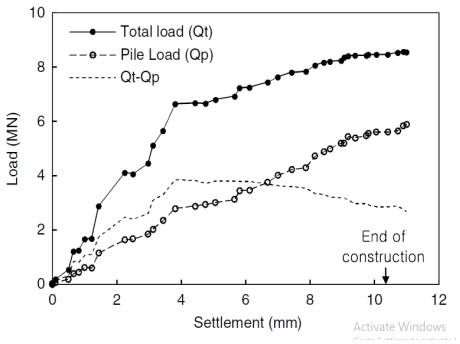

Fig 5: Load-settlement curves - piled raft piles Yanghoon Roh et al.,(2015)

The field monitoring and measured results in this study revealed that actual load response and load-carrying behavior of piled rafts can differ significantly from those assumed in the design. Such unexpected and unidentified load response would not have been caught and detected unless specifically addressed through a field monitoring program. Probably after the load increased the pedestals might have got full contact with the soil and might have

transferred some load. Considering the fact that the piles were socketed, the piles would have carried a higher load.

APPLICABILITY OF THE ABOVE STUDY

Having discussed the various but important site issues, an attempt has been made to see how far the above observations are applicable for the observational study conducted by the author on a piled raft supporting a basement, ground plus 10 storeyed structure, namely Palace Regency. The discussion is based on the inferences made from the existing results.

Paalace Regency at Chennai (Balakumar and Ilamparuthy,2007)

The above structure is a basement + 11 upper floors, basement and the first two floors are commercial and all the other floors are residential. Detailed soil investigation was conducted and the Fig 6 presents a plot of N-value with depth; corresponding E_S values are also given.The state of compaction as can be seen improves with depth and hence it was decided to support it on a piled raft, instead of deep piles as was decided earlier. Due to paucity of time initial design was done by an approximate method). The factor of safety against block failure was checked and found to be satisfactory. The piled raft consists of 93 numbers, 600mm diameter piles 14 m long below the bottom of the raft which was 600mm thick located at 3m below the existing ground level, and the water table was at 4m below the ground level. Figure 7 presents the pile layout with the settlement markers marked in the layout plan. More details are given in the earlier publication. Figure 8 presents loading sequence, and the corresponding settlement observed in a typical section. Table 1 presents the settlement observed with time. The basement had an RC wall, and the ground level slab was fixed on the wall. The wall was passing through the column and a floor beam was cast on the edge connecting the column. The structure itself was a framed structure. The settlement observations commenced after the raft was cast;. The settlement became measurable only after the 3rd level slab was cast. Since the depth of excavation was 3 meters below ground level, and above water table the relief in the stress was about 2.0 t/m^2 considering the buoyant density of the soil excavated. The applied stress, by casting a 600mm thick raft was 1.5t/m^2. Considering the water table at the base of the raft, the raft was subjected to an uplift of 3t/m^2. Till the 3rd floor was cast, the entire applied load from the structure appeared to have been resisted by the upward force, and hence there was no measurable settlement. The raft, RCC wall and the ground level slab formed a box type construction providing a high level of rigidity which was not considered in the design.

Figure 9 presents a comparison between the observed settlement and the settlement obtained through a three-dimensional linear elastic analysis (Balakumar and Ilamparuthy,2007). and Fig 10 presents the load shared by the raft with time, computed from the settlement, based on the elastic theory A comparison of the observed settlement and the computed settlement presents a common trend. In the edges, the computed settlement was higher than the observed settlement. This is mainly because of two issues, namely the raft top was kept flush with the ground and the basement wall which was present all-round the edges which was not considered in the analyses. In other words these two aspects can be considered as a simplification to make the analyses devoid of any complications and it would perhaps save the computational time.

Typically, in the case of Grid G, which is the central grid the settlement observed is far less than the computed one. In this case the difference between the outer column load and the next inner column is somewhat higher; in the numerical analyses the column load was applied as point load at the column location, whereas generally at the base the applied load would get transformed into uniformly distributed load. Hence the method of application of the load could also have played an important role

in causing a difference between the observed and computed settlement. The structural rigidity also could have contributed for the difference in the observed and the computed settlement. Although numerically they are smaller, this study confirms the effect of such short comings.

The sequence of construction was that, piling was done from the ground level and then the excavation was done. Although the excavation was of smaller depth, the levels of pile head was checked after trimming the pile head and no uplift was seen. The mobilisation of raft stress was computed from elastic theory and is provided in Fig 10. In the initial 100 days the applied load was 36 to 38% of the total load, but the settlement was of the order of 1mm to 3mm (7% to 21% of the total observed settlement.) and the raft stress developed was 10%; out of the 35% of the applied load, and the pile group had shared 25% of the load. In the next 100 to 150 days the rate of increase in the raft stress was smaller. The applied load increased by25%, but the raft share increased only by 5%.

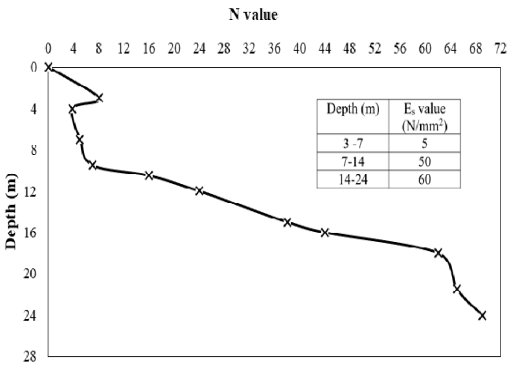

Fig 6: N-Values and E_S with depth.

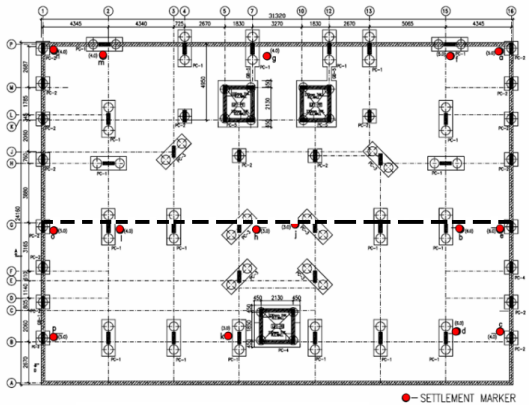

Fig 7 Layout of piles and settlement markers

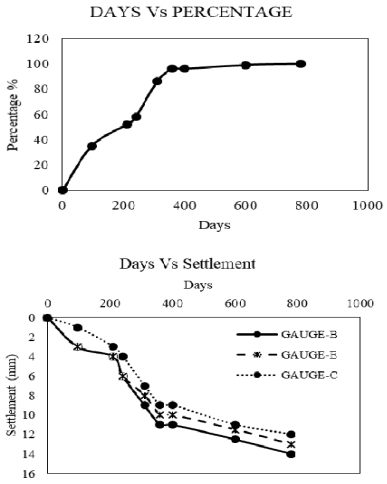

Fig 8. Rate of construction loading and observed settlement with time (typical)

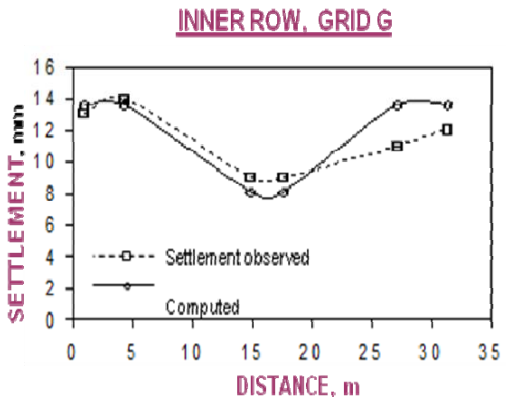

Fig 9: Observed and computed settlement

This is mainly due to the fact that the remoulded soil around the piles was getting consolidated, enhancing the confining pressure around the piles leading to the piles taking a higher share of the applied load. Thereafter the load shared by the raft increased rapidly, and at 600th day the applied load

was nearly 100% and the raft shared 40 % of the load, which increased to 45% finally. It is seen that although the piles were bored cast in situ piles as the strata was predominantly non cohesive, and so there was not much of a loss in shear strength; so, there were practically no detrimental effects due to pile installation. It can be seen from the fact that the enhancement of confining pressure reduced the rate of increase in raft stress between 100 and 200days, during which the applied load was 35 to 55%. The behaviour trend was in conformity with the predicted load sharing and settlement reduction behaviour.

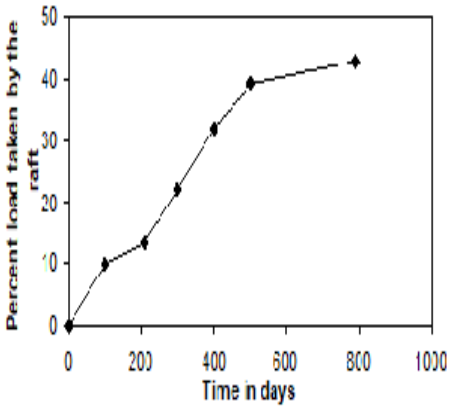

Fig 10 Load shared by raft time (computed)

Table 1 settlement observed with time.

Settlement in mm										
Days	A	B	H	C	G	K	J	E	D	Stages of construction
91	3	3	0	1	2	0	1	3	3	III floor
143	3	3	2	2	2	2	2	3	3	VI floor
204	4	4	3	3	3	3	2	4	4	VII floor
236	5	6	3	4	4	3	3	6	6	VIII floor
312	7	9	5	7	6	5	4	9	8	X floor
360	9	11	6	9	8	7	5	10	10	Completion
402	9	11	6	9	9	7	8	10	10	Post construction
796	12	14	9	12	12	10	11	13	13	Post construction

IN-SITU TESTING AND DESIGN METHOD

In the case of most of the numerical simulations, the reliability of the evaluation methods adopted to obtain the insitu parameters of various layers is very important. In order to obtain the insitu parameters directly, tests conducted with flat plate dilatometer and Menard's pressuremeter appear to be very effective. Research work carried out on behalf of ISSMGE- Technical Committee TC16 (Ground Property Characterization from In-Situ Testing), by Marchetti et al.,(2001) had brought out the features of the instrument, testing procedure and interpretation methods. The main advantage with this method is that it does not need any pre-boring like pressuremeter tests. Further pressure meter tests provide shear modulus and pressure versus volume change response; for evaluating the pressure meter modulus Poisson's ratio has to be assumed. Although correlations are available between N-values and pressure meter modulus these correlations are expected to be site specific and hence using them directly may not be advisable. However, pressuremeter tests have been successfully conducted to predict the load settlement response of the piles and the shaft stress distribution along the length of the piles, and the results have been published (Frank et al.,1991).

Frank et al., (1991) had studied the load settlement response of two piles forming a part of a bridge foundation and had established that their behaviour can be predicted by conducting the pressure meter test. Their prediction of pile behaviour is based on a tri-linear relationship for the shaft friction mobilisation based on the pressure meter tests. The model they had used is given in Fig 11;,and more details can be had from Frank et al., (1991. The terms k_τ and k_q are given as functions of pressuremeter modulus and pile diameter. The first segment has a constant slope. The slope of the second line has a flatter slope than the initial segment and third segment represents the mobilisation of total skin friction. The end of the second part is the limiting value of the friction. The slopes of the

lines depend upon the pressuremeter modulus (E_m) and radius of the pile. Frank et al., (1991) had conducted the pressuremeter tests on two piles forming a part of a bridge foundation and predicted the load transfer with depth under the pile loads 3.2MN and 7.2MN for the two test piles for the two test piles the pile soil system was divided into number of segments and the load transfer functions for the skin friction were constructed according to the trilinear simulation using the pressure meter data E_m and p_t- namely the limit pressure, more details are given in Frank et al.(1991),. Figure 12 presents the shaft stress distribution obtained for the test piles from test and numerical study. The close agreement between theoretical and the experimental values establish the effectiveness of the pressure meter test.

It has been established that while studying the settlement behaviour of the pile group, that if the pile group with the soil prism can be considered as a single pier, then the procedure applied for a single pile behaviour can be used for the prediction of the load settlement response of the equivalent pier numerically, using axisymmetric analyses. This establishes the fact that if the pile group of piled raft can be idealised as a single large pier (Balakumar et al., 2013), then the procedure adopted by Frank et al(1991) can be used to predict the shaft friction (pier shaft friction) of pile group of piled raft foundations adopting the equivalent pier modulus given by the expression given below:

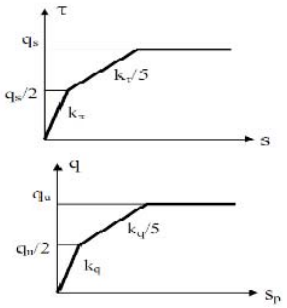

Fig 11 Trilinear model (Frank et al (1991))

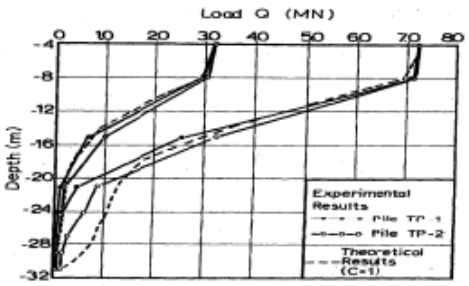

Fig 12 Comparison of Theoretical and Experimental Load Distributions for Test Piles, (Roger Frank et al., 1991)

The equivalent pier modulus e_{eq} is given by the expression, which can be used in the analyses is given by:

$$Eeq = E_S + (E_p - E_s)\, A_t/A_g \qquad [1]$$

The value of the Es can be derived from pressure meter tests, E_p is the pile material modulus, A_t is the total cross sectional area of the piles and A_g is the gross plan area of the group. ed in the detailed analyses.

CONCLUSIONS

The present study has established that monitoring during construction, and post construction is essential to identify the causes for any variations between the computed and observed values, particularly settlement and general behaviour. Whenever deep excavation is involved, and is done after installing piles, there are chances of tension getting mobilised in the pile due to the heave. Also, addition of structural elements during the construction of the foundation system can change the load settlement response as observed by researchers. Similarly pile installation remoulds the surrounding soil to varying degrees. Prediction of such issues during design may not be possible with the help of SPT and CPT results. This necessitates not only the monitoring of the works but also evaluations of in-situ parameters after the piles are installed to assess the remoulding effect. The changed parameters may be used to validate the design. In this process pressure meter tests and tests with dilatometers

appear to be an ideal method for assessing pre construction and the post construction parameters which can be used for validation of the design using equivalent pier concept.

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STUDIES ON STABILITY OF SEAWALLS OF KARNATAKA COAST

H.B.Krishna Rao [1], S.J.Swamy [2] B R Kiran[3] P.K.Suresh [4] R.Sundaravadivelu [5]

[1,2,3]*Karnataka Engineering Research Station, Mysore, krishnaraohb@yahoo.com,*

[4,5]*Department of Ocean Engineering,IIT Madras,Chennai * sureshpk2000@gmail.com, rsun@iitm.ac.in*

ABSTRACT

The coastline of Karnataka stretches from Mangalore to Karwar over a length of about 300km. It is bounded on the west side by Arabian sea and east by Western ghats. Along the coast ten major rivers like Netravathy, Gangavathy, Sharavathy, Sowparnika confluences with Arabian Sea. The coast is mainly influenced by south west monsoon from June to September. The waves during the non-monsoon months are generally less than 1 m in height.- The predominant wave direction is W and N-W and occasionally S-W directions. The littoral drift along Karnataka coast very low. However erosions are reported on open coast, the erosions reported particularly on the open coasts during monsoon. The coast consists of one major port namely New Mangalore port and minor ports like Old Mangalore, Batkal, Gangoli, Malpe.. Coastal erosion along Karnataka coast dominated by direct wave action. Along certain stretches, there is concentration of wave energy due to refraction and these areas are more vulnerable to erosion. The tides in this region are mixed semi-diurnal dominant, the range of which increases towards the north. Karnataka Engineering Research Station, Mysore under Government of Karnataka has carried out observations on beach formations along the coast for over 25 Km length every year in critical areas. Based on the observations the eroding coasts are identified. In order to combat erosion seawall section was designed. Physical model studies are done in flumes to assess the stability and designs are finalised. The paper describes the details of observations and modifications of seawall sections.

Keywords: coastline, waves, littoral drift, erosion, seawall

1. INTRODUCTION

Karnataka has about 300 km coastal line bordering the Arabian sea on its western side. Erosion at various segment along the coastal is almost an annual feature during the south west monsoon period damaging valuable lands, natural wealth and human habitation. As reported by Dattari (1973) waves reaching upto 6.5 m in height have been recorded off the Karnataka coast. A study carried out from satellite imageries by Rajawat et al (2015) concludes that nearly 0.47Km^2 coastline of the state is under threat of erosion. A Technical Sub-committee (TSC) was constitute first in 1978 which recommended temporary protection measures to combat beach erosion. On this basis, temporary seawalls with single layer armour stones were constructed. Government of Karnataka, considering the severity of problem constituted a Technical sub-committee to look into the aspect of erosion problem, to find a permanent solution by evolving suitable design and measures and entrusted Karnataka Engineering Research Station, Krishnarajasagara with the work of design and also to conduct model studies to check the efficiency of the design. The designs of permanent seawall comprising of two layers of armour stones were recommended by the TSC during 1982. The permanent seawall design comprised of individual armour stone of 1360 Kg were laid to a thickness of 1.85m, heavier weight of armour stones, due to construction difficulties, slowly necessitated a need to examine by the Technical Experts Committee (TEC) set up in April 1987. Later in August 1987 two new design of seawall were furnished by the TEC. While working out of these designs the entire Karnataka cost was divided into two reaches from Mangalore to Marvanthe adopting structure slope of 1:5 and other from Marvanthe to Karwar adopting structure slope of 1:7.(Fig 1 &2).

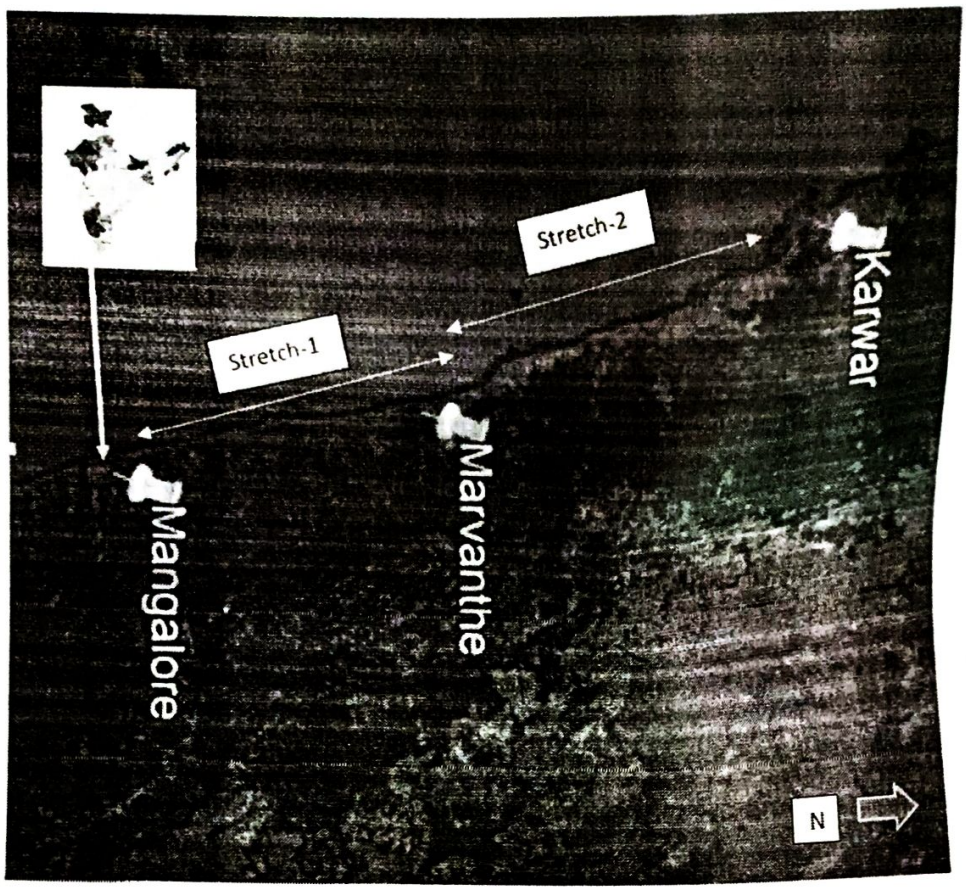

Fig 1 Index map

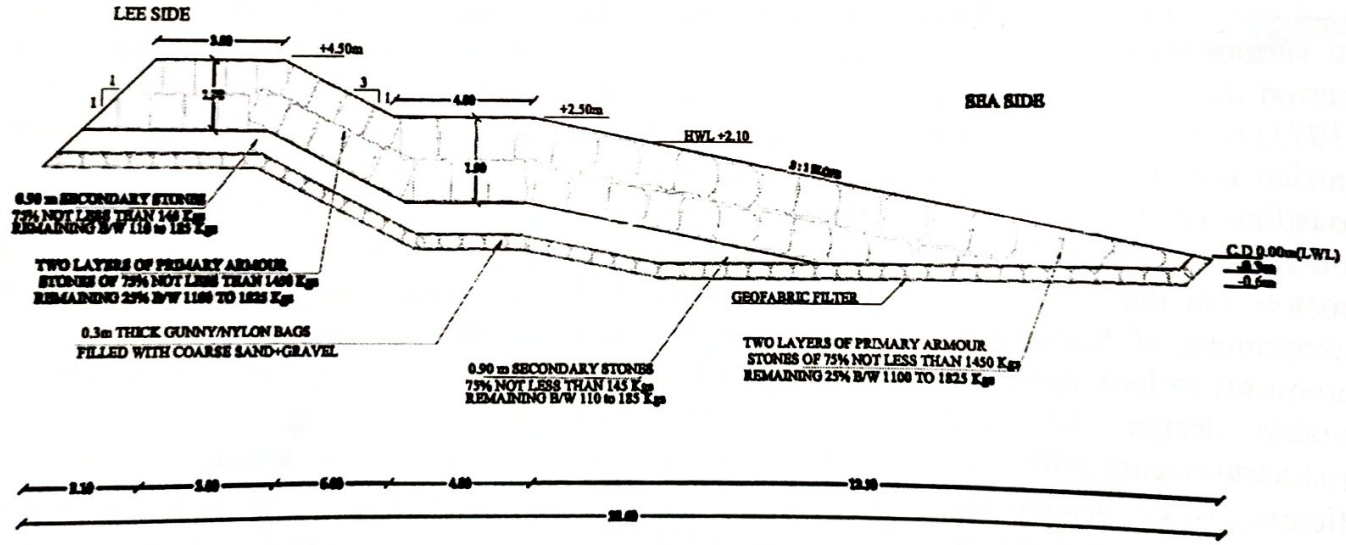

Fig 2 Typical design

Further, the technical sub-committee in its 6th meeting held on 27.6.1991 opined to design seawall for different beach slopes ranging from 1: 5 to 1: 7 as type design to account for in the absence of relevant data. (1:5 Slope in Strech 1 and 1:7 in strech 2 shown in fig 1)

Karnataka Engineering Research Station , KERS, took up this work, and on the basis of average beach slope type designs comprising of different beach slopes ranging from 1:25 to 1:10 beyond

the toe has been worked out. These designs are to be finalised after conducting physical model studies. Designs for Seawalls have been finalysed at many sites in West coast of Karnataka since several years. In the meantime recently the department of fisheries requested the institute to develop a sea wall design at Mangalore where the slope of beach is 1:20 beyond CD in surf zone.

2 .OBJECTIVE.

Sea walls are being felt indispensible as they are comparatively economical and immediate solution at vulnerable small reaches where net retreat with time is insignificant. Small stretches of west coast of Karnataka especially in Mangalore and Udupi districts are under severe erosion during monsoon. The coast is highly populated one with fishing hamlets. A site specific seawall is to be designed based on physical model studies.

3. DETAILS OF SITE

The length of reach is 275 M. The road level is (+) 6.650M.. Houses are located at +5.5 to +6.00 M level from CD. High Flood Line (Max wave run up) is up to + 3.80 M during HTL of 1.90mtr at this site. On the day of inspection of site, the beach slope of about 1 in 10 up to High Tide Line from CD. And about 1 in 17 to 20 above High tide line of +1.90 M.

4 .COASTAL PARAMETERS FOR THE STUDY

1. Effective size (D_{50}) of the Beach Material = 0.10mm
2. Breaker wave height = 1.30 m
3. Wave period = 8 Secs
4. Porosity of the Beach material = 40%
5. Manning's constant = n = 0.002
6. Depth of water at CD= HTL = 1.90 M
7. Storm surge = 0.30m
8. Maximum wave run up data supplied by Project authorities and local enquiry = 1.60 m
9. The position of location of "Toe" of the proposed sea wall is just 10 m from HTL line.
10. The position of Houses is about 15 m from max wave run up line.

5. DETAILS OF PHYSICAL MODEL

The theoretical designs are prepared as per the Shore Protection Manual Vol-II U S Army Coastal Engineering Research Center. Specific gravity of Armour stone =2.65 with adequate

filter, have been considered for the design of Sea wall. For the purpose of model study the laboratory a two dimensional wave flume of dimensions 44.5m* 1.50m * 1.50 m having a glass panel side at one end and a flap type wave speed dynodrive motor at the other end capable of generating only monochromatic waves of required height and Period. The wave generating unit consists of Variable speed mechanical motor, Gear box, Fly wheel, Flap unit (Fig 3).

Fig 3 Physical model flume

A sectional model of the seawall with granite armour stones with a model to proto scale of 1:12.205 was laid on a sand bed using High Density Polythene (HDP) mat as filter (Fig 4). A bed profile slope of 1:20 was provided beyond the toe. The model was run to a period of 1 hr. 46 min. 37 sec. for each level (corresponding to 6hr. 12.5 min. in proto). The sea wall section drawing and beach slope is plotted on the glass frame in the model then the sand is shaped as per the beach slope and sea wall section. HDPE mat will be put on shaped seawall section. In the model study instead of using gunny bags ,we use a sand layer of defined thickness on the HDPE mat, in proto gunny bags is used. Two layer of secondary armour stone is placed on the sand layer then two layer of primary armour stone is placed maintaining specified gradation. Each primary armour stone and secondary armour stone is weighed and counted before using in the model study.

The model bed is made rigid from the wave generating end till 0.50 mtr from CD, accomodating a moving bed in front of the sea wall to observe the possible qualitative erosion/accretion in front of the Toe.The model studies were carried out to know the effect of waves on seawalls for a period of 5 day cycle, at different water depths. As it was not possible to stimulate the actual

irregular wave conditions with the existing facilities in the laboratory, monochromatic waves of designed breaker wave height were made to act on the sea wall with the help of flap type wave generating unit. Each day cycle consisted of five levels starting from the level corresponding to , Mean Sea Level (mean water level), being increased to High Water Level including storm surge, lowering to Mean Sea Level again, further lowering to the Low Water Level/Chart Datum, finally again back to Mean Sea Level (from where started). Thus the sequence of operation being Mean Water Level, High Water Level, Mean Sea Level, Low Water Level/Chart datum and again Mean Water Level

Table 1 Proto - Model Details

Sl. No.	PARTICULARS	PROTO	MODEL
1	Breaker wave height (Hb)	2.762 m	0.226m
2	Wave period (T)	8 seconds	2.289 sec
3	Storm surge	1.60 m	0.131 m
4	Primary armour layer thickness	0.3048 m	0.025 m
5	Weight of each primary armour stone (W)	1.55 m	0.127 m
6	Secondary armour layer thickness	800.00 Kg	0.440 Kg
7	Weight of each secondary layer stones(W/10)	0.72 m	0.059 m
8	Seating of toe including filter	80.00 Kg	0.044 Kg
9	High water level (HWL + Storm Surge = d*s*)	-0.75m	-0.060 m
10	Mean water level(MWL)	2.20 m	0.180 m
11	Low water level (LWL)(CD)	1.3 m	0.1065 m

6. OBSERVATION AND DISCUSSION :

At the end of the 5th day cycle, it was observed that the primary armour stones dislodged beyond the toe were 6 No's, compared to the total number of 1214 No's of stones. It is 0.494 % which is less than 1%. Hence design is safe. It is preferred to lay heavier armour weighing more than 1000 Kg at "Toe portion" to make the Toe more stable. Modification of front slope with 1:6 from 1:5, made the structure comparatively less reflective promoting accretion near the toe rather than scouring and Toe protection improved its stability. The proposed design is furnished vide Fig 5.

In the event of rise in water level during storm beyond +2.20 mtr and wave period more than 8 secs with breaker wave height more than 2.75m there is likely hood of the "Toe " getting damaged. Hence as in the case of any structure, a periodical proper inspection and maintenance of the Toe and front slope is also important act of which can pay highest dividend in the long run.

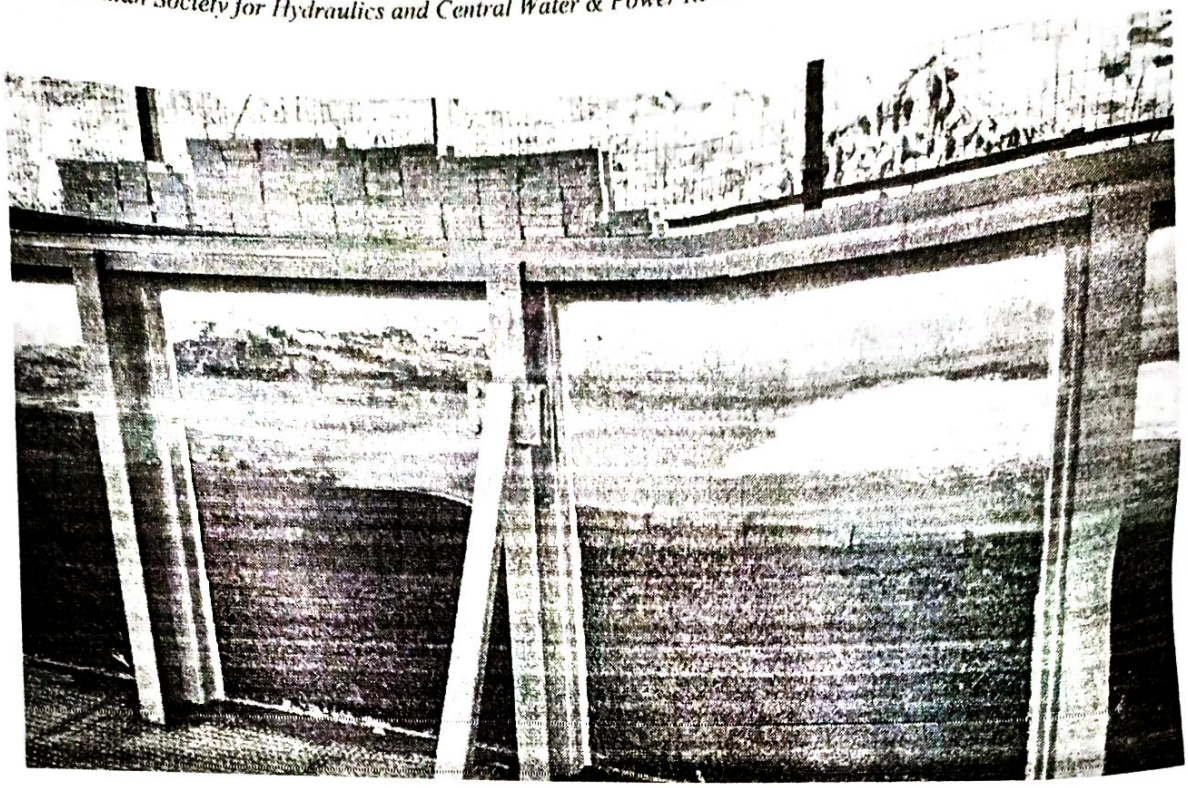

Fig 4 Model trial run

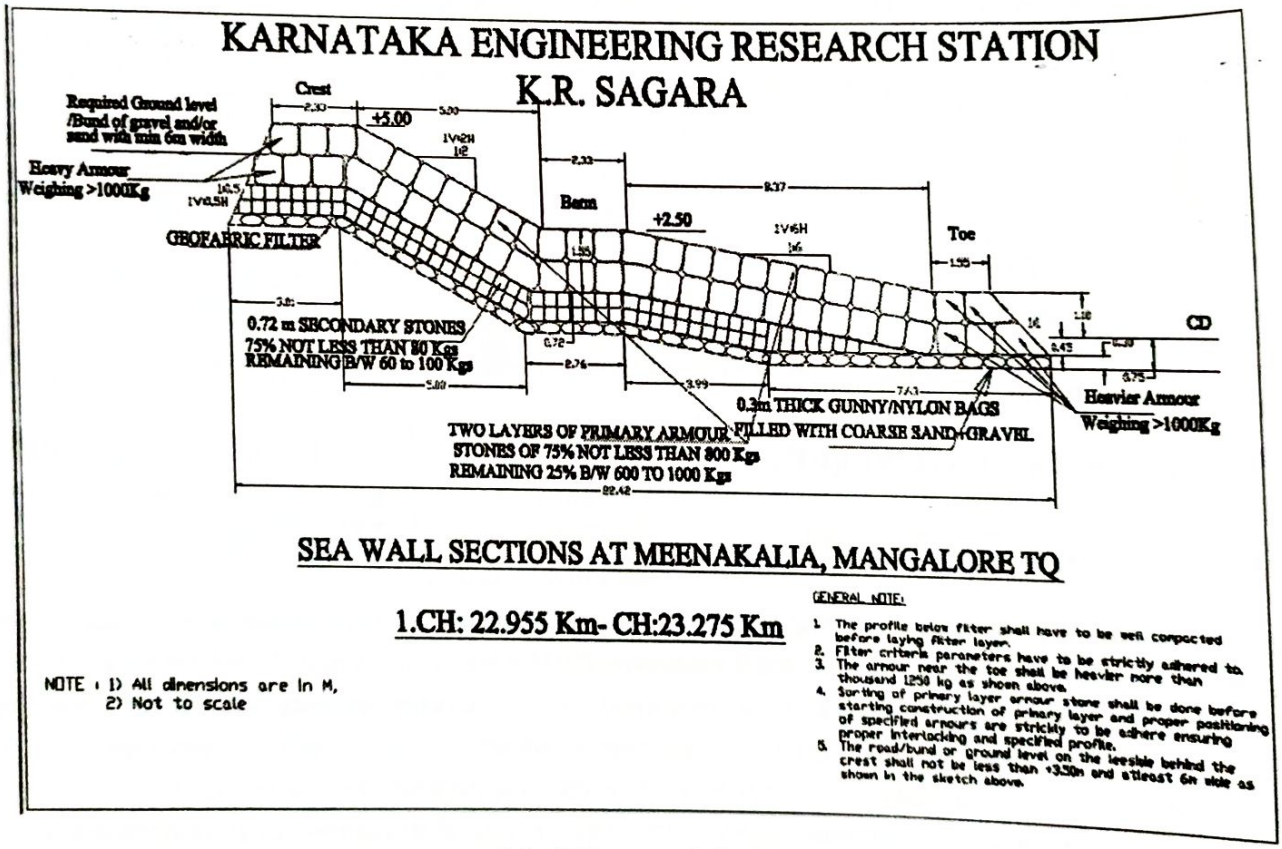

Fig 5 Proposed design

7. CONCLUSION

Initially a theoretical section was designed based on the guidelines by Shore Protection Manual. This was tested for hydraulic stability in a flume and the disturbance was in the range of 0.494%. Hence design is safe. It is preferred to lay heavier armour weighing more than 1000 Kg at Toe portion to make the "Toe" more stable

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Biogas Generation from Domestic Waste with the help of Algal Sequestration

Malini Gayathri M [1] , Thenmozhi E [2] , Riyanka Irene Sureshraj [3]

Assistant Professor, Department of Civil Engineering, Meenakshi Sundararajan Engineering College, Chennai, India [1]

U.G. Student, Department of Civil Engineering, Meenakshi Sundararajan Engineering College, Chennai, India [2]

U.G. Student, Department of Civil Engineering, Meenakshi Sundararajan Engineering College, Chennai, India [3]

ABSTRACT - Kitchen waste can be utilized to produce biogas due to its high biodegradability, calorific value and nutritive value to microbes, which will reduce our dependency on fossil fuels. The research work was conducted to investigate the production ability of biogas as an alternative energy from kitchen waste with co-digestion of cow manure through anaerobic digestion (AD). Firstly, digester was prepared to observe the individual degradation rate of kitchen waste, cow manure and the combination of co-digested kitchen waste with cow manure at room temperature and at temperature of mesophilic digestion respectively and observed the degradation rate for co-digested kitchen waste with cow manure was higher than kitchen waste and cow manure alone. Secondly, digester was constructed to observe the effect of alkalinity at mesophilic digestion temperature. Finally, a portable biogas reactor was fabricated for pilot-scale biogas production which included an agitator and heating system. This reactor was operated at both digestion temperature and room temperature. It is observed that the digestion rate was faster at mesophilic digestion than room temperature. The prime object of this work was to investigate the prospect of kitchen waste for biogas production and ultimate protection of environment from the bad effect of methane gas that would be produced by uncontrolled anaerobic digestion.

KEYWORDS: Biogas, anaerobic digestion, filtration, carbon sequestration

I. INTRODUCTION

Due to scarcity of petroleum and coal it threatens supply of fuel throughout the world also problem of their combustion led to research in different corners to get access the new sources of energy, like renewable energy resources. Solar energy, wind energy, different thermal and hydro sources of energy, biogas are all renewable energy resources. But, biogas is distinct from other renewable energies because of its characteristics of using, controlling and collecting organic wastes and at the same time producing fertilizer and water for use in agricultural irrigation. Biogas does not have any geographical limitations nor does it require advanced technology for producing energy, also it is very simple to use and apply.

II. METHODOLOGY

The methodology involved in the extraction of biogas from the domestic waste is starting from collection of sufficient amount of domestic waste(both solid and liquid) which includes leftover food, vegetable waste ,water used for washing hands etc. This is followed by testing the physical and chemical characteristics of the collected waste water. The waste water should be properly treated through organic method so that it could be effectively used in the biogas plant. After treatment the characteristics of the water is again tested to check the efficiency of the treatment process. Finally Carbon sequestration is carried out with the filtered water which is later mixed with domestic waste and the resultant inoculums is thus fed into the biogas plant for the anaerobic digestion to take place. The project execution follows the sequence of work mentioned below.

Stage 1-Physical Chemical Characterization of Domestic Waste Water

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Reason: To know the characteristics of waste water so that quality of water can be analyzed.
Stage 2- Filtration of Waste Water

Reason: To make use of waste water instead of normal water for anaerobic digestion to take place.

Stage 3- Carbon Sequestration

Reason: To capture the carbon dioxide emitted as well as to from an algal biomass which will be used a stimulant in biogas production process instead of the conventional cow dung.

Stage 4- Biogas Production

III. PHYSICAL CHEMICAL CHARACTERIZATION OF WASTE WATER

Municipal wastewater is mainly comprised of water (99.9%) together with relatively small concentrations of suspended and dissolved organic and inorganic solids. Among the organic substances present in wastewater are carbohydrates, lignin, fats, soaps, synthetic detergents, proteins and their decomposition products. Municipal wastewater also contains a variety of inorganic substances from domestic and industrial sources, including a number of potentially toxic elements such as copper, lead, zinc, etc. Table 1 gives the physical chemical characteristics of raw waste water.

PARAMETERS	**UNTREATED DOMESTIC**
SAMPLE DETAILS	**WASTEWATER**
APPEARANCE	A TURBID WATER
COLOR	DIRTY COLOR
ODOUR	UNPLEASANT ODOUR
TURBIDITY	5 NTU
TOTAL DISSOLVED SOLIDS	11593 ppm
TOTAL SUSPENDED SOLIDS	3493 ppm
ELECTRICAL CONDUCTIVITY	23.420 macro Siemens
pH VALUE	9.5
ALKALINITY	5.24
TOTAL HARDNESS	1035.6 ppm
CALCIUM	356.7 ppm
MAGNESIUM	982.3 ppm
SODIUM	1040.7 ppm
POTASSIUM	270.3 ppm
CHLORIDE	1987.5 ppm
FLUORIDE	6.3 ppm
IRON	10.5 ppm
AMMONIUM	140.3 ppm
NITRATE	145.6 ppm
SULPHATE	1198.2 ppm
COPPER	12.35 ppm
ZINC	21.93 ppm
PHOSPHORUS	20.4 ppm
NITRITE	12.56 ppm

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IV. FILTRATION OF WASTE WATER

Waste Water treatment is the process of removing contaminants from waste water, primarily from household sewage. It includes physical, chemical, and biological processes to remove these contaminants and produce environmentally safe treated wastewater (or treated effluent). A by-product of the treatment is usually a semi-solid waste or slurry, called sludge, that has to undergo further treatment before being suitable for disposal or land application. So in our laboratory treatment setup, we used layers of 12mm aggregate, 20mm aggregate, orange peel powder and sand. Before introducing waste water into the filter media, screening process is done to remove the coarser particles. And Table 2 gives the characteristics of filtered water.

TABLE II PHYSICAL CHEMICAL CHARATERIZATION OF FILTERED WATER

SAMPLE COLLECTION DATE	**09/01/2017**
SAMPLE DETAILS	**DOMESTIC WATER**
SAMPLE QUANTITY	**10LITRES**
APPEARANCE	VISIBLE SUSENDED PARTICLES
COLOR	SLIGHT DIRTY COLOURLESS WATER
ODOUR	SLIGHT STINKY SMELL
TURBIDITY	5 NTU
TOTAL DISSOLVED SOLIDS	5934.5 mg/litre
TOTAL SUSPENDED SOLIDS	219.5 mg/litre
ELECTRICAL CONDUCTIVITY	15.49 macro Siemens
pH VALUE	8.45
ALKALINITY pH	5.12
TOTAL HARDNESS	574.6 mg/litre
CALCIUM	350.5 mg/litre
MAGNESIUM	975.3 mg/litre
SODIUM	1035.7 mg/litre
POTASSIUM	246.7 mg/litre
CHLORIDE	985.7 mg/litre
FLOURIDE	5.91 mg/litre
IRON	2.023 mg/litre
AMMONIUM	125.7 mg/litre
NITRATE	140.6 mg/litre
SULPHATE	1056.7 mg/litre
COPPER	10.2 mg/litre
ZINC	20.6 mg/litre
PHOSPHOROUS	14.3 mg/litre
NITRITE	10.1 ppm

V. CARBON SEQUESTRATION

In recent years, biomass-derived fuels have received increasing attention as a solution to the nation's continued and growing dependence on imported petroleum-based fuels, which exposes the country to the risk of critical disruptions in fuel supply and concern of climate changes. Some of the aspects of algal bio fuel production that have combined to capture the interest of researchers and entrepreneurs around the world include

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a) High productivity of biomass yields per acre of cultivation.

b) Use of otherwise non-productive, no arable land, and avoids nutrients used for conventional agriculture.

c) Non-food-based feedstock resources.

d) Reduced competition for limited freshwater supplies by utilizing waste water, produced water, and saline water.

In this carbon sequestration we made a closed photo bioreactor provided algal species called *schenedesmus.* It is green algae through which bio sequestration is achieved. The CO_2 was incorporated at the amount of 5% to 90%. And it is observed that the tolerance limit of the bioreactor is 80%. Therefore the amount of carbon sequestered is 53.29% for schenedesmus species. And Table 3 gives the characteristics of the sequestered sample.

TABLE III. CHARACTERISTICS OF SEQUESTERED SAMPLE

ORGANISM	SCHENEDESMUS
SAMPLE COLLECTION DATE	10/02/2017
SAMPLE DETAILS	DOMESTIC WATER
SAMPLE QUANTITY	10 LITRES
APPEARANCE	Dark Green
ODOUR	Unpleasant odour
TURBIDITY	2 NTU
TDS	1067 mg/litre
TSS	767 mg/litre
TOTAL SOLIDS	1952 PPM
ELECTRICAL CONDUCTIVITY	5.0 macro Siemens
PH	6.63
ALKALINITY PH	5.09
TOTAL HARDNESS	550 mg/litre
CALCIUM	156 mg/litre
MAGNESIUM	67.7 mg/litre
SODIUM	498.7 mg/litre
POTASSIUM	98.7 mg/litre
CHLORIDE	287.9 mg/litre
FLUORIDE	2.4 PPM
IRON	0.98 PPM
AMMONIA	5.12 mg/litre
NITRATE	7.93 mg/litre
SULPHATE	45.7 PPM
COPPER	1.02 mg/litre
ZINC	0.91 PPM
NICKEL	Not detected
CADMIUM	In traces
CARBOHYDRATES	0.11 gm

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LIPIDS	10.35 mg/litre
VITAMIN C	9.34 mg/litre
VITAMIN E	Nil
BOD	120.3 mg/litre
COD	255.3 mg/litre
VITAMIN B1	Nil
VITAMIN B2	Nil

VI. BIOGAS PRODUCTION

It is also referred to as biomethanization, is a natural process that takes place in absence of air (oxygen). It involves biochemical decomposition of complex organic material by various biochemical processes with release of energy rich biogas and production of nutritious effluents.

Various Biological process involved are

1. Hydrolysis

2. Acidification

3. Methanogenesis

A. Hydrolysis

In the first step the organic matter is enzymolysed externally by extracellular enzymes, cellulose, amylase, protease & lipase, of microorganisms. Bacteria decompose long chains of complex carbohydrates, proteins, & lipids into small chains. For example, Polysaccharides are converted into monosaccharide. Proteins are split into peptides and amino acids.

B. Acidification

Acid-producing bacteria, involved this step, convert the intermediates of fermenting bacteria into acetic acid, hydrogen and carbon dioxide. These bacteria are anaerobic and can grow under acidic conditions. To produce acetic acid, they need oxygen and carbon. For this, they use dissolved O_2 or bounded-oxygen. Hereby, the acid-producing bacteria create anaerobic condition which is essential for the methane producing microorganisms. Also, they reduce the compounds with low molecular weights into alcohols, organic acids, amino acids, carbon dioxide, hydrogen sulphide and traces of methane. From a chemical point, this process is partially endergonic (i.e. only possible with energy input), since bacteria alone are not capable of sustaining that type of reaction.

C. Methanogenesis

Methane-producing bacteria, which were involved in the third step, decompose compounds having low molecular weight. They utilize hydrogen, carbon dioxide and acetic acid to form methane and carbon dioxide. Under natural conditions, CH_4 producing microorganisms occur to the extent that anaerobic conditions are provided, e.g. under water (for example in marine sediments),and in marshes. They are basically anaerobic and very sensitive to environmental changes, if any occurs. The methanogenicbacteria belongs to the archaebacter genus, i.e. to a group of bacteria with heterogeneous morphology and lot of common biochemical and molecular-biological properties that distinguishes them from other bacteria. The main difference lies in the makeup of the bacteria's cell walls.

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D. Construction of Biogas Plant

For the construction of biogas plant, we used a water can of 20liters and polyvinylchloride pipes in order to create a anaerobic digester. And the digestion of organic materials takes place when the digester is maintained at 30°C to 40°C. Mix ratio of water and organic waste should be 1:1 that is 1Kg of waste is mixed with 1 liters of water. Tire tube is used as a pressure gauge for storage of gas.

VII. CONCLUSION

After the thorough study on the performance of reactor and evolution of acidogenic reactor, the following conclusion have been reached, As a result of the treatment of food effluent using microorganisms, the useful bi product, bio-gas has been produced with a considerable rate of decrease in the values of COD, BOD, pH, acidity and alkalinity. Through the successful anaerobic processing inside the reactor in 30days food waste treatment, methanogen gradually converts the organic acids into the methane gas and carbon dioxide, which indicates that the waste has better anaerobic biodegradability. Thus achieves a waste of resource utilization. The results show that reactor can treat food waste with high contaminated load.

ACKNOWLEDGMENT

An endeavor over a long period can be successfully only with the advice and support of many well wishers. We take this opportunity to express our gratitude and appreciation to all of them. We are highly thankful to our principal Dr. P.K.Suresh**,** academic dean Dr. K.Umarani for their valuable efforts and appreciation to our project work. We take this opportunity to express our gratitude and heartfelt thanks to Prof. V.S. Sampath**,** Head of the Department and Dr. L.Ramajeyam**,** Dean of the Department for giving us encouragement for the successful completion of project work.

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TEAM : 1

KNOWLEDGE ENGINEERING FOR E-GRIEVANCE

Ms. S.Aishwarya lakshmi and Mrs.V.Sundari
Assistant Professor, Department of Computer Science & Engineering
MeenakshiSundararajan Engineering College, Chennai, Tamil Nadu, India
aish.sri05@gmail.com
sundarikkt@gmail.com

Abstract — Entity resolution (ER), also known as duplication detection, record linkage, etc. is the task of finding records referring to the same real-world entity in a dataset. A common framework of entity resolution is to first find similar record pairs, and perform the threshold-based similarity join under some similarity metrics, and then combine these pairwise results to partition all records into groups, each of which representing the same real-world entity.

This paper deals with rule-based entity resolution for E-grievance. Entity resolution is a widely explored analysis community. All this time it has been convention to transmit and thereafter receive assistance for the complaints manually; this takes plenty of time to complete the process.

I.INTRODUCTION

Data Mining also called as data discovery is the process of discovering patterns in large data sets involving methods at the intersection of machine learning, statistics, and database systems. It is the practice of examining large pre-existing databases in order to generate new information. Data mining is the analysis step of the "knowledge discovery in databases" process, or KDD. Aside from the raw analysis step,it also involves database and data management aspects, datapreprocessing, model and inference considerations,interestingness metrics, complexity considerations, post-processing of discovered structures, visualization, and online updation.Data mining is the process of analyzing hidden patterns of data according to different perspectives for categorization into useful information, which is collected and assembled in common areas, such as data warehouses, for efficient analysis, data mining algorithms, facilitating business decision making and other information requirements to ultimately cut costs and increase revenue.

II. PRESENT SYSTEM

In this project, the matter of rule-based entity resolution for E-grievance is observed. Entity resolution (ER) is a wide explored analysis community. Earlier, sending the complaints and helping the complaints to specific terms area unit wiped out manual method. In the proposed system, enforcement of the rule-based entity resolution for sending the E-grievance is being implemented. As a result of the elapsing of some time, records concerning the same entity discovered in various time periods may even be totally different. Besides ancient similarity-based ER approaches, by strictly exploring several information quality rules, e.g., matching dependency and data currency, plentiful information are obtained to facilitate and to handle this draw back. Throughout this project, usage of such rules to assign the work to individual department mechanically is implemented. Hence, the experimental result on every real and artificial information shows that the entity resolution technique helps in achieving every high accuracy and efficiency on datasets with hidden temporal information.This also solves the problems of entity resolution on inaccurate temporal knowledge. A rule-based ER methodology to handle the entity price evolution effectively for process E-grievance is observed here. By applying rules to assign the work to individual department mechanically and to work out the currency order of records from target attributes is applied . Numerous experiments on each real-life and artificial knowledge verify the ways out-performs ancient ways in entity resolution

A SURVEY ON HUMAN ACTIVITY RECOGNITION TECHNIQUES

E.Akshaya
Computer Science and Engineering
Sundararajan Engineering College
Chennai, India
prabavathi2070@gmail.com

C. Jerin Mahibha
Senior Assistant Professor, Computer Science and Engineering
Meenakshi Sundararajan Engineering College
Chennai, India

Abstract—Human activity recognition is the problem of analyzing the human movement and recognizing various activities that are performed. Human activity recognition has a wide range of applications in many areas. Human activity recognition plays a significant role in the area of surveillance. In surveillance systems, human activity recognition is used to detect any abnormal behavior and to prevent them .This paper gives a study of various human activity recognition techniques such as single human activity recognition, human-object activity recognition , multiple human activity recognition.

Keywords—*Activity recognition; human-object interaction ;human-human interaction, feature extraction, object detection*

I. INTRODUCTION

A large number of videos are being captured by the surveillance cameras everyday . The surveillance cameras are available everywhere and the number of videos generated by these cameras are enormous. Therefore , to monitor human activities ,human activity recognition techniques can be used to determine abnormal human behavior. Various methods have been proposed to determine the human behavior and these are classified based on the interaction among the moving objects in the video.

Surveillance systems demand for incorporation of smart systems that automatically recognize human activity .Abnormal activities are the activities that are rarely performed by humans. Normal activities occur frequently.Hence , by comparing the features ,abnormal activities can be differentiated from normal activities.

The sections in this paper are organized as follows. Section II describes the works related to single human activity recognition , Section III describes the works related to human object interaction recognition ,Section IV describes the work related to multiple human activity recognition, Section V gives the performance analysis off various techniques, Section VI deals with the challenges involved in activity recognition ,Section VII gives the conclusion and section VIII gives the references..

LITERATURE SURVEY

II. SINGLE HUMAN ACTIVITY RECOGNITION

Single human activity includes the activities that are performed only by a single person such as walking, falling , jumping, etc .

In[1], B.Robert , B.Jackson and N.Papanikopoulos had proposed a system that would track human in videos and would recognize the activity that is being performed by them. Human tracking is done by foreground segmentation using Gaussian mixture model and kalman filter .Human activity is recognized by calculating the position and velocity features. A warning is produced when the pedestrian enters the prohibited area or loiters for a longer time. However , the limitations pertaining to the system are that the system cannot adapt to rapid changes in illumination of the scenes

In[2], E. Abdalrahman, S. Cheema, C. Thurau and C. Bauckhage proposed a system that uses the temporal key poses. The motion history images and the motion energy images are used to produce a newer representation of the key poses. The dastasets that are used in this system are the MuHAVi dataset and the Weizmann dataset. For the MuHAVi dataset an accuracy of 98.5% is achieved. The major shortcoming of this work is that the results vary with changing camera views.

In[3], W. Lu and J. Little presented a template-based algorithm to track the actions of an athlete. This system used principal component analysis and histogram of oriented gradients to represent the athlete. Tracking has been done for hockey and soccer video sequences . The system is found to produce good results

Team : 3

DECISION SCIENCES INSTITUTE

Abstractive Summarization Through Sentiment Analysis Of User Product Reviews - An RNN Approach

ABSTRACT

This study focuses on performing granular sentiment detection, using a recurrent neural network approach, over a dataset of online reviews for Slack, an American cloud-based set of proprietary team collaboration tools and services. Based on this, a client interface was built, attaching sentiment scores to opinion units, keywords and performance indicators, and generating interactive visualizations of the same. An encoder-decoder model with attention was also implemented, to generate an abstractive customer feedback summary for the client, as a premise for future product development.

KEYWORDS: Information Science, Data Mining, RNN, Sentiment Analysis, and Summarization

INTRODUCTION

Online platforms, such as Capterra, are increasingly being used as a source of information and opinions about a plethora of issues, concepts and products. Such a user review corpus is a rich data source, as it provides information to both the company's prospective customers and marketing teams about the user sentiment with respect to the product or service considered. People's choices are also dependent to some degree on how others view and evaluate the world.

E-commerce platforms provide companies with a structured data set for analysis. In the real world, tracking data is not as easily obtainable, with the primary sources of intel being user feedback and financial data of firms. The aim here is to perform effective sentiment detection of the former, using an encoder-decoder RNN approach, with attention, to process a dataset of online service and product reviews for the Slack software. Based on this, a user interface will be built, to implement a report generation engine for the clients to present a priority view of areas to be addressed to increase customer satisfaction and maximize product performance and recommendation likelihood.

The first step towards training a classifier with machine learning is feature extraction: a method is used to transform each text into a numerical representation in the form of a vector. This is done using one shot encoding in RNN. Then, the RNN algorithm is fed with training data that consists of pairs of feature sets to produce a classification model. To learn new tasks, new tags can be created.

Key phrases can provide highly condensed and valuable information that allows users to quickly acquire the main ideas. The task of automatically extracting them is achieved using an RNN encoder-decoder model to combine key words and context information. It has two hidden layers to discriminate keywords and classify key phrases, and these two sub-objectives are combined into a final objective function.

Automatic summarization is the process of shortening a text document with software, in order to create a summary with the major points of the original document. Technologies that can make a

TEAM No: 4

IOT :WEARABLES TO MONITOR PILOT'S HEALTH

Ms. Archana C.S., Ms. Sneha J, Ms. D.N. VijithNiranjana and Mrs.S.Aarthi
Associate Professor, Department of Computer Science & Engineering
MeenakshiSundararajan Engineering College, Chennai, Tamil Nadu, India
archanalatha666@gmail.com
snehachandran99@gmail.com,
vijitha.niranjana@gmail.com
aarthigopinath.smile@gmail.com

Abstract—Pilots' drowsiness and stress has been a very serious cause of many air accidents, which makes it a great social and economic concern. This paper describes a system which uses ECG (Electrocardiogram) sensor, Heartbeat sensor and a eye blink sensor to obtain physiological readings of pilots' health condition . Generally signals are transmitted to base Tower as High frequency radio signals, which is used for practical test and classify data using classification algorithms. This is an intelligent system which playes key factor to avoid many unreliable situations .
Keywords—SVM Classifier, KNN Classifier,IOT

I.INTRODUCTION

Recently, the has been increase in accident due to poor stability of pilot which in turn has caused many serious havoc. From ages , pilot's drowsiness and stress have been one of the major causes of accidents. Using trending platforms such as Internet of things (IOT) and best classification algorithm, any glitch in the input can be easily identified.. For these reasons, many researches has been adopted by Société Internationale de Télécommunications Aéronautiques (SITA) to study the pilot's physical conditions and convert them as data points or signals and transfer them to tower. This system uses sensors ,IOT platform and classification algorithms to actively classify the data . However, the existing methods or system to measurement the physiological signals of pilot are very inconvenient and in accurate because it doesn't use any classified algorithm to monitor the health conditions. To improve these inconvenient factors, researches over the relations between drowsiness and fatigue are studied by using wearable sensor and classification algorithms. Many efforts has focused on retrieving to get the physiological signals or data under convenient and noninvasive environment.

II.EXSISTING SYSTEM

As such there is no proper existing system to monitor health condition, except alarming "black box". Hence in this study we are comparing it to driver so that a better optimal solution can be arrived . When the driver is stressed, fatigued, or drowsy, mind becomes incapable to think and hence these abilities degrade his health . Stress has been a key role to suppress driving performance and increases the likelihood of traffic accidents. Drowsiness is one of the major factors leading to driving errors, resulting in dangerous driving situations and sometimes fatal conditions. . The Department of Transportation National Highway Traffic Safety Administration reported that approximately 100 0000 crashes occur per year in the United States owing to drowsy driving.[2]Thus, driver's drowsiness and stress has been major cause of the traffic havocs, which makes this an area of great socioeconomic concern.

A. Composition of Sensors and Wireless Sensor Node

To obtain physiological signals and data, ECG and PPG sensors are fixed on the steering wheel for drivers. ECG and PPG sensors designed such that they are attached with wireless sensor node for enabling wireless communication. Conductive fabric electrodes are used for measuring of ECG signals on the steering wheel to maximize convenience.[1]

B. Personal Area Network

Personal area network is used as a communication tool to send data to computing devices. All retrieved physiological signals from both the sensors can be approximately sent to a base station with very low packet loss and low power operation by using personal area network that serves to interconnect and communicate all wireless sensor nodes themselves in the car. In PAN nodes is operated by TinyOS which is an open source operating system mainly for wireless embedded sensors networks.

C. Analysis of Heart Rate Variability Signals

For analyzing the measured physiological signals or data points, HRV signals are used. This is defined as the constant change of the interval between heart rate.
HRV signals are usually calculated by analyzing a continuous series of beat to beat intervals from the ECG or derived from a pulse wave signal measured by means of the PPG waveform. In the personal area network environment inside a vehicle, HRV signals are obtained by signal processing. In the existing uses the interpretation of HRV signals in time and frequency domain to monitor the car driver's condition accurately.

D. Flowchart

This diagram represents the flow of the system for detecting the drowsiness and fatigue of the driver using HVR signals. The signal is later on monitored by individual. Experiments are done to observe the monitoring performance using ECG and PPG sensors in real time as shown . HRV signals are obtained from measured ECG and PPG signals in the vehicle under personal area network environment. Two authors who are healthy without any heart diseases clinically participated in this experiment. It proves that sympathetic nervous system and parasympathetic nervous system of autonomic nervous system are active appropriately. On the other hands, HR distribution is spread narrowly and centrally under drowsy state as shown in Fig. 2.Three main spectral components arerequired for spectrum power indicator: very low frequency (VLF), low frequency (LF), and high frequency (HF) components. Measurement of VLF, LF and HF power components.[3]

Team :- 05

Road Traffic Recommendation by Multi-source Diffusion Modelling

Mr.Arjun Nag Ashokkumar, Mr.Sharook Ahmed.A, Mr.Vignesh.S and Mrs.Yamuna,Associate Professor, *Department of Computer Science & Engineering, Meenakshi Sundararajan Engineering College, Chennai, Tamil Nadu, India*
Arjun7ashok@gmail.com, sharookahmed7@gmail.com, vickydesires97@gmail.com, yamunavikramancse@gmail.com

Abstract — Road traffic speed prediction is a challenging problem in intelligent transportation system (ITS) and has gained increasing attentions. Existing works are mainly based on raw speed sensing data obtained from infrastructure sensors or probe vehicles, which, however, are limited by expensive cost of sensor deployment and maintenance. With sparse speed observations, traditional methods based only on speed sensing data are insufficient, especially when emergencies like traffic accidents occur. To address the issue, this paper aims to improve the road traffic speed prediction by fusing traditional speed sensing data with new-type "sensing" data from cross domain sources, such as tweet sensors from social media and trajectory sensors from map and traffic service platforms. Jointly modeling information from different datasets brings many challenges, including location uncertainty of low-resolution data, language ambiguity of traffic description in texts, and heterogeneity of cross-domain data. In response to these challenges, we present a unified probabilistic framework, called Topic-Enhanced Gaussian Process Aggregation Model (TEGPAM), consisting of three components, i.e., location disaggregation model, traffic topic model, and traffic speed Gaussian Process model, which integrate new-type data with traditional data. Experiments on real world data from two large cities validate the effectiveness and efficiency of our model.

Keywords-ITS, Raw speed sensing data, tweet sensors, TEGPAM

I.INTRODUCTION

Road traffic monitoring is of great importance for urban transportation system. Traffic control agencies and drivers could benefit from timely and accurate road traffic prediction and make prompt, or even advance decisions possible for detecting and avoiding road congestions. Existing methods mainly focus on raw speed sensing data collected from cameras or road sensors, and suffer severe data sparsity issue because the installation and maintenance of sensors are very expensive. At the same time, most existing techniques based only on past and current traffic conditions do not fit well when real-world factors such as traffic accidents play a part.

II. RELATED WORKS

Previous studies normally perform Traffic clustering based on only a single information source, such as location data; by viewing shared location as the sole determinant of community relationship, real relationships may be missed or non-existent communities may be falsely identified.

In the social graph community detection literature, a community is usually defined over a link-based graph capturing direct pair-wise interactions; such explicit interaction markers are obviously hard to directly obtain in many practical environments due to privacy concerns or technological limitations.

Unauthorized User Analysis With Machine Learning For Web Repository Results

Ms. Sushmitha Kennedy Kumar
Department of Computer Science & Engineering
MEENAKSHI SUNDARARAJAN ENGINEERING COLLEGE
Chennai-24, India.
ksushmitha54@gmail.com

Ms. B.Harshitha
Department of Computer Science & Engineering
MEENAKSHI SUNDARARAJAN ENGINEERING COLLEGE
Chennai-24, India.
harshitha8330@gmail.com

Mrs.P.Revathi
Assistant Professor, Department of Computer Science & Engineering
MEENAKSHI SUNDARARAJAN ENGINEERING COLLEGE
Chennai-24, India.
revathisprajesh@gmail.com

Abstract **—Information sharing is the key goal of Cloud Storage servers. It allows storage of sensitive and large volume of data with limited cost and high access benefits. Security must be in given due importance for the cloud data with utmost care to the data and confidence to the data owner. But this limits the utilization of data through plain text search. Hence an excellent methodology is required to match the keywords with encrypted cloud data.The proposed approach similarity measure of "coordinate matching" combined with "inner product similarity" quantitatively evaluates and matches all relevant data with search keyword to arrive at best results.This approach, each document is associated with a binary vector to represent a keyword contained in the document. The search keyword is also described as a binary vector, so the similarity could be exactly measured by the inner product of the query vector with the data vector. The inner product computation and the two multi-keyword ranked search over encrypted data (MRSE) schemes ensures data privacy and provides detailed information about the dynamic operation on the data set and index and hence improves the search experience of the user.**

Keywords—Cloud storage server, MRS(Multi-Keyword ranked search),Relevance score

I.INTRODUCTION

The term Cloud refers to a Network or net. In alternative words, we will say that Cloud is something thatare given at remote location. Cloud will give services over network. Service Models are the reference models on which the Cloud Computing relies on. These may be classified into three basic service models as listed below:

- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)

There are several alternative service models all of which may take the shape like SaaS and Anything as a Service. Thiscan beNetwork as a Service, Business as a Service, Identity as a Service, information as a Service or Strategy as a Service.

The Infrastructure as a Service (IaaS) is the simplest level of service. Every service models creation uses the underlying service model.The planned approach similarity live of "coordinate matching" combined with "inner product similarity" quantitatively evaluates and matches all relevant information with search keyword to make best results. Then that user can able to upload the same document with changes in that document that document modified words are updated in the individual page.

The proposed concept mainly focuses the individual page updation of the multiple page documents. We are introducing the system to update the particular modified page or word in that particular document when it can be uploaded again.Recent generations of computing is based on the searching of documents or contents in a huge data repositories. Storing the data and retrieving it in an efficient manner becomes a prominent challenging task in the recent generation.Enhancement is going on in system usability by enabling search result relevance ranking instead of sending different and irrelevant results, and further it ensures the file retrieval accuracy based on the data requested.

II. EXISTING SYSTEM

A large number of data users and documents in cloud is difficult for the search services to allow multi-keyword search query and provide result similarity ranking to meet the effective data retrieval need.

The searchable encryption concentrates more on single keyword search or Boolean keyword search, and it rarely differentiates the search results.By stop word concept the unwanted keywords will be removed.

Team No: 67

Location Identification for Non-Geotagged Tweets

Mr. B. Bhargavan and Mrs. M.R. Nithya
Associate Professor, Department of Computer Science & Engineering
Meenakshi Sundararajan Engineering College, Chennai, Tamil Nadu, India
bhargavan.balaji@gmail.com,
nithya.msec@gmail.com

Abstract — *As social media users are increasingly going mobile, various location based services (LBS) have been deployed on social media like Twitter. The success of them heavily depends on the availability and accuracy of users' location information. However, only a small fraction of tweets are geo-tagged. Thus, it is necessary to infer locations for tweets in order to attain the purpose of LBS. In this paper, we tackle this problem by scrutinizing Twitter user timelines. First, we split each user's tweet timeline temporally into a number of clusters, each tending to imply a distinct location. Subsequently, we adapt two machine learning models and design classifiers that classify each tweet cluster into one of the pre-defined location classes at the city level. The Support Vector Classifier focuses on the information gain of words with location implications in the user-generated contents.*

Keywords: Random Forest Classifier, Support Vector Classifier, Data mining

I.INTRODUCTION

Social media users are going mobile. For example, 53.5% of Facebook users login only from the mobile devices by the end of July, 2016, and Twitter has approximately 257 million mobile active users monthly as per the first quarter in 2016. This big trend has fostered various location based services deployed on social media. The success of such location based services heavily depends on the availability and accuracy of users' location information that a social media platform can get access to. Knowing the locations of the individual tweets of users enables a wide variety of applications eg., location-based summarization, location-aware recommender system, friends notification, influential users recommendation, place advertisements and business information spreading, city-scale collective attention analytics and even disaster detection. However, only a fraction of tweets are geotagged i.e., being sent with GPS coordinates. Therefore, it is necessary to infer locations for Twitter users in order to attain the purpose of and to improve the quality of the location-based services offered to the users. The experimental results suggest that the proposed models are effective at inferring locations for tweets and they outperform alternatives significantly in terms of inference accuracy.

II. EXISTING SYSTEM

Existing techniques for locations in social network fall in two categories: those inferring a Twitter user's location and those inferring locations for tweets. Most of them infer locations at the city level. Several existing techniques make use of social networks and friends' locations to infer locations for Twitter users. Davis Jr.et al. [17] and Jurgens [18] consider the locations of a user's friends and take the friend's location with the majority votes as the user's location. Rout et al. [19] use an SVC classifier and features extracted from Twitter user networks to predict home locations for Twitter users. Back strom et al. [20] study the relationship between friendship and spatial distance for Facebook users, and exploit the relationship

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IMPROVING THE LIFE OF CHILDREN AFFECTED BY AUTISM SPECTRUM DISORDER WITH THE HELP OF IOT

Ms. Gayathri.E[#1], Ms.Saranya.A[#2], Ms. Yashini.S[#3] and Mrs.B.Monica Jenefer[#4]

#1,#2,#3-UG Students, #4-Head of the Department, Department of Computer Science & Engineering Meenakshi Sundararajan Engineering College, Chennai, Tamil Nadu, India

[1]gayathrielankkathir83@gmail.com

[2]saranya291097@gmail.com

[3]yashinisuresh.97@gmail.com

[4]*hod.cse@msec.edu.in*

ABSTRACT: *This paper explicate an innovative IOT system which supports the children with autism spectrum disorder (ASD) and also acts as a guide system of their health. The main aim is to sense their EEG (Electroencephalographic) waves and to keep a track on it using Smartphone. EEG probes present in the cap helps in sensing their brain waves. The recorded brain signals are dispatched to the cloud by making use of the antenna present in the IOT module with GSM. The cloud acts as storage system and those signals are viewed by the application developed. The Therapists and the Guardian make use of this system to follow their children and can understand the complexity of the behaviour. Each autistic children has a marked set of talents and strengths. By making use of this application their skills can be improved to a certain level. This application also strives for improving their vocabulary skills and helps them in communicating.*

KEYWORDS – *Autism spectrum disorder (ASD), EEG probes, IOT module with GSM*

I. INTRODUCTION:

Autism spectrum disorder (ASD) is a neurological disorder that develops in a children within the age of 2 or 3 years. This disorder affects the communication and behaviour of a person. The autistic children have difficulty with communication, difficulty with social interactions, obsessive interests and repetitive behaviours. They also face mental health challenges such as anxiety, depression and attention issues. According to the CDC the number of autistic children have been increased from 1 in 92 in the 2016 report to 1 in 71 in the 2018 report. There are no cures for ASD but therapies and other treatment conisderations can help people feel better and can ease their sysmptoms. Behavioral theraphy, play theraphy, occupational theraphy, physical theraphy, speech theraphy aree some of the treatment methods. This paper makes use of the EEG sensors to sense their brain signals which comes under the IOT domain.IOT is a collection of reticulated computing devices, digital and mechanical machines, objects, animals or people that are provided with unique identifiers (UIDs) and capability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The IOT has countless applications in promoting the health of the patients, from remote monitoring to smart sensors and medical device integration. It has the potential to keep patients safe and hale. Healthcare IoT can also boost patient engagement and satisfaction by allowing patients to spend more time interacting with their doctors.The application developed will certainly promote the lifestyle of the autistic children.This application will not only improve the lifestyle of the autistic children but also help the parents to keep an eye on the child and can monitor their behaviour .It also help the therapist so that the treatment can be varied according to the mental health level.

II. RELATED WORKS:

Facial, Visual and hand movement response data were used to identify the behaviour of the children in different situations and it was also used to detect their

A SURVEY ON ONLINE AUCTION USING DATA MINING TECHNIQUES

Gomathi Sekar,Srinidhi Karthikeyan,Thenmozhi Baskaran
Computer Science and Engineering
Meenakshi Sundararajan Engineering College
Chennai, India

C. Jerin Mahibha
Senior Assistant Professor, Computer Science and Engineering
Meenakshi Sundararajan Engineering College
Chennai, India

Abstract--Thousands of people take part in Internet auctions every day, bidding on items from different places. Buyers and sellers alike benefit from the great opportunities that online auctions provide, but these auctions also provide criminals the opportunity to perpetrate fraud. The online auction environment is full of shill and fraud bidders and the losses incurred because of these offending activities are huge. This problem of Shill bidding and fraudulence can be solved by applying Data mining and Machine learning techniques. So, this paper will help us get an idea about different auction types and different data mining and ML algorithms that can be used to prevent the forgery that is prevalent in online auctions

Keywords—Online auction; Data mining ;Fraud detection

I. INTRODUCTION

Online Auction has significantly increased the variety of goods and services which can be bought and sold using the auction mechanisms. Online auction have broken all the barriers that were inhibiting the users for accessing the auction like geographical locations, time and a small target audience. Making auctions online, the numbers of users participating in the auctions have dramatically increased over time. It functions as, the bidder first starts quoting a smaller sum and then it gets increased over other bidders quoting higher amounts in order to win that particular good. The time limits for the auctions differ based on the domain where the auction takes place.

The main benefit of online auction over physical auction is that the user from different parts of the world can participate in the auction and then they are shipped globally. The objects sold can a single product of collection of many. Not all the users who are accessing the system are genuine and it is necessary to identify those who are not legitimate and try to increase theactual amount of the goods being sold.

Popular online auction sites like eBay protects the legitimate user from these swindlers by having a list called bidder block lists. If the user is from the list they are blocked from participating from the bidding. There are greater chances of selling pirated and stolen products.

The various Data Mining and Machine Learning techniques can be used to make the online auction safer and flexible for the user. Techniques like ID3, C4.5, C5.0, CART, Neural networks etc. are studied and analyzed here. This paper also present different other domains where these techniques were used successfully in other domains.

The rest of the paper is organized as follows. Section 2 presents an overview of different Data Mining techniques . Section 3 gives an idea about how CART can be used in different domains. Section 4 depicts how C4.5 can be used. Section 5 gives an outline of usage of other Machine Learning techniques used in acution systems. Section 6 concludes the work.

LITERATURE SURVEY

I. OVERVIEW OF DIFFERENT DATA MINING TECHNIQUES

There are different types of data mining techniques used namely Asssociation,Classification,Clustering, Prediction, Sequential patterns,Decision trees.

I.Association:

It is a well known and simple data mining technique where, a pattern is identified considering a relationship between two transactions and hence called as Relation Technique. It is generally used in marketing and purchasing domains and generally used for market basket analysis. It is basically to tempt buyers with other products that are frequently bought items. For Example, when a user buys bread placing the jam and butter on the same rack might tempt the user to buy them together, thereby increasing the sales.

II.Classification:

This is basically used to classify the items into predefined groups or classes using mathematical techniques like decision trees, statistics etc. For example we will be able to use medical data to classify them as Diabetic and non-diabetic patients so that treatment can be made even more efficient by considering their medical conditions and groups they are placed in.

Online Shopping Bargain Using Incremental Algorithm

S.Hari Venkatesh, J.Hari Krishnan, S.Gowtham and S.Yamuna

Abstract--- *E-commerce -- electronic commerce or EC -- is the buying and selling of goods and services, or the transmitting of funds or data, over an electronic network, primarily the internet. An online shop evokes the physical analogy of buying products or services at a regular retailer or shopping center; the process is called business-to-consumer (B2C) online shopping. Data mining is powerful technology that is widely used in various applications like e-commerce, educational system, remote sensing and online shopping system. it deal with online shopping processes i.e. it is concerned with developing new methods to discover knowledge from online store database. Price promotion refers to the fact that the actual selling price is lower than the price, so that the customer can get a discount on the price.Data Mining Group (DMG) and supported as exchange format by many data mining applications. As the name suggests, it only covers prediction models, a particular data mining task of high importance to business applications using data mining process to shopping the online products using bargain methodologyThe online shopping system presents an online display of an order ,where a customer tries to minimise the selling cost of a product from the administrator ,where to an correct extent the administrator is allowed to sell the product to a finite amount . The interaction is customer and administrator is maintained confidentiality*

I. Introduction

An online Bargain shopping system that permits a customer to submit online orders for items and or services from a store that serves both walk-in customers and online customers. The online shopping system presents an online display of an order ,where a customer tries to get minimisation of the selling cost of a product from the particular seller.The interaction between customer and seller is maintained confidentially. The request from the customer is sent to the seller and seller applies skyline query to the product and displays the result to thcustomer.Bargain works from admin , since admin gives the permission to seller and grant access to customer ,then the customer buys the product online Gain new customers with search visibility

Mr.S.Hari Venkatesh, , Assistant professor.Department of computer science &Engineerin, Meenakshi Sundararajan Engineering College, Chennai, Tamil Nadu, India, harivenkatesh777@gmail.com

Mr.J.Hari Krishnan, , Assistant professor.Department of computer science &Engineerin, Meenakshi Sundararajan Engineering College, Chennai, Tamil Nadu, India, hari.krishnan1601@gmail.com

Mr.S.Gowtham, , Assistant professor.Department of computer science &Engineerin, Meenakshi Sundararajan Engineering College, Chennai, Tamil Nadu, India, gauthirio97@gmail.com

Mrs.S.Yamuna, Assistant professor.Department of computer science &Engineerin, Meenakshi Sundararajan Engineering College, Chennai, Tamil Nadu, India

II. Existing System

Online shopping is a form of electronic commerce which allows consumers to directly buy goods or services from a seller over the Internet using a web browser. Consumers - find a product of interest by visiting the website of the retailer directly or by searching among alternative vendors using a shopping search engine, which displays the same product's availability and pricing at different e-retailers. Recent analysis- as of 2016, customers can shop online using a range of different computers and devices, including desktop computers, laptops, tablet computers and smartphones.An online shop evokes the physical analogy of buying products or services at a regular "bricks-and-mortar" retailer or shopping center; the process is called business-to-consumer(B2C) online shopping. When an online store is set up to enable businesses to buy from another businesses, the process is called business-to-business (B2B) online shopping.

III. Proposed System

A. Motivation

An online Bargain shopping system that permits a customer to submit online orders for items and or services from a store that serves both walk-in customers and online customers. The online shopping system presents an online display of an order ,where a customer tries to get minimisation of the selling cost of a product from the particular seller.The interaction betweencustomer and seller is maintained confidentially. The request from the customer is sent to the seller and seller applies skyline query to the product and displays the result to the customer.Bargain works from admin , since admin gives the permission to seller and grant access tocustomer ,then the customer buys the product onlineGain new customers with search visibility

B. Actual working

Registration module-In Online Shopping Process, Admin is the head of the organization. He has all the rights to authenticate the seller and user details. Admin can verify the seller and give approval to them.The Seller has to register first and get the approval from the admin. After the approval process only the seller can have access to login and add the products and cost of their choice. Seller can view the request of the customer for reduce of cost of the product. Seller can get the details of the users and payment details.

Purchase Module:-The customer and seller interacts with each other by the admin request and then the customers selects the seller for the required product to bargain The customers then interacts with the seller and bargain to the seller until to the maximum extend of the cost which profits both the customer and the sellerThe interaction between the customer and seller is maintained confidentiality

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TEAM 12

Secure and practical authentication application to evade network attacks

Ms. Indhumathi.V, Ms. Preethi.R, Ms. Raajashri.J and Mrs.B.Monica Jenefer Head of the Department, Department of Computer Science & Engineering Meenakshi Sundararajan Engineering College, Chennai, Tamil Nadu, India
indhu167@gmail.com, preeti3557@gmail.com, raaji0919@gmail.com, hod.cse@msec.edu.in

Abstract: ***This paper elucidates the different types of attacks such as IP attack, URL attack, DOS attack, phishing during a file transfer. The objective is to provide a single platform for file transfer that can identify and resolve pervasive attacks in networking. A web application is developed for this purpose. When a file is transferred from the sender to the receiver it is transported through a secure FTP channel. An attacker can easily manipulate the channel to retrieve the file. The sender generates a secret key during transfer which is shared with the receiver. Using DES encryption, the file is encrypted and decrypted at the sender and receiver side respectively. When it is transferred through a channel, the file is stored in the buffer area for quick access. The attacks are monitored and reported to the administrator if it occurs. An administrator monitors the channel during transfer so that any malicious act can be identified and resolved then and there. The file is not obtained by the receiver if an attack takes place. In case of an attack the IP address of the attacker is stored in a database and the file is destroyed by the administrator so that the attacker cannot retrieve it. If no attack occurs and the file is received by the receiver, and an acknowledgement is sent to the sender. On the receiver end, the IP address of the receiver provided by the sender is verified before it can be allowed to be decrypted by the receiver using the secret key shared. This way the file is completely secured and any attack that takes place can be detected and the source of attack can be determined. These schemes allow secure file transfer in any external environment of any type of files such as audio, video, document, etc. Thus, the data is given security, integrity and confidentiality and the network medium is made efficiently accessible.***

Keywords- IP attack, URL attack, Phishing, DOS, DDOS, DES

I.INTRODUCTION

One of the major challenges in the computer networking is the negligence of intruders, as several data are confidential and personal in all the areas like organization, banks, financial sectors, health care etc. In order to avoid the intruders, all the activities should be logged into an Intrusion Detection System (IDS) for identifying any malicious activity which is being performed on the network system. Data security is a protective measure that checks whether the user has a proper authorization to access the digital information. In a normal scenario if the attacker wants to download the file without proper authorization, it can be done through copying the URL and download the file easily. In this research work, data security principle will not allow the user or attacker to download the file without proper authorization. When an intruder tries to hack the data using IP address without key is said to be IP Spoofing. The authorized user can be able to download the encrypted data by decryption using the secret key mechanism namely cryptography technique.

II.RELATED WORKS

Generally, attacks such as IP attack, URL attack, phishing, etc. can be identified using different software. But a common platform to get rid of all these attacks has not yet been developed. In the existing system, the source

TEAM - 13

A SURVEY ON BLOCKCHAIN HANDLING HUGE DIGITAL INFORMATION

Janani.P[1], Kamini.M[2], Sai Preethikaa.R[3], Mrs.Aarthi[4](Sr.Assisstant Professor)
[1,2&3]Final Year UG Student [4]Assistant Professor
Department of Computer Science and Engineering, Meenakshi Sundararajan Engineering College
Chennai, India
jananipugazh.10@gmail.com
kaminijon777@gmail.com
saipreethikar@gmail.com

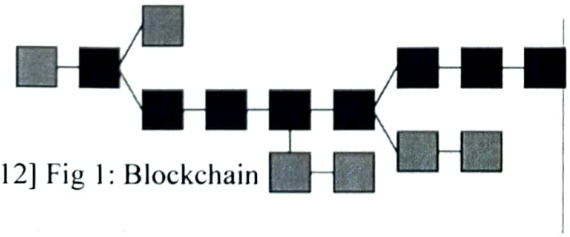
Abstract:Blockchain is grouping list of records, called blocks, which are linked usingcryptography. Each block contains a cryptographic hash of the previous block, a timestamp, data and nonce. It is resistant to modification of data. By allowing digital information to be distributed but not copied, blockchain technology created the backbone of new type of internet. This paper deals with applications of blockchain in various domains such as Education, Biomedical, IOT, Supply chain and more.A peer to peer network manages the blockchain communication and validation using protocols when it is used as a distributed ledger. In a distributed environment, when a block is to be added to the chain it requires the permission from half of the nodes in the system. Even though blocks are not completely unalterable they are considered as the role model for a secure distributed system with Byzantine fault tolerance.

Keywords:blockchain, survey, application of blockchain.

1. INTRODUCTION

A blockchain is a concept to store data digitally. In recent years, there is a lot of buzz on blockchain. Many have described this as a most disruptive technology of the decade. A blockchain, is also called distributed ledger. With a blockchain, many people can write entries into a record of information, and a community of user can control how the record information is amended and updated.

[12] Fig 1: Blockchain



[12] Fig 1: Blockchain

2.KEY CONCEPTS

2.1 Distributed Ledger

Ledger is a principal book or computer file for recording and totaling economic transaction. There is no centralized data storage. It relatedly shared across multiplesites and more. Blockchain is a form of distributed ledger. Thus each participate in the blockchain network can access records that are shared across it and can own an copy of it. Any changes or update made to the records are reflected and copied to all the participants in the network in a fraction of second. Changes and update means adding a new block to the existing blocks of data saying the x changes to y in so on so time this is because once the data entered in a ledger it becomes an immutable database.

2.2 Consensus

Consensus can be defined as achieving agreement on a single value over a distributed system. Thus achieving consensus in blockchain states that either a single value or a new block is added only if it is agreed by all the participants in the network. In blockchain systems do not trust each other this is because of Byzantine agreement problem. Consensus therefore should tolerate Byzantine failure.

2.3 Cryptography

Cryptography refers to secure communication by means of encryption and decryption. This means information can be
viewed by authorized person only. [13] "In blockchain cryptography is primarily used for two purposes one is securing identity of the sender of transaction and second is ensuring past records cannot be tampered with. Blockchain uses public key cryptography which is better than symmetric key cryptography".

Generating Unique ID for Individuals using Biometrics

Mr. K. Mani Kandan[1], Mr. R. Prem[2], Mr. K. Krishna Kumar[3] and Mrs. C. Jerin Mahiba[4]
1, 2, 3 – Final Year UG student, 4 –Sr. Assistant Professor
Department of Computer Science & Engineering
Meenakshi Sundararajan Engineering College, Chennai, Tamil Nadu, India
manikandan2213@gmail.com,
premr3997@gmail.com,
krishnakumar1171998@gmail.com,
jerinmahibha.msec@gmail.com

Abstract — This paper is about creating a unique identification number for individuals as their proof of living. The system uses biometric characteristics of an individual to create his/her unique identification number along with other essential details that needs to be present to withstand the living proof. At the time of enrollment, preprocessing for biometrics takes place in order to reduce delay in providing the unique id. The preprocessing phase is assisted with machine learning algorithm to find the uniqueness in each individual. The output of this system is QR code which is generated with hash value of the unique identification number in order to prevent visual representation of the unique id and to improve the efficiency in improving the response and result. The advantage is that the masking of unique id which makes it secure enough to avoid primary levels of threat.

Keywords: Feature Extraction, Facial landmarks, Biometrics, Unique ID, Minutiae

I.INTRODUCTION

India is a country with second largest population next to China .In this vast country providing security for each and every citizen is quite tedious task. Identification system was introduced by the government of India to define identity for people of the country. This system contains every information about people from their fundamental to biometrics details. It is used by various departments of the government to monitor the people activities and can have a trace of their routine. The technological concept that helps in the managing system is big data as the data generated from India is larger when compared to other countries. But this identification system was difficult to manage as the scalability increases and has several fraud attacks due to some insecure measures.

II. EXISTING SYSTEM

In India people use their voter id, pan card, driving license as identity proof. But these proofs have specific purpose such as Voter Id is used for the purpose of voting on election, driving license is used for eligibility to drive and Pan Card is used for Tax and transaction purpose. Aadhaar Card is the only proof that specifies the identification of the person. But these Identification systems are dependent on the government officials rather than the data. Data of the person is the most important part, must be reliable and need to be secured. Usually the identification systems uses the N-digit random number and these random numbers are easy to exploit and some third party agents can misuse with the other persons details such as mobile number, bank details, etc.

TEAM NO : 15

Preserving Privacy In Online Data Publishing

Mr. R. Madan Kumar, Mr. M. Sabari Krishnan, Mr. V. Suriya and Mr. R. Venkatesh
Assistant Professor, Department of Computer Science & Engineering
Meenakshi Sundararajan Engineering College, Chennai, Tamil Nadu, India
mdn871997@gmail.com
mskrish97@yahoo.com,
suriyavenkt@gmail.com
venkateshmecse@gmail.com

Abstract — This project is about conducting examinations in a secure way to avoid leakage of question papers. Our Technology can help to eliminate issue of question paper leakage. Question paper would be delivered to the respective examination location in digital encrypted format along with secure locking. Examination paper can be downloaded at exam center 10 minutes prior to examination start time. It eliminates logistical cost of transporting question paper to examination location in secure environment. First the examination board encrypts ten question papers using AES algorithm with different keys. Then they put the ten keys in a single encrypted file and send that to the examination centers with the decryption key. Then at the examination centers random selection for the key is made and the selected key is sent to all the registered candidates. Using that key candidates can request the examination board for the question paper at the time of examination.

Keywords: Exam Confidentiality, Digital Question Paper, Secure Delivery, Cost Effective Exams.

I.INTRODUCTION

The examination bodies put in a great amount of efforts to get the entire exam process get going. The examination board has to bear a big amount of loss in case a question paper is leaked. The examination board faces lot of issues due to the leakage of question papers. The leakage may lead to the examination being postponed or cancelled completely. In either of the cases, the loss will be beared by the examination body. The complete procedure of the exam is prepared and planned months before. Any last moment misconduct like the leakage of the question paper spills water on the months of efforts put in by the board.

II. EXISTING SYSTEM

Defining Examination paper according to syllabus and delivering printed question paper at multiple examination center has been huge task of administration and logistics. Question Bank is maintained in multiple formats including documents, texts, notes, excel. Single source of managing question bank for particular subject topic is missing in the current context.

Examination paper setters need to travel to university location to define question papers. Entire process is manual. Examiners need to define questions according to exam pattern.

As there is no standard way of maintaining question bank, time required to define question paper can be higher to extent of defining questions in the initial stages. Moderator need to verify question sets defined by the paper setters. There is possibility of errors due to manual process. One of the question paper is selected as final question paper for respective examination and it is then sent to printing at secure location. Printed Examination papers needs to be sent at each examination center on examination date.

During each process there is manual intervention and possibility of leakage of question paper to outside world increases. Technology can help to simplify this process up-to great extent.

There is no guarantee that the paper is secure they might be leaked.

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A SURVEY ON ORGANISATIONAL SUPPLY CHAIN PERFORMANCE MEASUREMENT

Manjula.T[1], Nikitha.M[2], Rashmika Calve[3] ,Ms.M.Sumithra[4]
[1,2&3]Final Year UG Student [4]Assistant Professor
Department of Computer Science and Engineering, Meenakshi Sundararajan Engineering College
Chennai, India
[1]manjulathambidurai@gmail.com [2]nikitha100@gmail.com [3]rashmika4321@gmail.com [4] msec.msumithra@gmail.com
#Corresponding Author

Abstract— A supply chain is the network of businesses and people that work together to move raw materials into finished goods and eventually to the end-user. In an industry which employs supply chain management, it is difficult for every single person to be involved manually. Hence in this day and age it is essential for the stakeholder's daily tasks to be automated. By this paper, we investigate several reputed articles to provide a better judgement on the management on performance in supply chain.

Keywords—supply chain management; performance measurement; scorecard; industries.

I. INTRODUCTION

Supply chain management involves a wide range of activities required to plan, control and execute a product's flow, from acquiring raw materials and production through distribution to the final customer, in the most streamlined and cost-effective way possible. For large complex supply chain networks, performance measurement is an important aspect to be considered. To use suitable supply chain performance systems and tools in industries, it is mandatory to clearly understand the current supply chain measurement system and performance processes. Performance measurement is critical to the success of any organization because it creates understanding, moulds behaviour and improves competitiveness [1]. Performance measurement provides the means by which a company can assess whether its supply chain has improved or degraded.

This paper is intended to provide a literature review on supply chain performance measurement. The review study covers articles coming from major journals related with the topic and explores more on the detailed methodologies that is provided in each article. This survey examines the solutions that have been explored in the past and provides a comprehensive study of the performance measurements used in the new supply chain era.

II. LITERATURE REVIEW

The research of performance management has been popular for years. There were numerous publications emphasizing the need for relevant, balanced, strategic and improvement-oriented performance measurement systems [2].

In an article [3] on the supply chain performance by Kuhner, he begins his views on the performance measurement with the necessary requirements needed for a supply chain-oriented analysis. In the paper, the authors evaluate the performance with the help of 3 phases: Identification of goals, measurement of performance and the future work that can be developed in the performance measurement. In the identification phase, the customer-supplier relationships are studied exclusively. The measurement phase includes crucial activities such as to monitor, control and direct certain logistic activities. Here, the authors use the analogy of the balanced scorecard approach. Using this approach, the enterprise business is categorized as 4 different perspectives: financial perspective, customer perspective, internal business perspective and learning and growth perspective.

The financial goals of an organization mainly include improving profits, increasing the revenue and cost reduction [4]. The inspection of potential customers, what they need, how to achieve customer satisfaction is dealt with in the customer perspective [4]. The internal business perspective deals with improving the existing business systems by implementing new business strategies [4]. The learning and growth perspective are applied in the final phase and aims at providing a continuous improvement in the industry's performance.

The table below represents the various supply chain measures and the techniques used by them in detail.

Static Code Analysis and Taint Checking to Avert SQL Injection and Cross Site Scripting

Neeraja. P
Computer Science Engineering
Meenakshi Sundararajan Engineering College
Chennai-600 024
neerajap45@gmail.com

Mrs.M.R.Nithya
Assistant Professor
Department of Computer Science Engineering
Meenakshi Sundararajan Engineering College
Chennai-600 024
nithyamr06@gmail.com

***Abstract*—. The popularity of web applications is increasing to a greater extent in today's world. From a simple application consisting of text and images to complex applications such as a banking or a shopping application, web applications play a vital role for the concerned organization. The more the functionalities included in an application the more the application is subjected to *vulnerability*. *Common vulnerabilities include SQL* Injection and Cross-site Scripting. The web application must be coded in such a manner to prevent these vulnerabilities. The efficient method to analyze a code and detect for the presence of vulnerabilities is static code analysis which is done between the software development and testing phase. In addition to static code analysis taint *checking is also performed where the user given values to* the application are considered as tainted values, and they not inserted into the application without proper escaping or validation. The advantage of static code analysis is that all the lines in the application code are analyzed and taint checking does not include an non escaped user input. Thus, the application is protected from the vulnerability to a greater extent.**

Index Terms—**SQL Injection, Cross-site Scripting, Static code analysis, Taint Checking**

I: INTRODUCTION.

The increasing functionality of web applications is increasing in the present era. Before 10 years people used web pages only for viewing information. Now web applications play an important part in our life. We can do activities such as paying electricity bills, booking railways and airline ticket, online transactions, shopping and so on. Everything is made online these days. We are entering sensitive information such as our credit card details case of online banking or any other important credentials the application specifies us to enter in its form. Any organization thus maintains its own web application for their business needs and maintains databases to store the details it gets from its users. However these applications when not properly coded can lead to vulnerability which may give an attacker to view the details inside the application, modify it and also can insert malicious scripts inside the application. The common vulnerability includes SQL injection and Cross-site Scripting. Both SQL Injection and Cross-Site Scripting are present in the OWASP Top 10 application security risks and still exist in most of the applications. The main reason for the presence of these vulnerabilities is that user's input are directly used in applications without proper validation or encoding. Applications must be coded in such a way to check and prevent these vulnerabilities. The two types of code analysis to check whether the application's code is immune to these vulnerabilities are dynamic and static code analysis. The cost of testing the application for vulnerability increases along the Software Development Life Cycle. Since static analysis is done between coding and testing phase and dynamic analysis is done during testing phase, static analysis provides cost- efficient and better code coverage than dynamic analysis.

II: CONCEPTS INVLOVED

A. SQL INJECTION

SQL injection is injecting the SQL query via the input data from client to the application. A successful SQL injection attack can retrieve, alter or delete the contents in the database.

Example:

An application directly uses a suspicious user input directly in a query. It consists of an admin login page where a successful login will give the admin access to all the user's details.

The login page prompts for the name and password and the SQL statement for comparing the user given details with the value in the database is:

String query="select * from admin where name='"+**admin**+"'and password='"+**password**+"'";

Authentication by Encrypted Negative Password for an Intuitive Stock Management System

K.Subramanian, V.Sreyas, M.Nikitha and Mrs.S.Aarthi(Assistant Professor)
Department of Computer Science & Engineering
MeenakshiSundararajan Engineering College, Chennai, Tamil Nadu, India
subu17may@gmail.com,
anithavenkysreyas@gmail.com,
nikithamanjunath43@gmail.com,
aarthigopinath.smile@gmail.com

Abstract *—This paper is about securing the passwords and making the system more secured from intruders. Most of the stock management systems uses the method where in the passwords are just encrypted and are not secured properly. This encrypted negative password system uses the technique where in the passwords are first hashed and then converted to negative password and finally encrypted and stored in the database.However the processor resources and storage resources are becoming more and more abundant, hashed passwords cannot resist precomputation attacks, such as rainbow table attack and lookup table attack. This Encrypted Negative Password system still can resist the precomputation attacks. Thus by securing the pages with negative password system, all these vulnerabilities can be reduced.*

Keywords *—Authentication, negative table, lookup table attack*

I.INTRODUCTION

The stock management systems generally consist of all the stocks which are managed by the stores and quality department of the company. These stocks may be raw materials or finished products and these are valuable information which is needed to be secured properly. Most of these data's need to be secured as they should not be available to the other department. These information should be unknown and must not be disclosed to others and thus instead of using just plain passwords we can use the encrypted negative password system.

II. EXISTING SYSTEM

The existing system actually uses the simplest mechanism of all the other techniques. The plain password is just encrypted and stored in the database. This mechanism is highly insecure and you can also find that it is easy to attack and get the password. The other main mechanism which is used till date is the hashing mechanism where in the plain password is hashed using hashing algorithms such as the Secure Hash Algorithm or the Message Digest Algorithm. Comparing to the previous mechanism it provides more security and also it doesn't provide the actual password but the hashed value of the password. But the plain password can be from the hashed value from the rainbow table attack and lookup table attack. Thus to reduce the vulnerability and risk we are using the Encrypted Negative Password System for the Stock Management system.

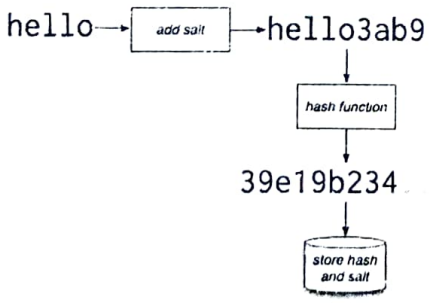

Fig.1 Salted Password

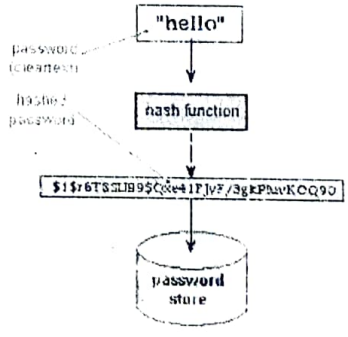

Fig.2 Normal Hash Password

A Unified Approach for Finding Optimal Route Using User's Preferences

K.Priyadharshini, S.Usha, N.Pavithra and P.Revathi

Abstract---*With the advent of technology, our dependence on location based search is increasing day by day. In our existing search process, the application will fetch various routes for the given destination with the help of user's location and it will display them in random manner. But this method fails when the user does not know the exact address of the destination. For example, the user goes to the unknown location, he does not know the exact address of the destination but still knows the point of interest like hospitals, restaurants etc...In our proposed system, it will overcome the drawbacks of the existing system by simply giving query as various point of interest like hospitals, restaurantsetc. without mentioning the exact address of the point of interest. In this proposed system, theuser has the ability to select in which order the point of interest will be displayed i.e. either by nearest location based or based on the rating of the destination location.*

Keywords---*Accuracy, Data mining, location based search services, location data quality, Rating based service, nearest location based search services.*

I. INTRODUCTION

WITH the emergence of technology, identifying the advantageous routes in a road network is the important problem. The existing system will offer different routes for particular destination or point of interest. But it will not address the issue of different destination for the particular point of interest. That point of interest may be hospitals, restaurants. and petrol bunks etc...

Consider a user who visits an unknown location, he does not know anything about that location but wants to explore the city. He just wants to visit the restaurants but he does not know what all the restaurants in that city are and which restaurant is nearer to him and which restaurant is better. At this time, our existing system will not address this issue. Our existing system will fetch different destination of the particular point of interest but does not give the destination which is nearer to the user and also fails to address which destination has the best user's rating.

The above given example has three important constraints: 1) the point of interest given by the user as the keyword for the query (restaurants, hospitals, petrol bunks etc.) as in [2].2) The preference of the user by the nearest location based on the user's current location 3) the preference of the user by the rating of the destination.

Ms.K.Priyadharshini,Department of Computer Science and Engineering, Meenakshi Sundararajan Engineering College,Chennai-24, India.Email: priyadharshinikj@gmail.com

Ms.S.Usha, Department of Computer Science and Engineering Meenakshi Sundararajan Engineering College, Chennai-24, India. Email: ushahindhu2298@gmail.com

Ms.N.Pavithra, Department of Computer Science and Engineering, Meenakshi Sundararajan Engineering College, Chennai-24, India. Email: pavithranageswarn@gmail.com

Mrs.P.Revathi, Assistant Professor, Department of Computer Science and Engineering, Meenakshi Sundararajan Engineering College, Chennai-24, India. Email: revathisprajesh@gmail.com

II. EXISTING SYSTEM

The existing system solves the problem in two cases: 1) the process of finding the routes for given destination (i.e. it will show the various routes for particular destination this case exists when the user knows the exact destination.)2)The next case is when the user does not know the exact destination but simply knows the point of interest like hospitals ,hotels ,restaurants etc...The above two cases can be described below.

Case 1: When the user knows the exact destination address, then the available location search services provides the n number of possible routes for the given destination .This is one of the location based search service.

Case 2: When the user does not know the exact location of the destination but knows only about the point of interest like hotel, restaurant mallsetc. The existing system will fetch the location according to the point of interest given by the user.

A. Drawbacks of Existing System

- The existing system will give only the relevant location according to the user query but not exactly the location which is nearer to the user.
- The existing system does not consider the user's rating of the particular destination rather it displays the entire destination which are relevant to the particular point of interest given by the user.

III. PROPOSED SYSTEM

In the proposed system, the above drawbacks of the existing system canbe resolved. The proposed system works in the situation where user does not know anything about the location this happens when the user visits unknown location. The user does not know the exact address of the destination but the user wants to visit the point of interest. The proposed system will get the current location of the user with the help of latitude and longitude of the device .This system will fetch the various location of the point of interest from the database by considering the latitude and longitude of the current user.

The proposed system will consider the various destinations which are nearer to the current location of the user. The proposed system will have the two options either it will display the various destinations in the order which is nearer

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TEAM 21

A COGNITIVE ASSISTING SYSTEM FOR DEMENTIA PATIENTS

USING ADVANCED MACHINE LEARNING TECHNIQUES

SRIVIDHYA S SUBRAMANIAN
Computer Science and Engineering
Meenakshi Sundararajan Engineering College
Chennai, Tamil Nadu, India
skssrividhya@gmail.com

SAKSHI SRIRANGAM
Computer Science and Engineering
Meenakshi Sundararajan Engineering College
Chennai, Tamil Nadu, India
srirangamsakshi35@gmail.com

RAMYA RAMDOSS
Computer Science and Engineering
Meenakshi Sundararajan Engineering College
Chennai, Tamil Nadu, India
anudhya1598@gmail.com

AARTHI GOPINATH
(Assistant Professor)
Computer Science and Engineering
Meenakshi Sundararajan Engineering College
Chennai, Tamil Nadu, India
aarthigopinath.smile@gmail.com

Abstract: **Daunting forgetfulness, frequent distress in recognizing people and objects, inability to process and remember minutiae are excruciating tasks for most dementia affected patients. According to the WHO currently, there are more than 50 million adults suffering from dementia. It is estimated by WHO that by 2030 there will be around 82 million dementia affected people. Dementia affects the brain of the patients by damaging the brain cells in parts of the brain leading to different levels of dementia. The degree or level of dementia depends on the level to which the portions of the brain are affected. Hippocampus is the region of the brain responsible for learning and cognition and is severely affected by the onset of dementia. Loss of memory is a consequence of this effect. The objective of this paper is to introduce an integrated system to assist and alleviate the pain of patients with dementia (CDR Rating 0.1-0.5) by helping them with everyday tasks. This assistant aims to improve the quality of life of patients' increases by reducing their dependency on the people around them.**

Keywords—Dementia, Assistant, Alzheimer

I. INTRODUCTION

In the past decade, there has been a tremendous growth in the field of machine learning and image recognition which has led to several advancements in every industry. This paper aims to use state-of-the-art machine learning algorithms to provide an assisting system for dementia affected patients. Face Recognition, Object Recognition and Voice Based Assisting System are the main features provided by the system to the patient to assist them in cognitive tasks involved in everyday life. Moreover, a GPS based tracking system and weekly charts of activities are also used to monitor the patient.

The assistant is designed to suit the needs of the patients three-fold. (1)Patients with dementia probably remember their close relatives and friends. However, they might not be able to relate their face to their name/identity. This assistant involves a two level neural network approach*based on facenet* to recognize faces. The training process involves a one-shot model and is very easy to use. (2)The assistant helps people identify daily objects by providing live object detection.(3)It also helps them with mundane jobs like searching for information on the web, sports, weather. It also delves into the possibility of creating a GPS based location tracking system, charts to handle everyday data and a comprehensive, user friendly interface.

II. LITERARY REVIEW

A. Impaired Facial Recognition Memory in Dementia

A study was conducted with dementia patients of different stages to analyze their ability to recognize faces. Repeated set of faces were used the purpose. When a signal detection analysis was performed, it revealed that dementia affected patients are quite unable to differentiate new and old faces

B. Association and Recognition for Novel Objects

This is based on a study done to analyze object recognition capability and object-location pair coordination in the subjects. Although this study tries to differentiate the type of Alzheimer's based on episodic memory which is beyond the scope of this paper, it implies that severe difficulties are faced by patients with dementia in recognizing objects.

C. An Analysis of the Viola-Jones Face Detection Algorithm

It involves a scalar product between the image and Haar-like features.The cores of the Viola-Jones algorithm rests in the decision stump function which is a decision tree by structure. It involves the use of

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Arduino and NodeMcu based Ingenious Household Objects Monitoring and Control Environment

S.Shakthidhar
Department of Computer Science and Engineering,
Meenakshi Sundararajan Engineering College,
Chennai, India
shakthidhar63@gmail.com

S.Santhosh
Department of Computer Science and Engineering,
Meenakshi Sundararajan Engineering College,
Chennai, India
santh5858@gmail.com

P.Srikrishnan
Department of Computer Science and Engineering,
Meenakshi Sundararajan Engineering College,
Chennai, India
mail2psrikrishna@gmail.com

M.K.Sandhya
Department of Computer Science and Engineering,
Meenakshi Sundararajan Engineering College,
Chennai, India
mksans@gmail.com

***Abstract* — With the advent of innovation and automation, convenience and simplicity has permeated all walks of life. Home automation is one such emerging technology which empowers the residents to have wireless, ubiquitous and computerized control over the household gadgets. Some popular ways to implement wireless connectivity amongst the connected devices are cellular networks, IR sensors, Bluetooth, ZigBee frameworks and Wi-Fi networks with each type having its intrinsic strengths and setbacks. There are a plethora of IoT setups available but most of them have restricted compatibility and are tailor-made for manufacturer supported devices. In order to overcome these difficulties and provide a cost efficient solution, a generic, all product supporting Wi-Fi based remote home automation scheme using an Arduino UNO (microcontroller), an 8 channel Relay module and a NodeMcu (Wi-Fi module) is proposed in this paper. Naive users are familiar with Wi-Fi as it is already used in consumer electronics sector. They can utilise their existing hotspots with minimal additional infrastructure for new IoT applications. Therefore, a Wi-Fi based system brings down the cost by eliminating the need to buy expensive auxiliaries. Being compatible with the Internet Protocol (IP), a significantly higher number of devices can be connected to the internet when Wi-Fi is used. Firebase functions as the cloud hosted real-time database assisting data exchange and synchronisation. The connected devices are monitored and controlled through a mobile application from anywhere across the globe. Additionally, voice based control can be provided with the integration of Google Assistant. The device statistics are visually presented as charts to provide the users an overview of their usage.**

Keywords* — *Internet of Things (IoT), Home Automation, Arduino, NodeMcu, Mobile App, Firebase.

I. INTRODUCTION

The Internet of things (IoT) is an emerging technological paradigm where the devices of everyday use are networked together. This includes mobile phones, refrigerators, washing machines, Television, lamps, watches, wearable devices and almost everything one can imagine. Even traditionally dumb devices can work in perfect synchronisation and interact with each other. The networked devices can identify themselves to other devices. These devices can exchange data through light weight protocols like MQTT, CoAP etc. IoT is seen as the next great revolution in technology which has the enormous potential to transform the way we live, think and act. Nowadays, it has expanded itself to cover almost all aspects of humaninterests. These devices can be remotely monitored and controlled from any corner of the world to perform the designated tasks. This has a huge scope to be scaled up and in future any device having an ON/OFF switch control has a chance to become a part of the IoT.

The connected devices can be assigned an IP address. With Internet Protocol Version 6 (IPv6), assigning an IP address to billions of devices has become very much feasible. Wi-Fi permits a significantly higher number of devices to be connected to the internet as it enjoys a natural compatibility with the Internet Protocol (IP). Wi-Fi also predominates in consumer electronics segment and enjoys a high degree of popularity [1].

There is no dearth of opportunities for smart homed IoT appliances as home automation seems to be imminent in near future. The principal advantage of such homes is amenity and contentment as it emancipates the dweller to perform other jobs. Smart homed IoT devices can help to cut costs and conserve energy. It can also be a blessing to the sick, elderly and all those requiring assisted living. From smart homes, the next improvement is smart cities, which would take the standard of living of its inhabitants to a higher standing.

The rest of the paper is organised as follows: Section II reviews related literature and briefs the methodology proposed in them together with their pros and cons. Section III provides the motivation for pursuing the work and reasons the chosen method. Section IV provides an overview of the components used, their functionality, the architecture of the proposed prototype and its implementation. Section V explains the various performance metrics considered for evaluation. Finally concluding remarks and possible future enhancements are listed in Section VI.

II. LITERATURE REVIEW

In [2], Manda et al. proposed a prototype in which the appliances are physically connected to a 4 channel Relay module. This is in turn cabled with a LPC11U24 (ARM mbed microcontroller) which is interfaced with a SIM 300 (GSM module) to enable wireless cellular connectivity. Through the registered mobile number the user sends an SMS to the GSM module with codified phrases to turn ON/OFF the household appliances. While GSM provides security, this system lags due to the lack of a user interface and suffers from coverage issues.

Team 23

An Automated Secure Voting System for Digital India

M.P.Swetha[1] N.Sharmila[2] M.K.Sandhya[3]
[1&2]Final Year UG Student [3]Associate Professor
Department of Computer Science and Engineering, Meenakshi Sundararajan Engineering College
Chennai, India
[1]swetha1014ms@gmail.com [2]sharmilanagarajan@gmail.com [3]mksans@gmail.com
#Corresponding Author

Abstract **— Digital India aims at empowering our country digitally in the field of technology. In the era of secured transactions from banking to smart ration cards, it is time to use technology for voting system to make it automated and secured. In this paper, an automated secure voting system using biometrics is proposed. This system is used to authenticate the voter and prevent fake votes. The iris and fingerprint data are used to authenticate the voter using image processing techniques. The ultrasonic sensors are used for fingerprint recognition. The contact details like mobile number and mail id of the voter are verified. The automated voting system ensures authentication of the voter and confidentiality of the vote casted using Advanced Encryption Standard. The authentication technique will help the migrants also to vote. Vote revocation can also be done in case of any discrepancy.**

Keywords—Automated Voting System, Biometrics, Ultrasonic sensors, Image processing, Advanced Encryption Standard.

I.INTRODUCTION

Elections in the Indian constitution comprises of elections for the Parliament, RajyaSabha, LokSabha, the Legislative Assemblies, and numerous other Councils and local bodies. The Election Commission of India is an autonomous entity prescribed in the Constitution of India [1]. It is the federal authority responsible for administering all the electoral processes of India and ensuring that the election processes are conducted in a free and fair mannerThe Electronic Voting Machines (EVM) are presently used for the elections in India. The paper ballot vote was replaced by EVM from 1999 in some part of elections and completely after 2014 in all general state elections in India [2]. Figure 1 presents the Electronic voting machine.

In this paper, an automated secure voting system using biometrics is proposed. This system is used to authenticate the voter and ensure valid votes. The iris and fingerprint data are used to authenticate the voter using image processing techniques. The automated voting system ensures authentication of the voter and confidentiality of the vote casted using Advanced Encryption Standard.

Figure 1. Electronic Voting Machine
(Source: www.indiatvnews.com)

The rest of the paper is organized as follows. Section II describes with the existing EVM system. Section III presents the related technologies to be applied in the proposed automated secure voting system. Section IV presents the working of the proposed automated secure voting system. Section V presents the concluding remarks and the future enhancements.

II.EXISTING EVM SYSTEM

An EVM comprises of a control unit, and the balloting unit. The five meter cable is used to join the two units of electronic voting machine. The voting counts and the results are displayed on 7th segment LED displays. The controller used in EVMs has its functioning program etched eternally in silicon at the time of manufacturing by the manufacturer. No one (including the producer) can change the program once the controller is factory-made [2].

TEAM 24

PERFORMANCE MONITORING SYSTEM FOR VIRTUAL MACHINES

Sri Upanya B, Uthra.V
Department of Computer Science and Engineering,
Meenakshi Sundararajan Engineering College,
Chennai,India
[1]sriupanya@gmail.com
[2]uthra2197@gmail.com

Dr.B.Monica Jenefer
Head of the Department,Department of Computer Science and Engineering,
Meenakshi Sundararajan Engineering College,
Chennai,India
hod.cse@msec.edu.in

Abstract- **Various virtualization technologies are adopted to reduce the cost while maximizing the productivity, flexibility, responsiveness, and efficiency. In this paper a virtual environment is proposed where there are multiple virtual machines including several virtual clients and a single virtual server. The virtual clients are monitored by a centralized server. A machine's resource utilization depends on the applications that are running on it. Thus the system metrics indicate the excessive use of a machine. Processor performance, memory utilization and network properties are fetched from the client and communicated to the server machine using ZeroMQ, a message queuing technique. ZeroMQ is an asynchronous messaging library where the API provides sockets for communication. This data that is received by the server is logged and evaluated. If certain resource utilization exceeds a threshold, an email notification is triggered. This system provides a highly secure and efficient environment with limited memory overhead. It is especially useful for applications such as military and medicine where confidentiality is a prime concern.**

Keywords- **virtualization, virtual machine, message queues, performance monitoring, ZeroMQ**

I. INTRODUCTION

Virtualization is the foundation of cloud computing. The hypervisor is a program that enables hosting of several virtual machine on a single hardware. It divides the hardware resources across the various virtual machines. By separating the operating system and the applications from the underlying physical hardware, it is able to provide advantages like ease of deployment, ease of management, reduced cost, portability and optimal utilization of resources. However, it is prone to risks such as virtual machine failure, virtual machine separation and other kinds of issues. To protect the VMs in an efficient way, a monitoring system was first proposed by Jiangyong Shi , where the virtual machines memory, network and file systems were monitored. By assigning higher privileges to a single centralized virtual machine, the various performance metrics of the virtual machines may be gathered and monitored. The performance of virtual machines memory, processor and network are monitored. In the first part of the paper the methodology for gathering this data is discussed. Message queues are used for communicating performance data. The details are discussed in the second part of the paper. This communicated data are stored in the central server for analysis. The monitored results are shown in the third part of the paper. Additionally, an environment which makes use of this monitored data is proposed.

II. RELATED WORK

Jiangyong Shi provided an introspection based virtual machine monitoring system that used the VMI technology to monitor the virtual machine one the hypervisor layer. The semantic information was analysed for intrusion using software tools like Snort, OSSEC and Volatility. The VM's memory, file system and network semantics were monitored. However, the passive technique is vulnerable to transient attacks.

Kenichi Kourai compared the performance of the virtual machine with that of the physical machine and provided methods by which the virtual machine could perform better than the physical machine. Though performance enhancement methods were provided, they were only applicable for certain configurations of the virtual machines and worsened the performance for other setups.

Hafiz ur Rahman monitored the virtual machine's performance by applying complex and heavy workload.

Sensor Based Accident Prevention and Detection using Raspberry Pi

B.Srividhya[1]
[1]Meenakshi Sundararajan Engineering College, ComputerScience and Engineering,
srividhyasankari@gmail.com

S.Subhashini[2]
[2]Meenakshi Sundararajan Engineering College, ComputerScience and Engineering,
subhashinisuresh98@gmail.com

Dr.B.Monica Jenefer[3]
[3]Meenakshi Sundararajan Engineering College, ComputerScience and Engineering,
bmonica20@gmail.com

Abstract— Accident rates are increasing and the reason behind them are various. Targeting the reason behind it at the initial stage will help reduce the number of accidents and its severity drastically. There is a lot of life loss after accidents due to no immediate medical attention.The project focuses on detecting one of the root causes of accident which is wheel alignment.Also accident is detected using a vibration sensor and the nearby hospital and family member is alerted which increases the chances of saving the life.

Index Terms— 3-Axis Accelerometer, Camber Angle, Latitudinal and Longitudinal points, Wheel Misalignment, Vibration Sensor

1 Introduction

THIS project focuses on detecting one of the root causes of accident which is wheel misalignment. Camber angle inspection plays a crucial role in vehicle safety and ensures the tyre quality. It influences the cornering force while driving and also road handling while driving. Camber angle affects steering controllability and stability while driving. Here we calculate the camber angle using the 3-axis accelerometer which gives the coordinate axes values.If the z-axis value does not fall under the given level, a message is sent to the mechanic nearby and also to a person the user has chosen. The user is also alerted to drive carefully.The next scenario where the project focuses is after the user has met with an accident. To avoid life loss and to provide immediate medical support, a vibration sensor is used which detects the magnitude level of the moving vehicle.Once the magnitude exceeds a certain level which is at a higher level,the user is alerted along with a set of people the user has chosen through SMS. The location is shared with them as Latitudinal and Longitudinal points by which they can get to know the exact location of the place the accident happened. This is all done with the help of a GSM module. By this,the chances of an accident happening could be sensed before so that the user could be more careful and alert while driving which could drastically reduce the chances of an accident happening. Also,if an accident occurs too, the chances of saving the life is high by providing immediate medical support.

2 Camber Angle

2.1 Camber Angle Inspection

Vehicle safety and quality are crucial to both manufacturing and maintenance in the automotive industry. Vehicle wheel alignments become essential since the wheel camber angle affects steering controllability and stabllity. Misalignments of wheels may effectuate rapid and irregular tire wear. In addition,they may decrease the capability of the vehicle's handling and safety. The camber angle is defined as the angle between the normal vector of the tire plane and that of the vertical plane viewed from the front of a vehicle. The camber angle has a major influence on the cornering force and on the road handling of the vehicle and therefore plays one of the most significant roles in vehicle handling and safety.

2.2 Camber angle Measurement

An approach is being proposed for performing Camber angle measurement based on a Micro-Control Unit (MCU). Two main components have been employed:the MCU and the 3-axis accelerometer. The MCU-based approach makes use of the 3-axis accelerometer to acquire gravity, and applies the coordinate transformation between the camber inspection system and the vehicle. the wheel is not necessary since the misalignment angle for the camber inspection system can be compensated by the proposed approach autonomously. Furthermore, the axis misalignment of the accelerometer can also be redressed by an appropriate calibration procedure to increase measurement precision. This paper also

A SURVEY ON EXTENSIBLE FRAMEWORK FOR E-COMMERCE ON CUSTOMER RECOMMENDATION AND BARGAINING FOR PRODUCT MODIFICATION USING KNN ALGORITHM

Ms. M.Vaishnavi
Department of Computer Science & Engineering
MEENAKSHI SUNDARARAJAN ENGINEERING COLLEGE
Chennai-24, India.
vaishu150197@gmail.com

Mrs.Sumithra
Assistant Professor, Department of Computer Science & Engineering
MEENAKSHI SUNDARARAJAN ENGINEERING COLLEGE
Chennai-24, India.
msec.msumithra@gmail.com

Abstract — There are a lot of e-Commerce websites for retail selling of products. They display the products and their features along with photographs and videos with prices and allow the user or customer to choose the product pay for it using net-banking or choose 'Cash on Delivery' option.But there are no retailing websites which allow the customer to either bargain the prices or to suggest a remodelling or remanufacturing of the product. If the customer is a Business retailer or uses this product as a raw material for his end-product, requesting for a re-modelling and remanufacturing of the product is all the more important for him.The main aim of this paper is to overcome the limitations faced by the buyers in other Online shopping sites. The first approach is to build or form a group of consultants or agents who will be assigned proper shifts and will be paid accordingly. These consultants will be online representing the website by answering the queries raised by the customers and will also negotiate the prices according to each customer on a one to one business process. The second approach is modifying or altering the products according to the customers' perspectives and views but for this scenario the customer must mandatorily cart the product, only then the product will be altered. This will help to increase the number of buyers and retain the existing ones. The third and the final approach is the development of a facility to upload designs. This page is for the customers to upload their designs since there may be good designers but not good developers. Good designs will be selected, developed and sold online. A fixed percentage of profits obtained from the sale of the design will be provided to the designer. This paper proposes bargaining for online transaction or for online purchase of a particular product that plays an important role in the benefit of the online retailers and customer as well, keeping profit margin into consideration.

Keywords— e-Commerce , knn ,large data.

I.INTRODUCTION

The domain touched by this paper is E-Commerce By Data Mining For Logistics, Erp And Cloud-Saas.

This web software is used for E-Retailing which is a customer facing e-Commerce portal used for show-casing products so that the customers choose the product they require order the quantity and pay for it.Data mining of historical purchase data can be used to predict price bargaining analytics. This needs organic growth of data while more and more customers continue to use the portal. This is a challenge during testing stage as enough volume of data cannot be obtained for testing. Only randomly generated data can be used during the testing stage as growth of volume is expected only after launching the product on the web.Logistics is part of the large ERP system connecting the

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ADVERTISEMENT FEEDS BASED ON ONLINE USER'S MOOD ANALYSIS

VishnuPriya.S and M.K.Sandhya
Department of Computer Science & Engineering,
Meenakshi Sundararajan Engineering College
Chennai
svishnupriya5198@yahoo.com mksans@gmail.com

Abstract— **The main objective of this paper is to increase the buying percentage of the online users. By analysing one's state of mind and displaying relevant advertisements will increase their interest in the product and thereby increase the buying percentage of the product. Social Media is a platform where many individuals express their feelings through words. By analysing these text contents and using stemming process, relevant advertisements will be displayed on the screen. If the user shows interest in the advertisement they can click on it, which will take them to the relevant link of the advertisement. This technique increases the percentage of sales of the product by displaying the right advertisement to the right person. The results show that the buying percentage increases by a minimum of 20% using this technique.**

Keywords: Social Media, Mood Analysis, Advertisements, Buying Percentage.

I. INTRODUCTION

Mental health [1] is a level of psychological well-being or absence of mental illness.The psychological state of someone who is functioning at a satisfactory level of emotional and behavioural adjustment is considered to be a person with a stable mental health. Mental Health Analysis is the process of breaking the mental issues or mental illness into smaller parts in order to gain a better understanding of it.A Human brain has seven moods between which it keeps switching according to the situation or the environment they are present in. Social media are interactive computer-mediated technologies that facilitate the creation and sharing of information, ideas, career interests and other forms of expression via virtual communities and networks. This is a paper that combines both mental health analysis and social media.

The technology used in the study is Stemming [2] technology. Stemming is a part of linguistic morphological which is used in reducing inflection. When an input data is entered by the user, the stemming process will take place between the tags provided for the advertisement and the keywords in the status. Accordingly the advertisement which relate to both the keyword and the tags are displayed on the screen for the easy access of the advertisement by the user.

The rest of the paper is organized as follows. Section II presents Literature Survey. Section III presents the proposed method. Section IV presents the system architecture. Section V presents the results and discussion. Section VI presents the concluding remarks.

II. LITERATURE SURVEY

The literature survey is presented below in a table 1 with the methodologies and its pros and cons.

METHODOLOGY	PROS	CONS
Deep convolution neural network [3]	F-1 measures for semantic classification	Cannot produce accuracy if it is not F-1
Psychomotor symptoms. [4]	Measures severity of moods.	Used in depression detection.
Lexicon based [5]	Language style is used to determine the mood	Low recall and high dependency on the quality
Fuzzy based [6]	Obtains simple solution rather than statistical issues	Unable to determine sentiment polarity of some statements
OCR technique [7]	Categorizes and stores the data in clipboard	No fixed output

Table 1. Literature Survey

III.METHOD

The major requirements for this paper is a platform to enter an input data and to display the advertisements, which is considered more often for a social media platform. These social media platforms are created with the computer languages HTML,CSS and JAVA. The usage of SQL is used for the storing of the data entered by the users.

The advertisements produced are also stored in a database for the stemming algorithm to take place. Stemming algorithm or Stemming Process or Stemming technique is a process of reducing inflected or sometimes derived words to their word stem. There are several types of stemming algorithm but a traditional stemming algorithm is which that looks up the inflected form in a lookup table. The advantages of this approach are that it is simple, fast and easily handles

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Mitigation of Selfish Node Attacks In Autoconfiguration of MANETs

Reshmi.T.R[1], Shymala L[2], Sandhya.M.K[3]
[1,2] School of Computing Science and Engineering, VIT University, Chennai, India
[3]Department of Computer Science and Engineering, Meenakshi Sundararajan Engineering College, Chennai, India

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ABSTRACT

Mobile ad-hoc networks (MANETs) are composed of mobile nodes connected by wireless links without using any pre-existent infrastructure. Hence the assigning of unique IP address to the incoming node becomes difficult. There are various dynamic auto configuration protocols available to assign IP address to the incoming nodes including grid based protocol which assigns IP address with less delay and low protocol overhead. Such protocols get affected by presence of either selfish nodes or malicious nodes. Moreover there is no centralized approach to defend against these threats like in wired network such as firewall, intrusion detection system, proxy etc. The selfish nodes are the nodes which receive packet destined to it and drop packet destined to other nodes in order to save its energy and resources. This behavior of nodes affects normal functioning of auto configuration protocol. Many algorithms are available to isolate selfish nodes but they do not deal with presence of false alarm and protocol overhead. And also there are certain algorithms which use complex formulae and tedious mathematical calculations. The proposed algorithm in this paper helps to overcome the attack of selfish nodes effect in an efficient and scalable address auto configuration protocol that automatically configures a network by assigning unique IP addresses to all nodes with a very low protocol overhead, minimal address acquisition delay and computational overhead.

Corresponding Author:

Dr.Reshmi T R,
School of Computing Science and Engineering,
VIT University, Chennai, India
Email: reshmi.tr@vit.ac.in

1. INTRODUCTION

Mobile Ad Hoc Networks (MANETs) are dynamic ad hoc networks with mobile nodes that self-configure for communication and frequently change the locations due to mobility. The mobile devices in MANETs use wireless connections for communications. The wireless communication can be a Wi-Fi connection, cellular or satellite transmission. MANETs are divided as Pure MANETs and Connected MANETs. Pure MANETs (also known standalone MANETs) are restricted to a local area of wireless devices (such as a group of laptop computers), while Connected MANETs (also known as Internet Connected MANETs) may be connected to the Internet. In local area MANETs, the IP address assigned to the nodes need to be locally unique. In Internet Connected MANETs the IP address assigned to nodes must be globally unique.

In MANETs, nodes are not assigned with static IP address due to the dynamic topology of the network. The centralized approach like Dynamic Host Configuration Protocol (DHCP) requires servers to serve multiple requests and assign IP addresses to the requesting nodes. But as these servers consume high battery consumption and resources, the centralized approach is not suitable for MANETs. To assign unique IP address for the nodes, Distributed dynamic addressing schemes are more suitable in MANETs. In these

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Chennai - 600024

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AUTOMATIC NODEMCU BASED WASTE SEGREGATION

Anitha Rajesh Kumar[1], Deepa Ragunathan[1], Kavya Dhandapani[1], N. Meenakshi[2]
[1]Students - Department of Electronics and Communication Engineering 4th year
[2]Assistant Professor - Department of Electronics and Communication Engineering
Meenakshi Sundararajan Engineering College
Kodambakkam, Chennai, Tamil Nadu, India

Abstract- The ever growing human population is imposing a strong demand and pressure on the environment for sustenance. This growth spurt has resulted in a steady increase in the amount of waste being disposed on a daily basis. In most of the developing countries, segregation and timely collection of waste is a major challenge. Due to inefficient waste segregation, a large amount of recyclable content go as waste.The waste, if not separated properly, gets mixed up and may eventually leak, resulting in toxicity and may contaminate the groundwater table through poisonous methane gas. In this paper, we present a SmartBin, a bin that is able to segregate waste at source with no human intervention and can automatically alert the waste collection center. The system segregates the medical wastage as metal, dry and wet based on the sensors . The system is used in recycling garbage. The waste is moved on the conveyor belt which moves it to the smart bin. The status and capacity of this SmartBin can be monitored by the municipal worker over their mobile phone, connected using a NODE-MCU Microcontroller.

I. Introduction

A notable inflation in municipal solid waste generation has been registered worldwide. This increase can be attributed to overpopulation, industrialization, urbanization and economic growth, which have caused a significant and noticeable effect on the total solid waste that is generated. Overflowing landfills are impossible to reclaim because of the unruly accumulation of wastes on the outskirts of the cities over the years. The separator will change the direction of medical garbage handling, which is but one part of the hardware module which is available in conveyor set up. The conveyor control, sensing operations, diversion control and other operations will be controlled by the NODE-MCU controller.

This controller drives the conveyor belt. This is the controller module which controls the output devices with the help of input devices such as the sensors, and a developed program. Now-a-days, industrial processes are monitored in an RTU unit. Thus, when Medical waste is being disposed, it requires the presence of an individual to monitor any decision-rule conflicts manually. If any error occurs in this process, it could lead to fatalities, so we need human involvement in today's existing system.

II. Drawbacks of Existing System

The most prominently used system of waste segregation today is manual segregation, which leaves a wide margin for human error. These errors can be fatal if the wastes are chemical or biomedical in nature.

The existing automated methods of segregation only separate wastes based on moisture, which can lead to metals being categorized erroneously. Systems that do incorporate metal detection fail to monitor the moisture levels of wastes. The greatest disadvantage of existing methods is the lack of isolation of human effort. There is no automated monitoring or alert system to track the bin capacities remotely.

III. Proposed Method

As discussed in the previous section, human effort is needed for analyzing the medical garbage and segregating it, which is very tedious. This drawback can be overcomed by our proposed system: an automated device which can be used for easily dividing and analyzing the medical garbage by the use of sensors and a NODE-MCU controller.

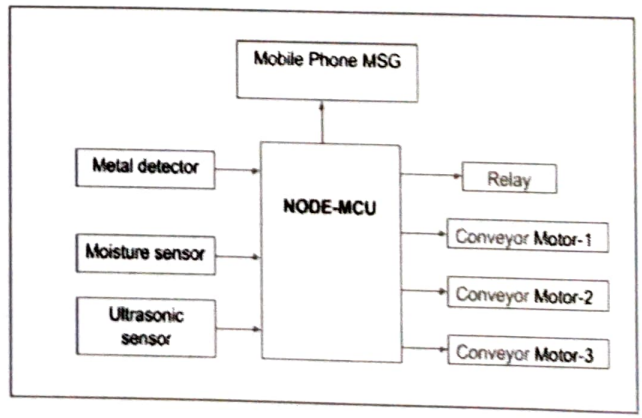

fig.1. Block diagram of NODEMCU

DESIGN OF CONTROL SYSTEM FOR HIGH PRECISION FEED DRIVES OF MACHINE TOOLS

Mr.Srikanth[1], Mrs. Uma[2],G.Atchaya[3],S.RoashiniPriyaa[4],P.ShreeShyamala[5]
External Guide[1],Internal Guide[2],Student[3,4,5]
Meenakshi Sundararajan Engineering College,Kodambakkam

Abstract-Nowadays, high speed and high acceleration machine tools are used for industrial purposes for which the structural vibrations are obtained in huge amount which affects the precision of the feed drives. The feed drives are used to position the cutting tool and work piece to a desired location, hence the positioning accuracy and the speed determines the quality and productivity of the machine tool. To avoid such structural vibrations obtained in those machine tools and to increase the performance characteristics and to maintain a nominal precision for such machine tools our project deals with controlling of different electrical parameters.

I. INTRODUCTION

The main purpose of this project is to attain a nominal precision in feed drives. The adoption of ball screw mechanism with a carriage mass with a supporting LM block which is driven by a motor from the electrical block is considered.

A ball screw is a mechanical linear actuator that translates a rotational motion to linear motion with little friction. A threaded shaft provides a helical raceway for ball bearings which acts as a precision screw. They are able to apply or withstand high thrust loads, they can do so with minimum internal friction.

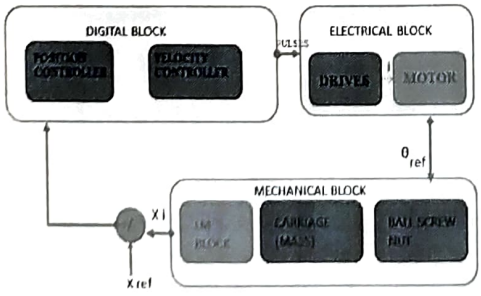

FIG 1 BASIC BLOCK DIAGRAM OF THE PROPOSED SYSTEM

They are made to close tolerances and are therefore suitable for use in situations in which high precision is necessary. The ball assembly acts as the nut while the threaded shaft is the screw. In contrast to conventional leadscrews, ball screws tend to be rather bulky, due to the need to have a mechanism to recirculate the balls. Therefore the amount of friction in the recirculation through balls technique is reduced.

The ball screw's input is given from the ac motor which is driven by a servo drive. The current from the servo drive is sent to the motor which is sufficient for the motor to operate whose output is a rotational reference angle that acts as the input for the ball screw. The ball screw converts the rotational force to linear force and moves the carriage mass on the ball screw in linear movement. The position and the velocity of the linear movement is the feedback controller that acts as the input for the digital block. The position controller and velocity controller filters the vibration and improves the precision of the system.

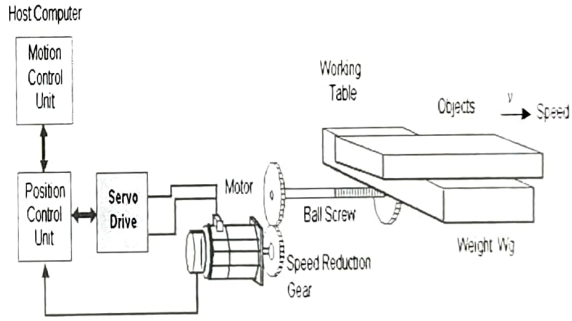

FIG.2: BALL SCREW MECHANISM

From the fig.2, the motion control unit is used to control the position of the ball screw movement. The servo drive drives the motor at very high speed which cannot be directly applied to ball screw. Hence an arrangement of speed reduction gear is made such the speed is reduced to a minimal value for the ball screw to function. The speed reduction gear reduces the speed nominally for the ball screw to operate. The feedback controller and feed frward controller plays the major part in maintaining stability of the system.

II. CONTROLLER SYSTEM

Most mechatronic systems are actively controlled motion systems, which impliesthat these systems are of a dynamic nature. These dynamics deteriorate the pre-defined trajectory of the machine tool. Motion control is all about the control of amachine to follow a pre-defined trajectory in space and time, with

variousapplications.The feedback and feedforward control enable to realise a significant improvement inthedynamic performance of mechatronic motion systems. Feedback control allows tomodify the system properties by changing the pole locations of the system, thereforeoffering to control unstable systems and add robustness to the feedback controlledsystem. Feedforward control enables to improve the performance of motion systemfor instance by zero-pole cancellation, while not being limited by the conditions forstability and, in general, being simpler and faster than feedback control. With thecombination of both, feedforward and feedback control, also called two degree offreedom control, we can optimise the control design including the trade-off betweenperformance and robustness. The behaviour of the plant has to be known sufficientlywell, either by means of system identification or by modelling.

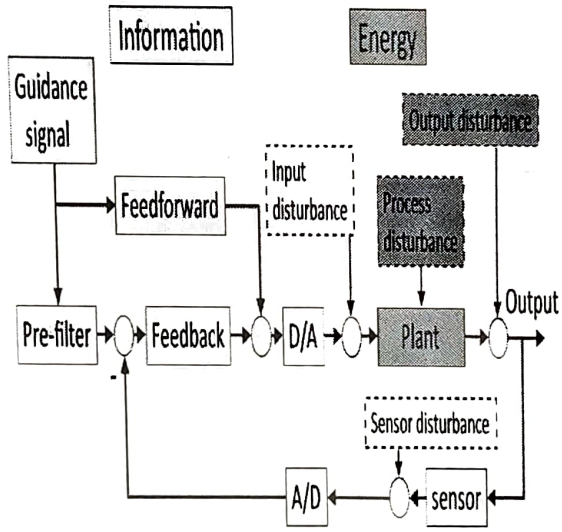

FIG.3 FEEDFORWARD AND FEEDBACK CONTROLLER

III. FEEDFORWARD SYSTEM:

For open-loop stable system, it is possible to apply feedforwardcontrol to improve the system performance when following a pre-defined trajectory like a reference signal or a repeating scanning motion.

A feedforwardcontroller basically consists of a filter that is placed in series with the plant in order tocompensateits dynamics.The reference or guidance signall r is applied to the controller that has a frequencydependent transfer function Cff(s). The output u of the controller is connected to the input of the motion system that has a transfer function G(s) giving the output y, whichis a position.

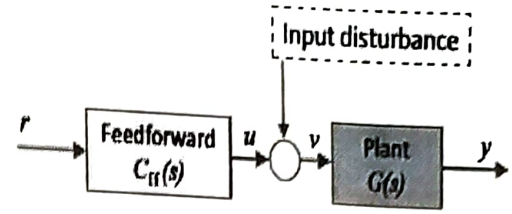

FIG.4: FEEDFORWARD CONTROLLER

In this configuration the feedforward controller acts as a filter thatmodifies the reference signal in such a way, that the motion of the controlledmechatronic system followsthe reference signal. If we want to achieve perfect control, which means that there isnodifference between the reference position and the actual position of the system, thecombined transfer function Gt,ff(s) from r to y has to be equal to one, hence showidentity:

$$Gt,ff(s) = y/r = Cff(s)G(s) = 1$$

In that case the feedforward controller has to be the exact inverse of the plant

$$Cff(s) = G(s)^{-1}$$

IV. FEEDBACK CONTROLLER:

If no dynamics are involved, the feedforward controller eventually would only represent a gain that scales the reference signal. In reality positioning systems include dynamics with a frequency dependent transfer function. In that case also thedynamics of the positioning system have to be inverted, which results in pole-zerocancellation between the controller poles and system zeros as well as controllerzeros and system poles. The feedforward problem can be more complicated as notalways all plant dynamics can easily be inverted.

In feedback control the actual status of the motion system is monitoredby a sensor and the controller is generating a control action based on the difference between the desired motion (reference signal) and the actualsystem status (sensor signal). The outputy is measured and compared with(subtracted from) rf which is the reference r, after filtering. The result of thiscomparison is used as inputfor the feedback controller. Because the sensor signal is fed back in a closed-loop tothe input of the system, feedback control is also called closed-loop control.It shows both the fitted dynamic model of the scanning unit without control (solidline), the notch filter by the 3rd order feedforward controller (dashed line) and theresulting compensated dynamic performance of the combined scanning unit and controller (dashed-dotted line).

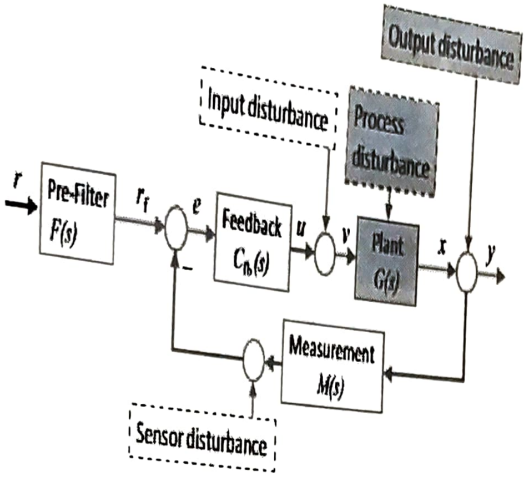

FIG.5: FEEDBACK CONTROLLER

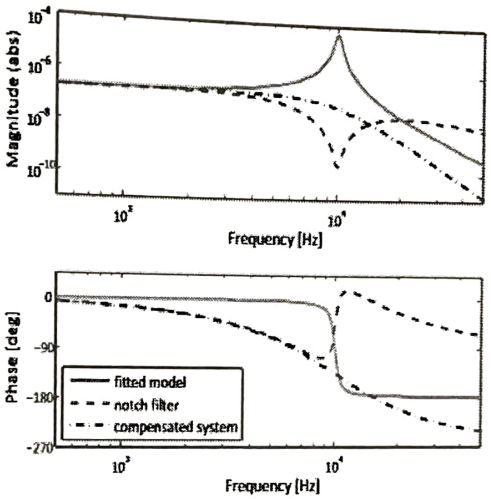

FIG.6: BODE PLOT OF FEED FORWARD CONTROL SYSTEM

V. INPUT SHAPING:

Another open loop method that is often used I motion control is called as input shaping. With this method the reference signal is modified in a different way than by the linear filtering and compensation. When step signal is given to a system, it would start to oscillate at its natural frequency where he oscillation would fade away after the step according to the damping of this resonance. In a first approximation, the system can be assumed to behave like a linear system which means that a reduction of the input step stimulus by a factor of two would result in a reduction of the amplitude of the response by the same factor two. When these steps are applied with only half the height of the full step,the same steady state would be obtained in with the full step stimulus after all_oscillations are damped out. If one of these half-height steps is delayed by half the period of the system's resonance frequency, the oscillations that_are caused by each individual step are 180◦outofphase and cancel each other.

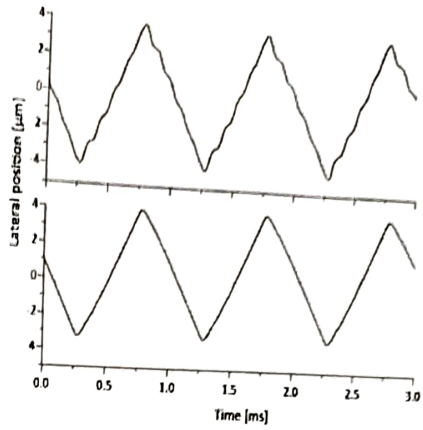

FIG.7: INPUT SHAPPED EXAMPLE OF A SYSTEM AFTER A APPLICATION OF POLE ZERO CANCELLATION

are caused by each individual step are 180◦outofphase and cancel each other.

This splitting of the reference signal into two equal signals and delaying one of them by half the period of the system's resonance is a typical example of input-shaping. This method clearly is very different from pole-zero cancellation as it is time domain instead of frequency domain based filtering. In the frequency domain these sampled adaptations to input create a frequency spectrum with a multiple of notch filters at the harmonics of the frequency that these adaptations are applied.

VI. ADAPTIVE FEEDFORWARD CONTROL

The model based pole zero cancellation and the input shaping only work reliably as long as the dynamic properties of the total plants are known and they remain constant. These dynamics include the transfer functions of passive elements like the mechanics as well as active elements like amplifiers and actuators.In reality often external influences have an impact on these dynamic properties, leading to an increasing deviation between theparametersinthe modelandthereality. This deviation canbepartly solved by adaptive feedforward control, adapting the feedforward signal by measuring it sreal behaviour. This method equires a sensor toob tainin formation about the behaviour and for that reason it isoften applied in combination with feedback.

A.P Controller: P controller is mostly used in first order processes with single energy storage to stabilize theunstable process. The main usage of the P controller is to decrease the steady state error of thesystem. As the proportional gain factor K increases, the steady state error of the systemdecreases. However, despite the reduction, P

control can never manage to eliminate the steadystate error of the system. As we increase the proportional gain, it provides smaller amplitudeand phase margin, faster dynamics satisfying wider frequency band and larger sensitivity tothe noise. We can use this controller only when our system is tolerable to a constant steadystate error. In addition, it can be easily concluded that applying P controller decreases the risetime and after a certain value of reduction on the steady state error, increasing K only leads toovershoot of the system response. P control also causes oscillation if sufficiently aggressive inthe presence of lags and/or dead time. The more lags (higher order), the more problem itleads. Plus, it directly amplifies process noise.

B.P-I Controller :P-I controller is mainly used to eliminate the steady state error resulting from P controller.However, in terms of the speed of the response and overall stability of the system, it has anegative impact. This controller is mostly used in areas where speed of the system is not anissue. Since P-I controller has no ability to predict the future errors of the system it cannotdecrease the rise time and eliminate the oscillations. If applied, any amount of I guarantees setpoint overshoot.

C.P-D Controller :The aim of using P-D controller is to increase the stability of the system by improving controlsince it has an ability to predict the future error of the system response. In order to avoideffects ofthe sudden change in the value of the error signal, the derivative is taken from theoutput response of the system variable instead of the error signal. Therefore, D mode isdesigned to be proportional to the change of the output variable to prevent the sudden changesoccurring in the control output resulting from sudden changes in the error signal. In addition, D directly amplifies process noise therefore D-only control is not used.

*D.P-I-D Controller:*P-I-D controller has the optimum control dynamics including zero steady state error, fastresponse (short rise time), no oscillations and higher stability. The necessity of using aderivative gain component in addition to the PI controller is to eliminate the overshoot and theoscillations occurring in the output response of the system. One of the main advantages of theP-I-D controller is that it can be used with higher order processes including more than singleenergy storage.

VII. SERVO DRIVES:

A servo drive is a special electronic amplifier that are usedto power the electric servo-mechanisms.A servo drive monitors the feedback signal from the servomechanism and continually adjusts for deviation from expected behaviour.A servo drive receives a command signal from a control system, amplifies the signal, and transmits electric current to a servo motor in order to produce motion proportional to the command signal. Typically, the command signal represents a desired velocity, but can also represent a desired torque or position. A sensor attached to the servo motor reports the motor's actual status back to the servo drive. The servo drive then compares the actual motor status with the commanded motor status. It then alters the voltage, frequency or pulse width to the motor so as to correct for any deviation from the commanded status. In a properly configured control system, the servo motor rotates at a velocity that very closely approximates the velocity signal being received by the servo drive from the control system. Several parameters, such as stiffness (also known as proportional gain), damping (also known as derivative gain), and feedback gain, can be adjusted to achieve this desired performance. The process of adjusting these parameters is called performancetuning.

VIII. SERVO TUNING:

In the latest high-speed and high-acceleration NC machine tools, the structural vibration is one of the most critical factors to deteriorate the machine's contouring performance. Particularly on such a machine, the parameters in a CNC servo control system must be carefully tuned, since too high response of the latest CNC units often causes severe structural vibration.. In order to reduce the structural vibration with the minimum sacrifice of control bandwidth, the tuning is based on iterative measurement and simulation of the machine's contouring performance. A case study shows that a proper tuning of servo parameters significantly reduces the structural vibration and improves the machine's overall contouring accuracy.A structural vibration is also a critical issue on typical high-

speed machines. A high-speed, high-acceleration feed drive naturally imposes a severer impact force on the mechanical structure, which causes the structural vibration of lower frequency, and larger amplitude. This issue becomes more critical on a linear motor driven feed drive. Since it is a direct drive with no transmission mechanism, its driving force is directly transmitted to the mechanical structure. In today's market, the majority of servo motor driven feed drives in machining centres still adopts the "semi-closed loop" control (i.e. the angular position of a servo motor is feedbacked for the position control). On the other hand, a linear motor driven feed drive system must directly feedback the linear position of a table. Therefore, the dynamics of structural vibration directly affects the dynamics of the position closed-loop system. When servo parameters are not properly tuned, it may even cause the instability of the closed-loop system. The

structural vibration becomes particularly a critical issue on a large-size machine tool, where the mass of the driven part is generally heavier and/or the travel range is longer.

Conventionally, the gains of position and velocity controllers are set as high as possible, under the condition that the stability (and robustness) of the closedloop system is secured with some stability margins. On the latest high-speed machines, however, it is often the case that feedback gains must be lowered to reduce the motion error caused by the structural vibration. On some large-sized machines, the maximum acceleration is set lower than the potential capacity of a servo motor, in order to secure required motion accuracies.

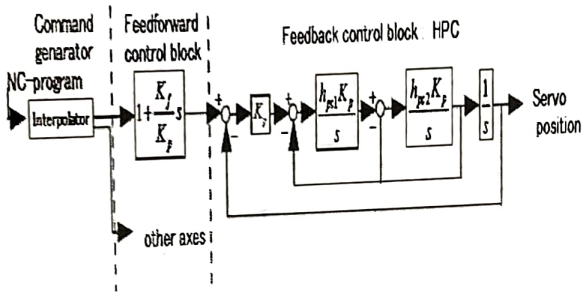

FIG.8: SIMPLIFIED CNC DYNAMIC FEED DRIIVE SYSTEM MODEL

Basically, the servo parameter tuning methodology is based on the measurement of the machine's two-dimensional contouring performance by using the cross grid encoder method, or the KGM (Kreuz Gitter Meβsystem in German) method, developed by Heidenhain GmbH. Since the KGM method is non-contact optical measurement, it is more suitable for high-speed and highaccuracy measurement. More importantly, unlike the DBB (Double Ball Bar) method that is restricted to a circular test, it can measure the machine's twodimensional contouring error on an arbitrary geometry.

IX. CONSIDERATIONS FOR TUNING:

1.From the fig.8, the command generator is considered exactly same as the one used in the actual CNC unit. Most commercial CNC units in today's market support an S-curve velocity profile which can be represented by the combination of two filters and has two parameters to be tuned.Typical commercial CNC units employ two ways to distribute a velocity command profile to each axis; the pre-interpolation and post-interpolation acceleration controls. In the post-interpolation acceleration control, a velocity command is distributed to each axis and then is filtered independently. On the contrary, in the pre-interpolation acceleration control, it is first filtered and then distributed to each axis. The pre-interpolation acceleration control must be used for high-accuracy contouring.

2.A feedforward controller of the first order is assumed for faster response while securing the stability of the feedback loops.

3.The transfer function of the velocity and current control loop is regarded to be ideal since the bandwidth of these loop is general sufficiently large compared to that of the position loop.

4.Many commercial CNC units in today's market implement a higher-order position control loop block to improve the response of the closed-loop system. The radius reduction in circular interpolation can be improved by using a high order position control loop.

For tuning all the servo parameters the following parameters have to be controlled, 1) an acceleration time (the first-order time constant for linear acceleration and deceleration), 2) a position loop gain, p K , 3) a time constant of asmoothing filter on the reference trajectory, 4) a feedforward controller gain, f K , and 5) a corner velocity.

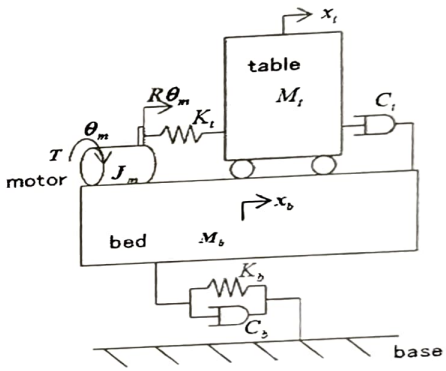

FIG.9: DYNAMIC MDEL OF FEED DRIVE SYSTEM

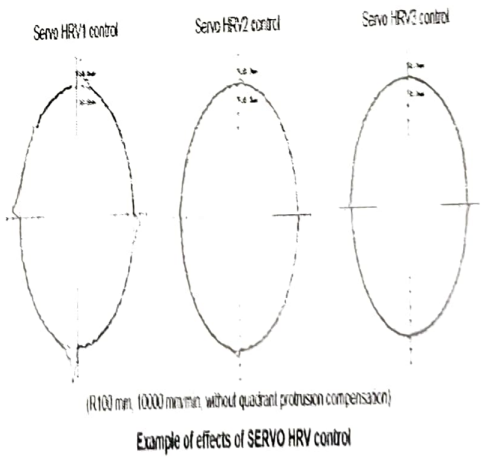

FIG 10: BY USING THE HIGH RESPONSE VELOCITY CONTROLLER I THE PROTRUSIONS ARE IDENTIFIED IN A CIRCULAR RADIUS WHEAREAS WITH HRV2 THE PROTRUSIONS ARE REDUCED TO MINIMUM AMOUNT AND WITH HRV3 THE PROTRUSIONS ARE TOTALLY NULLIFIED.

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DEVELOPMENT OF IOT BASED SMART SECURITY AND MONITORING DEVICES FOR AGRICULTURE

MEENAKSHI SUNDARARAJAN ENGINEERING COLLEGE

K.DEEPIKA 311515105020
A.GAYATHRI 311515105023
M.S.KOTHAI 311515105032

INTERNAL GUIDE:
Mrs.T.VANATHY M.E
Assistant Professor(EEE dept)
MeenakshiSundararajanEnggcollege

Mail id: deepikamalar3@gmail.com

***Abstract*—The Internet of Things (IoT) technology is currently shaping different aspects of human life. Precision agriculture is one of the paradigms which can use the IoT advantages to optimize the production efficiency and uniformity across the agriculture fields, optimize the quality of the crops, and minimize the negative environmental impact. In this paper, we present an IoT architecture customized for precision agriculture applications. The proposed three-layer architecture collects the needed data and relays it to a cloud-based back-end where it is processed and analyzed. Feedback actions based on the analyzed data can be sent back to the front-end nodes. We built a prototype of the proposed architecture to demonstrate its performanceadvantages.**

Keywords—Internet of Things (IoT); precision agriculture; sensor networks; platform implementation; cloud computing

I. INTRODUCTION

Precision agriculture emerged in the late 1980's with the matching of grid-based sampling of soil chemical properties with the newly developed variable-rate application equipment for fertilizers [1]. Since then, it became the main farming management practice worldwide. Precision agricultural services provide the means to (1) fight epidemic diseases by applying the appropriate types and amounts of fungicides, pesticides and organic fertilizers at the right times, (2) achieve efficient water consumption by watering the plants with only the needed amount of water and the right time, (3) reduce the harm to the environment since knowing when to spray a pesticide does not only lead to effectively killing harmful pests but also reduces the use of the pesticide, and (4) produce high-value agriculture productions by growing non-toxic, safe, and healthy crops.

The use of Wireless Sensor Networks (WSNs) in precision agriculture increases the efficiency, productivity and profitability of many agricultural production systems [2]-[11]. Real-time environmental information can be remotelygathered from the agricultural fields and transferred to where it can be processed to discover problems, store data, and/or take needed actions. This contrasts with the traditional agricultural approaches in which decisions are taken based on some hypotheticalaveragecondition,whichmaynotreflectreality.

WSNs are key components the Internet of Things (IoT) in which different pieces of information gathered from almost anywhere and anything in the world are accessible through the Internet. The integration of WSNs with IoT resulted in a plethoraofapplicationssuchassmart-cities,remotehealthcare, energy and water control, precision agriculture, wildlife monitoring,structuralandancientbuildingmonitoring,etc.

In this paper, we propose a cloud-based IoT architecture thatisapplicableindifferentprecisionagricultureapplications. The proposed architecture is composed of three layers: a front-end layer that collects the environmental information and applies the needed agriculture actions; a gateway layer that connects the front-end layer to the Internet, and a back-end layer in which the data storage and processing take place. A prototype of the proposed architecture is built and tested to illustrate itsperformance.

The remainder of the paper is organized as follows. In Section II, we review the related literature. The proposed IoTarchitecture is presented in Section III. A preliminary set of resultsofaprototypeofthisarchitectureispresentedinSection IV. The paper is concluded in SectionV.

II. RELATEDWORK

A. High-Level IoTArchitectures

This category represents the related IoT architectures that were proposed in the literature. A classification of generic IoT platforms is presented in [2], which also develops a top-level generic IoT architecture suited for smart city applications including precision agriculture. Likewise, [3] presents a functionalviewofanintegratedarchitectureofdataacquisition and intelligent control system that can be used in agricultural facilities such as greenhouse. In [4], the authors present a functional architecture that aims at promoting thedevelopment of facility habitat intelligence monitoring platforms. The authors of [5] integrate the recently developed Open IoT platform that is applicable in a number of use cases with the Digital Agriculture (Phenonet) to develop a semantically enhanced agriculture ontology. However, all such related works lack actualimplementations.

B. Crop MonitoringPlatforms

Several IoT systems have been developed for monitoring purposes in precision agriculture application [6]-[8]. With the goal of increasing the crop production, a crop monitoring system was developed to collect the crop data and use production system through correlation analysis between the crop statistical information and agricultural environment information [9]. The platforms presented in [10] and [11] and control functionalities based on the monitored data

C. *Irrigation ControlPlatforms*

Several IoT platforms have been recently developed to control the water consumption in irrigation. Examples include the simple system developed in [12]. More advanced systems such as the system presented in [13] which allow users to control the irrigation process via cellular technologies. Likewise, the system presented in [14] uses cellular technologies to transfer the sensors' data to a database system. The platform proposed in [15] directs the data to a cloud service through HTTP.

III. PROPOSED CLOUD -BASED AGRICULTURALIOT ARCHITECTURE

The proposed cloud-based IoT architecture for agricultural applications depicted in Fig. 1 is composed of 3 layers: front-end, gateway, and cloud back-end. In this section, we discuss these three layers and their implementation in detail.

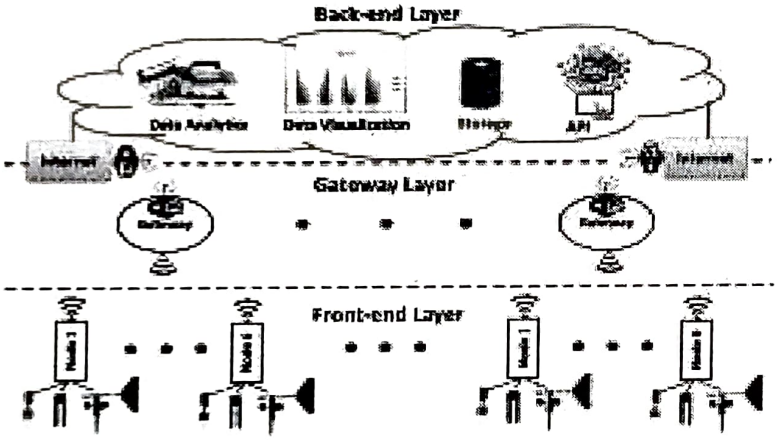

Fig. 1.Proposed cloud-based IoT architecture for agricultural applications.

A. *Front-endLayer*

The front-end layer is the physical hardware or the sensing nodes that are composed of 4 modules: a microcontroller, the environmental sensors and actuators, interfacing circuits, and a wireless communication module as shown in Fig. 2.

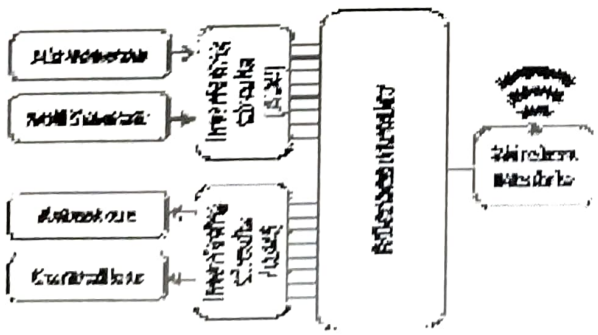

Fig. 2.Front-end node architecture.

Microcontroller: The microcontroller is responsible for collecting the data of the different sensors attached to it and communicating such data to the next layer of the architecture. Dependingontheapplication,themicrocontrollercanbeeither battery-powered,self-poweredusingsolarpanels,orself-powerwithbackupbatteries.WeusetheRaspberryPi2single-board microcontroller that is powered through a 3.7 V Li-Ion battery in our front-endnodes.

Sensors and Actuators: Different aboveground and underground sensors are used in precision agriculture to measure the different environmental attributes needed by a target application. Examples includes sensors that measure air temperature, air humidity, soil temperature, soil volumetric water content, wind speed, wind direction, rain meter, solar radiation (infrared, visible, and ultraviolet), and leaf wetness. These sensors collect the physical information to be communicated to the back-end server. Table I lists the sensors used in our node prototype. Based on the sensed information, the system is capable of taking the appropriate action such as spraying chemicals or fertilizers, watering the plants, etc. This is implemented through a set of actuators and mechanical controllers that are used to control pumps and sprayers. All communications between the microcontroller and the sensors/actuators are done using the I2C protocol.

TABLEI. USED SENSORS

Sensor	Model
Air Temperature	SHT11
Air Humidity	HTU21D
Soil Moisture Sensor	SEN0114
Leaf Wetness	FC-37
Wind Speed/Direction	SEN-08942
Rain Volume	SEN-08942

Interfacing Circuits: The different sensors convert the sensed phenomena (e.g., temperature) into an equivalent electric voltage or current. However, such electric voltage or current is still in the analog format. A sensor interfacing circuitry is needed to convert such analog signals coming from the sensors into the corresponding digital format and perform any further signal conditioning functionality to ensure compatibility with the used microcontroller. Analog-to-Digital Converters (ADC) are the core component of such interfacing circuits. We use the 6-bit CA3306 CMOS parallel ADC designed for low-power applications. On the other hand, the actuators and mechanical controllers use analog signals as inputs. Therefore, interfacing circuits that convert the digital outputs of the microcontroller to the needed analog control signals are needed. Digital-to-Analog Converter (DAC) interfacing circuits are used for that purpose such as the low-power MCP4725 DAC used in our system.

Wireless Communication Module: The purpose of this module is to provide the sensor nodes with the means to communicate the data to the nearest gateway. Unlike the vast majority of related works which use the high power Bluetooth orcellulartechnologies,weusethenRF24L01ultra-low-power transceiver operating on the 2.4 GHz ISM band which significantlyreducesthepowerconsumptionofourdesign.

B. *GatewayLayer*

The different front-end nodes deployed in the agricultural field collect the sensor data and relay it to a gateway. The

gateway then relays the collected data (possibly after manipulatingit)tothecloudserversintheback-endforstorage and extensive data analysis. The gateway layer also forwards requests from the back-end to the actuators in the nodes. Each gateway can be connected to up to 6 front-end nodes through nRF24L01 transceivers such as those used in the front-end nodes. The gateway is also implemented using Raspberry Pi 2 microcontroller. Being equipped with a 900 MHz quad-core ARM cortex-A7 CPU and 1 GB RAM, such a microcontroller provides the needed processing power and storage that ensure thatallthecapturesensordataisrelayedtothecloudserverfor analysis. A miniature IEEE 802.11b/g/n (WiFi) module isused to connect the gateway to the remote back-end. The used module is interfaced to the microcontroller using a standard TCP/IPinterface.Thedatarateofthismoduleis150Mbps.

C. *Back-endLayer*

The back-end is responsible for facilitating the end-users' ability of accessing the sensed data. This is achieved by implementing several services including, but not limited to, data storage, data analytics, and data visualization in addition to providing an appropriate application program interface (API) and software tools through which the end-user can accessthedata.Inourproposedarchitecture,weimplementthe back-endlayerviathecloud-basedservershowninFig.3.

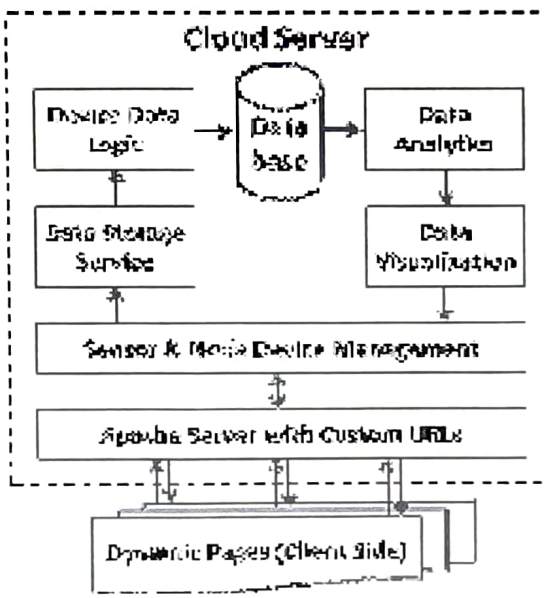

Fig. 3.Cloud server architecture.

The back-end cloud server has a large database at its core thatcanaccommodatehugeamountofdatarelayedthroughthe gateway layer from the front-end node. The database is interfaced to a wide set of data analysis algorithms and APIs such as Google Sheets for data visualization. Data can be accessed through the Internet using dynamic webpages as shown in Fig.3.

InourimplementationofthecloudserverbothApacheand MySQL run on the same virtual machine (VM) running Ubuntu 14.04. This VM is just one of the many VMs that constitute a larger VSphere implementation. The VSphere controlpanelisusedtoincreasetheresourceallocationofthe VM (such as memory and disk space) with a minimal downtimeandwithoutdatacorruption.Itisworthnotingthatif the agriculture system requirement exceeds the available hardware resources, the implemented VM can be easilymoved to a dedicated cloud hosting platform such as an EC2 instance on Amazon Web Services(AWS).

IV. PROTOTYPE PERFORMANCEEVALUATION

A prototype of the proposed architecture for IoT precision agriculture applications has been implemented for a proof of concept to evaluate the proposed IoT transducer framework. Three front-end nodes equipped with sensors listed in Table I were used. These three front-end nodes are deployed outdoors in the Central Michigan University (CMU) campus. The nodes connect to a single gateway using nRF24L01 wireless interfaces. The gateway connects to the Internet, and hence to the back-end cloud server, using the WiFi technology. The gateway collects data from the three front-end nodes and performs abstract data analysis for immediate feedback (if necessary), and transmits the raw data to the cloud for detailed data analytics. The back-end cloud server receives and stores the data received from the cloud server, performs data analytics, and creates visual illustrations for easier data interpretation.

A. *Wind Speed andDirction*

First, we collect the wind speed and direction data. For the wind speed data, the rotation of the sensor is converted into velocity measured in Miles Per Hour (MPH). The used SEN-08942 sensor gives different voltage values for different directions. The sensor used in the prototype gives up to 16 different directions. Fig. 4 depicts the wind speed collected over a 200 minutes window. This figure shows the variations of the wind speed by the minute over the observation window. Different granularities can be obtained using our cloud server. Weomitthewinddirectionresultsforspaceconsiderations.

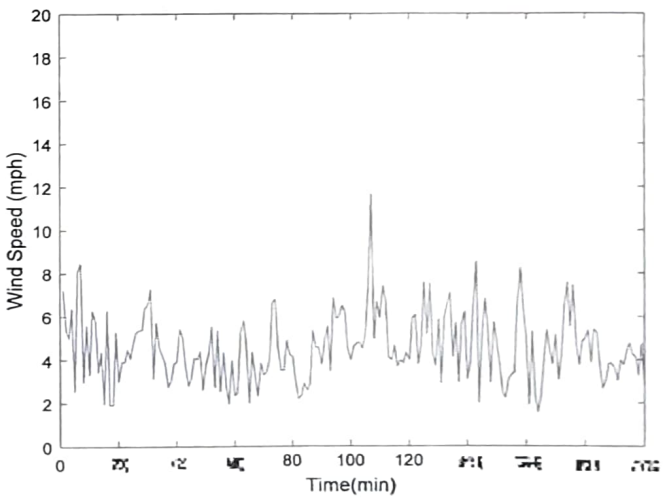

Fig. 4. Wind speed recorderd over a 20 minute window.

B. *RainVolum*

Next, we present the results of the rain meter and the moisture sensors. We show such data in Fig. 5 for a 200 minutes window in which the rain existed only in the first 23

minutes. Fig. 5 shows the gradual decrease in the rain volume before it stops. Meanwhile, the moisture slightly increased after the rain stopped. Such data can be used in predicting the evolution of plan diseases.

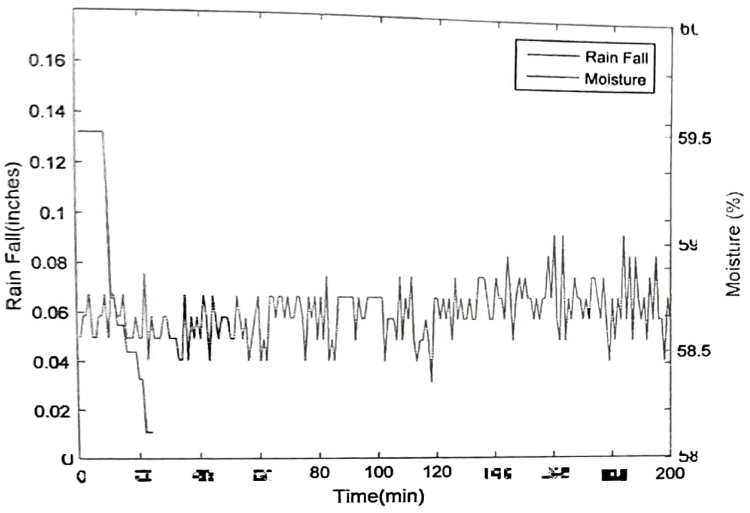

Fig. 5.Rain volume recorderd over a 30-minutewindow.

C. *Air Temprature and HumidityResults*

Another important environmental data for agricultural IoT applications is the air temperature and humidity. Fig. 6 depicts an example of the recorded air temperature and humidity results.

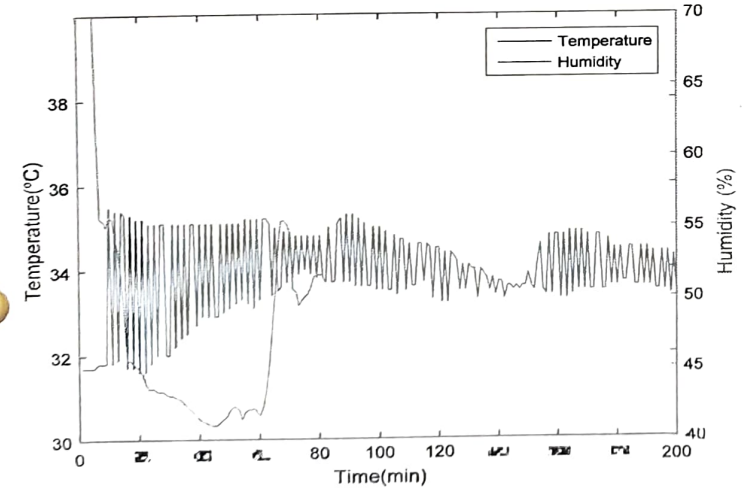

Fig. 6.Temprature and humidity data reports.

The results presented in this section demonstrate the ability of the proposed cloud-based IoT system to efficiently collect, store, process, and visualize the environmental data needed for different precision agriculture applications.

V. Conculsions

In this paper, we have presented a cloud-based architecture for IoT precision agricultural applications. We have outlined the three layers of the proposed architecture and explained their implementation details. We have built a prototype to illustrate the different performance aspects of the proposed architecture. The preliminary performance evaluation results have demonstrated the efficiency of the proposed architecture – despite its simplicity. This makes the proposed architecture a good candidate for implementing a wide set of precision agriculture systems. Our future work will include how to secure the access of the data and will develop a mobile application that allows access of the data on handheld devices.

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Adaptive Lane and Sign Detection for Advanced Driver Assistance System

Manikandan S

Asst Professor

Electrical and Electronics Engineering

Meenakshi Sundararajan Engineering

College, Chennai. Tamil Nadu

Harikrishnan M

Electrical and Electronics Engineering

Meenakshi Sundararajan Engineering

College, Chennai. Tamil Nadu

harikrishnanm51@gmail.com

Santhoseraaj S

Electrical and Electronics Engineering

Meenakshi Sundararajan Engineering

College, Chennai. Tamil Nadu

santhosesivaneela@gmail.com

Abstract- In recent years,Automobile companies are highly concerned with ensuring the safety of the passengers.In Order to provide support to the driver 'Advanced Driver Assistance System' has been employed in vehicles.In this paper we have proposed a robust visual based lane detection algorithm and efficient traffic sign board detection algorithm which could serve as support to the driver.We have used roberts edge detection and hough transform in lane detection algorithm.We have created a database of traffic sign board and with the help of MatchFeature technique we were able to highlight the region of sign board on each frame which is captured by the camera present in the front end of the car.

Keywords: Region of Interest, Hough Transform, Extractfeatures

I. INTRODUCTION

India is meant to have the second largest road network in the world.The accidents occurring on the road has been statistically increasing in the recent years despite of the efforts taken by the indian government.Ministry of Road Transport and Highways Transport Research wing, Government of India presented a report on the topic "Traffic accidents in 2016".The pictorial representation of the causes of the road accidents is shown in Fig. 1.They further stated all the possibilities which were the responsible for road accidents in india.It has been found out more than 80 percent of accidents are due to the driver's negligence.

Exceeding the lawful speed,Driving on wrong side,Using mobile phones while driving,Jumping/Changing the lane,neglecting the signboards are considered to be the major reasons for the road accidents especially in highways.

There is a need of a system which could intimate the driver in times of sudden lane departure and also provides information to the driver about the important life saving sign board which are present on the road.This system could serve as a support to the driver for safe driving.

The adaptive lane detection system is able to detect the lane marking present on the road and the visual output of highlighted lane marking is provided to the driver.Image processing techniques is used to perform the adaptive lane detection process.The sign board detection system detects the sign board present on the road and intimates the driver immediately with the help of a visual and audio output.A database of traffic sign board symbols are collected which helps in identifying and highlighting different sign boards.

II. LITERATURE SURVEY

In most of the existing lane detection system the first step is to efficiently remove the noise present in the

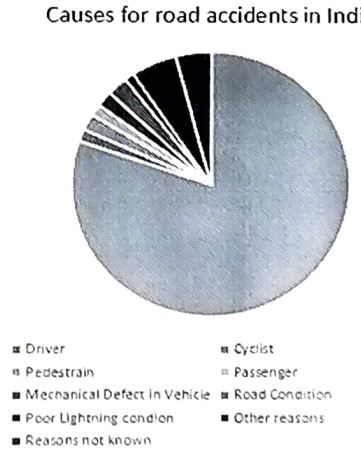


Fig. 1. Datas from Ministry of Road Transport and Highways Transport Research wing

image.There are three types of filters present namely Gaussian filter,Average filter,Median filter.Out of the three

filters Gaussian filter is the efficient one which removes the noise and the edge blurring is less which compared to other filters.The second commonly used step is the edge detection which involves three types namely sobel edge detection,roberts edge detection,prewitt edge detection and canny edge detection.The detection of lane from the edges is a complex process which involves different methods.Most commonly used methods are Hough transform,Modified Hough transform,Generalized Hough transform.[1]uses horizontal differencing filter for edge detection and modified hough transform for detecting the edges.[2]employes the canny method for edge detection and hough transform for detecting the lanes.[7]uses the

entional method of Vanishing point estimation method ich uses probabilistic voting procedure for obtaining the ane.As the field of artificial intelligence tend to get popularized convolutional neural networks were used to perform the sign board detection operation.

III. Our Approach

Adaptive lane detection system

Based on the overview of all the techniques which could be employed in lane detection as mentioned in section II,we have formulated an efficient lane detection algorithm with certain modification in order to improve the efficiency of the system.The flow diagram of the proposed lane detection system is shown in Fig. 2.

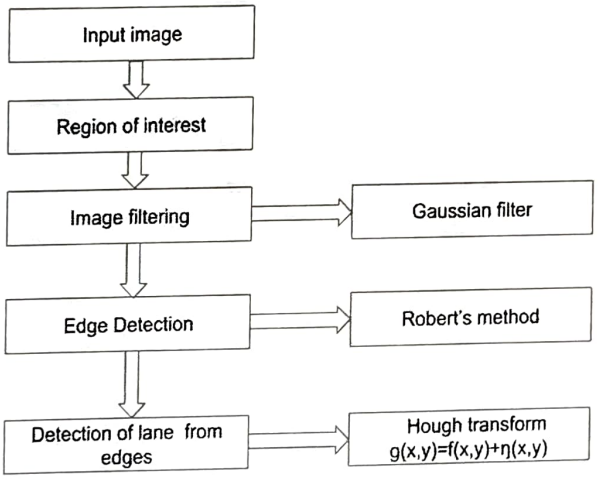


Fig. 2.Flowchart of Adaptive lane detection system

A.Region of Interest

The first step of the lane detection algorithm is the region of interest.In this step the potential region which consist of the valuable information about the lane from the frame is segregated and the other regions are blacked out.The region of interest is helpful in reducing the processing time of the program and the memory space required for processing each frame is reduced.Region of interest is also helpful in identifying the lane efficiently without any mismatch.The region of interest for the given frame obtained for the input video is shown in Fig. 3.

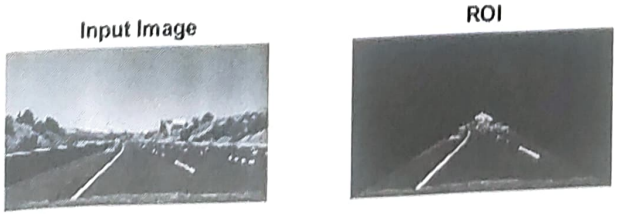


Fig. 3. Region of interest

B.Image filtering

As a smoothing filter ,Gaussian filter is used.Based on the comparison with other filter the gaussian filtered image obtained are free from noise and the edge blurring is very less. Equation (1) shows the filtering process.

$$f'(x,y) = (w*f)(x,y)$$

$$(w*f)(x,y) = \sum_{s=-a}^{a}\sum_{s=-b}^{b} w(s,t)f(x-s,y-t) \qquad (1)$$

f(x,y) - Input Image
w(x,y) - Filter Impulse

f'(x,y) - Filtered Image

C.Edge detection

Robert's Edge detection is employed in obtaining the edges.The change in intensity between the adjacent pixels are the edges in the frame.Discontinuities in depth,Discontinuities in surface orientation,Change in material properties and Variations in scene illumination are constituents for the edges.The output image after the edge detection process is shown in Fig. 4.

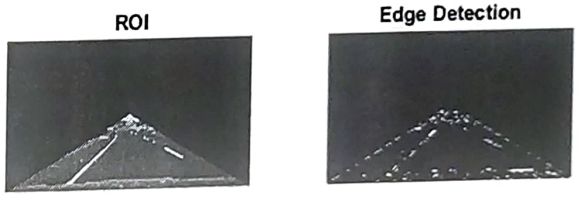


Fig. 4. Edge detection

Detected edges are further processed for removal of unwanted region through similarity of red channel . We are going to dilate the line for detecting it properly in further technique.Further processed image is shown in Fig. 5.

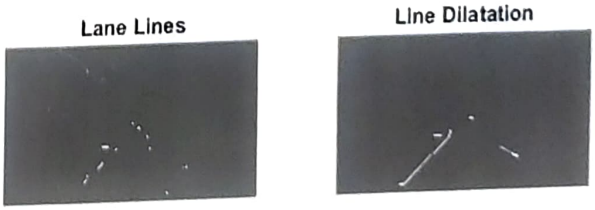


Fig. 5. Lane Lines

D. Hough transform

Hough transform is used to extract lines from a given image. Edge detection is considered as a preprocessing to this technique. It uses voting procedure which fills the gaps between points by drawing a line over it which forms the lane. They are initially designed for line

but it can be further developed for other shapes too. we are using Hough transform to detect the lane. sically Hough transform changes the normal xy plane to ab plane.Equation (2) shows the line in xy plane. Equation (3) shows the line in ab plane.

Normally line equation, $y = ax+b$ (2)

x,y be the coordinates

a be the slope(unbounded)

b be the intercept

To convert this to ab plane, $b = -ax+y$ (3)

when x and y are known,the equation b is considered as a line equation in xy plane

The normal to the line b is drawn towards the origin giving R(rho) the length of perpendicular line and

T(Theta) the angle between the a-axis and line.

Now again the another point is transformed until all the lines are drawn in ab plane.The number of lines coinciding at a point is counted as voting. When that point is found it is denoted as (a,b). By substituting we can get lines in x,y plane and the edge points of lines .

The lane is found out depending on the longest line on the plane . This line has the maximum number of collinear points.. The lines are drawn over two sides which leading to the Lane area estimation.The Lane lines drawn shown in Fig. 6.

E.Output Image

The joining point of the two straight lines is known as the vanishing points.. In general images are considered in x,y plane. The x- intercept in the vanishing point determines the orientation change of the lane.The identified lane along with the steering direction is displayed as output image shown in Fig. 7.

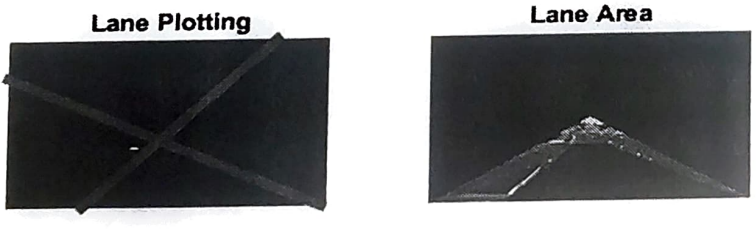


Fig. 6. Lane Area

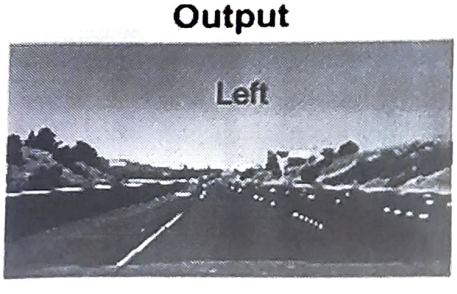
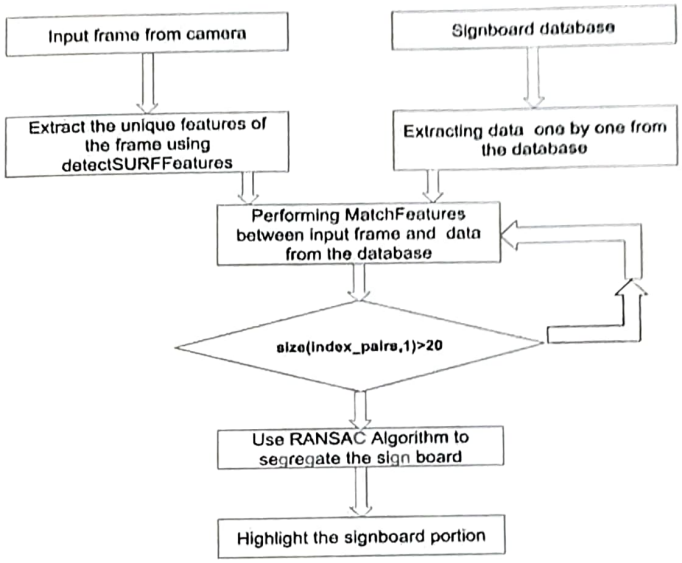


Fig.7. Output

Section II provided the information information about the different techniques which are present in the traffic sign board detection.Taking all the techniques into consideration a robust algorithm is created which perform



the traffic sign board detection operation efficiently.Fig.8 represents the flow diagram of the proposed sign detection system.

Fig. 8. Flow Chart of sign board detection system

A.Database of Traffic Sign symbols

The first step of the sign board detection process is creating a database which consist of all the sign board symbol which are meant to be identified and highlighted.The database of the traffic sign symbol is shown in Fig. 9.

B.Detecting surf features

Speeded up robust features(SURF) is the technique which obtains the mentioned number of defining feature of objects which is present in the given frame.In our project we are obtaining 25 defining SURF features.The SURF features for a given traffic sign board is shown in Fig. 10.

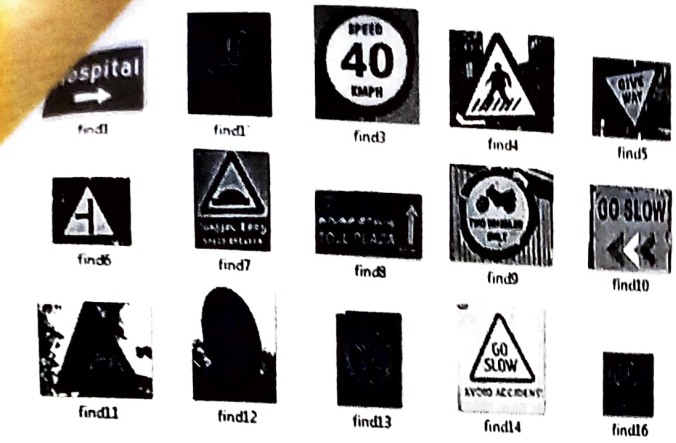


Fig. 9. Database of traffic sign symbols

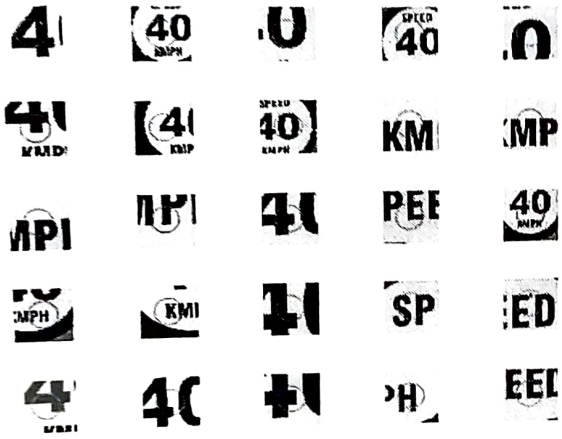


Fig. 10. SURF feature of the sign board

Fig.11.Feature extraction of sign board

C.Feature Extraction

The Extract Feature operation help to identify the defining feature and also validates the position where they are present in the frame.The circles are the important defining features present in the frame.Fig. 11 and Fig. 12 represents the feature extraction of sign symbol and the frame which is obtained from the input video.

D.Match Features

Match Features requires two images.This feature draws lines connecting the similarities which are present between the two image.The matching features between two images is shown in the Fig. 13.

Fig. 12. Feature extraction of frame obtained from input video

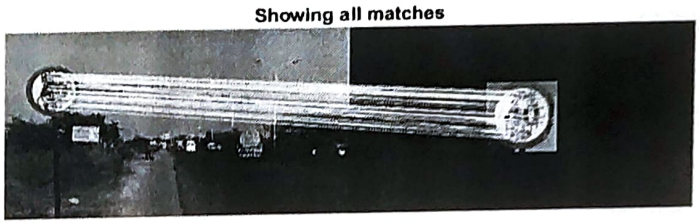


Fig. 13. Match feature

E.Random Sample Consensus (RANSAC)

RANSAC algorithm ensures that there are no outliers present and none of the inliner is neglected.The line marking between the similarities of two image is done again with only the inliners.

F. Output Image

The traffic sign board is highlighted and the highlighted region is cropped and displayed on the right bottom end of the output video.The Fig. 14 represents the output image.

IV. Conclusion and Future Scope

We were able to learn different techniques which are involved in lane detection system and sign board detection system.We were able to obtain the proposed output.Our project has better efficiency in highways but when it comes to urban areas the efficiency is less.Thus in future there is a need for adapting efficient technique which could be helpful to the drivers in urban areas.

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DR.S.CHAKARAVARTHI
CO-ORDINATOR

V. Vijayachamundeswari
DR.V.VIJAYACHAMUNDESWARI
CONVENER ,HOD-CSE

N. Duraipandian
DR.N.DURAIPANDIAN
PRINCIPAL

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DR.S.CHAKARAVARTHI
CO-ORDINATOR

DR.V.VIJAYACHAMUNDESWARI
CONVENER ,HOD-CSE

DR.N.DURAIPANDIAN
PRINCIPAL

VELAMMAL ENGINEERING COLLEGE

SURAPET, CHENNAI-600066

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
IN ASSOCIATION WITH CSI INDIA & IEEE COMPUTER SOCIETY

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DR.S.CHAKARAVARTHI
CO-ORDINATOR

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CONVENER ,HOD-CSE

DR.N.DURAIPANDIAN
PRINCIPAL

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Conference Chair

Dr.V.Krishnakumar
Principal

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This is to certify that Dr./Mr./Ms. Mathangi. N / IT / AP of Meenakshi Sundarasaran Engg College. presented a paper titled "AN INTELLIGENT SYSTEM TO IDENTIFY UNIVERSITIES FOR GRADUATE STUDIES." / participated in the National Conference on Inter Disciplinary Research in Engineering (NCIDRE 19) organised by the departments of Computer Science & Engineering , Electronics & Communication Engineering and Electrical & Electronics Engineering on 9th March 2019.

Dr.Nelson Kennedy Babu C
Conference Chair

Dr.V.Krishnakumar
Principal

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This is to certify that Dr./Mr./Ms. MATHANGI. N / IT / AP of MEENAKSHI SUNDARARAJAN ENGINEERING COLLEGE presented a paper titled "OPTIMIZED CROP RECOMMENDATION BASED ON SOIL CLASSIFICATION USING MINING ALGORITHM" / participated in the National Conference on Inter Disciplinary Research in Engineering (NCIDRE 19) organised by the departments of Computer Science & Engineering , Electronics & Communication Engineering and Electrical & Electronics Engineering on 9th March 2019.

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This is to certify that Dr./Mr./Ms. MATHANGI. N / II / AP of MEENAKSHI SUNDARARAJAN ENGG COLLEGE presented a paper titled "EARLY WARNING ERROR DETECTION AND PREDICTIVE MAINTENANCE OF PRODUCTION SYSTEM" / participated in the National Conference on Inter Disciplinary Research in Engineering (NCIDRE 19) organised by the departments of Computer Science & Engineering , Electronics & Communication Engineering and Electrical & Electronics Engineering on 9th March 2019.

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Conference Chair

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This is to certify that Dr./Mr./Ms. J. PRIYA of MEENAKSHI SUNDARARAJAN ENGINEERING COLLEGE presented a paper titled "IMPROVING INSTITUTION'S PERFORMANCE USING SENTIMENTAL ANALYSIS" / participated in the National Conference on Inter Disciplinary Research in Engineering (NCIDRE 19) organised by the departments of Computer Science & Engineering , Electronics & Communication Engineering and Electrical & Electronics Engineering on 9th March 2019.

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Certificate

This is to certify that Dr./Prof./Mr./Ms. G. PRISKILLA MANONMANI of MEENAKSHI SUNDARARAJAN ENGINEERING COLLEGE has participated and presented a paper titled RESPONSIVE STREET LIGHTING SYSTEM FOR EFFICIENT ENERGY CONSUMPTION USING IOT.

in the **National Conference on Smart Innovations in Communications and Computing (NCSICC'19)** in the Department of Computer Science and Engineering, Sri Sai Ram Engineering College, Chennai, India held on 5th March 2019.

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Certificate

This is to certify that Dr./Prof./Mr./Ms. A. SHAJI of MEENAKSHI SUNDARARAJAN ENGINEERING COLLEGE has participated and presented a paper titled GLOBALLY OPERABLE AND COST - EFFECTIVE VOICE BASED AUTOMATION USING ESP8266 & WiFi

in the National Conference on Smart Innovations in Communications and Computing (NCSICC'19) in the Department of Computer Science and Engineering, Sri Sai Ram Engineering College, Chennai, India held on 5th March 2019.

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This is to certify that Dr./Mr./Ms. SRIRAM. K.P of MEENAKSHI SUNDARARAJAN ENGINEERING COLLEGE presented a paper titled "CAB ACTUATION USING BEACON INTELLIGENCE" / participated in the National Conference on Inter Disciplinary Research in Engineering (NCIDRE 19) organised by the departments of Computer Science & Engineering , Electronics & Communication Engineering and Electrical & Electronics Engineering on 9th March 2019.

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16th March 2019

NATIONAL CONFERENCE AWARD

CERTIFICATE OF PARTICIPATION

This is to certify that ~~Dr/Mr~~/Ms GAYATHRI. R

of MEENAKSHI SUNDARARAJAN ENGINEERING COLLEGE has presented a paper titled ANTICIPATION OF MICROBLOGGING METADATA USING PARALLEL FREQUENT ITEM SET ALGORITHM in the National Conference on Advanced Computing Technologies Organized by Department of Computer Science and Engineering, Velammal Engineering College, Chennai held on 16th March 2019.

DR.S.CHAKARAVARTHI
CO-ORDINATOR

DR.V.VIJAYACHAMUNDESWARI
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