

# FAULT CURRENT LIMITER IN SINGLE PHASE AND THREE PHASE LINES FOR COMPENSATING VOLTAGE SAG

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## ABSTRACT

Potential fault current levels in power grids is approaching, and may eventually exceed, the short-circuit-current limits of existing protection devices. Alternative to expensive system upgrades of protection devices, Fault Current Limiters (FCL's) provide more cost-effective solutions to prevent old protection devices and other equipment on the system from being damaged by excessive fault currents. Short circuit faults are often the origin of voltage sags at a point of common coupling (PCC) in a power network, the extent of the voltage sag is proportional to the short circuit current level, reducing the fault current level within the networks can reduce voltage sags during faults and protect sensitive loads that are connected to the same PCC. The proposed structure prevents voltage sag and phase-angle jump of the substation PCC after fault occurrence. As a result, other feeders, which are connected to the substation PCC, will have good power quality. In this paper a three phase fault current limiter is proposed. A Matlab/Simulink model is developed and simulation results are presented. Finally the simulation results are validated through experimentation.

**Keywords - Fault Current Limiter (FCL), Point Of Common Coupling (PCC), Power Quality (PQ), Semiconductor Switch, Total Harmonic Distortion (THD), And Voltage Sag.**

## I. INTRODUCTION

Power quality variations are classified as either disturbances or steady state variations. Disturbances pertain to abnormalities in the system voltages or currents due to fault or some abnormal operations. Steady state variations refer to rms deviations from the nominal quantities or harmonics. In general these are monitored by disturbance analyzers, voltage recorders, harmonic analyzers etc. However with the advancement in the computer technology, better, faster and more accurate instruments can now be designed for power quality monitoring and analysis.

The input data for any power quality monitoring device is obtained through transducers. These include current transformers, voltage transformers, Hall-effect current and voltage transducers etc. Disturbance analyzers and disturbance monitors are instruments that are specifically designed for power quality measurements. There are two categories of these devices - conventional analyzers and graphics-based analyzers.

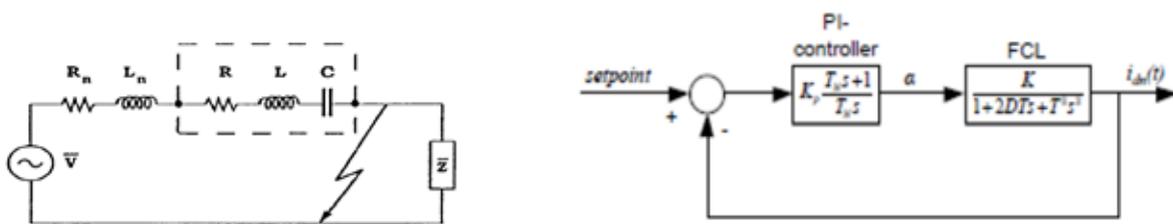
Conventional analyzers provide information like magnitude and duration of sag/swells, under/over voltages etc. Graphic-based analyzers are equipped with memory such that the real-time data can be saved. The advantage of this device is that the saved data can be analyzed later to determine the source and cause of the power quality problems.

Voltage sag is an important PQ problem because of sensitive loads growth. Worldwide experience has show that short-circuit faults are the main origin of voltage sags and, therefore, there is a loss of voltage quality. This problem appears especially in buses which are connected to radial feeders [1]–[6]. Faults at either the transmission or distribution level may cause transient voltage sag or swell in the entire system or a large part of it. Also, under heavy load conditions, a significant voltage drop may occur in the system. Voltage sags can occur at any instant of time, with amplitudes ranging from 10–90% and a duration lasting for half a cycle to one minute. Further, they could be either balanced or unbalanced, depending on the type of fault and they could have unpredictable magnitudes, depending on factors such as distance from the fault and the transformer connections. Voltage swell, on the other hand, is defined as a sudden increasing of supply voltage up 110% to 180% in RMS voltage at the network fundamental frequency with duration from 10 ms to 1 minute.

Voltage swells are not as important as voltage sags because they are less common in distribution systems. Voltage sag and swell can cause sensitive equipment (such as found in semiconductor or chemical plants) to fail, or shutdown, as well as create a large current unbalance that could blow fuses or trip breakers. The voltage sag during the fault is proportional to the short-circuit current value. An effective approach to prevent expected voltage sag and improve the voltage quality of point of common coupling (PCC) is fault current limitation by means of a device connected at the beginning of most exposed radial feeders [9].

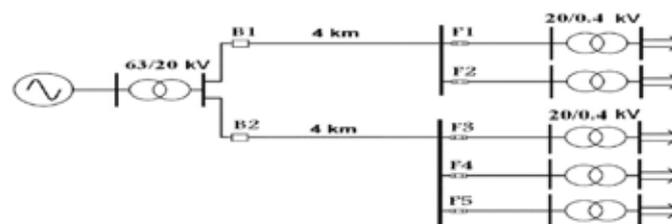
## II. BASIC FCL

For a highly reliable power supply, the fault current limiter (FCL) is becoming an essential part in modern power systems. The current-limiting device is required to be introduced into the power system to prevent the fault current from rising to its full prospective value.



(a).Basic FCL principle scheme

(b) Shows the control structure of the FCL



(c) Test System

Fig.1: Representation of Basic FCL System.

This can also be attributed to the concern over power quality (PQ) as FCLs can be used to mitigate voltage sags caused by faults. These will avoid upgrading switchgears during system expansion and improve the PQ delivered to customers. FCLs are needed to provide a limited and sustained short-circuit current through the fault for a sufficient time (e.g., 1 s) to enable proper coordination of protective relays in the overall protection scheme.

An ideal FCL should have the following characteristics:

- Ø Zero resistance/impedance at normal operation;
- Ø No power loss in normal operation and fault cases;
- Ø Large impedance in fault conditions;
- Ø Quick appearance of impedance when fault occurs;
- Ø Fast recovery after fault removal;
- Ø Reliable current limitation at defined fault current;
- Ø Good reliability;
- Ø Low cost.

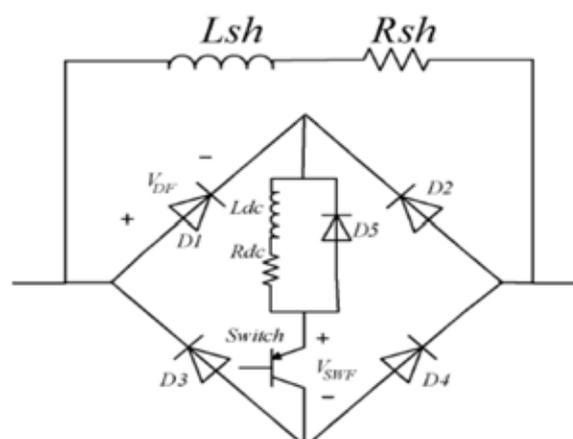
### III. PROPOSED FCL CONFIGURATION AND ITS OPERATION

Figure 2 shows the circuit topology of the proposed FCL which is composed of the two following parts:

1) Bridge part that includes a diode rectifier bridge, a small dc limiting reactor ( $L_{dc}$ ). (Note that its resistance ( $R_{dc}$ ) is involved too.), a semiconductor switch (IGBT or GTO), and a freewheeling diode ( $D_5$ ).

2) Shunt branch as a compensator that consists of a resistor and an inductor ( $R_{sh} + j\omega L_{sh}$ ).

Previously introduced structures for this application [4], [16], [17] have used two numbers of thyristors at bridge branches instead of one semiconductor switch inside the bridge (dc current route). Therefore, first, they have the more complicated control system. Second, in those structures, because of thyristors' operation delay (turn off at the first zero crossing),  $L_{dc}$  has a large value to limit the fault current between the fault occurrence instant and thyristors turn off instant, properly.



**Fig.2: Proposed FCL Topology**

This large value of  $L_{dc}$  leads to a considerable voltage drop on the FCL and the power losses including ac power losses on the shunt branch impedance and dc reactor power losses (if it is non superconductor) in the normal condition. By using the semiconductor switch in the proposed structure and its fast operation, it is possible to

choose a small value for  $L_{dc}$  to prevent severe  $di/dt$  at the beginning of the fault occurrence. So the voltage drop and power losses will be negligible. These days, high rating semiconductor switches are available in practice. However, using a self turn-off switch instead of thyristors in the proposed structure leads to higher cost [19]–[21]. From a power-loss point of view, in the normal condition, the proposed FCL has the losses on the rectifier bridge diodes, the semiconductor switch, and  $R_{dc}$ . Each diode of the rectifier bridge is ON in half a cycle, while the semiconductor switch is always ON. Therefore, the power losses of this FCL in the normal operation can be calculated as

$$\begin{aligned} P_{loss} &= P_R + P_D + P_{SW} \\ &= R_{dc} I_{dc}^2 + 4V_{DF} I_{ave} + V_{SWF} I_{dc} \end{aligned}$$

Where,

$I_{dc}$  dc side current which is equal to the peak of line current;

$V_{DF}$  forward voltages drop on each diode;

$V_{SWF}$  forward voltages drop on the semiconductor switch;

$I_{ave}$  average of diodes current in each cycle that is equal to  $I_{peak}/\pi$ .

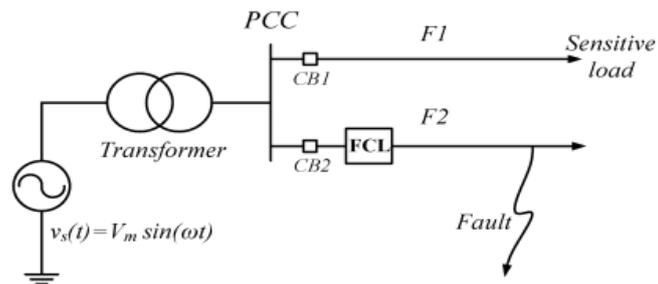
Considering (9) and the small value of dc reactor in this structure, the total power losses of the proposed structure become a very small percentage of the feeder's transmitted power. For example, by considering Table I parameters in the simulation section, the power losses will be 0.47% of the feeder's transmitted power.

On the other hand, in the fault condition, the PCC voltage drops on the shunt impedance. Therefore, the line current will pass through the shunt resistor ( $R_{sh}$ ). As a result, power loss on the  $R_{sh}$  depends on its value that will be discussed in design considerations section. Note that the fault condition is several cycles and it is a small time interval.

**Table-I**  
**System Parameters**

Source Side Data	Power Source	20kV, 50Hz, X/R ratio: 5 Total impedance: 1.608 $\Omega$
	Transformer	20kV/6.6kV, 10MVA, 0.1pu
Distribution Feeders Data	Feeder F1	j0.314 $\Omega$
	Feeder F2	j0.157 $\Omega$
FCL Data	DC Side	$L_{dc} = 0.01H$ , $R_{dc} = 0.03 \Omega$ $V_{DF} = 3V$ , $V_{SWF} = 3V$ , $I_m = 0.6kA$ Switch type: IGBT
	Shunt Branch	$L_{sh} = 0.08H$ , $R_{sh} = 5 \Omega$
Load Data	Sensitive Load	10+j5.7 $\Omega$
	Load of F2	15+j31.4 $\Omega$

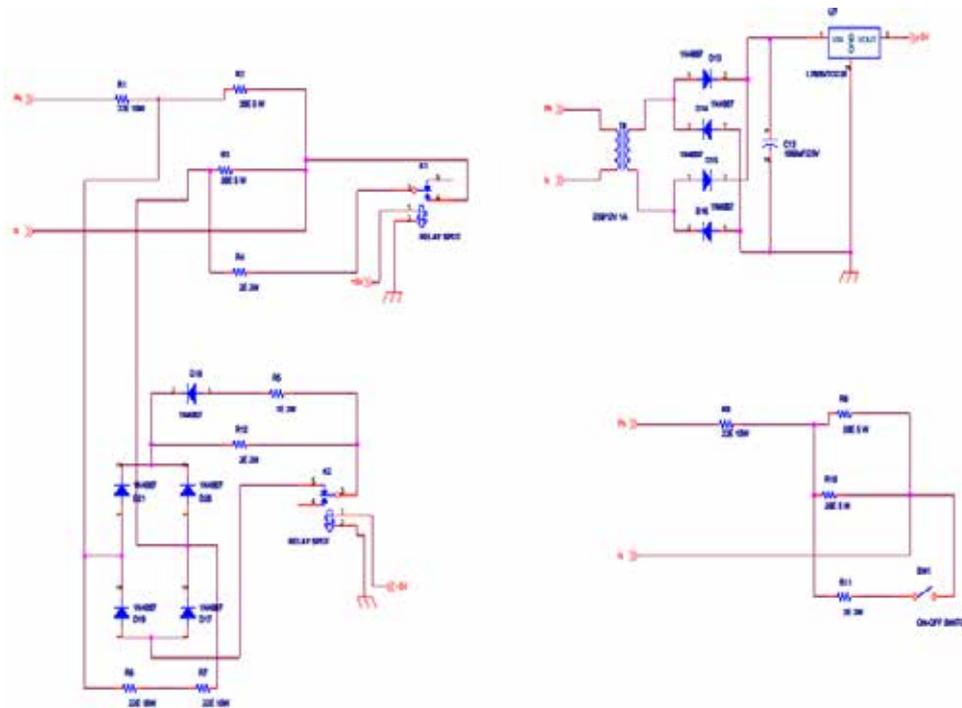
### 3.1 FCL in Distribution Network



**Fig.3: Single-line diagram of the power system**

Fig.3: shows the single-line diagram of the power system. This figure shows a substation with only two feeders F1 and F2. However, the presented analysis can be easily extended to any number of feeders; The F1 supplies a sensitive load. With a fault in the F2, the voltage sag occurs in the substation PCC.

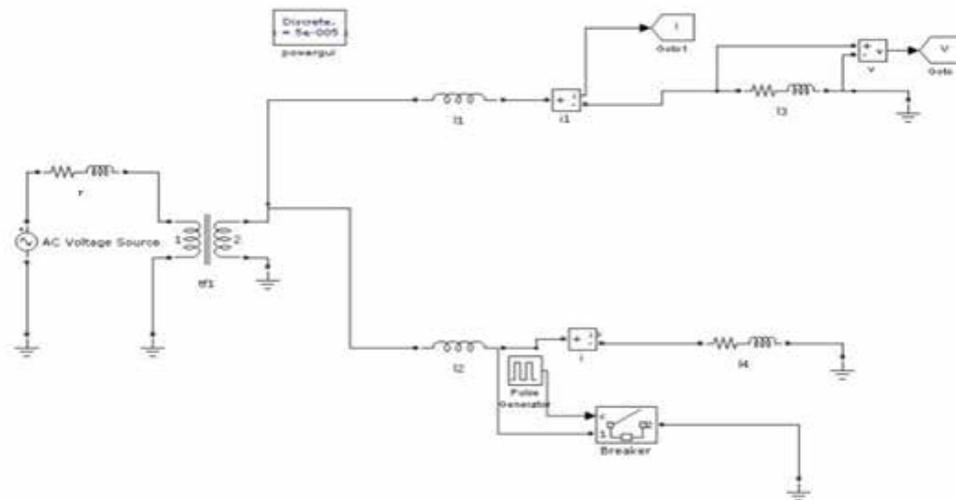
### 3.2 Hardware Schematic Diagram



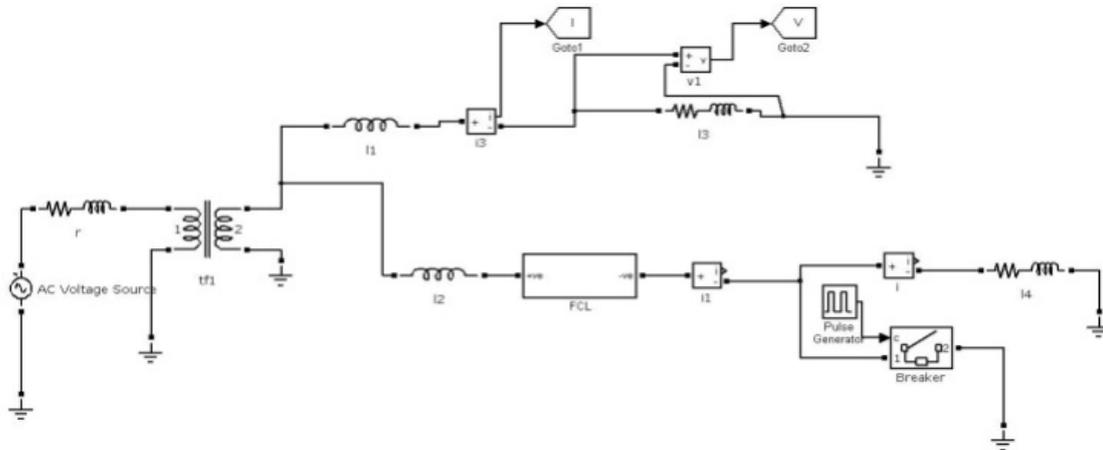
**Fig.4: Hardware Schematic Diagram Circuit**

## IV. SIMULATION RESULTS

### Case 1: Single Phase System.

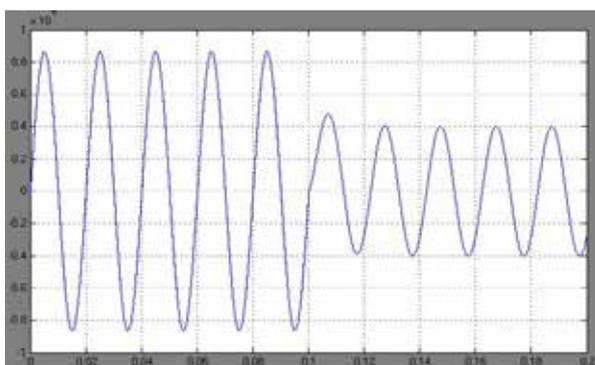


**Fig.5: Simulink circuit of PCC without FCL**

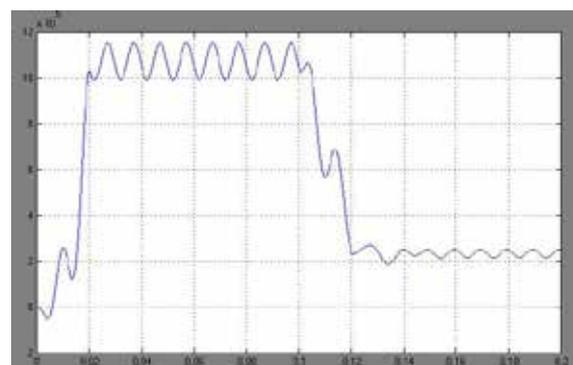


**Fig.6: MATLAB/Simulink of the proposed circuit**

Figure 5 and 6 shows the single phase power without and with FCL.

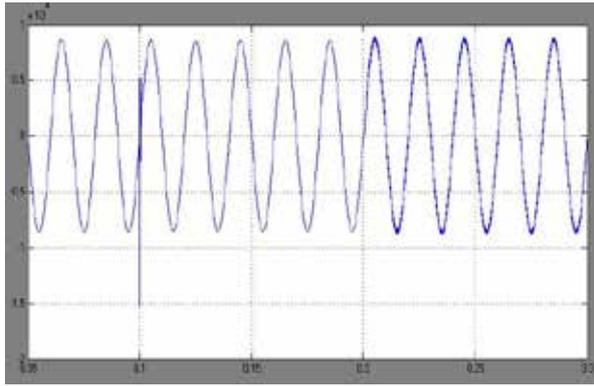


**Fig.7: PCC Voltage without FCL**

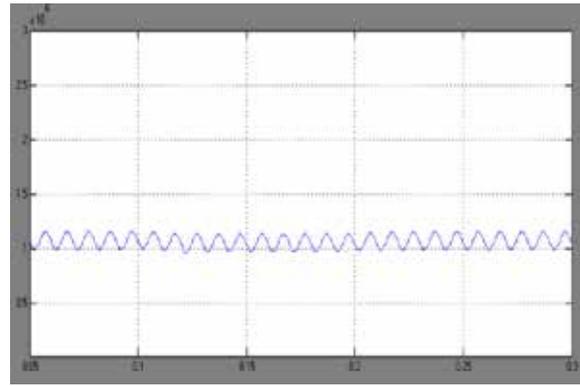


**Fig.8: Single-phase instantaneous power of the sensitive load without FCL**

Fig.7 shows the single phase voltage at PCC without the FCL. Fig.8 shows the single phase instantaneous power of the sensitive load which has reduced instantaneously after the fault has occurred.

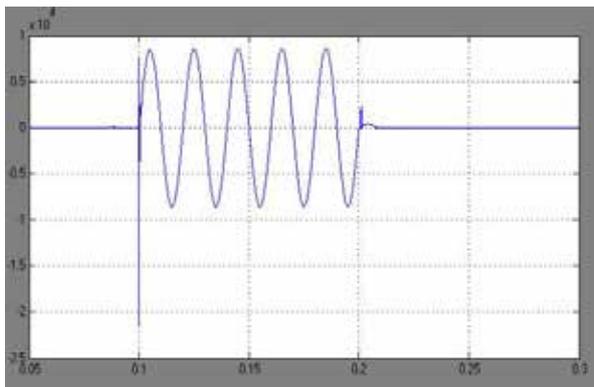


**Fig.9: PCC voltage with the proposed FCL.**

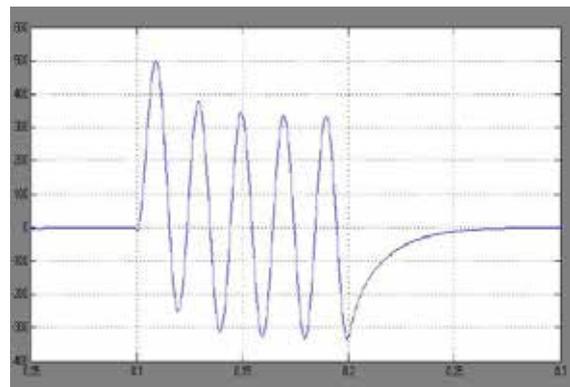


**Fig.10: Single-phase instantaneous power of the sensitive load with the proposed FCL.**

Fig.9. shows the single phase voltage at PCC with the FCL. It is found to be un distorted even a fault has occurred. Fig.10. shows the Single-phase instantaneous power of the sensitive load with the proposed FCL. It is seen that the power is remains unaltered during the fault. Fig.11. shows the voltage drop on the FCL during the fault. This voltage drop does not allow the PCC voltage to change.



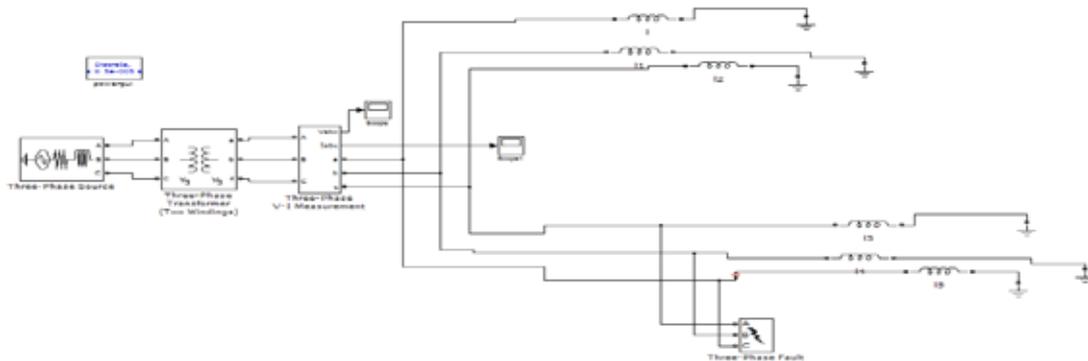
**Fig.11: Voltage drops on the proposed FCL during impedance currents.**



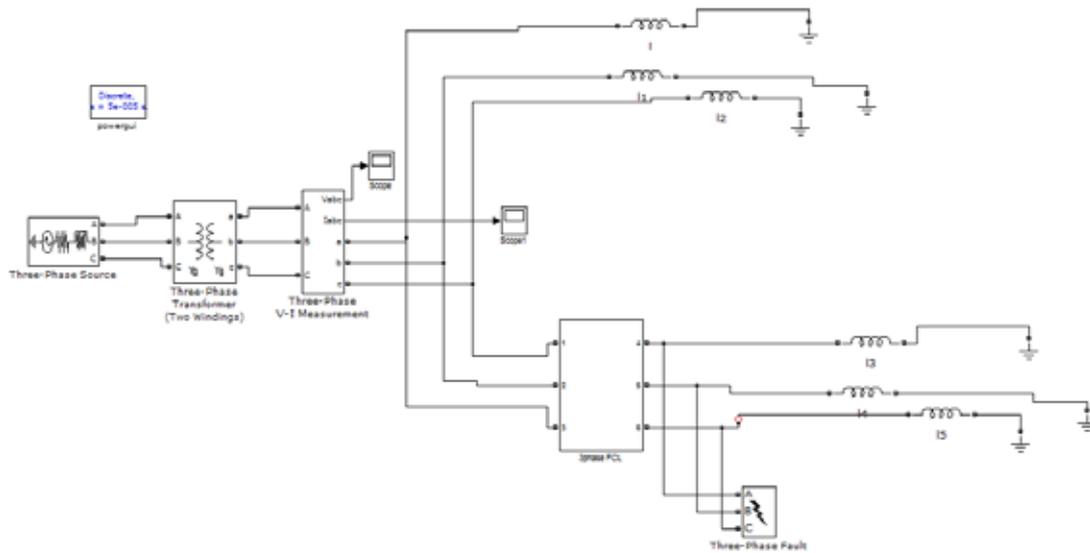
**Fig.12: Line, dc reactor, and shunt Fault.**

Fig.12. shows the shunt impedance current of the single phase system.

**Case 2: Proposal of Three Phases FCL**

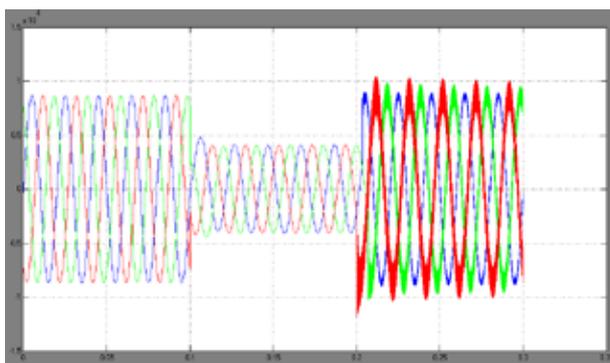


**Fig.13: Simulink circuit of PCC without FCL**

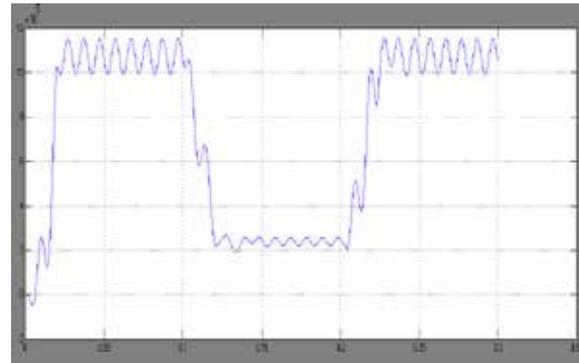


**Fig.14: MATLAB/Simulink of the proposed circuit**

Fig.13. and 14 shows the three phase power without and with FCL. Fig.15. shows the three phase voltage at PCC without the FCL

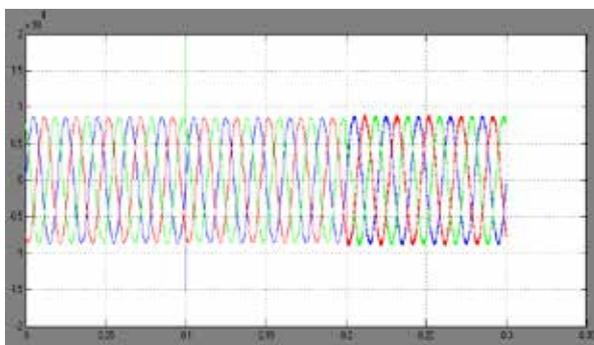


**Fig.15: PCC Voltage without FCL**

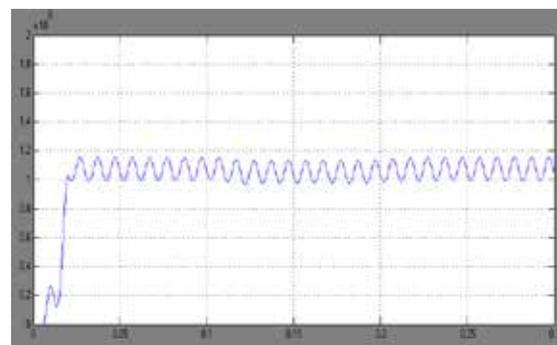


**Fig.16: Three-phase instantaneous power of the sensitive load without FCL**

Figure.16 shows the three phase instantaneous power of the sensitive load which has fallen instantaneously after the fault has occurred and recovered after the fault has cleared.

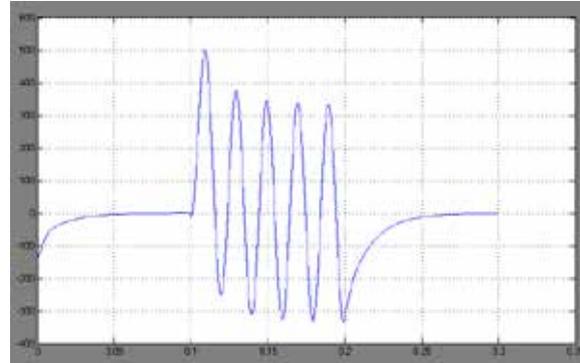
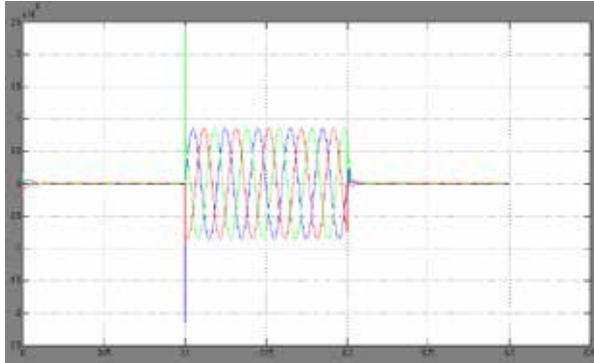


**Fig.17: Three phase PCC voltage with the proposed FCL.**



**Fig. 18: Three-phase instantaneous power of the sensitive load with the proposed FCL.**

Fig.17. show the three phase voltage at PCC with the FCL. It is found to be undistorted voltage waveform even a fault has occurred. Fig.18. shows the three-phase instantaneous power of the sensitive load with the proposed FCL. It is seen that the power is remains unaltered during the fault.



**Fig.19: Three phase Voltage drop on the proposed FCL      Fig.20:Line, dc reactor, and shunt impedance Currents during fault.**

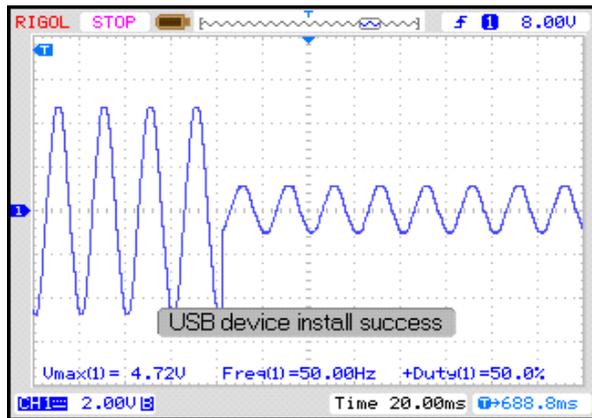
Fig.19. shows the three phase voltage drop on the FCL during the fault. This voltage drop does not allow the PCC voltage to change. Fig.20. shows the shunt impedance current for the three phase system.

**Case 3: Hardware Implementation of single Phase FCL**

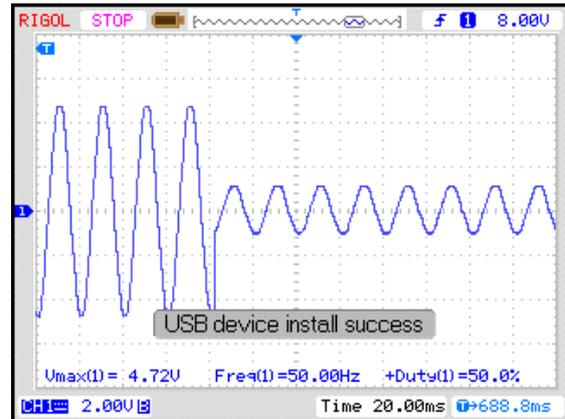


**Fig.21: Hardware circuit for single phase FCL**

The proposed Fault current limiter is implemented in hardware at a low voltage level and the circuit behavior is analyzed. The input voltage used is 12V and to simulate a fault, we used a 5V DC relay. The relay is powered by using a L7805 voltage regulator. Two conditions of the circuit have been tested. One without fault current limiter and the other one is with fault current limiter.



**Fig.22: Voltage at PCC without FCL**



**Fig. 23: Voltage at PCC with FCL.**

As you can see in Figure 22, when there is a fault occurrence the voltage magnitude has been dropped down. In this Figure 23 we can see that when there is a fault occurrence the magnitude of the voltage does not change.

## V. CONCLUSION

In this paper, by changing the previous circuit configuration the proposed FCL structure is introduced for voltage sag compensation, phase-angle jump mitigation, and fault current limiting operation due to the control method were analyzed. In this configuration the diodes will be in conduction only when fault occurs so, in normal condition current conducts through the switch by eliminating the diode losses in normal operating conditions. The proposed FCL has high speed. Note that the control system of this structure is simpler than previous ones. In addition, the dc voltage source placed in the proposed FCL structure reduces its THD and ac losses in normal operation. In general, this type of FCL, with the simple control circuit and low cost, is useful for the voltage-quality improvement because of voltage sag and phase-angle jump mitigating and low harmonic distortion in distribution systems. In addition to that the FCL is developed for the three phase power system. Their behaviors with and without the FCL are observed using Simulink results. Finally the simulation results are validated through experimentation.

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# DETERMINATION OF AGE AND GROWTH RATE OF FISH AMBLYCEPS MANGOIS (A CAT FISH) BY USING TRUNK VERTEBRAE AS AN INSTRUMENT

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## ABSTRACT

The present paper deals with the determination of age and growth rate of fish *amblyceps mangois* (Hamilton Buchanan) by using trunk vertebrae as an instrument. From the different section cuttings of vertebrae, it is inferred that the life span of the fish is three years. Also the probable cause of ring formation, length of the fish at the time of annuli formation, age at first maturity and various growth parameters have been discussed. The time of the annuli formation has also been discussed.

## I. INTRODUCTION

The determination of age in fish helps in understanding its life span along with the age at maturity, analysis of population dynamics, estimating the growth rate and optimizing the harvesting time. The known age method by establishing yearwise stocking ponds and also by the length frequency distribution are the methods used for validation of other skeletal techniques. Age determination of fish from skeletal structure like scales, otoliths, vertebra, fins, spines, fin rays etc. is very common in fish biological studies. This is for the reason that there is definitely a period of slow growth in life of fish which causes breaks in normal ring formation.

Monitoring of a population of known age requires long time and is quite an expensive method. Hence, the best validation method for annulus formation of fish seems to be marginal growth analysis. In particular, we attempt to detect annual formation in scales to meet following assumptions (a) the existence of periodical marks in the selected structures, the ability to identify these marks correctly (including discrimination from "false" marks) and (b) the ability to convert the number of marks into age. In present study the vertebrae method was used for the study of age and growth in *Amblyceps mangois*.

## II. MATERIAL AND METHODS

The age was calculated by analyzing the rings formed on vertebrae in *Amblyceps mangois*, a catfish. Age validation was done by length frequency distribution method. The fish were arranged in different length groups month wise for length frequency distribution, and finally an assessment is made based on the facts that the fish of same year classes form a bunching at a proper length group. A total of 50 specimens were considered for this study.

### 2.1 Trunk Vertebrae Method

The trunk vertebrae (50 specimens) were dissected (open) and transverse section of its Centrum was cut with the help of a clean sharp razor. It was then kept in clove oil to impart transparency. Clearing was also done with

the help of needle and forceps and finally the vertebrae were kept in a marked envelop for further examination. The fish length and vertebrae radius relationship was examined with the help of standard regression analysis. Viz.,

$$Y = a + bx$$

Where:

X = fish length (an independent variable)

Y = vertebrae radius (a dependent variable)

a & b = constants ( intercept and slope respectively).

Now the vertebrae were subjected for further examination, which includes the identification of annuli and its measurement focus. Also the minimum width in terminal zone (i.e. the distance from last annuli to margin) was noticed of each vertebra in each month round the year. The data was further analyzed to find out the month and probable cause of annuli formation.

## 2.2 Back Calculation Fish Length

The growth rate of fish was calculated by back calculation method as suggested by Lea (1910). The formula read as :

$$l_n = V_n / V \cdot l$$

Where

$l_n$  = length of fish when annulus "n" was formed

l = length of fish when vertebrae sample was obtained

$V_n$  = vertebrae radius of annulus "n" at  $l_n$

V = vertebrae radius

## III. OBSERVATIONS

The trunk vertebrae of *Amblyceps mangois* was found suitable for age and growth determination. It was observed circular in most of the cases (Plate 7.1 and 7.2). The opaque and hyaline zones were clearly distinct, hence the ring, which is all around the diameters, was considered as annuli. Each annulus comprised of two growth rings. Data on the age and growth in *A. mangois* based on the various length groups is presented in Table 7.1.

### 3.1 Fish Length And Vertebrae Radius Relationship

The relationship between fish length and vertebrae radius is shown in figure 1.1. It was calculated to be as

$$VR = -20.0010 + 0.87123 FL, r = 0.72983$$

Where:

VR = vertebrae radius

FL = fish length

r = Coefficient of correlation.

### 3.2 Time of Annulus Formation

In the present investigation maximum three age rings were counted (Plate 1.1 and 1.2). Minimum width in terminal zone for vertebrae was also observed during July-August (Fig. 1.2).

### 3.3 Growth Rate of Fish By Back Calculation Method

The growth rate of *A.mangois* was also determined by the back calculation method based on trunk vertebrae. It was observed that the first ring was formed at an average length of 44.13 mm. The second and third rings were appeared at an average length of 56.71mm and 67.79mm respectively. The annual increment (h) of 44.13mm, 12.85mm and 11.08mm were observed from first to third year (Table, 1.2).

### 3.4 Age Validation By Length Frequency Distribution

Length frequency distribution of the fishes collected during January 2008 to December 2010 is presented in Fig 1.3. On the basis of keen observation on bunching growth of different batches of fish, it was observed that the fish acquires a length of 45 mm, 55 mm and 65 mm during first, second and third year respectively.

## IV. DISCUSSION

Fish are cold-blooded animals. Thus, their metabolic and physiologic activities depend on water temperature. Fish show various growth rates in a year depending on various physiological and environmental characteristics during different seasons. This brings about the formation of annulus on some bony structures. The readability of annulus depends on the amount of calcium deposition on the bony structure. In fish, nearly 90% of calcium is deposited in the skeleton and scales. Vertebrae were reported as the most suitable ageing structure in comparison to scales and otoliths in *Pleuronectes flesus luscus* (Polat et al., 2001). Yilmaz and Polat (2002) also reported that vertebra was more accurate in estimation of age determination in shad, *Alosa pontica*.

In this study an attempt was made to establish relationship between the vertebrae radius and total length of *A. mangois* which indicated a linear growth of fish and vertebrae and indicated high significant correlation coefficient 'r' value. Monastyrky (1930) observed the mathematical relationship between fish length-scale radius and reveal that the ratio of the body length to scale radius is constant for all lengths of the fish. Various workers in different fish species reported similar linear relationship between the body length and scale length (Narejo et al., 1999; Narejo et al., 2000). Formation of alternating opaque and translucent bands on the trunk vertebrae was considered an annuli in *A. mangois*. At the same time, disturbances in the habitats can possibly result in the appearance of false bands, i.e., bands that do not completely encircle the centrum. Those disturbances seemed to include cessation of feeding, inhibited spawning, and failure to engage in physiological activity. There are several possible explanations for annulus formation. Sullivan et al. (2003) suggested that a shortage of food, deprivation caused by migration, and changing temperatures may all be factors affecting its formation, which can cause calcium deposited in the bone to be reabsorbed and reutilized, called the Crichton effect.

Back-calculated lengths for age were in close agreement with observed lengths. The results obtained with the back-calculation method were very satisfactory. In most the cartilaginous fish, age determination is impossible using a body component because of less calcification of bony structures (Avsar 1998; Aydin and Sen 2002). Several workers from India and abroad are of the view that the variation in temperature (Holcik, 1967) and spawning are the important causative factors responsible for annulus formation. Jhingran (1971) designated fall in feeding intensity on account of elaboration of gonads during the maturation phase, bringing about retardation in growth, resulting in annuli formation in *Setipinnaphasa*. Llewellyn (1966) considered flooding and draught to cause subsidiary annulus formation in Australian inland water fishes. Also, Garrod (1959) suggest that growth marks on hard structures in tropical fish are results of factors such as reproductive activity, feeding intensity, salinity and water level. Several factors might be responsible for this growth difference

between males and females, such as physiological changes influenced by temperature changes, feeding regimes, and reproductive cycles (Utagawa and Taniuchi 1999, Newman et al. 2000, Morales-Nin and Ralston 1990). In the present study, the probable months of age ring formation were observed to be July-August as the least minimum width in terminal zone was observed in these months. During the month of May and June highly mature eggs occurs in the abdominal cavity so, it affects the feeding intensity of fish so low feeding factor was noticed during these months. We can state that like a spawning stress, low feeding was also a causative factor for ageing in *A.mangois*.

On the basis of back calculation method it was observed that the first ring was formed at an average fish length of  $44.136 \pm 8.66$  mm for trunk vertebrae. The second ring was formed at an average fish length of  $56.71 \pm 3.03$  mm. The third ring was noticed at an average fish length of  $67.79 \pm 10.1$  mm for *A.mangois*. Lagler (1977) suggested that the length frequency method is based on the expectancy that the frequency analysis of a species of any one age group collected on the same data will show variations around the mean length according to normal distribution. Thus, there will be clumping of fish of successive ages at successive length when sampled at randomly. In *A.mangois*, on the basis of length frequency distribution, it was recorded that the fish attained a length of 50 mm, 60 mm and 70 mm after first, second and third year of age. Rao and Rao (1972) used length frequency method for the age determination in *L.calbasu* from River Godavari, India. They concluded that the fish attains modal length of 210, 270, 330 and 410 mm as zero, 1, 2 and 3 years of life. Narejo et al., (1999) reported age in *Tenulosailisha* from River Indus at modal length of 225, 275, 325 and 375 mm at the end of zero+, 1+, 2+, and 3+ year of life. Dobriyal et al., (2004) and Uniyal et al., (2005) also utilized length frequency for the age determination in Himalayan catfish *P.sulcatus* and *T.chelynoides* from River Alknanda and Western Nayer in Garhwal Himalaya, India.

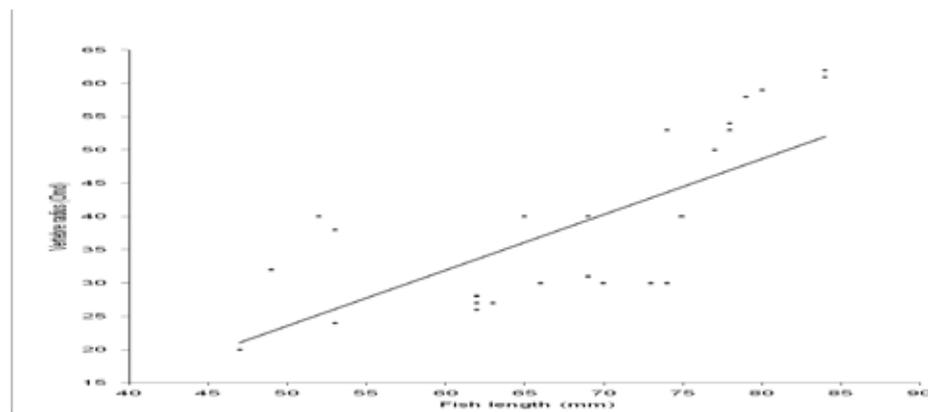
Estimates of fish age provide important demographic parameters to analyze and assess fish populations (Maceina and Sammons, 2006). Accurate age information is critical to the biological understanding and management of most fish species (Hurley et al., 2004; LaBay and Lauer, 2006). Mistakes in fish age determination can have negative effects on fish stock management. Fish can be aged using a number of structures which produce periodic growth increment, including scales, vertebrae, fin rays, cleithra, opercula, and otoliths (Campana, 2001). Two important considerations when selecting a structure for aging a sample of fish are whether the structure yields accurate estimates of fish age and whether the structure can be obtained without killing the specimens (Brenden et al., 2006).

**Table 1.1: Data on the age and growth of *A.mangois* based on various length groups.**

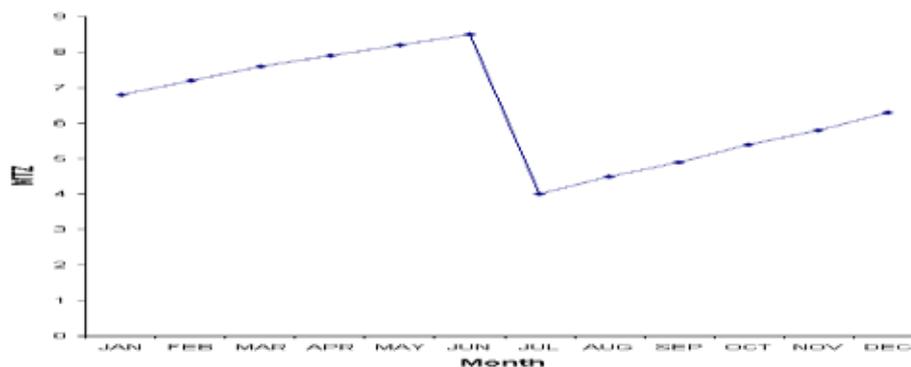
S. No.	Size Groups (mm)	Fish Length (mm)	VR (10 $\mu$ m=0.016)	Vn1	Vn2	Vn3	Ln1	Ln2	Ln3
1	4.0-5.0	42-49 46 $\pm$ 2.25	12-19 15 $\pm$ 1.50						
2	5.1-6.0	53-60 57 $\pm$ 2.39	18-27 24 $\pm$ 2.15	16.9-21.70 18.75 $\pm$ 1.25			36.79-40.95 38.65 $\pm$ 1.42		
3	6.1-7.0	61-69 66.72 $\pm$ 1.14	21-35 30.20 $\pm$ 4.25	18.2-23.9 20.93 $\pm$ 1.17	24.2-33.5 28.65 $\pm$ 2.96		34.13-47.61 42.25 $\pm$ 2.14	51.21-60.75 54.78 $\pm$ 2.25	
4	7.1-8.0	73-80 77 $\pm$ 2.25	33-40 35.35 $\pm$ 3.62	10-25 22.84 $\pm$ 1.91	26-37 32.50 $\pm$ 2.35		37.59-50.12 45.37 $\pm$ 3.65	46.85-62.45 56.95 $\pm$ 3.70	
5	8.1-9.0	82-90 85 $\pm$ 2.55	38-49 44.86 $\pm$ 3.95	20-27 24.25 $\pm$ 1.55	29-38 34.96 $\pm$ 2.10	33-45 40.55 $\pm$ 2.50	44.50-58.50 52.12 $\pm$ 4.35	55.45-65.50 61.45 $\pm$ 2.14	62.78-78.15 72.14 $\pm$ 4.25

**Table 1.2: Back calculated length of *A.mangois* based on age class collected from Mandal river during 2008-2010.**

Age Class	No. of fish studied	Average fish length at the time of capture (mm)	Ln <sub>1</sub>	Ln <sub>2</sub>	Ln <sub>3</sub>
I	18	62.85±10.12	56.19±20.17		
II	23	78.62±7.12	36.12±25.12	59.75±11.17	
III	14	89.35±8.91	40.10±7.23	53.68±7.5	67.79±10.1
Average value		76.94±10.88	44.136±8.66	56.71±3.03	67.79±10.1
h (annual increment)			44.13	12.58	11.08



**FIG. 1.1: Regression analysis of fish length and vertebrae radius of *A.mangois*.**



**FIG 1.2: Minimum width in terminal zone on the vertebrae of *A. mangois*(MTZ in micrometer divisions)**

Fig. 1.3: Length frequency distribution of *A. mangois* during January 2008 to December , 2010.

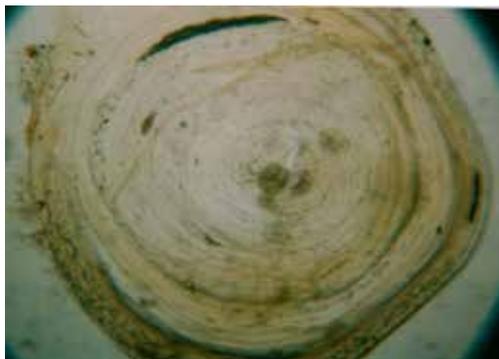
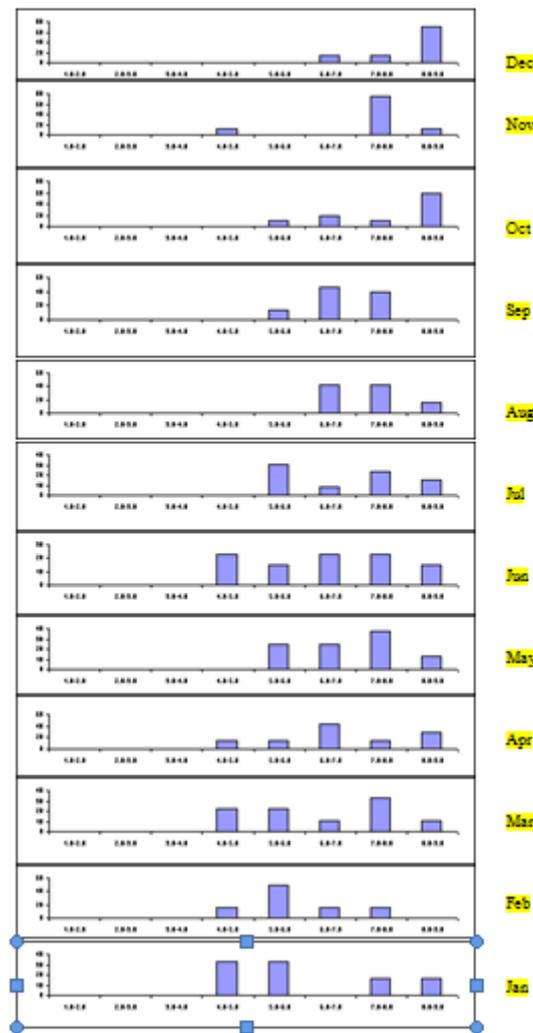


Plate.1.1: Trunk vertebrae of *Amblyceps mangois* showing 2 age rings



Plate.1.2: Trunk vertebrae of *Amblyceps mangois* showing 3 age rings

V. CONCLUSION

Relationship between the vertebrae radius and total length of *A. mangois* was established, which indicated a linear growth of fish and vertebrae and indicated high significant correlation coefficient 'r' value. Back-calculated lengths for age were in close agreement with observed lengths. The results obtained with the back-

calculation method were very satisfactory. It was observed that the first ring was formed at an average fish length of  $44.136 \pm 8.66$  mm for trunk vertebrae. The second ring was formed at an average fish length of  $56.71 \pm 3.03$  mm. The third ring was noticed at an average fish length of  $67.79 \pm 10.1$  mm for *A.mangois*. In the present study, the probable months of age ring formation were observed to be July-August as the least minimum width in terminal zone was observed in these months. During the month of May and June highly mature eggs occurs in the abdominal cavity so, it affects the feeding intensity of fish so low feeding factor was noticed during these months. We can state that like a spawning stress, low feeding was also a causative factor for ageing in *A.mangois*. Age validation was done with the help of the length frequency method. It is based on the expectancy that the frequency analysis of a species of any one age group collected on the same data will show variations around the mean length according to normal distribution. Thus, there will be clumping of fish of successive ages at successive length when sampled at randomly. In *A.mangois*, on the basis of length frequency distribution, it was recorded that the fish attained a length of 50 mm, 60 mm and 70 mm after first, second and third year of age.

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# A COMPARATIVE ANALYSIS OF EDGE DETECTION TECHNIQUES USED IN FLAME IMAGE PROCESSING

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## ABSTRACT

*This paper presents a review over the detection of edges by taking a flame as an input image. The identification of flame edge is the process of locating a boundary between those areas where a thermochemical reactions take place. The determination of flame edges is necessary for early fire detection, fire analysis and the estimation of various flame parameters. Edge detection is an important process which aims to identify and locating the sharp intensity changes in an image. Generally, Edges are find out by reducing the unwanted or unnecessary data from an image, while preserving and maintaining it's important structural properties. The study has been done on various edge detection methods such as Sobel, Robert's cross, Prewitt, Laplacian of Gaussian (LoG), Canny edge detection & the technique which is based on Local Binary Pattern (LBP). The study also explores various advantages and disadvantages of existing edge detection techniques.*

**Keywords:** *Canny, Edge Detection, Flame, Local Binary Pattern, Sobel.*

## I. INTRODUCTION

There has been increasingly use of fire detection in power generation industries since many years. These industries continuously monitoring different types of flame to obtain geometric properties such as shape, size, location etc. and luminous properties such as brightness, nonuniformity etc. These properties are achieved if the closed and continuous contour or boundary edges of flame can be detected properly [7]. Edge detection is very important area in many applications in the field of image processing such as image enhancement, compression, watermarking, registration, retrieval, recognition and morphing. Edges are mainly occur over the boundary between two areas which are different from each other. Edges contain many points and each point occur where the brightness of image changes sharply and abruptly. These points are organized into set of curved line segments called edges [1]. Edges are used to find changes in local of intensity from an image. Edges are of different types which are a) Step edge, b) Line edge, c) Ramp edge, and d) Roof edge.

### 1.1 Step edge

It is a perfect transition from one segment to another segment. The intensity of image changes abruptly from one value to different value on the opposite side, called step edge.

### 1.2 Line edge

When the segment of an image is very narrow, then it has two edges in close proximity. This type of arrangement is called a line edge.

### 1.3 Ramp edge

In case of ramp edges, it allow for a smoother transition between segments. It is used for modelling the blurred edges created from sampling a image containing objects not aligned to the pixel grid.

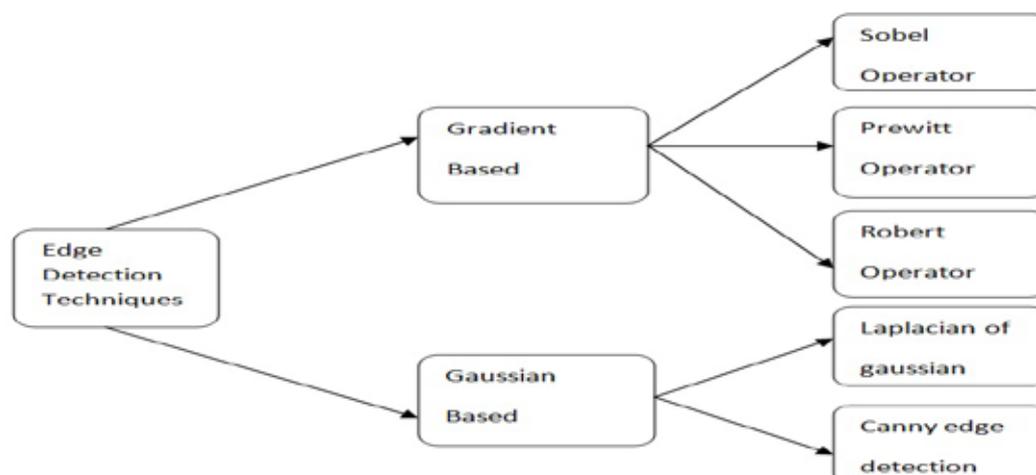
### 1.4 Roof edge

when two nearby ramp edges resulting in a line structure, called roof edge. Edge detection is define as a process which identifying the fine & abrupt discontinuities over an object of an image. The abrupt changes occur in the intensity of pixel are the discontinuities which are able to characterize the object boundaries in an image. Edges detection mainly depends upon object intensity, noise, blur, illumination in an image. Edge detection plays an important pre-processing step for object recognition and object detection. The lighting conditions, the presence of objects of similar intensities, density of edges are the quality measures of edge detection [2].

The edge detection methods structurally incorporate three operations: smoothing, differentiation and thresholding. Smoothing is done for reducing the noise. Differentiation includes in evaluating the desired derivatives of an image. Thresholding is used to determine edges where some pixels are remove as noise and some pixels are retained.

## II. REVIEWS OF EDGE DETECTION TECHNIQUES

The main purpose of studying various edge detection techniques is to overcome the problems which are encountered during the analysis of edges of an image. The problems such as missing true edges, fake edges, malfunctioning at the corners and curves etc. In general, all edge detection techniques are either gradient based or gaussian based [1].



**Fig. 1: Various Edge Detection Techniques [1].**

### 2.1 Gradient based techniques

The gradient based edge detections look for the first derivative of an image where the maxima and minima are occur. These techniques used sobel, prewitt and robert's cross operator for finding the edges.

#### 2.1.1 Sobel Operator

Sobel operator applies two dimensional spatial gradient measurements on an image and also highlight spatial component that belongs to edge. The operator contains a two  $3 \times 3$  convolution mask to calculate the gradient between two directions (i.e. row and column orientation). For obtaining gradient component in each direction,

the mask is used over an image separately i.e.  $G_x$  and  $G_y$ . The Sobel Operator uses the common masks which are given by  $G_x$  and  $G_y$  [3].

-1	0	+1
-2	0	+2
-1	0	+1

 $G_x$ 

+1	+2	+1
0	0	0
-1	-2	-1

 $G_y$ 

The magnitude of gradient is given by:  $|G| = \sqrt{G_x^2 + G_y^2}$

The gradient angle is given by:  $\tan^{-1}(G_y / G_x)$

### 2.1.2 Prewitt Operator

The prewitt operator estimates the magnitude and orientation of edges same as sobel operator. It is used for calculating horizontal and vertical edges with  $3 \times 3$  convolution mask  $P_x$  and  $P_y$  respectively. The common mask is given by  $P_x$  and  $P_y$  [4].

-1	0	1
-1	0	1
-1	0	1

 $P_x$ 

1	1	1
0	0	0
-1	-1	-1

 $P_y$ 

### 2.1.3 Robert Operator

The Robert operator is similar to sobel & prewitt and performs two dimensional gradient measurements on an image. It thus highlight region which are related to high spatial frequency of edges. The operator contains pair of  $2 \times 2$  convolution mask. These masks are prepared in the manner that they give maximally response to an edges which are at 45 degree running to the grid of the pixel. The common mask is given by  $R_x$  and  $R_y$  [2].

1	0
0	-1

 $R_x$ 

0	-1
1	0

 $R_y$ 

The gradient magnitude is given by:  $|R| = \sqrt{R_x^2 + R_y^2}$

The orientation of angle is given by:  $\tan^{-1}(R_y / R_x)$

## 2.2 Gaussian Based Techniques

The main purpose of this technique is to detect the zero crossings in the second order derivative of an image to find edges. The Gaussian based techniques are Laplacian of Gaussian (LOG) and Canny edge detection.

### 2.2.1 Laplacian of Gaussian

The laplacian of Gaussian performs two dimensional isotropic estimation of the 2<sup>nd</sup> spatial order of an image. It highlights the region of fast changes in intensity that is used in the detection of edges. The laplacian of Gaussian uses Marr-Hildreth for estimating the second derivative of an image i.e. called LoG operator. [1].

It is a second derivative and defined as :

$$\nabla^2 f = \frac{d^2f}{dx^2} + \frac{d^2f}{dy^2} \quad (1)$$

The pixel intensity value L(x, y) of the laplacian of an image is given by:

$$L(x, y) = \frac{\partial^2 I}{\partial x^2} + \frac{\partial^2 I}{\partial y^2} \quad (2)$$

The common mask of the laplacian of Gaussian is given by  $L_x$  and  $L_y$  which are given below [1]

1	1	1
1	-8	1
1	1	1

$L_x$

-1	2	-1
2	-4	2
-1	2	-1

$L_y$

### 2.2.2 Canny edge detection

It is well known and commonly used image processing tool which is used to detect edges in a very robust manner. This method is used to find edges by separating noise from image and extract information from the image without disturbing its feature. There are some points which are to be kept in mind for improving the above said method of edge detection. These points are low error rate, well localization of edge points and one response per edge [1].

The algorithms of canny edge detection are in following steps:

**Step 1 Smoothing:** First of all, Smoothing is done by convolving the image with Gaussian filter to remove noise from the image. The number of steps must be followed in order to implement canny edge detection algorithm. The suitable mask is taken for smoothing with the image. When the width of the mask is larger, than the detection sensitivity to noise will be lower [1].

**Step 2 Finding Gradients:** After removing the noise from an image by smoothing, the next step is to find the edge strength by taking the gradient of the image. By taking horizontal and vertical gradient of an image for this purpose, this method applies respective sobel kernel mask in both horizontal and vertical direction. It uses a couple of 3×3 convolution mask that approximate the x-direction gradient and y-direction gradient [5].

**Step 3 Non Maximum Suppression (NMS):** It is applied over the image to find every maxima in the gradient direction that is preserve as edges and deleting everything else. Finally, it will provide thin edges in an output image [5].

**Step 4 Double Thresholding:** This type of thresholding is used to determine the potential edges. The canny edge detector uses the hysteresis to do thresholding. In double thresholding, there are two types of thresholding level i.e. low threshold and high threshold. When the value of edge pixel is stronger than the high threshold then they marked as strong; An edge pixel is said to be a strong if its value is greater than high threshold and weak, if its

value is less than low threshold. Weak edge pixel must be suppressed and consider only strong pixel as well as those pixel whose value lies between low and high threshold ( if they are connected to strong edge pixel )[5].

### III. LOCAL BINARY PATTERN (LBP)

LBP is a gray scale texture classification operator computed from the neighbour of particular pixel which is to be analysed. This particular pixel is considered as a central pixel and the analysis is done by describing the relationship of the central pixel with its neighbouring pixel. It was first introduced by “Ojala” in the year 1996. The LBP mainly act as an unified approach to the existing statistical and structural models of texture analysis.

There are many other applications, such as localization of shape, recognition of face and recognition of dynamic texture. The image texture is represented by building the histograms after the identification of LBP pattern of each pixel. Due to its flexibility, the LBP method becomes applicable for different types of problems. Some extension and modification of LBP have been applied to improve its robustness and power of discrimination [6].

6	5	2
7	(6)	1
5	4	7

(i) 3×3 window with (6) as a  
Central pixel

0	-1	-1
1	(6)	-1
-1	-1	1

(ii) Subtraction of central pixel  
from its neighbour

1 (LSB)	0	0
1 (MSB)	(6)	0
0	0	1

(iii) Assume (-) sign as 0  
Other as 1

1	2	4
128		8
64	32	16

(iv) Weight Matrix

LBP Code = 10010001

$$(10010001)_2 = (145)_{10}$$

Fig. 2: Computation of LBP pattern

From the figure 2, it is clearly seen that if the value of the neighbouring pixel is lower than the value of central pixel, then it is assigned as 0, otherwise it is assigned as 1. Then the 8 bit LBP code is obtained by arranging 1's

& 0's in their respective positions according to their weights given by fig 2(iv). Then the central pixel is replaced by the decimal equivalent of obtained LBP code.

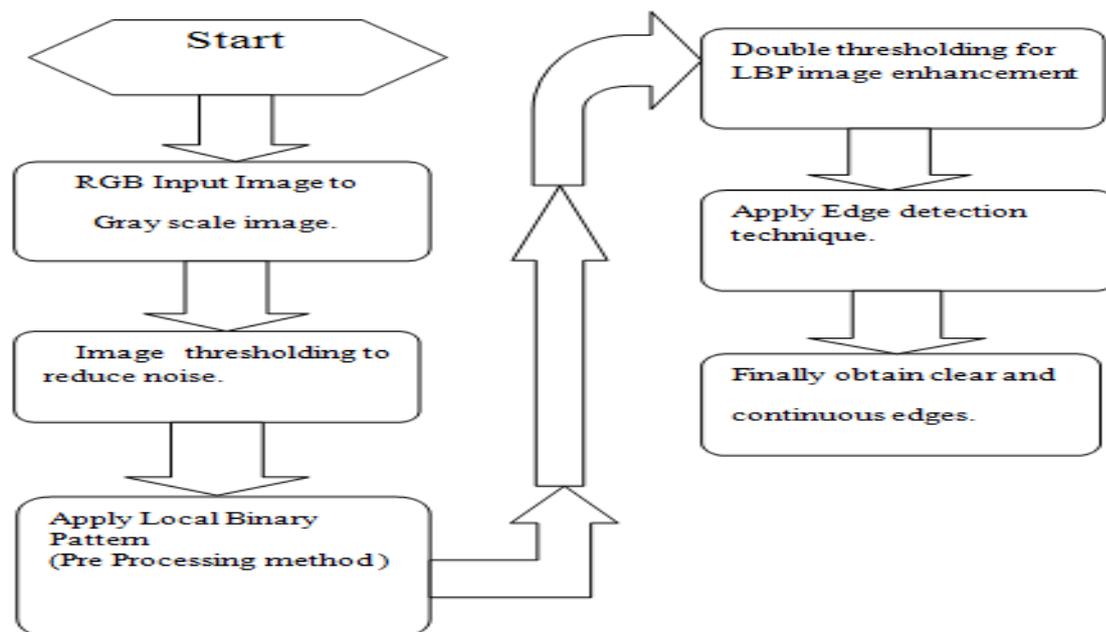


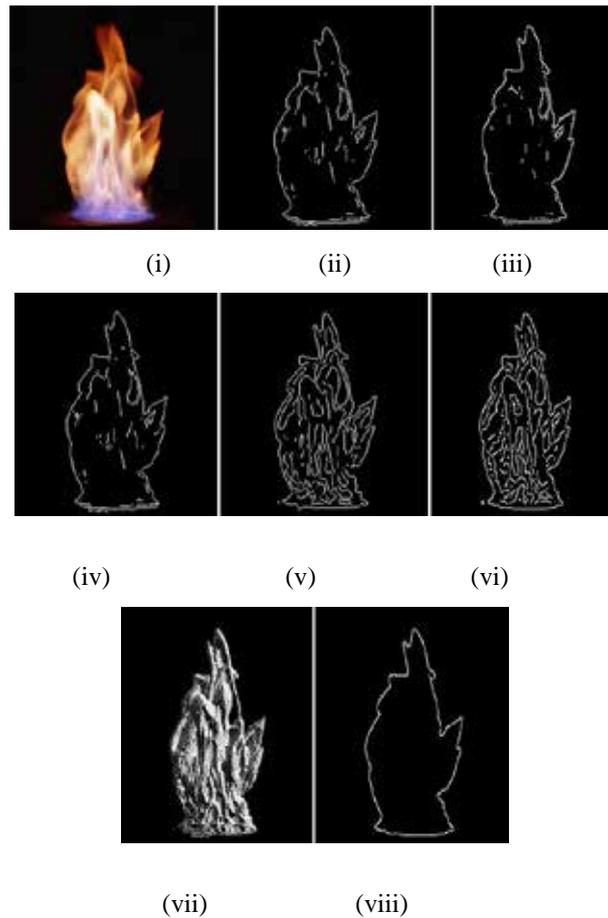
Fig. 3: The flowchart for edge detection using LBP [7].

#### IV. ADVANTAGE AND DISADVANTAGE OF TECHNIQUES [1]

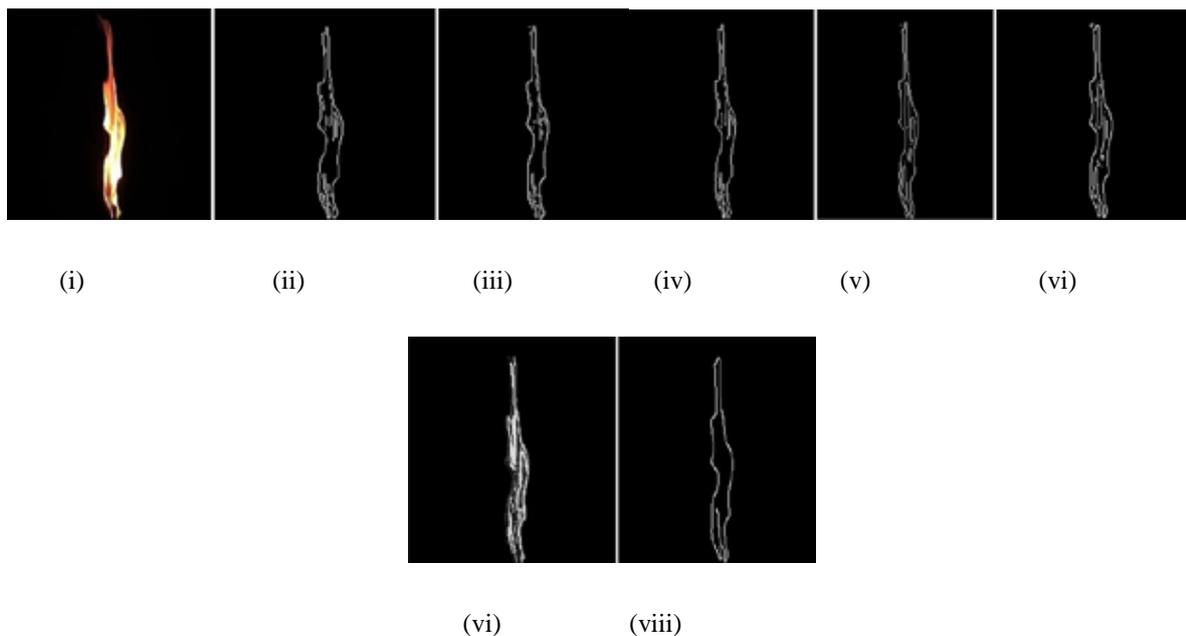
Techniques	Advantages	Disadvantages
<b>Gradient Based Techniques</b>	1) It is simple, quick and easy to compute.	1) These are more sensitive to noise.
	2) Edges are detected along with their orientation.	2) The detection of edges are inaccurate.
<b>Gaussian Based Techniques</b>		
<b>1) Laplacian of Gaussian</b>	1) Due to the approximation of gradient magnitude, the cross operation detection of edges and their orientation is simple.	1) The edge magnitude degrades as noise increases due to detection of edges and their orientation.
	2) The characteristics are fixed in all direction.	2) At the corners and curves, malfunctioning are varies.
<b>2) Canny edge detection</b>	1) Signal to noise ratio is improved.	1) Complex and time consuming computation.
	2) Better detection in noise condition.	2) False zero crossing.

#### V. EXPERIMENTAL RESULTS

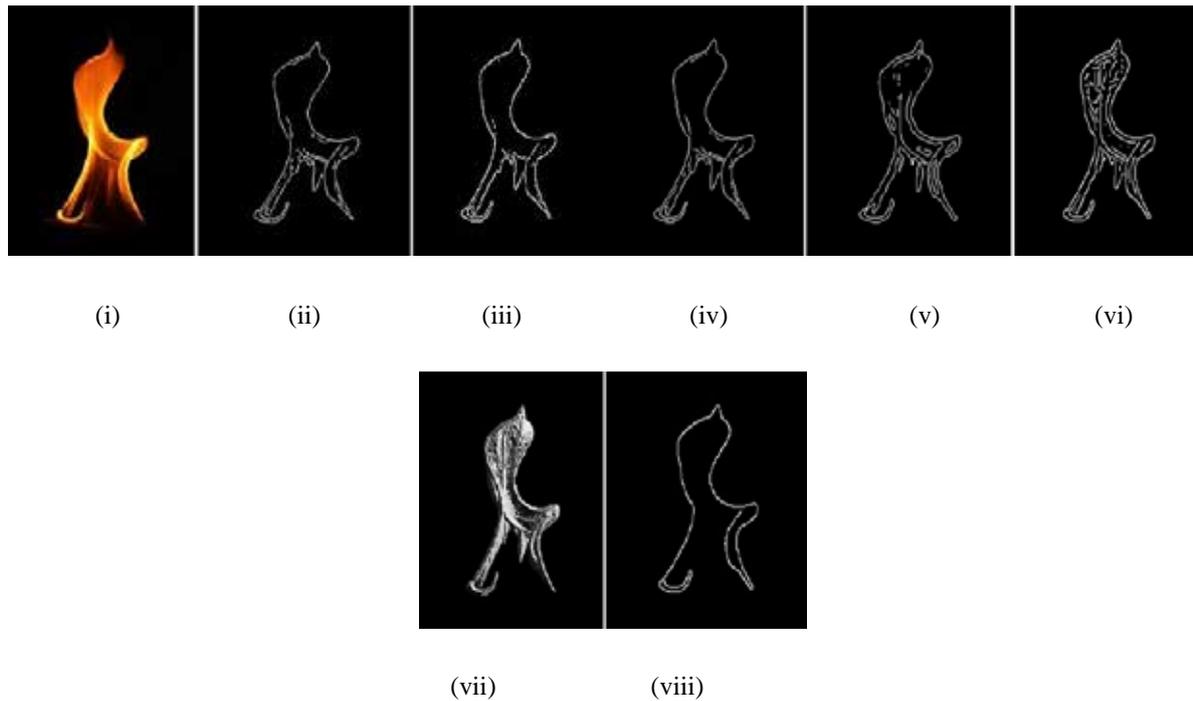
In this paper, flame image is considered to study various edge detection techniques:



**Fig. 4:** Comparison of different edge detection methods (i) Original Image, (ii) Sobel method, (iii) Robert method, (iv) Prewitt method, (v) LoG method, (vi) Canny method,(vii) LBP Image, (viii) Edge detection after applying LBP.



**Fig. 5:** Comparison of different edge detection methods (i) Original Image, (ii) Sobel method, (iii) Robert method, (iv) Prewitt method, (v) LoG method, (vi) Canny method,(vii) LBP Image, (viii) Edge detection after applying LBP.



**Fig. 6: Comparison of different edge detection methods (i) Original Image, (ii) Sobel method, (iii) Robert method, (iv) Prewitt method, (v) LoG method, (vi) Canny method, (vii) LBP Image, (viii) Edge detection after applying LBP.**

## VI. CONCLUSION

The main aim of this paper is to present a review on various edge detection techniques. The sobel, Robert and Prewitt can compute the edges along their orientation easily but the detection of edges are inaccurate and more sensitive to noise. Canny edge detection in comparison to sobel, Robert and Prewitt is complex, it's computation is time consuming and detection of edges is immune to noise. But after analysis of different types of edge detection techniques, it is concluded that the detection based on Local Binary Pattern gives better results in comparison to Canny edge detection. Experimental results proved that clear, continuous and uninterrupted edges are obtained through LBP which is necessary for the estimation of various parameters of a flame.

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## BIOGRAPHICAL NOTES

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# 360 DEGREE APPRAISAL SYSTEM AND ITS SUITABILITY FOR INDIAN PRIVATE SECTOR BANKS- AN EMPIRICAL STUDY

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## ABSTRACT

*PAS (Performance Appraisal System) is a very predominant component of overall HRD system in any organization. Whether it is manufacturing sector or services sector, periodic appraisal of employees is a very important HR developmental tool towards focusing career development of an organization. A large number of organizations have been using 360 degree feedback in India as leadership development intervention. The concept of performance appraisal is still emerging and finding space in both academic and practitioner spheres. This paper focuses on appraisal in Indian private banking sector. Banking sector, a live catalyst for business sector as it contributes to economic development of a nation. PAS is being used to evaluate whether employees at various levels of perform their assigned jobs as per the expectations of their supervisors & set standards. PAS in Private sector banks has been in vogue over past many decades and periodic changes are getting introduced in this system. This paper brings out features of 360 degree Appraisal and its suitability & relevance for Private Sector Banks in our country.*

**Keywords: Banking Sector, Performance Appraisal, PAS, 360 Degree Appraisal, PMS**

## I. INTRODUCTION

Performance appraisal system (PAS) is an important Human Resource Development (HRD) mechanism designed and utilized for the all round development and growth of employees as well as organizations.

Organizations use a variety of methods for evaluating employee performance. There are so many types of performance management methods, understanding how each of them works will help to determine the best one to use within your organization. Each type has benefits and drawbacks. Performance appraisal systems solve the review process problem—normally a formidable and complicated task—by making it both efficient and effective for managers and employees. HR often gets bogged down with the process, and managers are often untrained in delivering effective reviews that actually reflected in workforce performance and help to grow the business.

But there's a much bigger business impact to be had from an online performance appraisal system than simply time saving method. The centralisation will lead to thrive the managers effectively and caus. The managers can more easily communicate business strategy and create measurable goals for their employees that will support overall company objectives. This, in turn, gives management the tools to measure individual performance throughout the organization and identify top performers for further development and establish a *pay-for-performance* compensation plan.

## II. 360 DEGREE FEEDBACK

The use of a 360 degree feedback appraisal system is ideal to may prove the businesses that value the input of employees concerning the effectiveness of supervisors and managers. This type of performance appraisal method solicits input from employees of all ranks who interact with the employee being evaluated. Everyone from executive leaders to frontline workers receive anonymous and carefully considered feedback from co-workers. Using a 360 degree feedback method requires training on how to evaluate others. Individuals who do not have the experience of composing appraisal statements may need additional training pertaining to evaluating the quality of work rather than the employee's personality or popularity. Nevertheless, this is a very effective way to get a good reading on your management talent by obtaining commentary from the people who frequently interact with managers.

Many managers aspire that PAS occupy more time in their productive hours without adequate rewards; quit in few organizations are in search of perfect performance appraisal system for their organizations to promote and inculcate a performance culture among the employees. In the present research, efforts will be made to diagnose the factors involved for discontent among the employees at different levels about the operations of PAS and to know the remedy for the same. The present piece of research is also an attempt to identity the relevancy of 360 degree appraisal at organizational levels to make the appraisals more acceptable, more effective, more workable and more palatable.

### 2.1 Research Objective

The research Objective is to understand the relevance of 360 degree performance appraisal system particularly in context of Indian private Banking sectors only in urban area and to present the study findings based on individual perception of working bankers about their preference towards introducing 360 degree performance appraisal system within private sector banks.

### 2.2 Literature Review

(Spriegel and Mumma, 2006 Rudrabsavaraj 2007; Levinson 2010)

Performances appraisal system provides information to management about and employee's performance which can be used for succession plan by identifying the people with potentialities. It helps the management to take administrative decisions such as, pay increase, promotion, placement, transfer and lie off to help supervisors to

know their subordinates and give an opportunity to the subordinates to know where they are in front of supervisors and stand with the boss

(Thathachary 2000, Latham & Wexley 2001 and Rao 2002)

Research has also indicated that quite often appraisal system practices are ill designed in most organizations this is mainly due to the fact that existing system is not effective. The reason was being the objective of this system does not need out nor made known to the employees. Many managers view that PAS occupy too much of their productive time without adequate rewards, quite a few organizations are in search of perfect performance appraisal system for their organizations to promote and inculcate a performance culture among the employees

(Rai and Singh, 2012)

*360-degree feedback* has been linked to several positive outcomes like improved performance, better interpersonal communication, smoother work relationships, etc

Himanshu Rai and Manjari Singh (2012)

In a recent study of the mediating effects of *360 Degree feedback* Himanshu Rai and Manjari Singh (2012) empirically examined the mediating effects in the relationship between 360-degree feedback and employee performance with a sample of executives (N=198) working in four organizations in Western India. The results showed that interpersonal communication and quality of working life (QWL) had a complete mediating effect. Leader member exchange quality and perceived organizational support were found to have a partial but significant mediating effect.

### 2.3 Results from Empirical study

During 2013-2014, a perceptual study was carried out among 100 senior private bankers randomly from different private sector Indian banks. The questionnaire was got responded during informal interactions in some training programs at training colleges of different banks.

### 2.4 Would you prefer 360 Degree Appraisal?

Response	Percentage
Yes	74 respondents
No	26 respondents
No comments	Nil

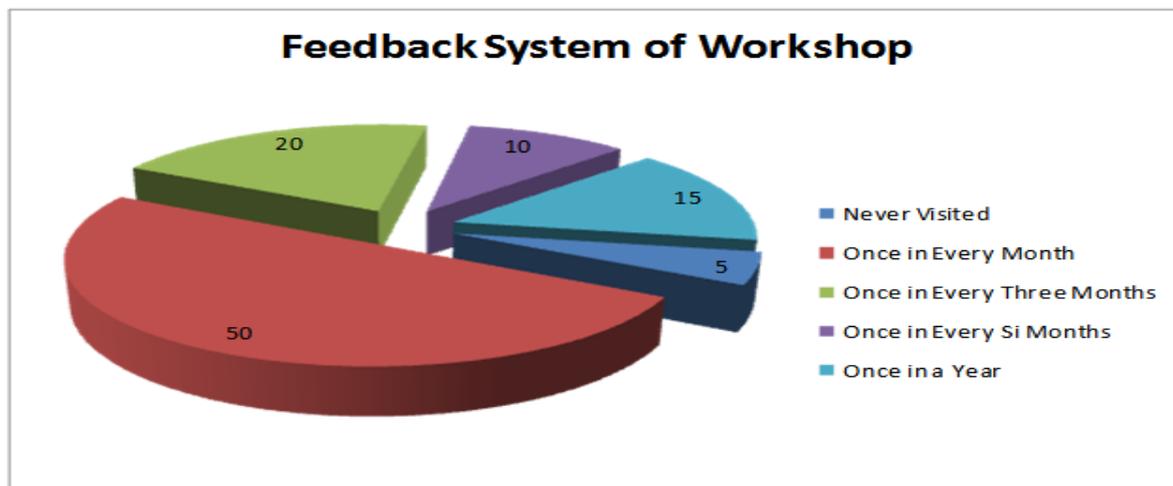
## III. IMPACT AT INDIVIDUAL LEVEL

### 3.1 To What Extent Individuals Think “The Leadership Development” Has Been Achieved Through 360-Degree Feedback

The collected data interprets and outcomes as furnished below. Around 40 respondents felt that 360 Degree Feedback had fully achieved its aim of “leadership development”. 20 respondents felt that 75% of leadership development was achieved through 360 Degree Feedback system. 14 respondents felt that leadership development was achieved to an extent of 50% through 360 Degree Feedback system. 16 respondents felt that leadership development was achieved to a limited extent i.e. less than 50% out of only 5 individual felt that leadership development was achieved to an extent of 25% through 360 Degree Feedback system and the 5 felt that no development was achieved

### 3.2 How Often Have You Visited Your 360 Degree Feedback Data After The Feedback System of Workshop?

<i>Review of 360 Degree Performance appraisal system</i>	No of respondents
Never visited	5
Once in every month	50
Once in every three months	20
Once in every six months	10
Once in a year	15
Total	100



The above table shows that the no. of visitors over a period of time to private banks. While analysing the data it has been noticed considerable visitors in percentage every month is high when compared with never visited customers.

### 3.3 Top Three Changes That You Have Observed In Yourself After The 360- degree feedback analysis (v1, v2 & v3).

The common areas where participants observed a change after 360 degree feedback are

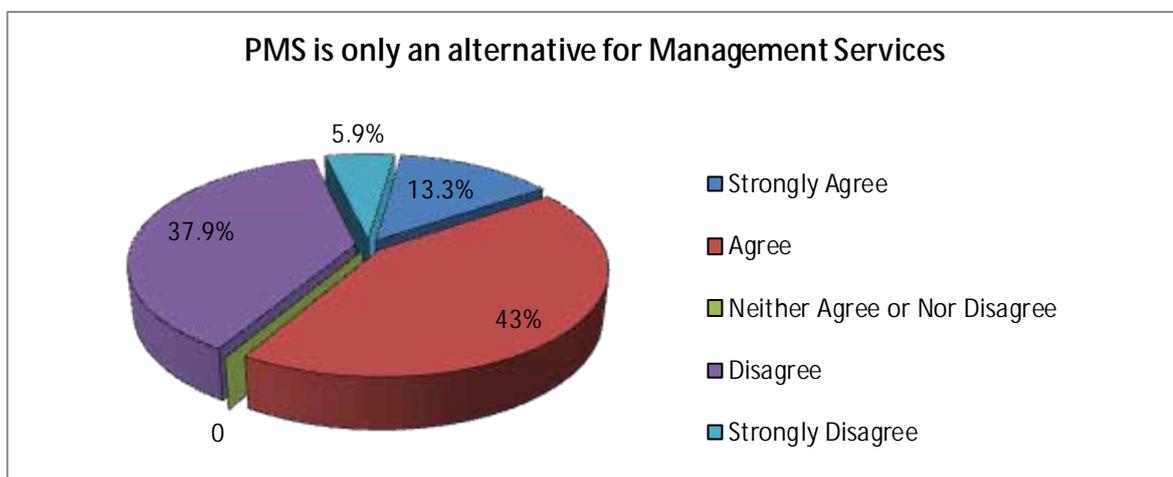
a little more interactive, is how to control my anger in difficult situation, recognizing and acknowledging other’s contribution, articulate the vision/culture of department with colleagues, avoid sarcasm , become a better listener and less reactive among bank employees.

**IV. ATTITUDE TOWARDS ORGANIZATIONAL SUCCESS**

**Perception Towards Components Of Organizational Success**

Component	Strongly Agree	Agree	Neither Agree or nor Disagree	Dis Agree	Strongly Disagree	Mean and SD	Percentage Mean
1. PMS is only an alternative for Management Success. (V1)	30 (5.9%)	194 (37.9%)	0	220 (43.0%)	68 (13.3%)	2.63±0.78	65.92
2. PMS is better than traditional performance appraisal system (V2)	16 (3.1%)	70 (13.7%)	0	230 (44.9%)	196 (38.3%)	3.18±0.78	79.59
3. It helps in reducing strain, de-motivation and Conflicts. (V3)	30 (5.9%)	158 (30.9%)	0	224 (43.8%)	100 (19.5%)	2.76±0.82	69.24

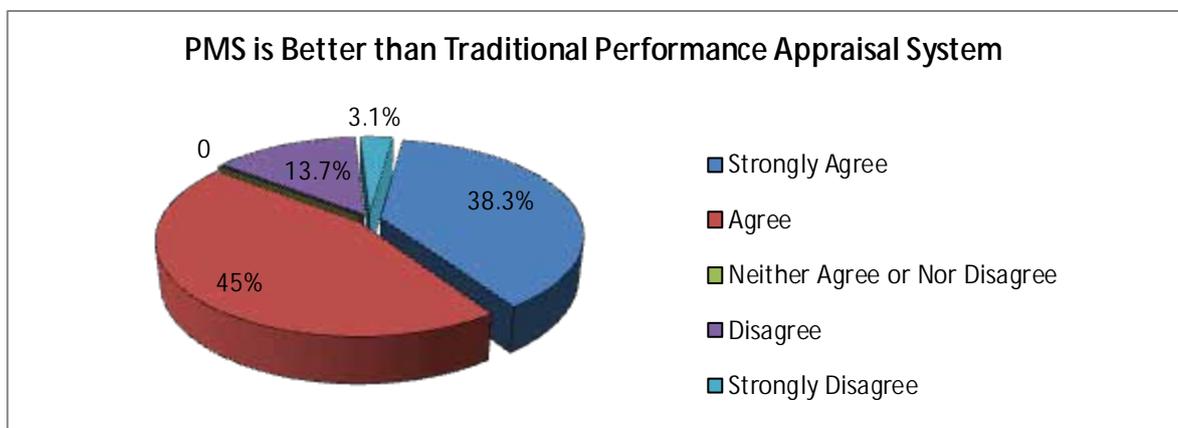
**4.1 Performance Management System (PMS) Is Only An Alternative For Management Success (V1)**



As per the above table, we have chosen 512 respondents for our study. Only Five Point LIKERT Scale is used to collect data and interpreted for three variables such as PMS is only an alternative for management success (V1), PMS is better than traditional performance appraisal system (V2) and PMS helps in reducing strain, de-motivation and conflicts (V3).

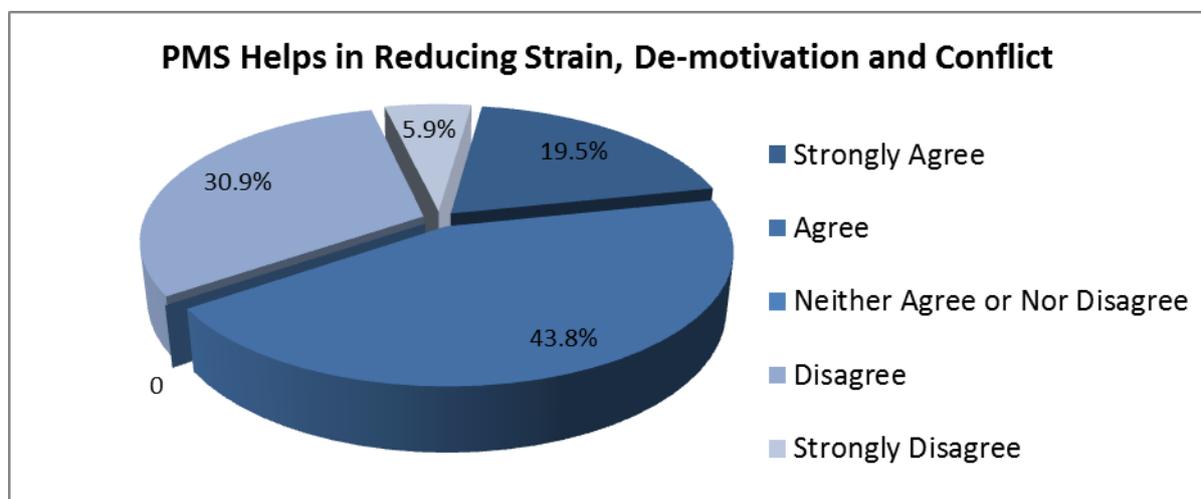
From the studies 5.9% of the respondents strongly agree, 37.9% of them agree, 43.0% respondents disagree, and 13.3% of them strongly disagree. The percentage mean 65.92 (Mean and SD (V1)  $2.63 \pm 0.78$ ) shows that PMS is only an alternative for management success as it falls in the category of **51% to 75%**.

#### 4.2 PMS Is Better Than Traditional Performance Appraisal System (V2)



The researcher has identified that 3.1% of the respondents strongly agree, 13.7% of them agree, 44.9% of them disagree, 38.3% of them strongly disagree that PMS is better than traditional performance appraisal system with Mean and SD (V2)  $3.18 \pm 0.78$ . The percentage Mean 79.59 shows that PMS is better than traditional appraisal system as it falls in the category of **76% to 100%**.

#### 4.3 It Helps In Reducing Strain, De-Motivation and Conflict (V3)



Based on research studies 5.9% of the respondents strongly agree, 30.9% of them agree, 43.8% of them disagree, 19.5% of them strongly disagree that PMS helps in reducing strain, de-motivation and conflicts among employees with Mean and SD (V3)  $2.76 \pm 0.82$  percentage Mean 69.24, this shows that PMS helps in reducing strain, de-motivation and conflicts among employees as 69.24% falls in the category of **51%** to **75%**.

## V. CONCLUSION

The main finding of this research supports that the view of Performance Appraisal System (PAS) should be HRD oriented. Besides being a base for making administrative and developmental decisions, performance appraisal can be useful instrument for a) building a good relationship with employees, b) planning employee performance, c) discovering employee potential and improving organizational effectiveness. Organizations are increasingly implementing the self-appraisal and 360 degree appraisal instead of traditional top-down appraisal in hopes of improving satisfaction towards Performance appraisal (PA) practices. This study suggests that 360 degree appraisal system including multiple appraisal and developmental value based appraisal system can overcome the threat of personal bias. While no major attempt has so far been made to experiment and introduce 360 degree appraisal for officials in private sector banks. From this study it appears that a reasonable majority of bankers are really interested in using a 360 degree appraisal system and they felt a high relevancy of introducing the system in private sector banks in India. Moreover we may eradicate the empirical study on performance appraisal, most of the officials and top management cadre employee deal with their subordinates in biased manner. Hence this method of PAS motivates all levels of employees in the bank sector to improve their service levels in a better manner.

***“FOR EVERY FAILURE THIS TIME, THERE WILL BE BETTER CHANCE NEXT TIME”.***

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# QUADCOPTER VIDEO SURVEILLANCE AND CONTROL USING COMPUTER

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## ABSTRACT

In the past decade Unmanned Aerial Vehicles (UAVs) have become a topic of interest in many research organizations. UAV can engage in finding unusual objects and they can perform their surveillance. Unmanned Aerial Vehicle (UAVs) is controlled from the control room. Now a day's UAVs used in many sectors like rescue, cost guard etc. The project exposes that the UAV is controlled to surveillance the desired location and the information of the location and the activities are sent through the mini cam built in the UAV. The capturing clips are simultaneously displayed in the connected computer according to the command. The received clips of the surveillance location is also saved. The commands given to the UAV receiver is a human command rather than the machine command. The receiver in the controller fetches the commands and they act according to that. Quadcopter can be controlled or they can travel automatically by encoding the map pattern. Quadcopter changes direction by manipulating the individual propellers speed and does not require cyclic and collective pitch control. Here the project explains by handling manually through the computers instead of the RC. They can perform their action only within the limited distance. The Quadcopter can perform their mission at any risk places and based on the risk factor no humans are injured or killed.

***Keywords : Quadcopter, Microcontroller, Wireless Camera, RF Transmission and Receiving***

## I.INTRODUCTION

The quadcopter is a unique type of UAV which has the ability of Vertical Take Off and Landing (VTOL). The quadcopter has an advantage of maneuverability due to its inherent dynamic nature. Quadcopter has advantages over the conventional helicopter where the mechanical design is simpler. Besides that, Quadcopter changes its direction by manipulating the individual propeller's speed and does not require cyclic and collective pitch control. The

Quadcopter configuration will also be capable of being remotely controlled to fly a specific pre-determined area such as used for surveillance from a pre-planned route around campus

The quadcopter control requires joystick or a remote controller to control it. But we use computer for controlling the quadcopter. The monitoring process is also done by the computer instead of using separate display. Controlling of the quadcopter using separate control is a tedious process and it requires more practice. But, the control by the computer is an easy process as it requires less practice. The quadcopter can be controlled by varying the speed of the four rotors and no mechanical linkages are required to vary the rotor blade pitch angles as compare to a conventional helicopter.

The main applications include they can used for rescue missions, in military for discovering the mines by using certain metal detector in the quadcopter and made them fly over the area, in film making, in agriculture and others. Nowadays in most of the developed and developing countries UAVs especially quadcopter is being used in Coast Guard maritime search and rescue mission.



## II. PROJECT OVERVIEW

The ultimate goal of the project is to create a live aerial video feed which can be sent to the computer for the surveillance purpose. This technology can be used for search and rescue operations, fire fighting, law enforcement, military, news reporting and filming by being able to deploy aerial correspondence much faster than normal ones. The results in providing digital video signal to the computer which will pave us a way for future expansions such as UAV sentience, target tracking and video compression. There are many components to this project and we must decide which areas will be developed by ourselves and which areas will be implemented with many other products.

## III. FLIGHT PLATFORM

There are various types of quadcopter platforms for designing methodology. The project objective is to reduce the cost of the already existing methods and make the quadcopter comfortable and user-friendly. The frames or arms of

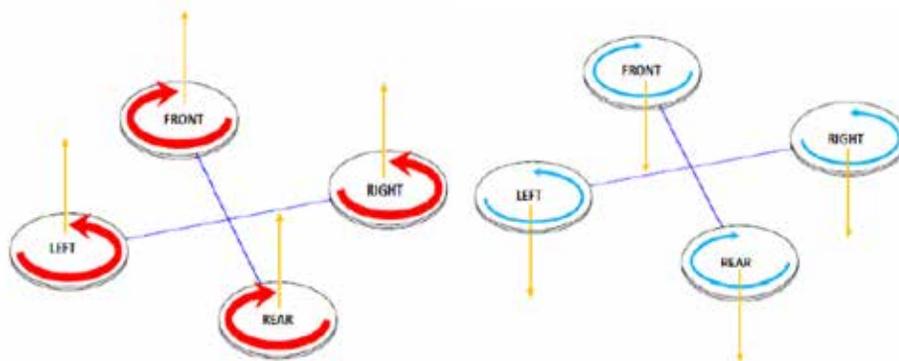
the quadcopter are made of fibres to reduce the weight of the vehicle. So, the quadcopter design is based on the embedded system platform. In embedded system , it consists of microcontrollers which controls the overall the performance of the quadcopter such as flying mechanism and live streaming of the videos. After the microcontroller , the electronic speed controller (ESC) is to be used to control the propeller speed depending on the signal from the computer. The power supply for the quadcopter is given by the battery. As the application is surveillance it requires long life battery which is capable of giving power for longer duration more than 45 mins. Lithium polymer batter satisfies our requirement. These requirement makes sure that the quadcopter maintains stable flight while moving or hovering.

#### IV. FLYING MECHANISM

Quadcopter can described as a small vehicle with four propellers attached to rotor located at the cross frame. This aim for fixed pitch rotors are use to control the vehiclemotion. The speeds of these four rotors are independent. By independent, pitch, roll and yaw attitude of the vehicle can be control easily. There are six major operations or movement which has to be controlled. They are Take off , Landing , Forward , Backward, Right and Left motion.

##### 4.1 Take-Off and Landing Motion Mechanism

Take-off is movement of Quadcopter that lift up from ground to hover position and landing position is versa of take-off position. Take-off (landing) motion is control by increasing (decreasing) speed of four rotors simultaneously which means changing the vertical motion. The take off and landing motions quadcopter is shown below.

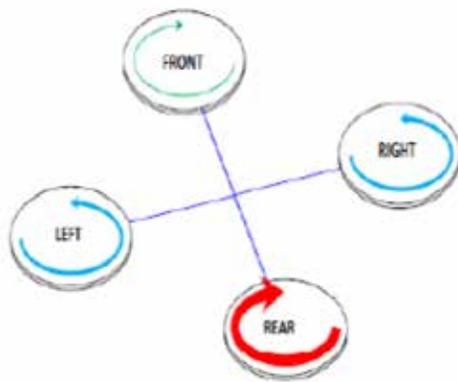
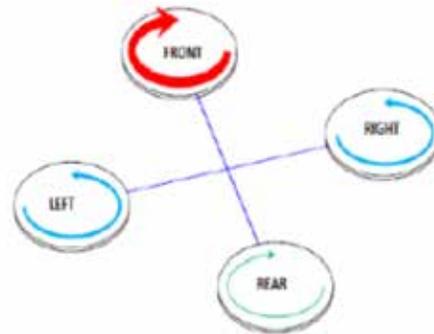


**Take off Motion**

**Landing Motion**

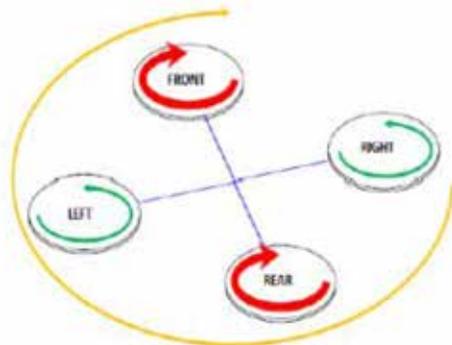
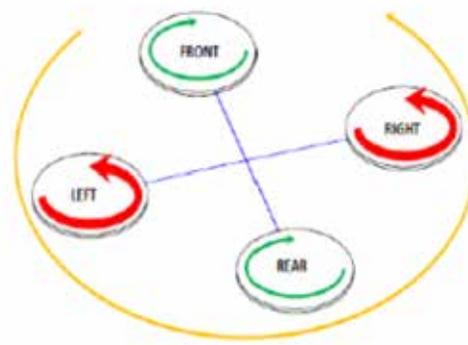
##### 4.2 Forward and Backward Motion

Forward (backward) motion is control by increasing (decreasing) speed of rear (front) rotor. Decreasing (increasing) rear (front) rotor speed simultaneously will affect the pitch angle of the Quadcopter. The forward and backward motion of the quadcopter is shown in below respectively.

**Forward Motion****Backward Motion**

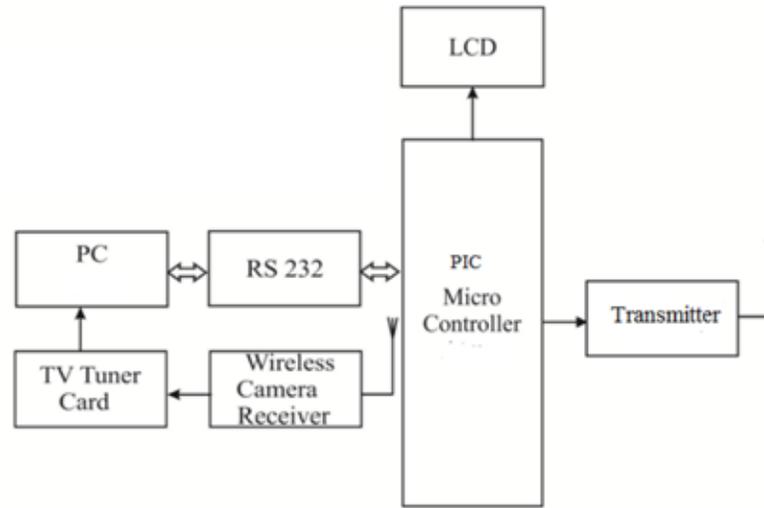
### 4.3 Left and Right Motion

For left and right motion, it can control by changing the yaw angle of Quadcopter. Yaw angle can control by increasing (decreasing) counter-clockwise rotors speed while decreasing (increasing) clockwise rotor speed. Figure below shows the right and left motion of Quadcopter respectively

**Right Motion****Left motion**

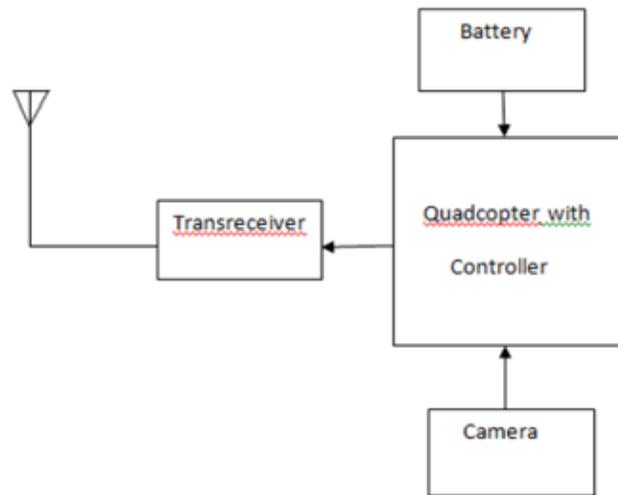
## V. BLOCK DIAGRAM

The computer side consists of Personal Computer , Micro controller, RS 232 and TV tuner cards. Initially, the control from the computer is decoded using microcontroller and is send to the quadcopter through the transmitter. On receiving the video signal from the quadcopter system, the TV Tuner card helps to live telecasting of the video. Here RS 232 Cable acts as the communication channel between the microcontroller and Computer.



**Computer Side**

Quadcopter side consists of the quadcopter module which has speed controller , wireless camera and Power supply i.e Battery. The wireless camera records the video signal and sends to the computer as the radio signal. The ESC is used to control the speed of the propellers and the power required by the whole system is supplied by the Battery.



**Quadcopter Side**

**VI. VIDEO RECORDING AND TRANSMISSION**

The choice of video system is one of the most crucial decisions for the project. The camera needs to be light enough so that the unmanned aerial vehicle can fly unabated and compact enough so that it does not interfere with the landing gear and rotors. The video transmission system must also be able to transmit a suitable distance over open space without any interference or losing signal. For this design criteria, consider 100m to be a suitable range.

## VII. CONCLUSION AND FUTURE WORK

The project going to play a major role in civilized countries. In all civilized countries surveillance of the terrestrial areas is very important. The core intension of the project is to study the complete designing process of quadcopter from the engineering prospective and improving their balancing and stability system. The main goal of the project is to use that quadcopter for the civil surveillance and live telecasting of the video obtained. This will also be able to shoot the videos and record it for the film industries, managing traffics and other applications.

Quadcopter will be able to do surveillance by live recording the video and provide security for selected areas. Our work is do implement the wireless camera in that quadcopter to record the video and dual antenna to transmit the acquired video signal to the control room. The future work consists of develpoing a prototype that controls the quadcopter by using computer instead of Remote to reduce the complexity in flying control.

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# ANALYSING ELECTRONIC WORD-OF-MOUTH (eWOM) IN SOCIAL MEDIA FOR CONSUMER INSIGHTS – A MULTIDISCIPLINARY APPROACH

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## ABSTRACT

Marketing has been criticised from all spheres today since the real worth of all the marketing efforts can hardly be precisely determined. Today consumers are better informed and also misinformed at times due to the bombardment of various pieces of information through a new type of interactive media, i.e., social media (SM). In SM, communication is through dialogue channels wherein consumers pay more attention to SM buzz rather than promotions of marketers. The various forms of SM create a complex set of online social networks (OSN), through which word-of-mouth (WOM) propagates and influence consumer decisions. With the growth of OSN and user generated contents (UGC), WOM metamorphoses to electronic word-of-mouth (eWOM), which spreads in astronomical proportions. Previous works study the effect of external and internal influences in affecting consumer behaviour. However, today the need is to resort to multidisciplinary approaches to find out how SM influence consumers with eWOM and online reviews. This paper reviews the emerging trend of how multiple disciplines viz. Statistics, Data Mining techniques, Network Analysis, etc. are being integrated by marketers today to analyse eWOM and derive actionable intelligence.

**Key Words - Consumer Behaviour, Electronic Word-Of-Mouth (Ewom), Online Social Networks (OSN), Social Media (SM), Word-Of-Wouth (WOM)**

## I. INTRODUCTION

Communication to the customers by marketers has seen a sea change over the decades. Traditionally, communication with the customers – whether print or electronic media – was almost entirely one-way, originating from the media source or advertising agency and ending at the target consumers. That is, communication was often through monologue channels – television, radio, newspaper, magazines, and web pages. However, in the later part of the 2000s, a new media came into existence – the social media. Here, communication is no longer one-way, since if the source of the communication sends a message, the feedback from the receiver is instant and real time. The monologue communication channels thus gave way to dialogue channels.

The communication systems of the world have been taken by storm by Social Media (SM). Woodall and Colby [1] analysed the appeal of social media over traditional media and characterized four important elements. They are: (i) satisfying an impulse; (ii) the excitement of sharing; (iii) seeking advice; and (iv) sharing with others with similar interests. This has resulted in far more engagement of people in SM rather than traditional media.

The role of brand managers in the yester years has been that of creating messages that offer a reason to buy their products and place them in media with the hope that consumers will prefer their brands. With the advent of SM and Web 2.0 technologies, consumers are better informed, as well as often misinformed. The side effect of communication through SM is that promotion of companies falls into deaf years and SM buzz falls into consumers' ears, which play the role of a critique. SM have changed marketing by shifting the scalability of influence and the ways in which consumers share, evaluate and choose information [2]. In SM, the ability of consumers to consult each other instantly has reversed the traditional brand manager/consumer power relationship [3, 4]. Consumers now want to be partners in marketing rather than be marketed at [5]. Looking at the spread of the social contagion in the online environment, marketers have been looking to harness the power of Web 2.0 technologies. However, the technology that was supposed to empower marketers has empowered consumers instead, with or without permission of the firms involved [6].

With the rapid growth of OSN and user generated contents (UGC), WOM has metamorphosed itself into electronic word-of-mouth (eWOM) and it spreads in astronomical proportions as compared to WOM. Previous works have been carried out to study the effect of external and internal influences in affecting the behaviour of consumers, however, the need of the hour today is to resort to multi-disciplinary approaches in order to find out how SM and web 2.0 technologies influence consumers with eWOM and online reviews (recommendations and experiences). Various studies have been carried out that appreciate the importance of studying SM to connect with consumers and there are specific studies that talk about the origin and diffusion of ideas and how they affect opinions of people. This paper reviews how multiple disciplines viz. Statistics, Data Mining techniques, Network Analysis and other such related fields have been integrated by marketers today to analyse eWOM to gain into consumer insights and derive actionable intelligence out of the deluge of data and information in SM.

The paper begins with introducing the major types of SM prevalent today (section II), the evolution of eWOM and its difference with WOM (section III), the importance of eWOM (section IV), methodology (section V) and then delves into the ways and means by which eWOM has been utilised by researchers and marketers using multidisciplinary approaches (section VI). Section VII concludes the paper.

## **II.SOCIAL MEDIA – THOU ART SOCIAL; THOU ART VOCAL**

There are various definitions of SM. We first start with a working definition of SM [7] as “Any tool or service that uses the Internet to facilitate conversations”. One of the popular definitions of SM [8] is “a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content”, which has been further extended [9] as “a group of Internet-based applications that exist on the Web 2.0 platform and enable the Internet users from all over the

world to interact, communicate, and share ideas, content, thoughts, experiences, perspectives, information, and relationships”.

The major types of SM prevalent today [10, 11, 12, 13, 14, 15, 16] are as follows:

**Table 1. Major SM Types and their Examples**

<i>Type</i>	<i>Examples</i>
Blogs	Blogger, LiveJournal, WordPress, Travel Blog
Micro-Blogs	Twitter, GoogleBuzz
Opinion Mining	Epinions, Yelp
Content Community Sites or Photo and Video Sharing Sites	Flickr, YouTube
Social Networking Sites	Facebook, LinkedIn, MySpace, Orkut
Social News	Digg, Slashdot
Collaborative Projects – Wikis	Wikipedia, Wikihow, Scholarpedia, Event maps
Collaborative Projects – Social Bookmarking and Voting Sites	Delicious, StumbleUpon
Sites Dedicated for Feedback	Online Forums and Review Sites
Virtual Social World	Second Life

A brief description of the various types of SM is given below:

**Blogs:** Blogs are websites that allow blogger(s) to keep logs, share personal experiences and insights in a particular area, and interact with readers through the posting of comments.

**Micro-blogs:** The content of these blogs are mainly text-based and are limited to a certain number of characters.

**Opinion mining:** Here users share a myriad of opinions and the polarity of the opinions are highlighted.

**Content community sites or photo and video sharing sites:** Sites designed for sharing of materials (text, photos, videos, etc.) modified from pre-existing work or originated with people who upload the materials.

**Social networking sites:** Websites where people create personal profiles, virtually meet, connect, communicate, and develop relationships with other users.

**Social news:** Here users post various pieces of information and news of their interests and the same are subjected to review and discussions.

**Collaborative projects – wikis:** The sites aim at aggregating the community intelligence and highly depend on the users to work out the content. In these sites, users interact with each other in the process of content collaboration.

**Collaborative projects – social bookmarking and voting sites:** Social Bookmarking is a technique that is explained as organizing and maintaining resourceful bookmarks online. These sites are a popular way to store, classify, share and search links through the practice of folksonomy technique (an Internet-based information retrieval methodology consisting of collaboratively generated, open-ended labels that categorize content such as Web pages, online photographs, and Web links).

**Sites dedicated for feedback:** Websites that allow users to post, read, review, discuss, and share experiences and opinions on a myriad of topics.

**Virtual social world:** A virtual social world is an online community that takes the form of a computer-based simulated environment through which users can interact with one another and use and create objects. The term has become largely synonymous with interactive 3D virtual environments, where the users take the form of avatars visible to others. These avatars usually appear as textual, two-dimensional, or three dimensional representation, although other forms are possible (auditory and touch sensations for example).

All the above-mentioned SM can be broadly categorised [17] into the following: (i) *Expressive SM* (e.g. blogs, micro-blogs, content community sites, social networking sites, opinion mining, feedback sites), and (ii) *Collaborative SM* (e.g. collaborative projects).

#### **Major effects in the emergence of SM**

SM are about ordinary people taking control of the world around them and finding creative new ways to bring their collective voices together to get what they want. The major effects in the emergence of SM include the following: (i) SM are interactive media and the information derived from them are real time; (ii) SM are fundamentally changing the way consumers search, read and trust, as well as collaboratively produce information about market offerings – goods, services, experiences, events, persons, places, properties, organizations, information and ideas; (iii) In using SM, consumers coproduce and share a huge amount of information and knowledge namely UGC; and (iv) In SM, personal channels of communication propagates eWOM and online reviews (recommendations and experiences) and as a result consumers become co-marketers, co-designers, co-producers and co-consumers of product experiences, which in turn **influence purchase behaviour and decisions**.

### **III. THE EVOLUTION OF eWOM AND DIFFERENCE BETWEEN WOM AND eWOM**

Consumers get messages about market offerings either through *personal communication channels* or *non-personal communication channels* and within each are many sub-channels [18]. Personal communication channels involve two or more persons communicating directly with each other face to face, person to audience, over the telephone, or through e-mail. The sub-channels within personal communication channels include *advocate channels*, *expert channels* and *social channels*[19]. WOM usually spread through expert and social channels.

One of the first seminal studies on WOM was carried out by Ernest Dichter[20]. He identified four key motivations that drive individuals to engage in WOM behaviour: (i) perceived product-involvement; (ii) self-involvement (gratification of emotional needs from the product); (iii) other involvement(a need to give something to the person receiving the WOM transmission); and message involvement (talk that is stimulated by the way the product is presented in media).

Among the first academic researchers to define WOM was Arndt [21] and he defined WOM as the "oral, person-to-person communication between a receiver and a communicator whom the receiver perceives as non-commercial, regarding a brand, a product, a service or a provider" (Arndt, 1967). The Word of Mouth Marketing

Association (WOMMA) [22] offers a more pragmatic perspective of WOM defining the concept as, “the act of consumers providing information to other consumers”.

Researchers [23,24,25] have long studied and understood that WOM (or referrals) have two prominent advantages: (i) WOM sources are convincing, and (ii) WOM sources are low cost. Due to such influencing power of WOM, McKinsey & Co. has called WOM “the most disruptive force in marketing” [26]. In the online perspective, too, WOM and online reviews (recommendations and experiences) propagates through Online Social Networks (OSN) and it has been a proven fact [27] that WOM has more credibility among consumers and positive or negative WOM can make or mar the market standing of a firm.

Due to the rapid growth in information and communication technologies (ICTs), social relationships between individuals have exploded from micro level to macro level through OSNs and with the diffusion and amplifying of information gathered from the world and the web through these channels, WOM today transmutes itself in these channels to give rise to eWOM. One of the early definitions [28] of eWOM is “any positive or negative statement made by potential, actual, or former customers about a product or company, which is made available to a multitude of people and institutions via the Internet”. The concept of eWOM has since been extended and it is suggested [29] that eWOM can be defined as “all informal communications directed at consumers through Internet-based technology related to the usage or characteristics of particular good and services, or their sellers”. This definition highlights the communication flow between producers and consumers as well as those between consumers themselves through internet based technologies, signifying that marketers themselves are also part of eWOM communications along with neutral individuals.

There are four unique differences [30] between WOM and eWOM, which are described below:

**Table 2. Difference between WOM and eWOM**

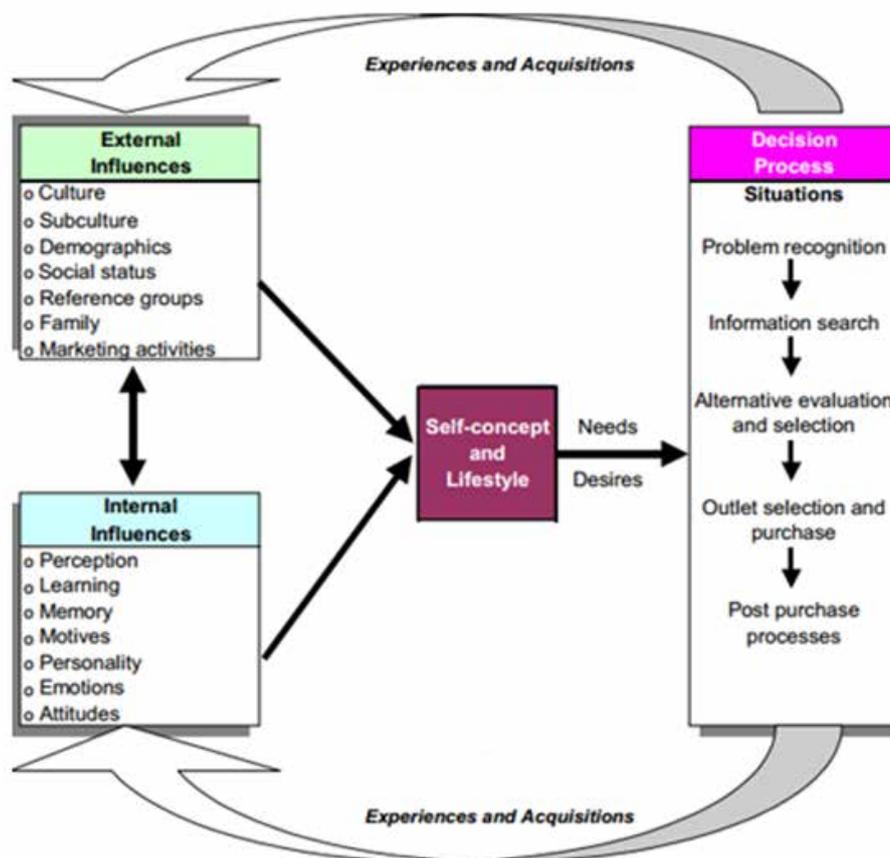
<b>WOM</b>	<b>eWOM</b>
WOM exists only within the space of the individuals having a conversation.	eWOM has the ability to spread amongst a multitude of individuals rapidly via the Internet
WOM only exists at a moment in time	eWOM has the ability to be archived and retrieved at any point in the future
WOM cannot be easily quantified	eWOM has the ability to be quantified more easily
In WOM the receiver generally knows the sender and has the ability to judge their credibility	In eWOM there is inability of a receiver to determine the credibility of the sender

**IV. IMPORTANCE OF eWOM**

WOM and online consumer reviews can be a good proxy for overall WOM [31] which, in turn, can have a strong influence on the decision-making processes of other potential buyers, who search the Internet for product information [32]. From message perspective [33], the dissemination of eWOM has three potentially influential factors: awareness of persuasive intent, perceived humour and multimedia effect. It has also been studied from

opinion mining perspective [34] that textual factors in online product reviews make consumers interpret the information and in turn get influenced by them.

To get more insights into how consumers are influenced by eWOM and online reviews we go to the basic conceptual model of consumer behaviour [35] as given in Fig. 1.



**Figure 1. Conceptual Model of Consumer Behaviour**

From Fig. 1 it can be observed that reference groups and family form external influences of affecting consumer behaviour. Reference groups have been defined [36] as “actual or imaginary institutions, individuals or groups having significant relevance on the target individual’s evaluations, aspirations, or behaviour”. Both WOM and eWOM disseminates through reference groups; but with the growth in OSNs, size of reference groups has increased tremendously. eWOM within this enlarged reference groups form bigger external influences, which in turn affects the internal influences and consumer behaviour as a whole. Reference group influence can also be [37] (i) *Informational* (situations in which consumers seek information from people they consider experts in the product category) and (ii) *Normative* (situations in which consumers identify with a group to enhance their self-image and ego or comply with a group’s norms to gain rewards or punishments). While WOM falls under informational influence, eWOM falls under both. Moreover, with the scale of OSNs, the chance of formation of opinion leadership is higher as compared to offline social networks. As a result success of eWOM is much higher in OSNs.

To sum up, the expected outcomes [38] from the dissemination of eWOM include: (i) influence on purchase decision; positive WOM increases the probability of purchase, while negative WOM has the opposite effect [39]; (ii) product evaluations [40]; (iii) consumer loyalty intentions [41]; and (iv) empowerment of consumers [42, 43].

## V. METHODOLOGY

To understand emerging and recent trends in analysing eWOM, a methodology-driven systematic review was carried out. The initial pool of studies was obtained by conducting searches in EBSCO, Science Direct, Emerald Insights and IEEE. The search items included “Electronic Word-of-Mouth”, “eWOM”, “Online Word-of-Mouth”, “Online Reviews”, “Online Recommendations”, “Product Reviews” and “Online Consumer Reviews”.

The literatures so obtained were reviewed and only those studies which have employed novel methods and multidisciplinary approaches have been presented here to highlight the recent trends in analysing eWOM.

## VI. MAJOR STUDIES IN ANALYSING eWOM – A MULTIDISCIPLINARY APPROACH

The concept of *information cascading (or herding)* [44,45,46] had been taken well by businesses, especially in financial markets since the 1990s. Through SM and OSNs opinions, ideas, reviews, discussions and experiences from all over the world are continuously disseminated and propagated in the form of eWOM. What caught the fancy of businesses and marketers was the speed at which information was disseminated. Works such as those of James Surowiecki [47] added further impetus to the interests of businesses as it talked about “*wisdom of crowds*” and how human paradigm gets affected due to aggregate behaviour of people. As a result, businesses and marketers have found it prudent to participate in the buzz of SM and learn about what consumers are talking about – their experiences, their recommendations and their grievances.

A netnographic approach was employed [48] in the wine sector to explore the content of discussion and the relationships between posters on OSNs. Netnography is an established tool to study online communities. It is defined as “a qualitative, interpretive research methodology and adapts the traditional research techniques of anthropology to the study of online cultures and communities formed through Social Networks” [49]. In the above-mentioned netnographic study, the researchers (i.e. Quinton and Harridge-March) indicated in their findings the following: “individuals within fora develop relationships with each other, the network itself and brands. Such relationships are predicated on trust between members, shared interests and experiences and relationships with the brands that they discuss. These relationships can develop into strong bonds and even evolve into offline activities”. The study gave valuable insights into how marketers can delve into customer-product relationships using netnography and gain insights into behaviour of consumers in the online environment.

To find out the drivers [50] of immediate and ongoing WOM in OSNs, Poisson log-normal model (a statistical analysis), a type of generalised linear mixed-effects model was employed and it was found out that (i) interesting products get more immediate eWOM; and (ii) products that are cued more by the environment and are more publicly visible receive more eWOM over time.

Moreover, to find out the determinants [51] of eWOM, a meta-analysis of previous works were carried out which stated the following determinants: (i) consumer characteristics; (ii) information characteristics; (iii) communication channel characteristics; and (iv) product characteristics.

Researchers have further gone to the extent of deciphering [52] eWOM using information theory. They employed Sentiment Analysis (using information sciences) and the mathematical basis of their measures was the Kullback-Leibler divergence (developed in information theory) to decipher eWOM.

In the field of insurance, Twitter posts have been successfully analysed [53] using correlation, clustering, and association analyses. The study demonstrated that such analyses can proactively address potential market and customer issues more effectively.

In order to find out the value of eWOM in seeding trials [54], agent-based modelling techniques were used to find out the social value of seeding programmes and agent-based simulations and game-theoretic modelling was used to find out that positive eWOM from customers of rival firms can make exclusivity unprofitable [55].

Another study to model consumer learning based on online product reviews [56], the Bayesian learning framework to model consumer learning on both product quality and review credibility was employed. For choice interdependence in social network [57], the authors used discrete-time Markov chain model for complete information on choices and their sequence. They also employed Markov random field (MRF) model as an alternative when the information on choice sequence was missing.

In one of the prominent studies in tourism industry, data mining tools were employed and Twitter data was extracted to study how tourists use eWOM and online reviews in tourism services [58]. The statistical tools employed were regression analysis, Kaiser-Meyer-Olkin measure of sampling adequacy and principal axis exploratory factor analysis with Promax rotation.

The relative importance of eWOM and advertising on firm performance over time since the introduction of the product was studied using a dynamic hierarchical linear model (DHLM) [59]. The study revealed the following marketing management insights: (i) although both attribute-oriented advertising and emotion-oriented advertising are important, emotion-oriented advertising has a stronger effect on sales and wears out more slowly; (ii) managers should focus on *what* is said and less on *how much* is said; (iii) the key lever that the firm can use to drive eWOM recommendations is emotion-oriented advertising; and (iv) brands can be classified as being firm driven or consumer driven, depending on which type of media has the greatest impact on its sales.

Lately observations were also made by researchers that a certain gap exists between the streams of literature on opinion leaders and eWOM. Bao and Chang [60] have addressed this issue. They used an Amazon user review dataset extracted by Leskovec and colleagues [61] and used a message-based approach to study opinion leadership and its relation to eWOM. With their objective measures they identified three influential disseminators of product information:

- (i) *communicative opinion leaders* (who write a large number of reviews),
- (ii) *buzz-generating opinion leaders* (whose online reviews generate contagious talk about a brand, service, product or idea), and
- (iii) *trustworthy opinion leaders* (whose online reviews are useful to fellow consumers).

A further impetus to understanding the important nodes in social networks was given by concept of implicit networks [62]. The researchers differentiated between explicit social networks from implicit social networks as follows “Explicit social networks are where the users define the network by explicitly connecting with other users, possibly, but not necessarily, based on shared interests. Implicit social networks are networks where a user is defined by his or her interests and the (implicit) connections between users are not explicitly created by the users themselves but evolve purely on their interests as exemplified by their online behaviour”. They developed a social network matrix to measure the implicit relationships among the entities in various social networks using Matrix Algebra and carried out lowest cost (shortest path) problem, Max flow and budgeting problem. Based on their study it is possible to analyse and discover not only the topology that is different from a traditional explicit social network but also the key nodes, the bottleneck and optimisation strategy with respect to balancing cost and capacity for the social network.

From visual analytics perspective, a visual analytics system which extracts eWOM data from Bitly and Twitter has been used for box office revenue and user rating predictions [63]. The basis of the study was the results from the VAST Box Office Challenge 2013. ‘VAST’ stands for ‘Visual Analytics Science and Technology’. The study demonstrated that an interactive environment for predictive analysis is more beneficial as compared to a purely statistical modelling approach. The researchers showcased that the visual analysis method employed by them can be generalised to fields where SM data can be involved, such as sales forecasting, advertisement analysis, etc.

From the various studies described above, it is clear that today researchers are employing various data mining techniques to extract data from SM and employing multiple tools for deciphering and analysing eWOM in the online environment to understand the influence in consumer behaviour. It is quite apparent today that the emerging trend among businesses and marketers is *developing new web feat to understand words’ worth when cliques click* in the online environment.

## VII. CONCLUSION

Today data has grown exponentially and the spread of such data is in astronomical proportions. The reason for the explosive growth of data is due to the spread of the social contagion via SM and Web 2.0 technologies. It is a well-established fact that marketing and businesses thrive on information to plan their way ahead. Today SM has been continuously disseminating and propagating opinions, ideas, reviews, discussions and experiences from all over the world and has taken over as the new seed of WOM in the form of eWOM. This has given businesses opportunities to listen to consumers and potential consumers. The recent trend that has emerged in marketing is managing the deluge of information and derive actionable intelligence out of them using various

multidisciplinary approaches drawing from Statistics, Data Mining techniques, Network Analysis, Information Theory etc.

## VIII. LIMITATIONS AND FURTHER RESEARCH

The present work is a humble attempt to study and review how eWOM originates and diffuses in the online environment and how researchers have been analysing eWOM using various tools and techniques from multiple disciplines. Analysis of eWOM is still in its infancy and the current review of the major works, which is within a particular time frame, cannot be called as completely exhaustive. Further works may be carried out to study the new developments and delve more into the tools and techniques so that concrete techniques for analysing particular eWOM requirements may be framed in future.

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# ADVANCED LOCKER SECURITY SYSTEM

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## ABSTRACT

The purpose of this paper is to provide a secured locker security system based on RFID, PASSWORD, CONVEYER and GSM technology which can be organized in bank, secured offices and homes. This system allows authentic person only can be recovered money from locker. The implemented locker security system based on RFID, PASSWORD and GSM technology containing automatic movement of lockers system which can be easily activate, authenticate, and validate the user in real time for secured locker access. The RFID, PASSWORD, GSM and HEAT SENSOR provides the advantage of high security than other systems. In general terms, RFID is an object or person identifier using a radio frequency transmission. In electronic terms RFID is an electronic method of exchanging data over radio frequency waves. With RFID technology we can identify, sort, track or detect variety of objects.

**Keywords:** *RFID, GSM, Conveyer, Microcontroller, Heat sensor.*

## I. INTRODUCTION

The main purpose of this paper is to implement a locker system with high security based on RFID, PASSWORD, CONVEYER, GSM and HEAT SENSOR technology which can be organised in banks, offices and other places where high security is required. In this only authorized person can open the locker. The initial security levels are RFID verification and PASSWORD. The After this security verification the details of the person will provided to the security in charge like manager, after that conformation CONVEYER setup will bring only the appropriate locker from the locker to the person. The GSM server send the random password to the customer mobile. The locker can be accessed if the password matches. Otherwise the alarm is on. In addition to this, the heat sensor can access the alarm when anyone try to open the locker by using electrical machine which produce heat.

## II. EXISTING SCENARIOS

The locker systems involve manual lock in most of the banks. Whenever the user uses the locker, user should be assisted by the bank employee. It leads to waste of time for both the customer and the employee. Lack of security and the waiting time of the customers are the major drawbacks of such manual lock systems. The person accompanying the customer can be any employee who is free at that instant of time it should be noted. Hence, time is wasted. This can be overcome with the automatic locker system. There are many techniques in which the proposed technology can be implemented. The RFID tags are used in this project which holds the user's information like locker number, username, etc, in the existing project RFID tag read by the RFID reader

will automatically open and close the locker. Hence, security is guaranteed and the customers waiting time is reduced.

### III. PROPOSED METHOD

In this proposed method after the password verification for the RFID tag the details of the customer will be provided to the manager. The manager authenticates, selects the locker and moves it to the opening with the help of the stepper motor. The locker will have keypad for password. By GSM technology the customer receives the random password provided by the server. The locker can be accessed if the password matches otherwise the alarm rings. To avoid theft by using electrical gadgets to break the locker the heat sensor is provided to detect the heat while breaking with alarm.

### IV. RFID FUNDAMENTALS

RFID is an effective automatic identification technology for a variety of objects and persons. The most important functionality of RFID is to track the location of the tagged item. RFID tags can be classified into three major categories which are based on power source, active tags, passive tags, and semi-passive (semi-active) tags. An active tag contains both a radio transmitter, receiver, and a battery that is used to power the transceiver. Active tags are more powerful than the passive tags/semi-passive tags. RFID tags can also be classified into two categories: tags with read/write memory, and tags with read-only memory. The tags with read/write memory are more expensive than the tags with read-only memory. RFID tags operate in three frequency ranges: low frequency (LF, 30–500 kHz), high frequency (HF, 10–15 MHz), and ultra-high frequency (UHF, 850–950 MHz, 2.4–2.5 GHz, 5.8 GHz). The LF tags are less affected by the presence of fluids or metals when compared to the higher frequency tags. RFID reader is shown in Fig 1.

The most important functionality of RFID is the ability to track the location of the tagged item. Typical applications of HF tags are access control and smart cards. RFID smart cards, working at 13.56 MHz, are the most commonly used tags.

## How does RFID work?

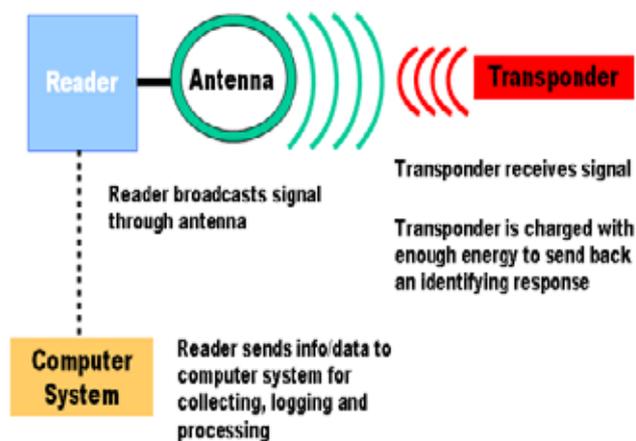


Fig1 RFID Reader

However, UHF tags are severely affected by fluids and metals. UHF tags are more expensive than any other tag. The typical frequency of UHF tags are 868MHz (Europe), 915MHz (USA), 950MHz (Japan), and 2.45GHz. The active tag enables higher signal strength and extends communication range up to 100-200m.

## V. GSM

GSM (Global System for Mobile communications) is the technology that underpins most of the world's wireless mobile phone networks. GSM is a digital cellular and an open technology used for transmitting mobile voice and data services. GSM operates in the 900MHz to 1.8GHz bands. The supported data transfer speed of GSM is up to 9.6kbps. It allows the transmission of basic data services such as SMS. In the current work, GSM module SIM300 is used, it is shown in figure.2. The SIM300 module is a Triband GSM/GPRS solution in a compact plug-in module featuring an industry-standard interface.

### *Features of GSM*

- Single supply voltage 3.2v-4.5v
- Typical power consumption in SLEEP Mode: 2.5mA.
- SIM300 tri-band
- MT, MO, CB, text and PDU mode, SMS storage SIM card
- Supported SIM Card: 1.8V, 3V



**Figure 2 GSM Modem**

## VI. STEPPER MOTOR

A stepper motor (or step motor) is a brushless DC electric motor that divides a full rotation into a number of equal steps. The position of the motor can then be commanded to move and hold at one of these steps without any feedback sensor (an open-loop controller), as long as the stepper motor is carefully sized to the appropriate

application. In this project the stepper motor is used to move the locker towards the opening in the room and bring it back to the original position with accuracy

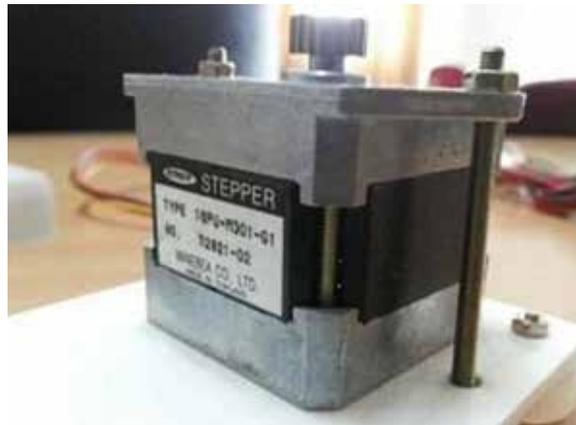


Figure 3 Stepper Motor

## VII. KEYPAD

The keypad is used to get the password from the customer in two different situations. Initially the RFID tag requires the password. Then the server requires the password to open the locker. In this the 4\*4 matrix keypad is used. Since the passwords are four digit random numbers.

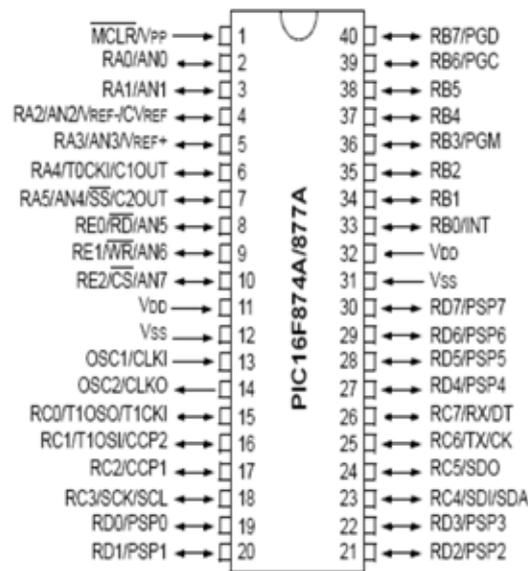


Fig 4 Keypad

## VIII. LCD DISPLAY

LCD stands for liquid crystal; this is an output device with a limited viewing angle. The LCD is mostly preferred as an output device because of its cost of use and is better with alphabets when compared with a 7-segment LED display. Now a days we have so many kinds of LCD and our application requires a LCD with 2 lines, each line consist of 16 characters, the LCD receives data from the microcontroller and displays the same. It has 8 data lines and 3 control line. LCD has a supply voltage Vcc (+5v) and a GND. This low voltage supply makes the whole device user friendly by showing the balance left in the card. It also shows the card that is currently being used.

## IX. MICROCONTROLLER



**Fig 5 PIC16f874A**

The security options are controlled by the microcontroller. The operating voltage is 2.0-5.5V with low power consumption. It is fully static design. The operating speed is 20MHZ. This microcontroller is 40 pins dual in line package. It has three timers with high speed. When compared to others it has high efficiency.

## X. TEMPERATURE SENSOR

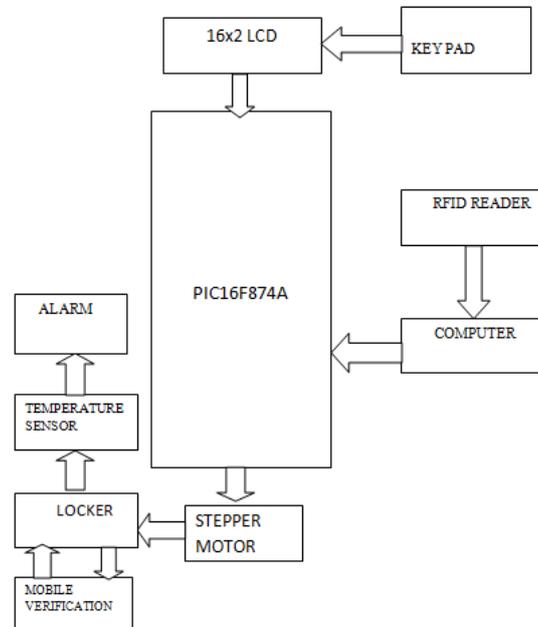
The LM35 series are precision integrated-circuit temperaturesensors, the output voltage of the sensor is linearly proportional tothe Celsius (Centigrade) temperature. The LM35 hasan advantage over linear temperature sensors calibrated in §Kelvin, as the user is not required to subtract a large constantvoltage from its output to obtain convenient Centigradescaling.

### Features

- Calibrated directly in § Celsius (Centigrade)
- Linear a 10.0 mV/§C scale factor
- 0.5§C accuracy guarantee able (at a25§C)
- Rated for full b55§ to a150§C range
- Suitable for remote applications
- Low cost due to wafer-level trimming
- Operates from 4 to 30 volts
- Less than 60 mA current drain
- Low self-heating, 0.08§C in still air
- Nonlinearity only g(/4§C typical
- Low impedance output, 0.1 X for 1mA load

## XI. BLOCK DIAGRAM

In the given block diagram, the controller of this arrangement is microcontroller PIC16F874A. The initial security levels are controlled by the computer. The keypad reads the password entered. Then the RFID tag is swiped. The RFID reads the customer details if the password is correct. Otherwise it will not allow the process of opening. The computer verification sends the result to the microcontroller.



**Fig 6Block diagram**

If the security proceedings is authorised by the manager the stepper motor bring the appropriate locker to the opening. Then the server will generate the random password. It received in the customer mobile phone as a message with the help of GSM technology. If the password matches the locker will open. To avoid breakages with welding equipments the heat sensor block is provided. If the heat is high enough to melt the metal then the alarm goes on.

## XII. CONCLUSION

The implemented project provides a locker system with RFID, password verification, GSM technology. It provides more security facilities. In this the future extension can be made by adding the Digital Image Processing for face recognition. It will ensure high security.

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# GENERATION OF ELECTRIC POWER FROM WASTE NOISE ENERGY USING PIEZOELECTRIC TRANSDUCER

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## ABSTRACT

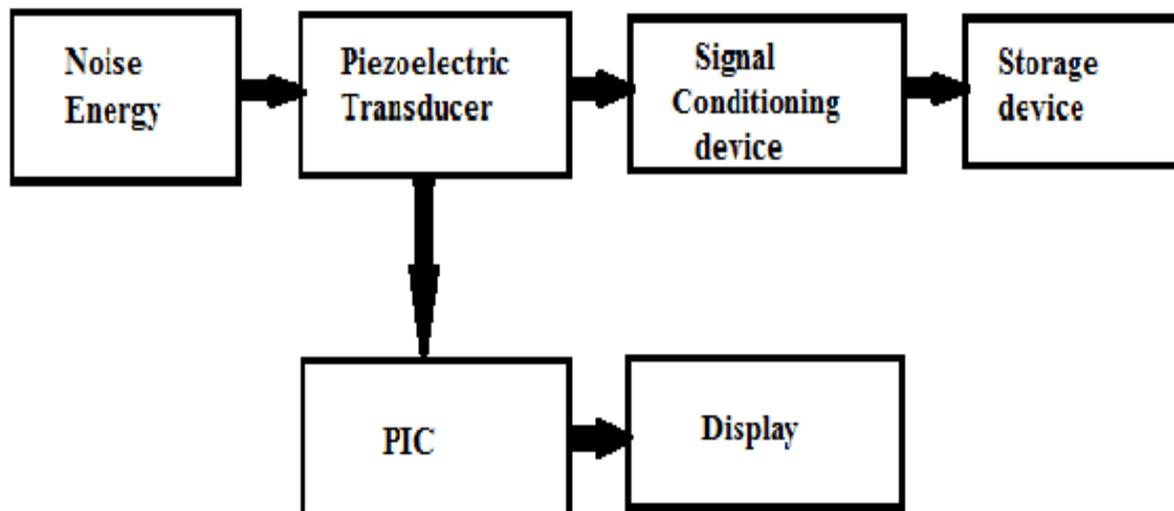
Waste form of sound energy can be converted and used for some productive purpose. Random sound energy or unwanted noise around us can be treated as a source of electric power after their efficient conversion using suitable transducer. A device is used to measure and store the sound pressure level. Transducer is used for conversion of sounds into electric energy. Produced output from the transducer is boost up by using signal conditioning device. The resultant electric power will be used to charge a rechargeable DC battery so as to store this energy. The proposed idea can give a new source of green energy and can contribute in global search for renewable energy. A portable system which designed that generates power from the noise energy using transducers in a closed environment.

**KeyTerms : Noise Dosimeter, Noise Energy, Piezoelectric Transducer, Power, Signal Conditioning Device.**

## I. INTRODUCTION

In this 21st century electric power has very deeply indulged in our society. It is really very hard to imagine our life without these electric appliances and all these appliances require electricity to operate and as fast as these world population is rising and also due to the drastic progress of mankind day by day the electric consumption is increasing drastically on the other hand the production of electric power is limited and it is not increasing to that extent, due to which there is a huge scarcity of electricity not only in India or particular region but across the whole world as development is taking place in very high range. The METI long term vision, proposed in 2005, the final energy which is mainly supplied by electricity towards 2050 for a low carbonated society. Actually today, the demand of electricity is continuously growing in this world and set to be doubled by 2030, so it is necessary to increase the supply of electric power. This electric power is very essential for us to find other alternative methods to produce electric-energy. When we think of another method of solar, wind, hydro and thermal energy but we forget about the sound energy. This property of sound pressure allows to change sound energy into kinetic energy by transferring the sound energy on to the vibrational diaphragm and change the kinetic energy into electrical energy by using vibrational nature of kinetic energy. In this century the most

common thing we encounter everywhere (roads, airports, industries, etc...) is noise pollution and irritatings. This waste form of noise could be converted and used for some productive purpose. The project aims to design a portable system that generates power from the noise energy using piezoelectric transducer in a closed environment . In this work, a less explored source of green energy is proposed and random sound energy around us can be treated as a source of electric power after their efficient conversion using suitable transducer is used to producing usable electric power from available random sound energy is presented here. In simple words, sound is the vibration of any substance can be air, water, wood, or any other material. The only place in which sound cannot travel is a vacuum. When these substances vibrate, or moving back and forth, they produce sound. Sound can be sensed through various types of sound sensors. Piezoelectric material is one of the most effective sound sensors. Piezoelectric transducers are used for conversion of sounds into electric energy. The word piezoelectricity means electricity resulting from pressure. Piezoelectricity is the charge that accumulates in certain solid materials (notably crystals and certain ceramics) in response to applied mechanical vibration. This piezoelectric effect is understood as the linear electromechanical interaction between the mechanical and the electrical state in some crystalline materials with no inversion symmetry. The piezoelectric effect is the process of internal generation of electrical charge resulting from an applied mechanical force. The resultant electric power was used to charge a rechargeable DC battery so as to store this energy. In this way, random sound energy from numerous sources around us can be stored as electric energy which can be used later to deliver electric power to drive compatible small loads. This proposed idea can give a new source of green energy and can contribute in global search for renewable energy. Piezomaterial converts mechanical strain into electric energy. This property of piezomaterial could be used to make a portable device which would be able to sustainably convert the sound energy.



**Fig1. Block diagram of Noise-Power conversion**

This block diagram consist of noise energy, piezoelectric transducer, signal conditioning device, and storage device. The sound is naturally a mechanical wave which causes the vibration or Mechanical stress on piezoelectric crystal. When a piezoelectric material subjected to a mechanical stress which produces the voltage.

Output from the transducer is boost up by using signal conditioning device. The resultant voltage will be stored in a storage device like battery which can be further used to power up small devices.

**TABLE 1**  
**SOUND PRESSURE LEVEL – SPL**

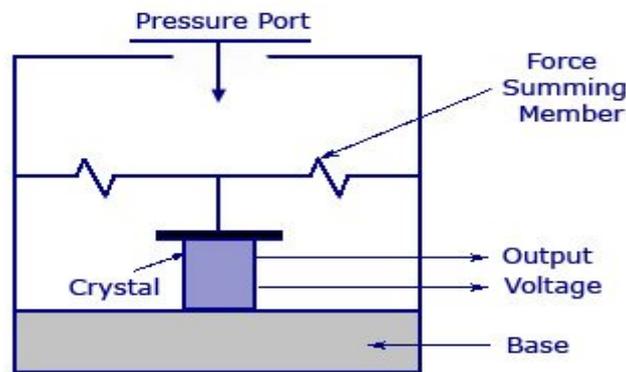
Sound Pressure Level	Sound pressure
115 Db	11.2 Pa
112 Db	7.96 Pa
109 Db	5.64 Pa
106 Db	3.99 Pa
103 Db	2.83 Pa
100 Db	2.00 Pa
97 Db	1.42 Pa
94 dB	1.00 Pa
91 dB	0.71 Pa
88 dB	0.50 Pa
85 dB	0.36 Pa
82 dB	0.25Pa

Law of thermodynamics mechanical energy could be converted into electricity. Piezomaterial converts mechanical strain into electric energy this property of piezomaterial could be used to make a device which would be able to sustainably convert the sound energy to electric energy as piezomaterial convert sound energy to electric energy. Transducer is used to convert Mechanical energy to electric energy. It can convert sound energy to electric energy. The simple use of transducer to convert sound to electric and vice versa is in speakers, headset...also it could be converted into electric energy.

## II. METHODOLOGY

A number of piezoelectric transducers collected from acoustic electric guitars are used for conversion sound into electric energy. As these type of piezoelectric transducers are small enough, the produced voltage across the transducer using medium range of sound is also very small. In this experiment, a small buzzer was used as sound source which was operated by a 6 volt, 2 KHz sinusoidal wave. The resultant buzzer sound produces around 200 mV across the transducer. As this generated voltage is in ac form and noisy in nature, so as 1 farad super capacitor is used in parallel to the piezoelectric transducers for both filtering and storing the produced electric energy. The super capacitor, also known as electrical double layer capacitor is a relatively new technology. Super capacitors have the highest capacitance values per unit volume and have the greatest energy density compared with other capacitors. With their high capacitance values, super capacitors with up to 100F of

charge storage, are emerging as an alternative to batteries in applications where the importance of power delivery trumps that of total energy storage. One important feature of supercapacitor is, they can be charged very quickly whereas discharge slowly because of their much larger value in farad than conventional capacitors. This feature will be utilized in our proposed method for producing electric power from sound energy. Due to its quick charging characteristics, super capacitors can effectively store momentarily produced electrical energy through piezoelectric material from available sound energy. Due to its slow discharging characteristics, it can hold this stored electric energy for a longer time than usual capacitors, hence output from multiple super capacitors can be added easily.



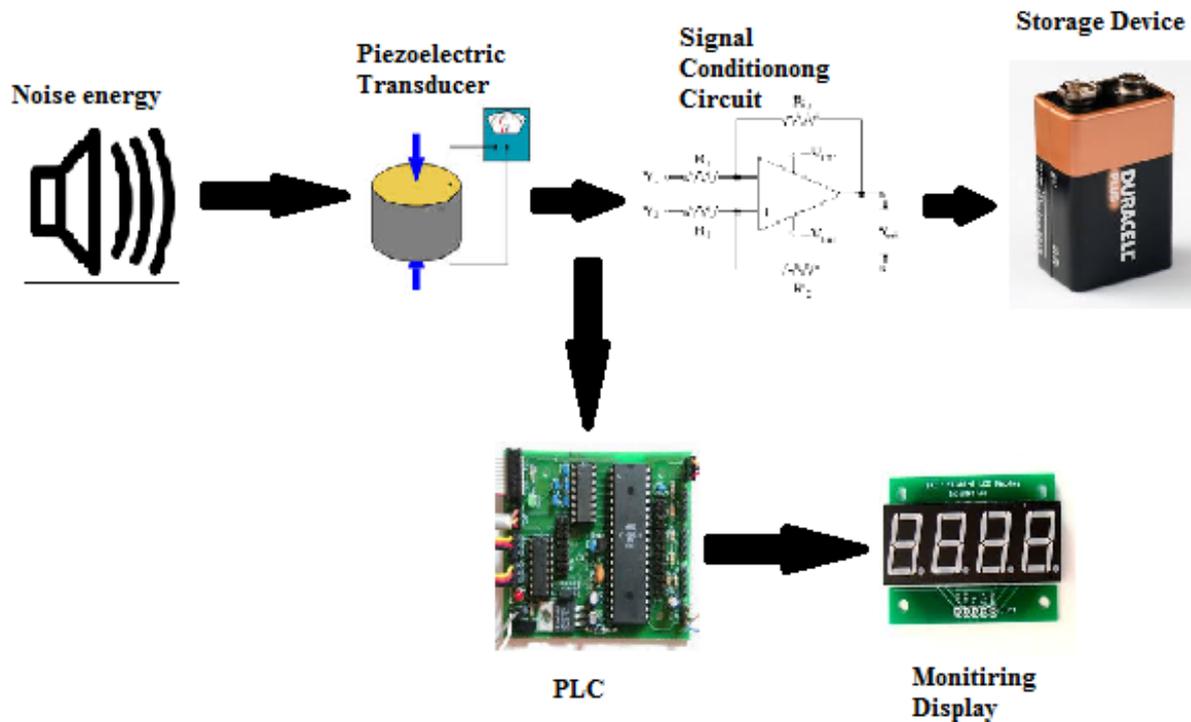
**Fig.2 Piezoelectric Transducer**

The principle of a piezoelectric transducer is that a kinetic force, when applied on the quartz crystal, which produces electric charges on the crystal surface. The charge that produced can be called as piezoelectricity. Piezoelectricity effect can be defined as the electrical polarization produced by mechanical strain on certain crystals. The rate of charge produced will be proportional to the rate of change of pressure applied as input. As the charge produced is very few amount, a charge amplification is needed so as to produce an output voltage large enough to be measured. The device is known to be mechanically stiff. For example, if a force of 20 KN is given to the transducer, it may only deflect to a maximum of 0.005mm. But the output response may be as high as 100KHz. This shows that the device is best applicable for dynamic measurement.

Piezoelectric transducer with a piezoelectric crystal kept between a solid base and the force summing member. If a pressure is applied on the pressure port, the same force will fall on the force adding member. Thus a potential difference will be generated on the crystal surface due to its property. The voltage produced is proportional to the magnitude of the applied force.

The conversion of electrical pulses to mechanical vibrations and the conversion of returned mechanical vibrations turned into electrical energy is the basis for ultrasonic testing. The active element is the most important part of the transducer as it converts the acoustic energy to electrical energy, and vice versa. The active element is basically a piece of polarized material (i.e. some parts of the molecule are negatively charged, while other parts of the molecule are positively charged) with electrodes fixed to two of its opposite faces. When an electric field is charged across the material, the polarized molecules each will align themselves with the electric field. In result, the induced dipoles inside the molecular or crystal structure of the material. The

alignment of molecules will cause the material to change dimensions. This phenomenon is also known as electrostriction. In addition, a constant polarized material such as quartz ( $\text{SiO}_2$ ) or barium titanate ( $\text{BaTiO}_3$ ) will produce an electric field when the material changes dimensions as a result of an imposed mechanical stress. This phenomenon is also known as the piezoelectric effect. Additional information on certain materials produce this effect can be found in the linked presentation material, it was produced by the Valpey Fisher Corporation.



**Fig.3 Schematic Diagram of Noise Power Conversion**

The active element of most acoustic transducers are used today is a piezoelectric ceramics, which can be cut in various ways to produce distinct wave modes. A large piezoelectric ceramic element can be seen in the figure of a sectioned is low frequency transducer. Preceding the adventure of piezoelectric ceramics in the early 1950's, piezoelectric crystals obtained from quartz crystals and magnetostrictive materials were primarily used. The active element is still referred to as the crystal by old timers in the NDT domain. When piezoelectric ceramics are introduced, they became the dominant material for transducers due to their good piezoelectric characteristics and their ease of manufacture into a variety of modules and sizes. They also operate at low potential and are usable up to about 573K . The first piezoceramic in general use is barium titan ate, and that was followed during the 1960's by lead zirconate compositions, which are the most commonly employed ceramic for manufacturing transducers. New materials such as piezopolymers and composites are also being used in some applications.

The thickness of the active element is defined by the desired frequency of the transducer. A thin wafer element oscillates with a wavelength that is two times of its thickness. Therefore, piezoelectric crystal is cut to a thickness that is half the desired radiated wavelength. The higher frequency of the transducer, the thinner active

element. The primary reason that high frequency contact transducer is not produced is because the element is very thin and too fragile.

### **III. CONCLUSION**

Multiple types of sounds are often produced around us from various sources. These random sounds play no role except producing noises for us. In this work, random sound energy around us is treated as a source of electric power after their efficient conversion through suitable transducer is producing usable electric power from available random sound energy is presented. Piezoelectric transducers are used for conversion of sounds into electric energy. The produced electric energy from piezoelectric transducers is stored in supercapacitors which are then summed up and amplified through adder and voltage multiplier circuits. In the resultant electric power was used to charge a rechargeable DC battery so as to store this energy. A small 6 volt DC battery was found to be fully power looms, factories, industries, laboratories, class rooms, etc... Sound produced from a running hydraulic pump and sound produced from construction piling. In all cases, it was found that battery can take charge from these sound sources through the proposed conversion circuit from a reasonable distance from the source. This distance varies depending on the nature and intensity of the tested sound sources. Using the proposed method, random sound energy from numerous sources around us can be stored as electric energy which can be used later to deliver electric power to drive compatible small apparatus. The proposed method opens the door of a relatively less explored source of green energy. It can give a new source of green energy and can contribute in global search for renewable energy.

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# PARTIAL UPDATE ADAPTIVE STRATEGIES FOR DISTRIBUTED WIRELESS NETWORKS

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## ABSTRACT

*A partial update adaptive distributed strategy is developed based on incremental techniques. The proposed scheme apply on the problem of linear estimation with less number of computation in a co-operative manner. The proposed algorithm responds in real time to change in environment. It is efficient and power having learning mechanism for solving distributed estimation and optimization problem over wireless networks. In sensor networks there are various application that involves physical phenomenon featuring space varying parameter like battle field, surveillance, environment monitoring, precision agriculture and medical application. In incremental partial update algorithm, complexity in computation and communication are reduced. Computational complexity analysis is evaluated and performance characteristics of each algorithm are given with computer simulations.*

**Keyword:** *Incremental Network, Max Partial Update, Sequential Partial Update, Stochastic Partial Update*

## I. INTRODUCTION

A wireless sensor network consists of an arrangement of sensor nodes distributed over a geographical area to cooperatively observe physical phenomena through noisy observing processes. The nodes, which we also interchangeably call agents, consist of at least three main components: process units, sensing devices and a wireless transmit-receive unit. In more advance sensor networks, nodes are also equipped with actuators to take action according to the command issued from a control unit. Initially, Wireless sensor networks were developed for military applications, including localization and battle field surveillance. Nowadays they are several areas in industrial monitoring and consumer applications, including intelligent transportation, precision agriculture, and smart spaces. Adaptive strategies with incremental mode of communication described in [2] focus on reduction in communication among the nodes by restricting a particular node receiving and transmitting to the immediate nodes only instead of every node of the network. The drawback of this technique is that it involves high computational complexity.

In a wireless sensor network, two different approaches are implemented to perform signal processing, namely centralized and distributed techniques. In former nodes send their information to a central unit for further processing and storage, whereas in latter the measured information or data are locally exchanged and processed within distributed network. In a centralized approach, transmitting a measured information to a fusion center may cause network congestion and result in a waste of power and communication resources. In addition fusion center require relatively high computation power to process the large collected data. In a distributed approach, the network computational load is divided among nodes no centralized structure is required. In a distributed approach data are exchange locally i.e. single hop or multi- hop data transmission also reduce the network energy consumption. These advantages encourage the use of distributed signal processing(DAP) approaches for various application in sensor network.

Over the past few years, there has been covering a large research on distributed signal processing, as it support the assurance of overcoming the issue of bandwidth limitation and limited energy budget in denser sensor network. Within this underlying structure, in distributed adaptive signal processing is apparent as a key technology to support the implementation of flexible co-operative learning and information processing scheme across a set of distributed nodes, with communication, computing and sensing capabilities. Distributed adaptive algorithm are particularly useful for parameter estimation and for the solution of optimization problem, where the underlying signal statics are time –varying or unknown. Clearly adaptivity helps the networks to track variation of the desired signal parameter as new measurement becomes available. More importantly, as a result of DAP, a sensor network becomes robust against changes in the environment condition and network topology.

In this paper we study and develop distributed adaptive strategies for monitoring time – varying physical phenomenon in sensor network under real – world limitation and change in environment condition.

In this paper, incremental partial update strategies are proposed for weight update which reduce computational complexity to a considerable amount. Incremental partial update algorithm choose a subset of coefficient to be updated in every iteration based on some criterion instead of updating all the coefficient. These algorithm are simple, less complex, adaptive and inherit robustness of distributed incremental LMS algorithm[1].

## II. INCREMENTAL LMS FOR DISTRIBUTED SOLUTION

For distributed optimization problem there have been cover a lots of work for incremental solution[2,6]. Consider a network with P nodes as shown in figure.1

Let  $\{d_k(i), \mathbf{u}_{k,i}\}$ ,  $k = 1, 2, 3 \dots P$  be the data available for a particular node  $k$  at a time instant  $i$  from environment . At time  $i$ , the sensor at node  $k$  collects a measurement  $d_k(i)$ , where  $i$  denotes the discrete time index and  $k$  indicates the node index, and assuming an autoregressive(AR) model is adopted to represent these measurement as follows :

$$d_k(i) = \sum_{m=1}^M \alpha_m d_k(i - m) + n_k(i) \quad (1)$$

where  $n_k(i)$  is additive zero – mean noise

Coefficients  $\{\alpha_m\}$  are the parameter of the underlying model.

Define parameter  $w^0$  which is the desired optimum solution for the network which is

$M \times 1$  parametr vector

$$w^0 = \text{col}\{\alpha_1, \alpha_2, \dots, \alpha_M\} \quad (2)$$

and regressor vector

$$u_{k,i} = [d_k(i - 1) d_k(i - 2) \dots d_k(i - m)] \quad (3)$$

then (1) at each node k can be given as

$$d_k(i) = u_{k,i} w^0 + n_k(i) \quad (4)$$

Here, the objective is to estimate the model parameter vector  $w^0$  from the measurement  $d_k(i)$  and  $u_{k,i}$  over the network. Thus in order to find the  $M \times 1$  vector  $w^0$ , we formulate the linear space – time LMS estimation problem as  $\min_w J(w)$  and  $J(w) = E \|d - Uw\|^2 \quad (5)$

Where  $\{d_k(i), u_{k,i}\}$  are realization of  $\{d_k, u_k\}$ . Thus optimum minimum mean – square error (MMSE) solution

$w^0$  is calculated, for which the normal equation (5) are satisfied

$$R_{du} = R_u w^0 \quad (6)$$

Where  $R_u = EU^*U$  and  $R_{du} = EU^*d$

When nodes in the network has access to data in order to take advantage of node cooperation, we can introduce a distributed network with incremental learning, where at least one cyclic path can be established across the network. In this type of network, information should be transferred from one node to its immediate node in cyclic manner to return to the initial node (see Fig. 1)

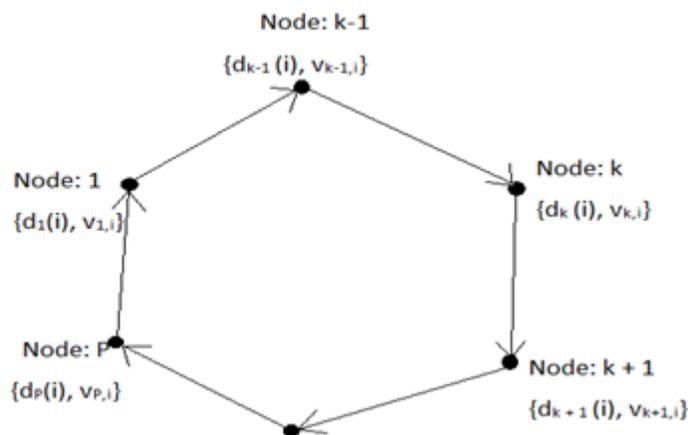


Fig. 1 Distributed network accessing data with P nodes

The incremental LMS solution for distributed network can given [1] by

$$Y_n^{(i)} = w_{i-1} \quad (7)$$

$$Y_k^{(i)} = Y_{k-1}^{(i)} + \mu_k v_{k,j}^* (d_k(i) - v_{k,j} Y_{k-1}^{(i)}) \quad (8)$$

$$K = 1, 2, \dots, P$$

$$w_i = Y_n^{(i)}$$

Where

$\mu_k$  = step size parameter at node  $k$

$Y_k^{(i)}$  = local estimate at node  $k$  at time  $i$

$w_i$  = estimate of  $w_i$  at node  $k$

$v_{k,j}$  = input at node  $k$  at  $i^{th}$  iteration.

$Y_{k-1}^{(i)}$  = local estimate of immediate node  $k-1$

$v_{k,j}^*$  is the hermitian of  $v_{k,j}$  the above mentioned algorithm uses local data realizations  $d_k(i), v_{k,j}$  and  $Y_{k-1}^{(i)}$  weight estimate of immediate node. This incremental procedure purely relies on local data estimation and gives truly distributed solution.

### III. PARTIAL UPDATE INCREMENTAL SOLUTIONS

In spite of the incremental adaptive solutions reduce the number of communication at each iteration are equal to LMS. We can reduce computational complexity by partial update algorithm[3,4,6]. In few application adaptive filter have large number of coefficients. Updating the whole coefficient vector is costly in term of memory, power consumption and computation. Generally more hardware implies more power. Here we proposed incremental partial update techniques which reduce computational complexity to a considerable amount.

#### 3.1 Sequential Partial Update Incremental LMS

Sequential partial update(SEPU) method updates a subset of the adaptive filter coefficient so as to reduce the computational complexity associated with adaptation process [3,6] at each iteration for every node in the network. The coefficient subset to be updated is selected in a deterministic fashion.

The update equation is given by

$$Y_k^{(i)} = Y_{k-1}^{(i)} + \mu_k I_{M,k}^{(i)} e_k^{(i)} v_{k,j}^* \quad (9)$$

$$\text{Where } e_k^{(i)} = d_k(i) - v_{k,j} Y_{k-1}^{(i)} \quad (10) \text{ and}$$

$$I_{M,N}^Q = \begin{bmatrix} b_1(i) & 0 & 0 & \dots & \dots & 0 \\ 0 & b_2(i) & 0 & \dots & \dots & 0 \\ \dots & \dots & b_3(i) & \dots & \dots & \dots \\ \dots & \dots & \dots & b_4(i) & \dots & \dots \\ \dots & \dots & \dots & \dots & \dots & \dots \\ 0 & \dots & \dots & \dots & \dots & b_M(i) \end{bmatrix}$$

$$\sum_{j=1}^M b_j(i) = N, \quad b_j(i) \in \{0,1\}$$

$I_{M,N}^Q$  is the coefficient selection matrix to select a subset of N coefficient out of M total coefficient at node k at  $i^{th}$  iteration.

Let the coefficient index set be  $Q = \{1,2,3\dots M\}$  i.e. there are M coefficient totally out of which N coefficient are to be updated. Then Q is divided into S number of subset  $L_1, L_2, \dots, L_S$  with each subset having N coefficient where  $S = \frac{M}{N}$ . Let  $R = M/N$  be an integer then R coefficient subsets are arranged in periodic sequences with respective coefficient selection matrix  $I_{M,N}^Q$

$$I_{M,N}^Q = \begin{bmatrix} b_1(i) & 0 & 0 & \dots & \dots & 0 \\ 0 & b_2(i) & 0 & \dots & \dots & 0 \\ \dots & \dots & b_3(i) & \dots & \dots & \dots \\ \dots & \dots & \dots & b_4(i) & \dots & \dots \\ \dots & \dots & \dots & \dots & \dots & \dots \\ 0 & \dots & \dots & \dots & \dots & b_M(i) \end{bmatrix}$$

$$= 1 \text{ if } j \in J_{(i \bmod S)R+1} \text{ and zero otherwise.}$$

For a given M and N,  $I_{M,N}^Q$  is not unique. Updating N out of M coefficient reduces the complexity of adaptation process by a factor R.

### 3.2 Stochastic Partial Update Incremental LMS

Stochastic partial update improves the performance of the network over the sequential partial update algorithm with same amount of computational complexity reduction. In this method coefficient subsets to be updated are chosen randomly instead of deterministic fashion as in SEPU algorithm.

The update equation is given by

$$Y_k^{(i)} = Y_{k-1}^{(i)} + \mu_k J_{N,k}^{(i)} e_k^{(i)} v_{k,i}^* \quad (11)$$

The coefficient selection matrix is given by

$$J_{N,k}^{(i)} = \begin{bmatrix} b1(i) & 0 & 0 & \dots & \dots & 0 \\ 0 & b2(i) & 0 & \dots & \dots & 0 \\ \dots & \dots & b3(i) & \dots & \dots & \dots \\ \dots & \dots & \dots & b4(i) & \dots & \dots \\ \dots & \dots & \dots & \dots & \dots & \dots \\ 0 & \dots & \dots & \dots & \dots & bM(i) \end{bmatrix}$$

$b_j(i) = 1$  if  $j \in J_{m(i)}$  and zero otherwise.

Where  $m(i)$  is an independent random process with probability mass function

$$\Pr(m(i) = c) = \pi_c, \quad c = 1 \dots R$$

$$\sum_{c=1}^R \pi_c = 1$$

The computational complexity of stochastic algorithm(STPU) is same as that of the SEPU and slower than incremental LMS algorithm by a factor R because of the decimation of the adaptive filter coefficient.

### 3.3 Max - Partial Update Incremental LMS

In this algorithm at each iteration largest magnitude vector entries are updated.

This is a data dependent partial update technique which is based on finding N largest magnitude entries from M total coefficient [5].

The update equation is given by

$$Y_k^{(i)} = Y_{k-1}^{(i)} + \mu_k v_{k,i}^* J_{N,k}^{(i)} e_k^{(i)} \quad (12)$$

$$\text{Where } e_k^{(i)} = d_k(i) - v_{k,i} Y_{k-1}^{(i)}$$

The coefficient selection matrix  $J_{N,k}^{(i)}$  is given by



update		$\mu$		SEIA	MSE Result (STIA)	(MAIA)
70	10	0.03	7	0.1215	0.1379	0.0583
50	10	0.03	5	0.2015	0.1810	0.1004
30	10	0.03	3	0.2245	0.1854	0.1406

Above MSE result are compared with incremental algorithm in which all the coefficient are updated whose MSE s 0.0078

SEIA – sequential incremental algorithm

STIA – stochastic incremental algorithm

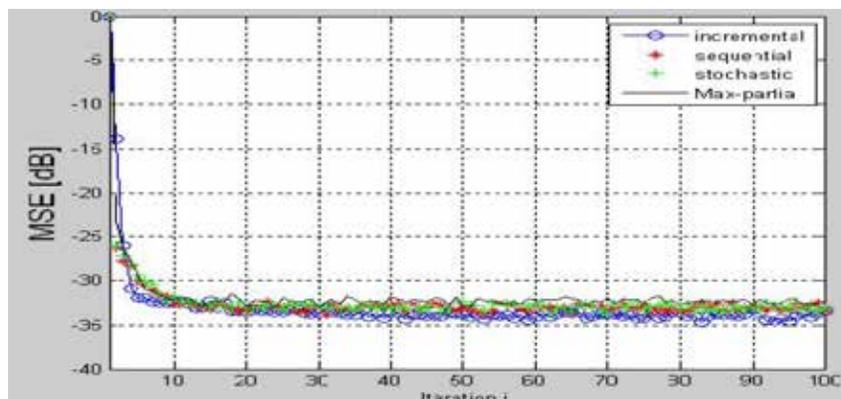
MAIA – max increment algorithm

The simulation results for performance estimation are compared with incremental LMS in which all the coefficient are updated in each iteration. From simulation result and figure, we say that max – partial outperform sequential partial and stochastic partial update in performance. Stochastic technique give better performance over sequential for same computational complexity. But sequential partial update converge with faster convergence rate compared to other to algorithm. Stochastic partial update converge at a fast rate compared to max partial update.

The advantage of proposed algorithm over incremental algorithm is achieved at the cost of degradation in performance.

From observing simulation result it is obvious –

1. It is more sensitive to local statistics.
2. Mean – square error depends on number of coefficient updated.
3. Because incremental mode of communication is considered every node k is influenced by its immediates neighbors.



**Fig. 2 Comparison of each techniques with incremental LMS for 70 % Coefficient update**

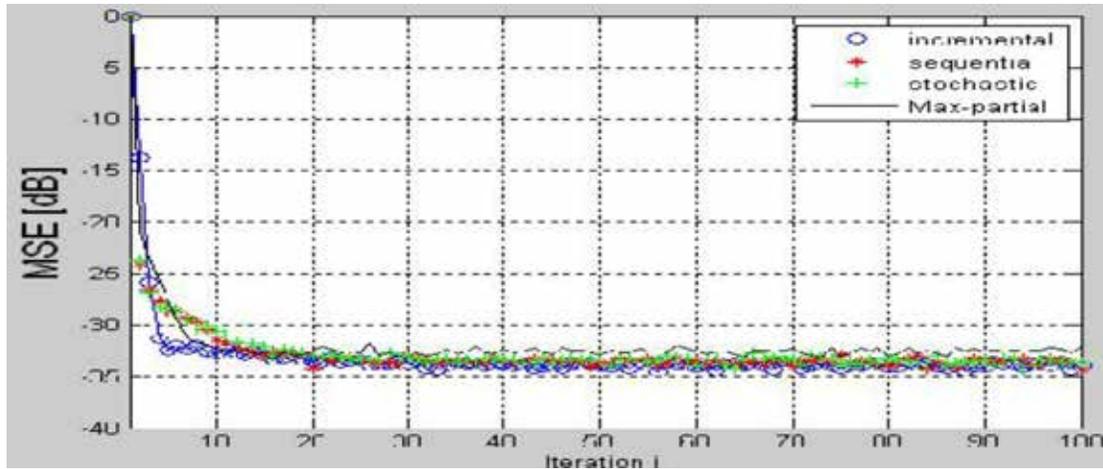


Fig. 3 Comparison of each techniques with incremental LMS for 50 % Coefficient update

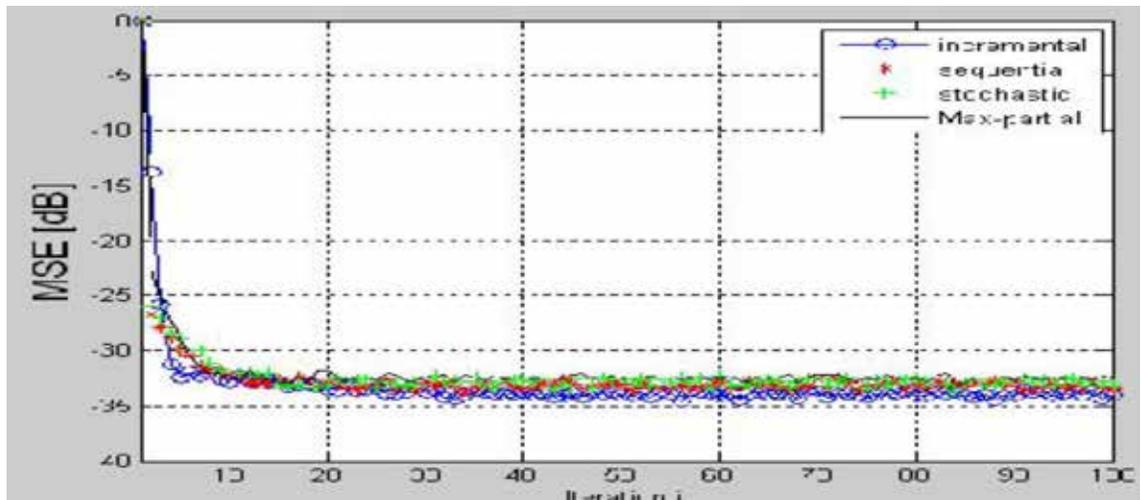


Fig.4 Comparison of each techniques with incremental LMS for 30 % Coefficient update

## V. CONCLUSION

It is clear from the result and analysis that sequential and stochastic partial update algorithm the computational complexity but stochastic partial update algorithm gives better performance compared to sequential. Max – partial algorithm converge quickly and has consistent steady state performances and reduce computational complexity as the same amount as other two technique. So with little worse in the performance the computational complexity can be reduce to a considerable amount. This reduce power consumption and suitable for low energy budget i.e. low energy sources.

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# DYNAMIC WEB BASED MOBILE (ANDROID) APPLICATION (Traffic system)

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## ABSTRACT

Recently, the use of mobile communication devices, such as smart phones and cellular phones, in field data collection is increasing due to the emergence of embedded Global Position systems (GPS) and Wi-Fi internet access. Accurate, timely and handy field data collection is required for disaster management and quick response during emergencies. In this paper, we introduce a web based mobile (android) application (for traffic system) to collect field data from personal mobile phones. The main objective for this project is to develop a dynamic web application which can be used to take real time data as well as location and transfer it to dynamic web application integrated with Google Map API. The dynamic web application can change the XML at runtime using the metadata entries.

**Keywords--GPS (Global Position System), LBS, Metadata, Personal Mobile Phone, Real-Time Field Data Collection**

## I. INTRODUCTION

In recent years, smart phones are becoming more and more popular. So the data can be collected through it and all the record can be kept in database. This reduces the manual work and error and previous data can be fetched in future for reference.

In this paper, we propose a web application where IMEI number is used for registration of a new user. The user will be created from the web application and user name and password will be assigned to his/her IMEI number. We are also transferring the images from android phone to web application. We will be generating reports which will show the daily collections of police as well as faulty drivers and will also plot the network on Google Maps using the data sent from android phone.

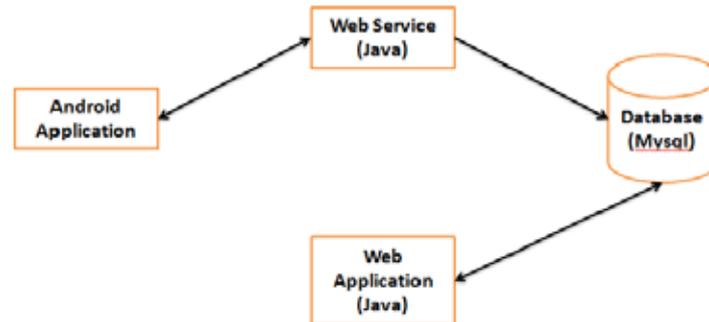
## II. EXISTING SYSTEM AND THEIR ISSUE

Traditional field data collection for traffic system (i.e. on pen and paper based) is a time consuming and bulky task. For example, we need to prepare base maps, collect an ancillary dataset, and other paper work. This is not practical to use in real-time disaster, which occurs in unpredictable places. We propose an android application for the collection of real-time data. The web application has a master page through which new fields related traffic system can be added, which will be reflected in mobile phone and the entire database is stored.

## III. PROPOSED ARCHITECTURE

Figure 1 shows the system architecture. It can be divided into three parts, which are android application, web services and web application. The work flow of this architecture is shown as follows:

- 1) User (traffic police) enters data regarding violation through android application on his/her personal mobile phone.
- 2) Web services will pass this information to web application which will be later stored in database.
- 3) Web application is the main application where dynamic features are retained.



**Fig.1 Architecture diagram**

Information can be fetched back through the mobile phone. Database can be invoked to fetch the previous information.

## IV. BACKGROUND AND RELATED WORKS

### 4.1 GPS and Google Maps

With location positioning system such as GPS becoming popular, there is a growing demand for location-based applications. It is easier, these days to utilize map information by connecting GPS receiver to PC and PDA. Corresponding to this momentum, GPS receivers are now embedded into mobile phones and applications using the location of the user in real-time are widely available. GPS chips are now included in many devices to analyze satellite signals and determine the user's location with high accuracy.

### 4.2 Android

Google published an open source mobile operating system based on Linux- Android in Nov. 5, 2007. Android platform has five advantages: open source, no restricted by operators, more choices of hardware, no restricted third-party developers, seamless integration of Google applications. Due to these advantages Android occupies much market once published.

Layer of Linux Kernel provides system kernel services, such as system security, memory management process management, network stack and driver model. At the same time it hides details to provide uniform services for upper layers as an abstract layer between hardware and software.

Layer of Android Runtime is a muster of kernel libraries of Android and provide most functions called by Java Class Libraries. Layer of libraries is a muster of C/C++libraries in Android and is used by the components of Android. Developers use these libraries through Application Framework of Android. Layer of Application Framework is the developing platform of Android which includes APIs called by kernel applications.

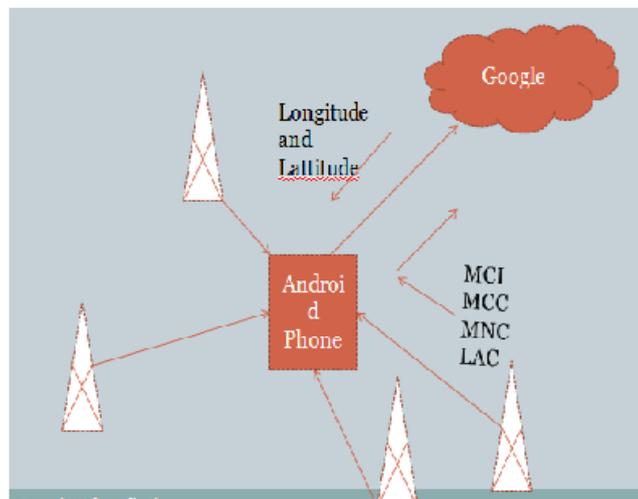
Developers could develop plenty and novel application by these APIs and use the device hardware freely, access location information, run background service, set clock, add notices to status bar etc.



**Fig.2 Android Architecture**

### 4.3 Location Based Services

Location Based Service (LBS) is mobile service that has the capability to provide real time information based on the user’s location. Geographical Information system (GIS) has been the heart of LBS in order to provide all the functionalities in LBS.



**Fig. 3 LBS**

### 4.4 Algorithm

User algorithm for image scaling is used in android code. The size of the image should be appropriate to store it on web application.

Pseudo code for image uploads:

- 1) Get image from camera
- 2) Change it to thumbnail view
- 3) Pass to web service
- 4) Listen on socket
- 5) Show on Map

#### 4.5 Dynamic web application

There is a master page in web application which will control the field visible in android application through metadata entries. The field added in web application will be shown in the android application. This dynamic feature enables us to add new required fields at anytime in future.

#### V. CONCLUSION AND FUTURE WORK

In this paper, we discussed about dynamic web application and android application. We realized one application based on dynamic web application. This paper focuses on real-time data collection and GPS (location based services). In Future we can involve dynamic web based android application in many fields, like restaurants, electricity bill, hospital etc. In future, the use of GPS is also going to evolve.

#### VI. ACKNOWLEDGEMENT

We express our gratitude to all those who have provided us with valuable guidance towards the completion of this system as part of the syllabus of the Bachelor of Engineering course. We express our sincere gratitude towards cooperative department who have provided us with valuable assistance and requirements for the system development.

We hereby take this opportunity to heartily thank our esteemed Mr. K. R. Pathak for his useful guidance, as well as making available to us his intimate knowledge and experience in making “Dynamic Web Based Mobile Application for Traffic System “as a project.

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