Enhanced Face Recognition Using Euclidean Distance Classification and PCA

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Abstract: Biometrics is the study of methods for uniquely recognizing humans based upon one or more physical or behavioral traits such as; face, voice, fingerprint, gait, iris, signature and hand geometry. Several research works have been reported in literature, still there is a lack of accurate and robust methods and techniques. As compared with other biometrics systems using palm print, fingerprint and iris, Face recognition has other advantages because of its non-contact process. Face images of a person can be taken from a distance without touching the person who is to be identified, and the identification does not have need of interaction with the person. In the present work, the complete work is carried out in two phases viz. Face Detection and Face Recognition. In the first phase, the strategy applied to face detection from different sources like still images, webcams and videos. In the second phase, the strategy that is applied to the face recognition is Principal Component Analysis (PCA).

Keywords: Principal Component Analysis (PCA), Face Detection, Face recognition, Euclidean distance.

1. INTRODUCTION

It has been observed that recognition of a person has been done using several approaches. Different researchers have used different traits to develop biometric systems. Many of the researchers have used a unimodal approach for face recognition. In this present work, face recognition is done from different sources of face images. H. C. VijayLakshmi et al.[1] detected faces and facial features by extraction of skin like region with YCbCr color space and edges are detected in the skin like region. Then, the eyes are found with PCA on the edged region. Finally, Mouth is found based on geometrical information. Another approach extracts skin like region with Normalized RGB color space and face is verified by template matching. To find eyes, eyebrows and mouth, color snakes are applied to verified face image. R. Ajmera et al.[2] segmented with YCbCr color space and eyes & mouth are found in the combination of edged image and segmented image. For final identification, horizontal and vertical profiles of the images are used to identify the position of the mouth and eyes. All the techniques are using skin segmentation to eliminate non-face objects in the images to save computational time. Skin color is one of the most significant features of a human face. Skin color can be modeled with parameterized or non parameterized methods. Skin color region can be identified in terms of, elliptical modeling, statistical modeling, threshold region or Neural Network. The skin color region is described in all color spaces like RGB, HSV and YCbCr. RGB is light sensitive, but YCbCr and HSV are not sensitive to light because these two color spaces have separate color channel and intensity. In literature, many techniques based on skin color are available. V. S. Bhatt et al.,[3] used a hybrid skin color model that is a combination of RGB, YCbCr and HSV for a face detection system. R. Azad et al.[4] modeled a robust and adaptable method for face detection based on color probabilistic estimation technique. Skin like region is selected as a face applicant with respect to the bounding box fraction of the region and candidates are verified with template matching. An additional method pre-processes the given image to eliminate background and surroundings part.

2. PROBLEM STATEMENT

Person identification presents a challenging problem in the turf of image analysis and computer vision, and as such has gained a great consideration over the last few years because of its many applications in a range of domains [5-9]. In the words of information theory, the intention is to extract the pertinent information in a face image, train it as efficiently as possible, and take a new face image, extract its features and compare its feature with the features of trained face images. The aim of this work is to get unique features of the face and compare these unique features with the extracted features of all facial images which are stored in the database.

3. PROPOSED MODEL

In this implementation, we recognize the face from multiple sources like still images, webcam and recorded videos. Face detection module detects face from different sources using different pre-processing techniques. This implementation can detect single face as well as multiple faces from images, webcam and recorded videos. Face recognition module; compares face candidate with face images which are stored in the database. And finally, recognize the face candidate with the best solutions. The methodology for face recognition system has been shown in Fig.1. The figure shows the steps to recognizing a person using face. Methodology is divided into 3 basic phases: Preprocessing, Processing, Pattern matching.

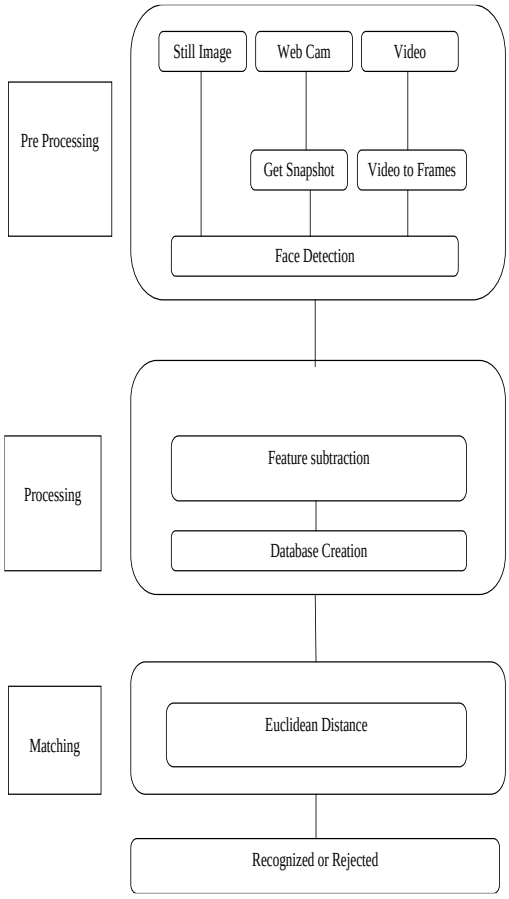

Fig. 1: Methodologies for Face Recognition

3.1 Preprocessing

The task of Pre-processing phase is that detect the face portion from input images. If the input is in the form of video, then first construct frames/snaps from video and then process each frame individually to crop a face portion.

3.2 Processing

Processing phase consists of two tasks: feature extraction from face images and database creation.

3.2.1 Feature Extraction

This work used PCA method to extract features from face images. PCA computes the Eigenvectors of the covariance matrix, and projects the original data onto a lower dimensional feature space, which is defined by Eigenvectors with large Eigen values. These Eigen vectors are also known as Eigen faces.

3.2.2 Database Creation

A database is created to store face images and their information such as name. In this implementation, all face images are stored in folders and their information is stored in my sql database. Face images stored in the database are known as trained face images.

3.3 Pattern Matching

The task of the face matcher is to discover the most alike feature vector among the training set to the feature vector of a given test image. Once the Eigenvectors of each face image are calculated then Eigenvector of the test face image is compared with each calculated Eigenvectors and the weighted Euclidean distance between them is taken. The face image with the minimum Euclidean distance is chosen if their Euclidean distance is less than the threshold value otherwise tested face image get rejected.

4. RESULTS AND DISCUSSION

In the first part of the implementation of face recognition systems, detection of faces from acquiring a color image is performed. Before detecting the face, input color images need some preprocessing. In this project, face images can be taken from a webcam and video also. So the first video is converted into frames then particular frame is selected as the input image. After selecting the color images, this color image is converted into a gray scale image. Fig. 2 shows the gray scale conversion of the color image.

Fig. 2: RGB to gray scale conversion

Then, face detection started with the resultant gray scale image.

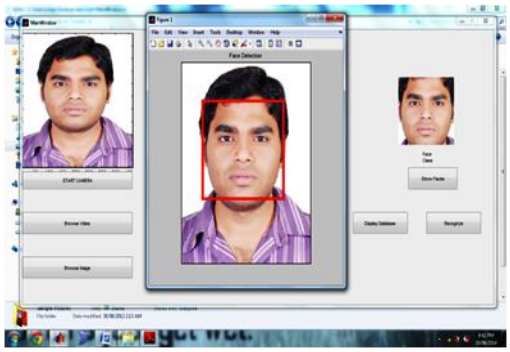

Fig. 3: Single face detection

In this project, MATLAB library functions are used to detect face from gray scale image. Methods used to detect face are based on Viola-Jones algorithm. Fig. 3 shows the face Detection. Multiple faces from same image can also be detected using same Viola-Jones algorithm based method. Fig. 4 shows the multiple face detection in a single image.

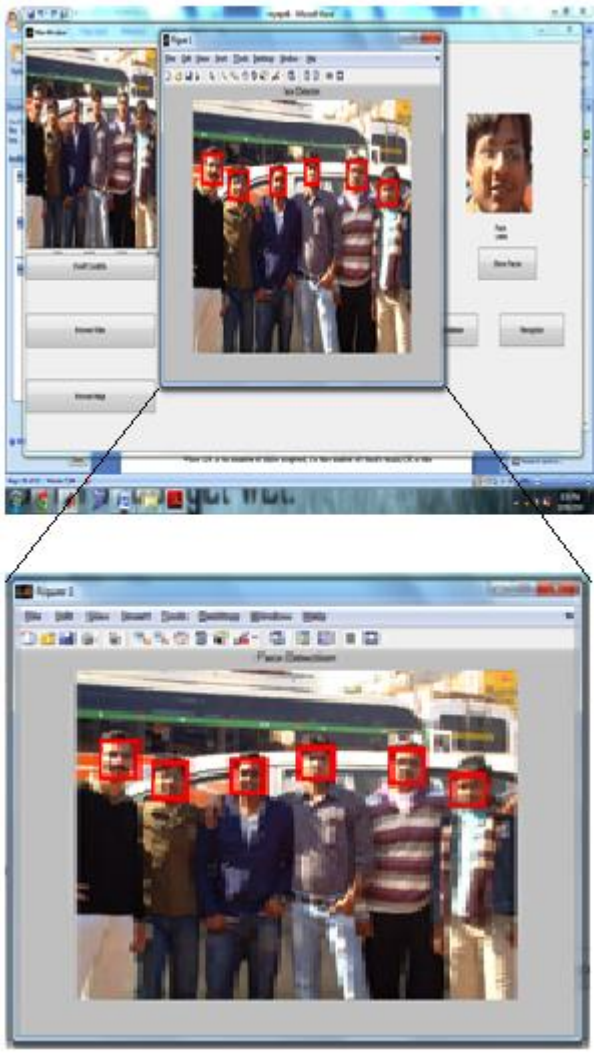

Fig. 4: Multiple face detection

In face recognition part of the implementation, input test image is acquired from a webcam or video. Still images can also be taken as an input test image. Before processing to recognize, again test color image is converted into gray scale. This input test image is to be compared with the all face images stored into database. First, eigenfaces for all face images stored into the database are calculated. PCA algorithm is used to calculate the eigenface. After finding eigenfaces for trained face images, eigenface for input test face is also calculated. Then, Euclidean Distance is measured from input test face to all trained faces. The face from trained faces is identified as recognized face, which has a minimum Euclidean Distance from input face. Fig. 5 shows the bar chart for Euclidean distance for trained face images.

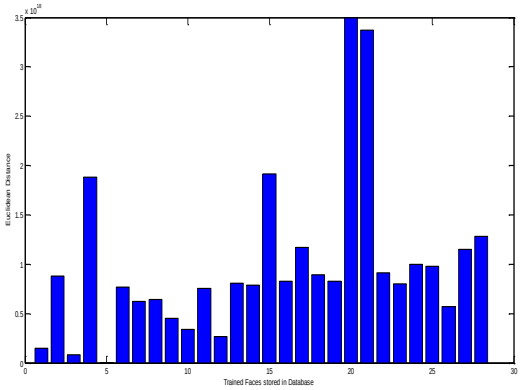

Fig. 5: Euclidean distance from test image to all trained face images.

In this figure, we can see that face id 5 has a minimum Euclidean Distance. So face id 5 is recognized as face. All information regarding the face id 5 is displayed on screen. Fig. 6 shows the face recognition.

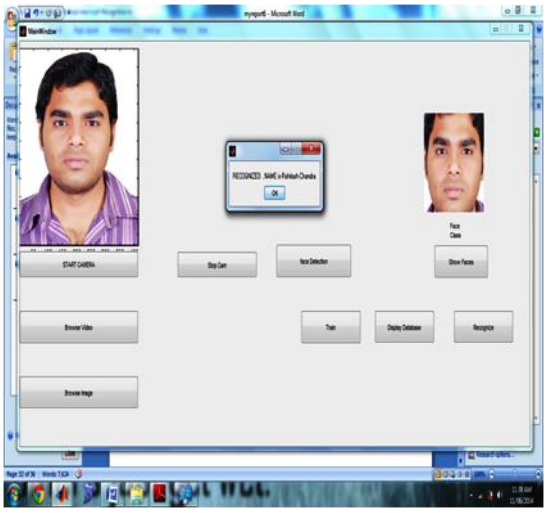

Fig. 6: Face recognition systems with successful recognition

The present system has also been tested with the unknown person's image whose face image and information are not stored in the database. Eigenface for input test face is calculated. And then Euclidean Distance is measured from the input test face to all trained forces. With unknown face image, minimum Euclidean Distance is greater than the threshold value. So the input test image is not recognized and displayed result as unknown person. Fig. 7 shows the face recognition and their result with unknown faces.

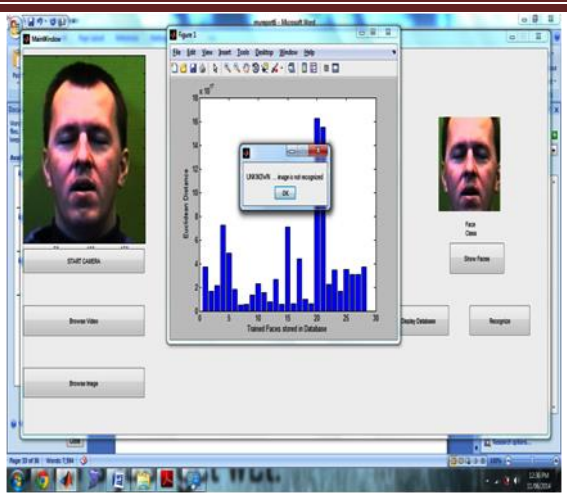

Fig. 7: Face recognition system with unsuccessful recognition

4.1 Performance of the system

For verification of face images, two procedures are used, which are the False Acceptance Rate (FAR) and False Rejection Rate (FRR). When a fraud, claiming the identity of another person, is accepted, this case is the FAR case. On the hand, FRR is the case when a person claiming his true identity is rejected. The FAR and FRR are given by:

$$\text{FAR} = \frac{\text{IA}}{\text{I}}$$

$$\text{FRR} = \frac{\text{CR}}{\text{C}}$$

Where IA is the number of false accepted, I is the number of fraud's trials, CR is the number of true people rejected and C is the number of true person's trials. The face verification performance of this face recognition system implemented using the original face images is tabulated in Table 1.

Table 1: Verification Results

Feature Extractor	Total Test Images	FAR	FRR
PCA	30	3.04%	5.62%

5. CONCLUSION AND FUTURE SCOPE

This dissertation focuses on designing and implementing of a face recognition system. Although a conventional PCA can enhance the recognition accuracy for a face recognition system, yet, there exists a limitation over PCA. Therefore, in this work, several issues were

evaluated and examined, particularly in terms of the computational time complexity through the covariance matrix computation stage. Face recognition system is a part of the facial image processing application and their importance in a research area is increasing recently. In this thesis, we implemented the face recognition system using Principal Component Analysis and Eigen face approach. The system successfully recognized the human faces and worked better with frontal face images. Applications of the system are video surveillance, person verification, crime prevention, and similar security activities.Whilst face recognition system implemented, performs extremely well under constrained conditions. But there exists significant room for development in extending the system to work in more difficult conditions. The future work will involve development of fusion models using face and other traits for different under controlled and uncontrolled environments.

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Path Planning for Automated Guided Vehicle Using Distance Based Approach

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Abstract: Path Planning is the fundamental aspect of every autonomous vehicle and is used for the process of breaking down a desired movement task into discrete motions that satisfy movement constraints and possibly optimize some aspect of the movement. This paper presents distance based methodology for the autonomous vehicles to carry out the motion planning for the predefined path. The vehicle is made to travel from source to destination by taking inputs from multiple sensors such as RADAR, LIDAR and Camera and also the battery level through Controller Area Network(CAN) bus which uses a message oriented transmission protocol. The actuation of braking system is controlled by sending the actuating signal from the Electronic Control Unit (ECU) and the steering system is actuated by sending the steering angles in terms of degrees. In distance based approach the travelled distance is compared each and every time with the actual distance to be travelled and vehicle is made to traverse the pre-programmed path. The proposed technique also considers the objects which cause collisions and provides a measure to avoid collision. On the basis of battery level the autonomous vehicle is able to cover the predetermined path. It alerts the braking and motor control system on detection of the obstacle. Thus the vehicle traces the pre-defined path making it an autonomous vehicle.

Keywords: Path planning, ECU, Pre-programmed path, CAN protocol.

1. INTRODUCTION

It has become a trend to travel by four-wheeler these days. The car is a most preferred and most used auto-mobile. Travelling by car is luxurious as well as dreadful. It results in millions of deaths annually worldwide. The accidents and the car crashes are caused mainly due to the human error. Many times the driver becomes drowsy which may lead to accidents. During panic conditions as well, the human driver cannot effectively maintain the car on track due to the panic and stress. So, it becomes very important for the evolution of cars to whole new automated cars which are least prone to the errors and accidents. An autonomous vehicle is a self-driven vehicle that does not require a driver to manually operate it for controlling its navigation or to accomplish other tasks. In this modern era, the vehicles are more focused to be automated which can be decisive for building new paradigms of mobility, more flexible with substantial reduction in road accidents, especially the ones caused by human fails, and with the need of less number of vehicles in the road and mainly in cities. Fully autonomous vehicles are being researched and developed such as the Google driverless car, cybercars in the framework of European projects[1], automated vehicles in the Autopia program[2], and vehicles targeted for competitions, like the DARPA Urban challenge[3] and DARPA Grand challenge. Google is the biggest search engine in the world has started working on the self driving cars since 2010 and is still developing new changes to give a new level to the automated vehicles. Path planning becomes the most important part for the unmanned vehicle. It is important that the automated vehicle travels path correctly by taking intelligent decisions, without any human intervention and without any effort. Here, we have focused on one of the applications of an automated vehicle, i.e., motion planning or path planning for Autonomous Vehicle(AV).

Path planning is considered as an important module in making the AV. It is mainly considered as the central Electronic Control Unit(ECU) of automated vehicle as it takes the smart decisions by avoiding confusion i.e. consider a situation where the obstacle detection module sends the signal directly to motor control module to stop the vehicle but the path planning ECU sends the signal to the motor control module to continue the motion. Here the motor control module is getting two signals, one is stop signal and another is to continue the motion. Here the confusion occurs to take the decision. Hence instead of sending the signal directly to other modules it is first sent to path planning ECU and then it is sent to the respective modules in order to avoid confusion. All the signals are sent over CAN. Hence it is the main coordinating system of the vehicle that interfaces all different types of modules to make vehicle automated, so that vehicle traces the predefined path. Since taking intelligent decisions in the traffic to follow the predefined path is also an issue for the automated vehicle, so this aspect is also under consideration in this paper. Many companies and

organizations are spending a great deal of time and money developing autonomous vehicles for numerous applications[4-5].

This paper proposes a method to make the vehicle to traverse the pre-defined path by taking smart decisions and thus avoiding the collisions and follows the distance based approach to travel the pre-programmed path. It makes use of CAN protocol to send and receive the signals. In section 2 discussion is mainly on the different approaches to achieve motion planning. Section 3 discusses about the proposed methodology. Section 4 is mainly about the algorithm to achieve the pre-programmed path. Section 5 is about the results based on the experiments conducted

2. RELATED WORK

In order to achieve automation in vehicles many research and projects were undertaken. A great achievement has been seen in this field. The projects undertaken for AV include EUREKA Prometheus Project[6], DARPA Grand Challenge. Many papers are also submitted in this approach. There are different methods to achieve the path planning like time based approach, interval based algorithm, grid based search and reward based algorithm. Reward Based algorithms says that the vehicle choose the direction based on different actions. But the results of each action is not definite. That is, outcomes (displacements) are partly random and partly under the control of the vehicle. The vehicle gets positive reward when the vehicle reaches the target and gets negative reward if the vehicle collides to the obstacle. Reward-based algorithms is that they generate the optimal path. The disadvantage of these is that they limit the vehicles to choose from a finite set of actions. Our proposed paper follows the distance based approach to travel the pre-programmed path. It makes use of CAN protocol to send and receive the signals. Gordon T. Wilfong et al.[7] published a paper in which motion planning for an autonomous vehicle is discussed. The main motto is to provide a collision free path for the vehicles. Lane changing with collision free environment is also described in the paper. The main drawback of the explained algorithm is motion planning is provided for the vehicle in only one direction i.e. either forward or in reverse direction. Limited steering range is provided. Emilio Frazzoliet al.[8] published a paper in which real-time motion planning for agile autonomous vehicles is discussed. A randomised motion planning for dynamical systems with constant and moving obstacle is discussed. The main drawback is the sensors used are of limited range, algorithm fails for multiple vehicles and there exists computational complexity. Luca Lattanziet al.[9] proposed a paper in which path planning for a robot is discussed. The robot has to cover the path by covering the reference points. The limitation of this proposal is that complexity in coding. There are different approaches to achieve motion planning. By referring to the techniques cited above the proposed work focuses on the algorithm takes care about the entire environment such as battery condition, accuracy of each and every sensor before starting the motion. The proposed technique is distance based and Wheel Speed Sensor data is used to traverse the pre-programmed path. Vehicle is provided with different speeds such as low, medium and high by controlling the Pulse Width Modulation (PWM) values to traverse the path and also provides the respective Rotations Per Minute (RPM) of the motor. During curving i.e. during taking turns particular data is transferred to the steering system through CAN bus. By comparing the distances, the vehicle travels the entire path. Time taken for the vehicle to travel or to cover the entire path is also considered in the algorithm. The main area of application of this method is in the industries where the fixed path is followed every time to transfer the spare parts.

3. PROPOSED METHODOLOGY

Initialization of the vehicle parameters such as fixed path distance, steering angles, various speed levels, diameter of the wheel, and width of the road. The parameters related to the vehicle such as battery level and sensors accuracy are considered and analysed to initiate the motion of the autonomous vehicle. Signal to start the motion is sent to the motor control unit which is acknowledged by selecting a particular speed level. Motion of the vehicle starts and corresponding RPM of the wheels is displayed. The time required to cover the fixed distance is displayed. Wheel Speed Sensor data is used to obtain the covered distance and hence on comparison remaining distance to be covered is obtained.

The distance is calculated by considering the radius of wheels and sensor data using equation 1 given below. Signal carrying particular angle is sent to the Steering unit. During turn radius of curvature of the path and vehicle size is taken into consideration. Analysing the data obtained from sensor fusion and particular signal is sent to motor control unit and braking unit. By considering all the parameters preprogrammed path is traversed. Vehicle stops once the path is covered.

3.1 Block Diagram

The Fig. 2 shows the block diagram of path planning. The main block is the ECU of path planning system. The blocks to the left side represents the various input to the main ECU and these inputs are received through CAN bus. The blocks to the right represent the systems to which the actuating signals are sent through CAN bus.

Wheel speed sensor is used to calculate the distance covered by the vehicle. The calculated distance is compared with the actual distance and if it is greater than or equal to the threshold then signal is sent to the steering, braking, and motor control system. On detection of obstacles a signal is received through CAN bus and

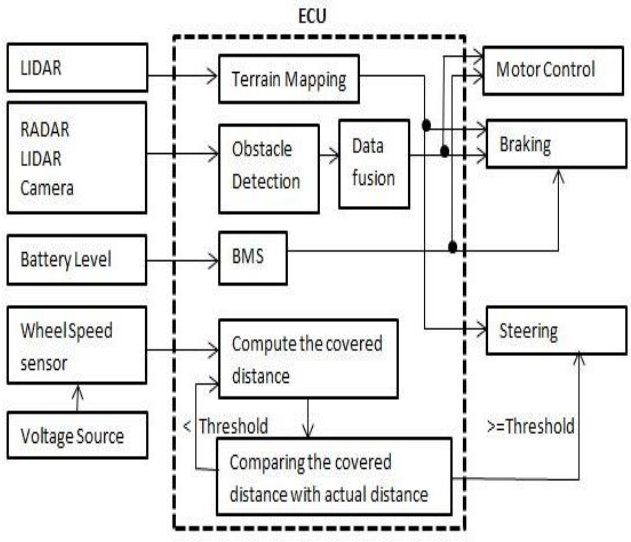

Fig. 1 Functional Block Diagram of Path Planning

corresponding action is taken and particular actuating signal is sent through CAN bus to the output systems. The data from the Battery Management System(BMS) system regarding the battery level is analysed and the signal is sent to the Motor control, and Braking system depending on the situation. The data from the terrain mapping is also analysed and sent to the motor and Braking control system. The respective acknowledgement is received from all the systems.

3.2 Mathematical Model

The formula to calculate the distance using Wheel Speed Sensor data is given as,

$$Distance = \frac{2*\pi*N*r}{T} \qquad (1)$$

Where, N = Number of pulses; r = Radius of wheel in metres; T = Total number of teeth's on the gear(if sensor is placed near the gear).

The formula to calculate the RPM of the motor is given as,

$$RPM = \frac{N * 60}{t} \qquad (2)$$

Where, t = Time.

4. ALGORITHM

The algorithm which is proposed for the complete traversal of pre-programmed path is simple and can be easily implementable.

1: **initialize** Distance of straight path(Ds), Distance of curved path(Dc), various
speed levels(L, M, H),Diameter of he wheel(d), straight path count(cs),curved
path count(cc),sensor status(s),constant(cst),total straight path(ts),total curved
path(tc),sensor value(sval).
2: cs = 0
3: cc = 0
4: **if** s == 1 **then** {Check the status of all sensors.}
5: Start the timer.
6: Start the forward motion.
7: Calculate distances(Ds and Dc) using the equation 1.
8: **while** Ds <= ts **do** {Continue until the straight distance is covered}
9: Forward motion
10: **if** sval < 0.52 **then** {check whether the metal is detected}
11: cs = cs + 1
12: calculate distance using equation 1.
13:**end if**
14: **end while**
15: Straight path is completed
16: Stop the motor
17: Take curve
18: Start curved motion
19: **while** Dc <= tc **do** {Continue until the curved distance is covered}
20: Curved motion
21: **if** sval < 0.52 **then** {check whether the metal is detected}
22: cs = cs + 1
23: calculate distance using equation 1.
24: **end if**
25:**end while**
26: Curved path is completed
27: Stop the motor
28: Take curve
29: cs = 0
30: cc = 0
31: Repeat from step 8 one more time to complete the path.
32: **end if**
33: Stop the timer and calculate RPM using equation 2

5. EXPERİMENTAL RESULTS AND DİSCUSSİONS

AV is designed to traverse the pre-defined path. It is the path of certain distance which is to be traversed by the autonomous vehicle considering all the test cases.
Parameters considered during implementation are represented in the Table1. The angle 230 degree is considered as the base angle i.e 0 degrees. Table2 lists the RPM of the wheel for the particular speed levels. The PWM value ranges from 0 to 1 i.e 0 to 255 is mapped as 0 to 1. The 3 different speed levels are shown, 0.06 being the minimum speed and 1 being the maximum speed.

Table 1: Parameters Considered During Implementations

Sl.No	Parameters	Values
1	Length of straight path (each side)	100m
2	Length of curved path (each side)	50m
3	Steering angles	230,240,260,335,70,48 (in degrees)
4	Diameter of wheel	14inches
5	PWM values	0.06(Low speed), 0.6(Medium speed), 1(High speed)

The proposed algorithm is also tested on the vehicle for the path which is shown below. The shown path has 100m straight path on both sides and a width of 3.2m with different turning angles in degrees.

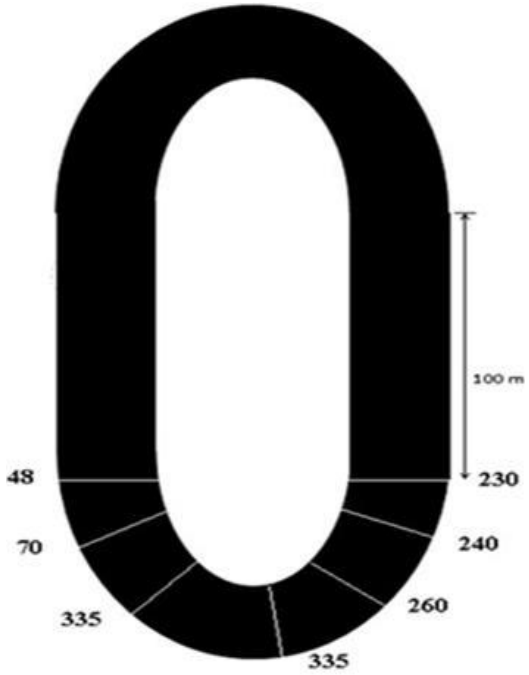

Fig. 2 Pre-planned Path

On the basis of battery level the autonomous vehicle is able to cover the preplanned path with all necessary calibrations. It alerts the braking and motor control system on detection of the obstacle. Along the curved path, the steering angle is sent to the steering control system to take the appropriate action and thus travelling the curved path. Table 2 lists the RPM of the wheel for the particular speed levels.

Table 2: RPM Values for Different PWM Values

PWM Values	Actual RPM	Calculated RPM
0.06	12	10.95
0.6	150	149.89
1	200	198.16

6. CONCLUSION

The vehicle traces the pre-defined path making it an autonomous vehicle. The vehicle detects the obstacle which it encounters in the path. The motion planning unit sends the steering angle in the curved path so that the vehicle takes the turn with the angle specified for steering. The braking unit applies the brakes on receiving the signal to apply the brake. Therefore, the vehicle behaves autonomous and traces the pre-defined path taking care of the various situations.

In future Global Positioning System (GPS) and Inertial Measurement Unit (IMU) can be included in the algorithm so that it works not only for fixed paths but also for other paths. IMU will help in obtaining the exact position of the vehicle. This will help mainly during taking turns.

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Performance Analysis of Low Power Linear-Phase FIR Filter by Reconfigurable Applications in Cascaded Form

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Abstract: In multiplier less FIR filter, tremendous effects came into existence to minimize the adders which are present in the multiplier block, for the sake of reducing total area of chip and consumption of power. If there are less no of adders in the multiplier block then there is no need to reduce the power consumption of power in a finite impulse response circuit. Here comes a power oriented method of optimization in a linear phase finite impulse response filter which is used in this system [1]. In search of discrete coefficient algorithm, we use the power index which has the mean adder depth in structural adders. The existing systems techniques uses transposed form configuration, the drawback are less efficiency and area complexity. Instead of searching for coefficient sets that reduces the adders as traditional algorithm, to find a coefficient set that minimize the AAD addition adder depth of SA's structural adders. By using stable and reconfigurable applications is developed to search for the discrete coefficients. As a result, area complexity reduces with increases performance and high efficiency is obtained [2,3]. XILINX system generator toolbox is required for circuit implementation.

Keywords: Transposed form FIR, Multiple Constant Multiplications(MCM), block processing, VLSI.

1. INTRODUCTION

A FIR filter is used in modifying the input signal in order for advancement in DSP systems. FIR digital filters are used in some applications of DSP systems; such as, speech processing, cancellation of echo, and various applications including software defined radio. Most of these applications requires FIR filter having large orders to satisfy the precise frequency criteria[1]. The no of multipliers adders required for the filter output will increase linearly with respective with the order of filter. The nodes will have battery power.

To extend or to increase the lifetime of a network these batteries should be used efficiently. The consumption of energy of every node differs with its communication state: mode of transmitting and receiving, sleeping or listing modes. Researchers have been working on the mechanism to extend the nodes battery lifetime. Whereas for deciding the node that should select for communication [3]. We use routing algorithm as energy efficiency. In signal processing applications filter coefficients remain constant very often. This features realization of multiplication. Finite impulse response filters is having two maintain the integrity of the specifications configurations, namely transposed form and direct form FIR filter.

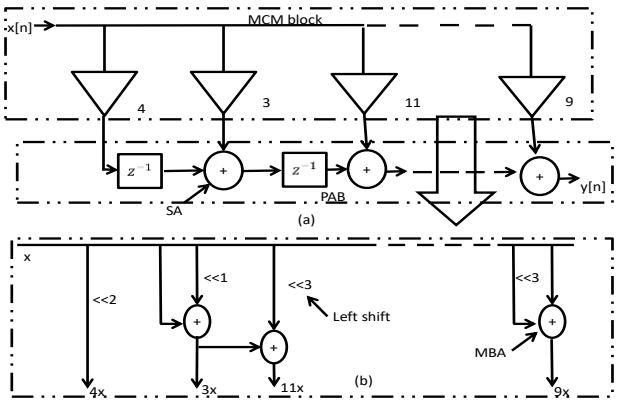

Fig. 1 (a) transposed direct form FIR structure

(b) Shift-add implementation of the MCM block

To store pre computed results we use lookup tables (LUT's) in DA based design. The transposed FIR in fig.1 needs only N delay units, N represents order of filter. Hence once can identify that the two columns of delays which tap off the center net and can be combined together since they are redundant. We notice the possibility of block FIR in transpose form to take over advantage of MCM method and pipelining for area, delay efficiently for large order.

1. The computational performance analysis of transposed FIR and deriving of rooted graph with reducing register complexity.
2. Using MCM technique for block implementation of stable FIR filter low complexity method is designed.

2. EXISTING SYSTEM

In the previous paper we have used multiple constant multiplication algorithms MCM. But we have used multiplier less multiple constant multiplication algorithms to decrease the area complexity of the chip. In the place of multiplication we have used shifting. From a circuit Fig.2, MCM dominates the complexity of the whole category of linear time invariant (LTI) systems. We have used left shifting it can be compared to the multiplier because we have to show the difference between the performance of FIR filter by using multiplier and multiplier less MCM algorithms. Therefore, the MCM problem is defined as the process of finding the minimum number of addition and subtraction operations. Because of increasing the demand in high – speed MCM algorithm is most preferable to obtain the low power optimization designs[4]. It is called RADIX-2r. It has so many advantages compared to the existing MCM algorithms, where AD (i) is the adder depth of i^{th} interval, N is no.of iterations of adder depth. We want to analyze to find the parameters like area,delay and dynamic power. The upper depth and average are known with exact analytic formulas.

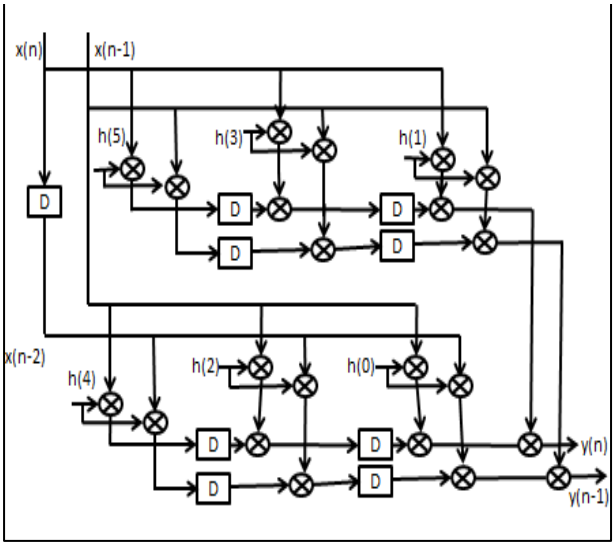

Fig. 2 Transpose form type-I configuration for block FIR structure

We want to compare the existing method to the design of FIR filter by using Wallace tree multiplier and Kogg stone adder. Because the existing method is multiplier less so we are to clearly explain the difference between performance analysis of FIR filter by using multiplier and without multiplier. The Wallace tree multiplier has to a fast way to multiply two binary integers[5]-[6].

Any multiplier has 3 stages:

1. Partial products
2. partial products addition
3. final addition

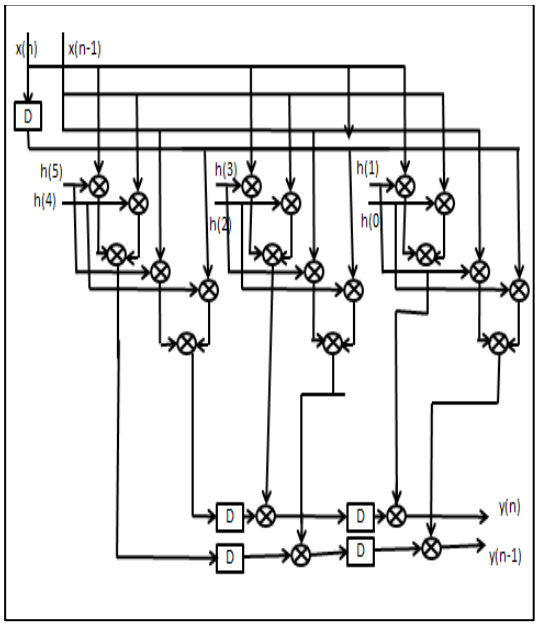

Fig. 3 Transpose form type-II configuration for block

Then the comparison between the FIR filter by using with a multiplier and without multiplier is shown in Table.1. In the Table 1, we considered the dynamic power as it gives information about the consumption of power in transistor switching. Static power is not considered because the static power is different for different IC families. We want to consider spartan6, its static power is 13.69mW.

Table 1: Comparison between WTM&KSA and existing method

Method	Delay(ns)	Area	Dynamic power (mW)
WTM&KSA	1.641	982	1.86
MCM	2.058	426	0.75

3. PROPOSED SYSTEM

The configured structure for block FIR is shown in Fig.4 for size L=4. Block size consists of one register unit, one selection unit, one IPU. It can be implemented by using N ROM LUT's and can be obtained in one

clock cycle. Where N is filter length. The M IPU's weight vector form CSU during K^{th} cycle. Each IPU has vector product of S_O^K with short weight vector. Where the duration of cycle is

$$T = T_M + T_A + T_{FA} \log_2 L$$

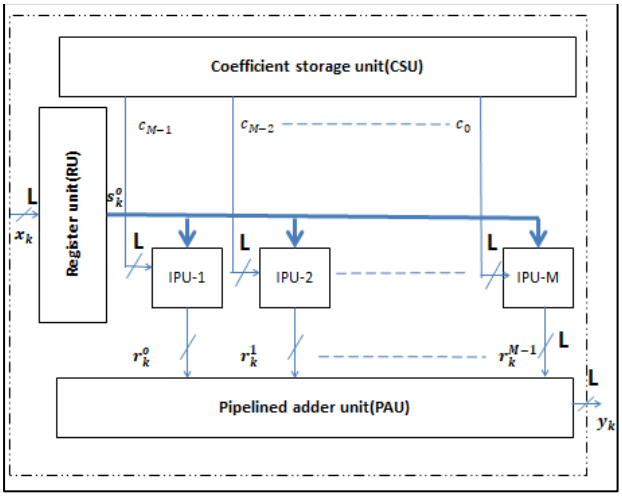

Fig. 4 Proposed structures

Then the equation of FIR filter is

$$Y(z) = z^{-1}.z^{-1}(z^{-1}.r_{m-1} + r_{m-2} + r_{m-3}) \ldots\ldots + r_1 + r_0.$$

Where $r = S_O^K$

For low complexity realization multiplications are required to map to the MCM units. We will show that proposed formulation for MCM based implementation of block FIR can on make using symmetry in input to minimize no of shift-add operations in MCM blocks.

4. RESULTS AND DISCUSSIONS

To implement the stable and reconfigurable coefficients Transpose form and also in cascaded form, FIR filter is simulated using Xilinx Tool. The family of integrated circuit is spartan6 and the code will be written in behavioral structure. The area (no. of LUT's and flip-flops clock buffers and I/O buffers), delay and power were analyzed for reconfigurable circuits. Dynamic power also compared because the real power is observed in on-board but we consider only simulation that's way we can analyze the performance of the dynamic power. It is constant at that IC family, so we are not considering the static power. In Fig.5 experimental result of FIR filter, it is a simulation result of reconfigurable coefficient transposed form FIR block with two coefficients. The input given to the filter is 00000101 and the output achieved for the filter is 0001101100110100. The delay for the reconfigurable filter is 1.64ns. The delay of the direct form is 2.94ns.

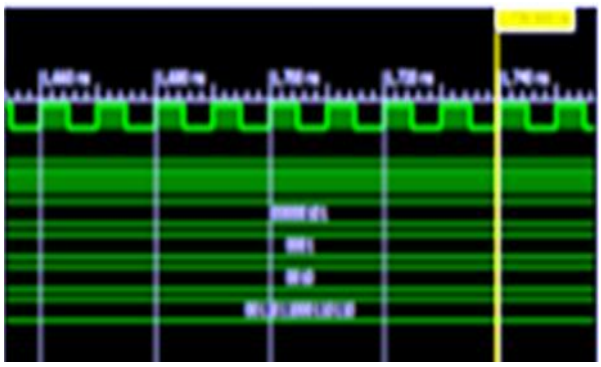

Fig. 5 Experimental Result of FIR Filter

The LUT'S utilized in the reconfigurable FIR is 135; the flip-flops are 52, no of bonded input/output buffers 25 and slices 70. The LUT'S, Flip-flops are reduced when compare with direct form. The length of the reconfigurable transposed form and cascaded form FIR filter is increased 8-bit, 16-bit, 32-bit and 64-bit. Then the comparison of area, delay and dynamic power is shown in below Table 2.

Table 2: The result comparison between reconfigurable transposed form and cascaded form of FIR filter

Length	Method	Delay (ns)	Area	Dynamic power (mW)
8-bit	Reconfigurable	2.446	294	0.45
	Cascaded	3.425	256	0.46
16-bit	Reconfigurable	3.312	312	0.96
	Cascaded	4.243	292	1.05
32-bit	Reconfigurable	4.562	384	1.86
	Cascaded	5.247	342	1.95
64-bit	Reconfigurable	5.963	419	2.73
	Cascaded	6.524	364	2.95

The graphical representation of reconfigurable transposed form FIR filter at different lengths is shown in fig.6.

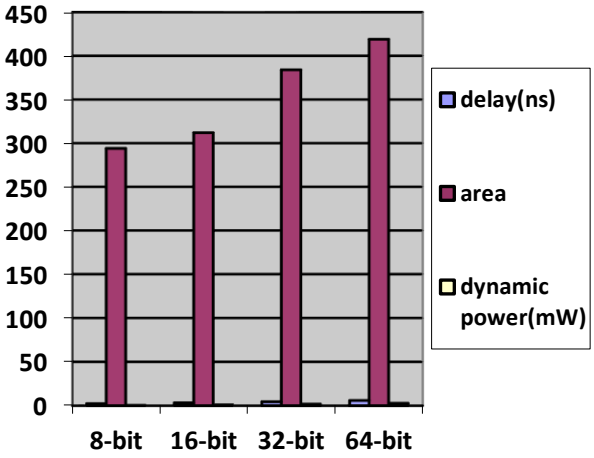

Fig. 6 Comparison of Delay, Dynamic power and Area

5. CONCLUSION

The design of cascaded form FIR and reconfigurable coefficient of transposed form FIR filter. At its nature transposed form FIR filter is a pipelined structure, in reconfigurable coefficients. MCM technique implementation is a bit difficult. But in reconfigurable coefficients transposed form FIR filter, the area and dynamic power can be minimized up to some extent by using MCM technique. In reconfigurable transposed form FIR filter we use the multiplier design, the structure which we have implemented. i.e., transposed form FIR filter will have less area and dynamic power compared with direct form FIR. In future delay can be further minimized by applying various techniques in transposed FIR filter.

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Real Time Object Detection and Localization: Autonomous Vehicles

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Abstract: Obstacle detection plays a major role in autonomous vehicles which has to be performed at high speed with good accuracy with constraints in computational resources. To solve this we choose MobileNet_SSD neural network and performed experimentations to increase its performance. We initially carried out testing of MobileNet_SSD with standard convolution networks like YOLO, Faster R-CNN and Fast R-CNN. Therefore to improve the performance of MobileNet_SSD in terms of speed and accuracy we choose optimal values of its parameters such as image input resolutions, aspect ratio. We carried out tests on different versions of MobileNet (v1 & v2) and SSD on COCO and ImageNet Datasets. Later we considered different test cases to evaluate MobileNet_SSD. Finally, we demonstrate the factors responsible for best trade-off between speed and accuracy. PASCAL VOC Dataset was trained on SSD300 and SSD512 architectures to validate the SSD framework. We successfully performed object detection on test cases such as in-motion frames, multiple-objects. For smaller input image size SSD outperforms other single stage methods in terms of accuracy.

Keywords: MobileNet, SSD, Faster R-CNN, COCO.

1. INTRODUCTION

Autonomous vehicles have the potential to significantly reduce road-accidents, making them a safer transportation mode. Object detection is required to see the surrounding and to navigate through it and hence becomes an important part Autonomous Vehicles. To help to this cause, object-detection has to be light-weight and low on system resources, so that there won't be any lag in computation and the obstacles are detected instantaneously. According to Wei Liu, et. al [2] depthwise separable convolutions becomes the base for MobileNets which was initially introduced by L. Sifre et. al [13], and later used in Inception models [14] to reduce the computation in the first few layers. Related papers on small networks consider accuracy, but do not pay attention to speed. Faster RCNN which is one of the fastest high-accuracy detectors, processes only 7 frames per second (FPS). After AlexNet [15] brought deep convolutional neural networks to fame by winning the ImageNet Challenge: ILSVRC 2012 [16], Andrew G. Howard, et. al [1] came up with Convolutional neural networks. To obtain higher accuracy the focus has been to make deeper and more complicated networks. These changes may improve the accuracy but on the other hand affect the size and speed of the network. However in many real time applications and augmented reality, the recognition tasks has to be performed in a timely fashion on a computationally limited platform. To solve object detection more complex methods are required compared to image classification. Recently, Ross Girshick, et. al [3] came up with deep ConvNets [15] which have significantly improved image classification and object detection accuracy. Due to this complexity, currently e.g., [17, 18, 19] models are trained in multi-stage pipelines. Based on the above observations, the mentioned methodologies focus only on accuracy but not speed. To address this gap, we present techniques for tweaking MobileNet_SSD and finding optimal values for its parameters to increase its object detection performance. We performed experiments on MobileNet [1] and SSD [2] to obtain better trade-off between speed and accuracy. Furthermore, by improving the speed of object detection we can have positive effect on many computer vision applications.

2. METHODOLOGY

For the purpose of object-detection for Autonomous Vehicle, we needed a light-weight detection and classification platform. We explored various neural-network Architectures like Fast R-CNN[6], Faster R-CNN[7], Yolo[8] and SSD[1-2]. As our vehicle had very less system resources to allocate for the object-detection task, we choose MobileNet since it has lower footprint on the computational requirement. We use MobileNet as the base network, which extracts high-level features along with SSD as detection network. MobileNet architecture is more suitable for mobile and embedded based vision applications where there is lack of computing power. We trained the two variants of

MobileNet Architecture v1 & v2 with COCO and ImageNet Dataset having 80 classes, with 80,000 and 50,000 training images respectively. Mobile architecture uses Depthwise separable convolutions as shown in Fig 1. Batch Normalization (BN) and ReLU activation functions are applied after each convolution.

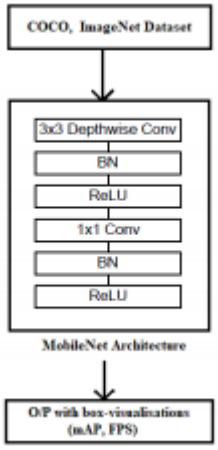

Fig. 1 MobileNet Architecture

Fig. 2 depicts spatial convolution done separately on every channel of input called depthwise separable convolution. Here, over each input channel a single filter is applied and in pointwise convolution a 1×1 convolution filter is later used to generate a linear combination of the output of the depthwise layer. Performance of MobileNet is better than other CNNs because of the use of Depthwise Convolutions, which has the following advantages: 1. It reduces the number of parameters involved. 2. Total number of Floating point multiplications are reduced which decreases the requirement of computational power These factors make MobileNet favorable for mobile and embedded vision applications. MobileNet has two hyper parameters to adapt the architecture to our needs, 'α' – the depth multiplier which changes how many channels are in each layer and 'ρ', which denotes the aspect ratio of input frames. 'α' of 1 corresponds to the default number of channels in the convolutions. Some of the options are 0.75 and 0.5.

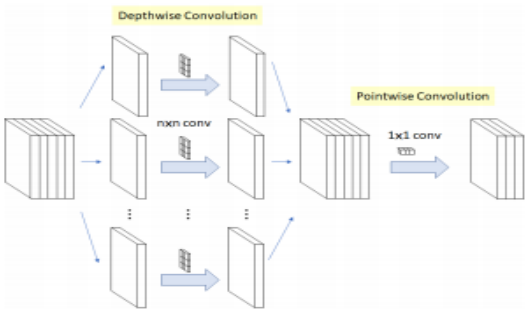

Fig. 2 Depthwise Convolution Architecture

Computational costs and also the number of channels can be decreased by decreasing the number of channels We used mAP (mean average precision) and FPS (Frame per second) metrics to measure and compare the performance of object-detection modules. FPS is calculated by the system considering the number of frames it processes per second, while mAP calculation is based on the accuracy of predictions.

On the other hand, Input image size has significant influence on the speed and accuracy of neural networks. Henceforth, there arises a need to find an optimal value of input frame size by considering the factors of camera resolution and aspect ratio. SSD detector requires the input images to be in the aspect ratio of 1:1, meaning they should have same height and width. We can't specify a fixed custom ratio for this architecture, but we can vary the image sizes which are fed to the network, and hence based on results obtained from experimentation, optimal values can be chosen to increase the performance. MobileNet performs better for embedded applications because of the innovation in depthwise separable convolutions. We experimentally validate that MobileNet_SSD outperforms Faster R-CNN and R-FCN in accuracy and speed metrics.

3. EXPERIMENTAL RESULTS AND DISCUSSIONS

3.1 Quantitative Analysis

Here, we study the performance of MobileNet_SSD relative to standard convolution networks like Fast R-CNN, Faster R-CNN and YOLO. Experiments were carried out to examine and understand how components of MobileNet_SSD affect the performance. We tested SSD_MobileNet and other CNNs on "07++12" dataset. Experimentation was performed on two models of SSD, which are SSD300 (default 300x300 low resolution input image, faster) and SSD512 (default 512 x 512 input image, higher resolution, more accurate version). Taking into account the results obtained as shown in Table 1, we can infer that SSD512 performs better than the other Convolution Networks since it has the highest mAP of 74.9 among other CNNs.

Table 1: mAP metric for different CNNs

Detection network	Dataset	mAP
Fast R-CNN	07++12	68.4
Faster R-CNN	07++12	70.4
YOLO	07++12	63.5
SSD300	07++12	72.4
SSD512	07++12	74.9

COCO dataset was trained on SSD300 and SSD512 architectures to validate SSD framework. It has 80 classes with 80,000 training and 40,000 validation

images. The results obtained for different versions of MobileNet_SSD relative to speed (ms) and mAP metrics is depicted in table 2.. Here v2 scores better than v1. To obtain a system without memory constraint the inverted residual bottleneck layers in MobileNet v2 is used. But in particular, we can infer that SSD_512_MobileNet_v2 outperforms other tested versions.

Table 2: Comparison of performance of V1 and V2

Model Name	Speed (ms)	mAP
SSD300_Mobilenet_v1_coco	31	22
SSD300_Mobilenet_v2_coco	37	24
SSD512 MobileNet v1 coco	28	18
SSD512 MobileNet v2 coco	39	21

In SSD, we cannot specify a fixed custom aspect ratio for input frames (default value is 1:1). The general guidance is to preserve the aspect ratio of the original image while the image size can be of different value. Therefore, we varied the image sizes to find out the best possible performance in SSD network as shown in Table 3.

Table 3: Performance of CNN for different Input resolutions

Module	mAP	FPS	Input resolution
Faster R-CNN (VGG16)	72.3	4.5	1024 x 1024
	73.2	7.1	1000 x 600
	73.1	12.3	480 x 480
	74.8	14.7	300 x 300
SSD300	74.3	22.3	1024 x 1024
	68.7	18.9	1000 x 600
	71.7	34.5	480 x 480
	72.8	46.1	300 x 300
SSD512	72.4	11.2	1024 x 1024
	64.5	14.3	1000 x 600
	69.8	28.7	512 x 512
	72.9	36.4	480 x 480

We found out that the FPS varies accordingly to the input frame size, i.e. inversely proportional to the frame size. For SSD in particular, reducing the image size by half in width and height lowers the accuracy by 15.88% on average but also increases processing time by 27.4% on average.

3.2 Qualitative Analysis

The results obtained on MobileNet_SSD for custom dataset are shown in Fig 3.

Fig. 3 MobileNet_SSD results for custom dataset

MobileNet_SSD handles in-motion frames as shown in Fig.4, thus providing robust object detection. This turns to be a vital advantage for Autonomous Driving vehicles since it has to deal with images while in motion.

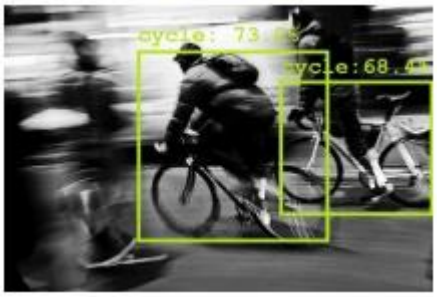

Fig. 4 Detection by MobileNet_SSD

In case of multiple objects in the frame, MobileNet_SSD performs better by detecting most of the objects in the frame than other CNN. Fig. 5 shows the result obtained on R-CNN, where it only detects larger objects. Fig. 6 shows the same frame processed by MobileNet_SSD where even smaller objects are detected

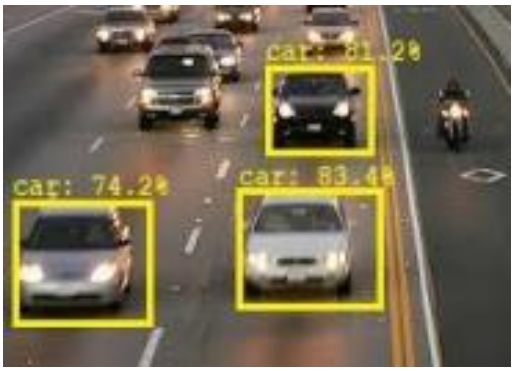

Fig. 5 Multiple object detection by R-CNN

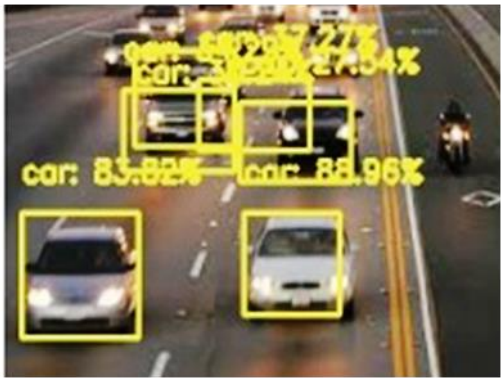

Fig. 6 Multiple object detection by MobileNet_SSD

Successful Detection of multiple objects in the frame would also be helpful in solving Object Counting problems of Computer vision.

4. CONCLUSION

The MobileNet_SSD has been used for the task of embedded object detection, and experimentally validated that it performs faster than standard CNNs like Fast RCNN, YOLO. We also found out the optimal values of input image size, SSD variants and backed them up with mAP and FPS calculations. We successfully performed object detection on testcases such as in-motion frames, multiple-objects. We performed the tests on an Intel i5 powered host computer with NVidia 940MX GPU. These results highly depend on hardware configuration, and hence should be treated as relative speeds. Because of the innovation of depthwise separable convolutions, MobileNet does 9 times less computational work, maintaining the same accuracy compared to than other standard neural network. SSD on MobileNet has the highest mAP among the models targeted for real-time processing. Since it requires less than 1 GB memory for processing, it has the lowest footprint on system resources. SSD with MobileNet provides the best accuracy for small objects whereas, it performs relatively bad for larger objects.

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Multi-Focus Image Fusion Using DT-CWT, Curvelet Transform and NSCT

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Abstract: The method of combining images having different focus depths to get an image with full information is known as multi focus image fusion. For good enhancement and to get all the information in one image, different methods have been used before. To extract features accurately for multi focused image data, this paper involves new image fusion methods based on Dual Tree-Complex Wavelet Transform (DT-CWT), Curvelet transform and Nonsubsampled Contourlet transform (NSCT). The parts of the image set which are not in focus can be made available in a single image. Apart from this, good clarity and good contrast can also be obtained from fused image. From the results of statistical evaluation parameters demonstrated for the image pairs, the results of the used techniques can be found and are compared with each other.

Keywords: Curvelet Transform, DTCWT, Image Fusion, Multi Focus, NSCT

1. INTRODUCTION

The procedure of combining images to get a single image by using a fusion rule is known as image fusion [1][2]. The usage of image fusion in current image processing systems is increasing, because of the increased number of applications and development of image acquisition techniques. There are many conventional image fusion algorithms. These can be classified as (i) Arithmetic combination and band ratio, such as Brovey and Synthetic Variable Ratio, (ii) projection and substitution methods, as Intensity-Hue-Saturation color fusion, and Principal Component Analysis fusion, and (iii) the wavelet fusion techniques [8].

Image fusion can be done using two main methods – Transform domain and spatial domain. Spatial domain methods lead to spectral distortion in the fused image. In later stages, the spectral distortion will become a drawback. Spectral distortion can be reduced by using transform domain methods for image fusion. The multi focus image analysis has its importance in digital photography. Previously the discrete wavelet transform (DWT) has been in use for fusion. But the discrete wavelet transform can retain only the horizontal and vertical features. NSCT is a multi scale and multi directional method which can be implemented in image fusion [6]. The filters in both the Pyramid and the directional filter banks are upsampled. This reduces the shift invariance problem, but a new problem arises in the form of aliasing effect. In order to retain features from different angles and to avoid aliasing, the curvelet transform is useful [3][4]. This method shows a better performance in enhancement and contrast of the fused image compared to other methods of fusion.

In this paper, a curvelet transform fusion is proposed to obtain appreciable clarity and the results are compared with DTCWT and NSCT. This paper is arranged as follows: Section 2 describes the dataset used, Section 3 describes the methodology for DTCWT, curvelet transform and NSCT, Section 4 discusses the results of the demonstrated parameters and spatial analysis of fused images and Section 5 concludes the paper.

2. IMAGE DATASET

The multi focus image data pairs involve different focus depths of the same image. The focus depth can be changed based on focal length, distance to object and aperture. This depth of field helps to see the features clearly on focused areas. But the remaining features in unfocused area remains blur. So the same image with different focus depths is considered for image fusion. The input test image pairs are shown in Fig. 4.

3. METHODOLOGY

3.1 DT-CWT fusion

The DT-CWT has two discrete wavelet transforms, separating the real and imaginary parts of transform into two trees. The real part of this complex wavelet is obtained as the difference of two separable wavelets and is oriented at -450 and +450. Four more oriented real wavelets in the direction of +750, -750, +150 and -150 can be obtained. The real oriented 2D dual tree transform is the real part of the complex dual tree wavelet Transform. The Imaginary part of complex 2D

wavelet is similar to that of its real part oriented at -450. In this transform, there will be two wavelets in each direction and produce six such distinct directions. A perfect reconstruction is done as the filters are chosen from a perfectly reconstructed bi-orthogonal set. It is applied to images by using complex filtering in the two dimensions. The multi focus fused image offers good spatial fidelity compared to DWT techniques [7]. The methodology of DTCWT based image fusion is shown in Fig. 1.

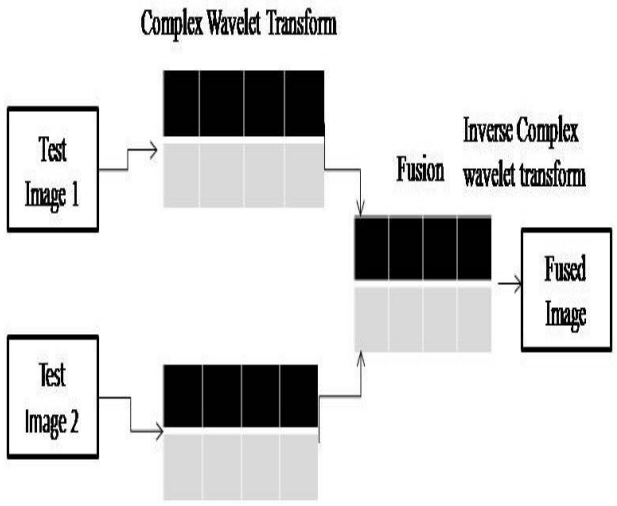


Fig. 1 Architecture of Dual Tree Complex Wavelet Transform (DTCWT) Image Fusion

The test image 1 is a histogram matched with the test image 2. The complex wavelet transform is applied to test image 1 and test image 2 which are focused at different regions. In complex wavelet transform, two DWT with different filters are used. This decomposes the image into two approximations subbands and six detailed subbands. The two approximation subbands has the low frequency components which are filtered using two different opposite direction filter. The six detailed subbands have high frequency components, which are symmetrically opposite in direction. The approximation subbands are fused using averaging fusion rule and the detailed coefficients are fused using the maximum method. Now to get the fused image in the original form, the inverse complex wavelet transform is applied.

3.2 Curvelet Fusion

Curvelet transform is the most suitable technique for multi focus image fusion. The curvelet transform is the multi scale transform with directional elements. In this, with the variation of scale, the degree of localization with orientation varies. So it is like an extension of the wavelet transforms [5]. The use of the curvelet is to represent the curve as a superimposed function of variable lengths and widths. A second generation curvelet transform based on wrapping is used for image decomposition. The process of curvelet image fusion is shown in Fig. 2.

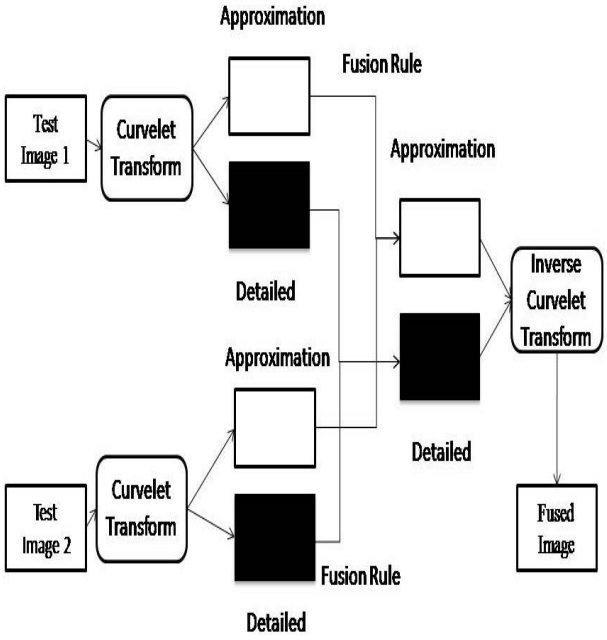


Fig. 2 Architecture for Curvelet Image Fusion

The test image 1 of multi focus image set is resampled to the size of test image 2 using a bilinear interpolation technique. Curvelet transform is performed to both test image 1 and test image 2. Both the images are decomposed into the detailed and approximation coefficients. The coefficients of high frequency of the decomposed image are fused using a fusion rule called maximum method. The coefficients of low frequency of the decomposed image are fused using the minimum method. Inverse curvelet transform is performed to obtain the fused image.

3.3 NSCT Fusion

NSCT is multi-direction and multi-scale in nature in which the images can be divided into two stages. The two stages are nonsubsampled directional filter bank and nonsubsampled pyramid. At each level of pyramid decomposition, one low frequency image and one high frequency image can be produced with the help of multi scale property using two channel filter bank. The low frequency image is further decomposed into subsequent nonsubsampled pyramidal decomposition. It results in m+1 sub image, which consists of one low frequency image and m high frequency images having same size as that of the input image, where m denotes the number of levels of decomposition. The nonsubsampled direction filter bank is a form of two channel nonsubsampled filter bank with the directional filter bank. The direction decomposition is performed in n stages for high frequency image from nonsubsampled

pyramid at each scale. It produces 2n directional subimages which have same size as that of the input image.

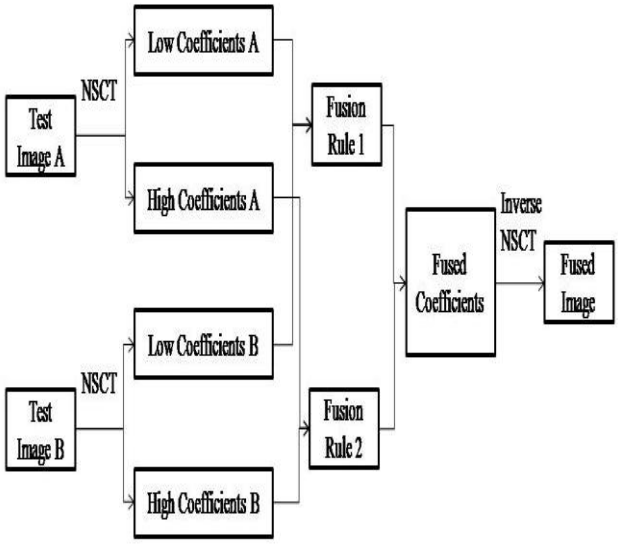


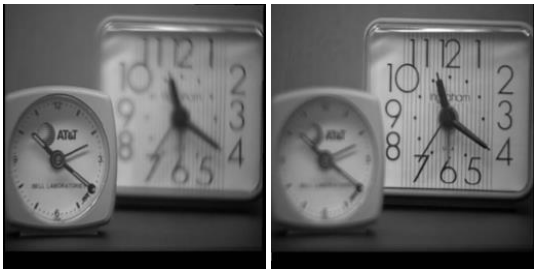
Fig. 3 Architecture for NSCT Image Fusion

Firstly, NSCT is applied to the test image A and test image B to get low frequency and high frequency coefficients. The high frequency coefficients of image A and the high frequency coefficients of image B are fused with the help of a decision map for maximum value. Then the low frequency coefficients of image A and the low frequency coefficients of image B are fused by calculating the mean. Now, an inverse NSCT is applied on the fused low frequency and high frequency coefficients to get the fused image. The process of NSCT image fusion is shown in Fig. 3.

4. RESULTS AND DISCUSSION

The output of the fused images based on three methodologies is shown in fig. 5 and fig. 6.

(a) **(b)**



(c) **(d)**

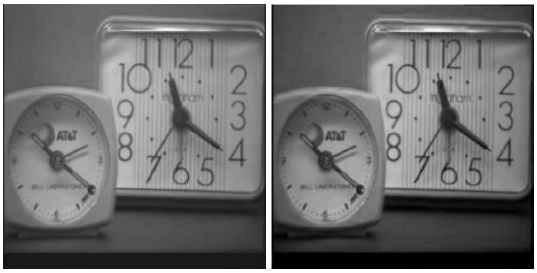
Fig. 4 (a), (b) Test image 1, Test image 2 of Image pair 1 and **(c), (d)** Test image 1, Test image 2 of Image pair 2.

(a) **(b)**

(c)

Fig. 5 (a) DTCWT Fusion, **(b)** Curvelet Fusion and **(c)** NSCT Fusion of Image pair 1

Based on visual and statistical parameters, the fused images are compared. It is observed that the fused images shows good clarity and contrast of multi focused images. The comparison of visual of images indicates that the curvelet image fusion shows good contrast and clarity of letters on plane with less amount of blur compared to that of other techniques.



(a) **(b)**

(c)

Fig. 6 (a) DTCWT Fusion, **(b)** Curvelet Fusion and **(c)** NSCT Fusion of Image pair 2

Also the contrast features present in the clock images are retained in a good manner and are highly visible in curvelet fused image compared to the other method's fused images. The correlation coefficient gives the measure of strength of the relationship between the original image and the fused image. The value of correlation coefficient is from 0 to 1. Entropy is used to calculate the amount of information present in an image. High entropy means high amount of information is being retained. RMS Error represents the amount of error between the fused image and the original image. The low value of RMSE represents better performance. Average Gradient describes the amount of visual information present in an image.

Table 1: Statistical Evaluation of image fusion of multi focus image pairs

Statistical Parameter	Fusion Technique	Test image set 1 (planes)	Test image set 2 (clocks)
Correlation Coefficient	DTCWT	0.9749	0.9787
	Curvelet	**0.9800**	**0.9797**
	NSCT	0.9799	0.9786
Entropy	DTCWT	0.0328	0.5183
	Curvelet	**0.0390**	**0.6544**
	NSCT	0.0202	0.4919
RMS Error	DTCWT	11.1339	10.7071
	Curvelet	**9.8481**	**10.3915**
	NSCT	9.8963	10.5382
Average Gradient	DTCWT	25.0064	62.4578
	Curvelet	**35.7532**	**62.8775**
	NSCT	35.0183	61.9511

From the results, the values of correlation coefficient for curvelet fused images are high compared to the other methods. This means the curvelet fused images retains information from original images effectively and there is a good relation between original test images and fused image. The values of entropy for curvelet fused images are also high compared to the other fused images. It means they have more information in comparison to other methods. The RMSE values are low for curvelet fused images when compared to DTCWT and NSCT fused images. The low value of RMSE is an indication of less amount of error is present between the original images and fused image. The high average gradient values of curvelet fused images shows that the more visual information is present in them.

5. CONCLUSION

With the help of statistical parameters considered for fused image evaluation, the performance of DTCWT, curvelet and NSCT is evaluated and compared. The high average gradient, entropy and correlation coefficient values shows that the visual information, contrast and clarity are good for the curvelet fused image. The low RMSE of curvelet fused image indicates that the data is concentrated around the line of best fit for fused image. Overall, the curvelet transform produced good results, compared to DTCWT and NSCT for the fusion of multi focus images.

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Monitoring, Controlling and Power Sources for Digital Terrestrial Television Transmission in Rural India

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Abstract: The rural India is the backbone of the country's development in aspects of farming and small-scale business. For improving the livelihood in rural and remote areas the government of India implemented many programs. The main focus of these programs is to improve the education, health, transportation and communication systems in rural areas. These benefits reach to people the mass communication is playing a vital role. Prasar Bharati introduced many regional and national channels for welfare of society and rural development. For wide-ranging communication in rural and remote area Prasar Bharati introduce the digital terrestrial Television (DTT) Transmission for TV broadcast with best quality. In remote and rural area major challenges is Power supply and monitoring. In this paper, we are reviewing the DTT transmitter, power requirement, monitoring and proposed solution for DTT transmitter in rural and remote area for improving the services.

Keywords: Mass communication, Prasar Bharati, Digital terrestrial Television, Transmitter, Power, monitoring.

1. INTRODUCTION

Rural and remote area development is the precursor to overall development of India, where more than 70% of the country's population is living in the villages and remote areas. The rural population has the major contribution in nation's development through agriculture and farming. On other side the development in rural and remote area is very slow due to poor information system [1]. Government of India introduced many programs in education, health, transportation and communication for improving the livelihood in the villages and remote area in last few years. On the same path Prasar Bharati a public broadcaster under government of India introduces many regional and national channels in rural and remote areas. The Prasar Bharati introduced terrestrial television broadcasting domain exclusive for rural India, which is broadcasting Doordarshan TV channels and All India radio through traditional methods of broadcasting. The Doordarshan is covering 92.6% population in 81.0% area through analog terrestrial TV services, which have major challenge for low quality videos. For improvement of transmission along with the better quality Prasar Bharati introduce the Digital terrestrial television transmission system for rural and remote areas [2-3].

Even today in India more than 200 TV channels are available on DTH and cable service network, still in rural areas population are depending on Terrestrial TV broadcasting, which is major contribution of Doordarshan for rural development. The Terrestrial broadcasting is more effective and economical for delivering media services in remote and rural areas across the country. It is playing a key role for information broadcasting in rural India and playing key role in safety and protection. The Digital Terrestrial transmission is one step forward for improving the services and quality of Doordarshan services in rural and remote areas. The main advantage of terrestrial digital transmission system, it can carry more than one TV channels with high quality with crystal clear picture and sound. On other side the digital transmission system has less power consumption compare to analog transmission system. For development of digital terrestrial transmission system in rural or remote area the major challenge is skilled manpower for operation and maintenance. The other challenge is regular power supply in rural and remote area in case of grid connectivity. In rural area the power supply regularity is very poor, so for transmission systems back DG set is required. The overall cost of operation for Digital terrestrial transmitter will be high. In this study, we are considering the monitoring and power challenge for digital terrestrial transmitter in rural or remote area and alternative solution for power generation and monitoring system. In Section-2, the brief about digital terrestrial transmitter, section-3, monitoring and power challenges, Section-4 alternative solution

for power and monitoring and finally we conclude the paper.

2. DIGITAL TERRESTRIAL TRANSMITTER (DTT)

The digital terrestrial transmitter is more efficient technology for use of TV spectrum for providing the better-quality image and sound for end users in urban, rural and remote areas. Digital terrestrial transmitter is one of the best supporting solutions for upcoming broadcasting services such as Mobile TV, Radio and TV channels within the bandwidth of 7 or 8MHz. In DTT the single frequency can be used to cover the large geographical areas with high quality of TV channels. Other side the main advantage of DTT transmitter over the analog transmitter is less power consumption in operation [4].

India is large pollution country with different regional languages and cultures. The Prasar Bharati providing the regional TV and FM services across the country with different transmitters in rural and remote areas. The analog TV or FM transmitter is coving the small geographical area only. For improving the services in large area Prasar Bharati upgrading analog transmitters with digital terrestrial transmitter for better quality of video and sound in remote and rural areas. Digital terrestrial transmitter has the potential for community TV services along with community FM services in rural areas. The FTA DTT services are more economical and effective platform for rural and remote India. Digital terrestrial transmitter also an important communication tool for disaster management during emergency in rural and remote areas. So, Prasar Bharati along with government of India is working for development of DTT services across the country for rural and remote areas services[4].

3. MONITORING AND CONTROL SYSTEM

The digital terrestrial transmitter technology provides the best conditions for operators or viewers to meet the requirement at full satisfactory. Prasar Bharati implementing number of DTT transmission stations in different area for improve the coverage of Television across the country with best quality videos. At the same time operation cost and reliability of small stations is major challenge in rural and remote areas. For minimize the operation cost government proposed unmanned stations for remote areas. For unmanned station the stability and reliability are the challenge due to grid power connectivity. The same time monitoring and control of operation and synchronization also a big challenge. To improve the stability and reliability of the monitoring system the real time monitoring system is required at every station. The main functionality of monitoring system is visualizing of all major components in global control centre. So that maintenance, electrical source status, integration of different electrical sources based on the demand, control of operations for cooling and report generation etc can be done. The monitoring and control unit generate the alarms at control centre if any fault occurs [5]. The monitoring systems have different parameters to control the transmission are as follow [6]

- RF Power measurement
- Power amplifier Power measurements
- DC Power supply measurements
- The performance of exciter circuits
- Coolant Temperature
- Status of heat exchanger
- Report of faults
- Electrical grid status
- DG parameters
- Status of alarms
- Solar Power plant parameters

The control parameters for controlling units are

1. Integration of Electrical power sources
2. Reset of alarms
3. Programming scheduling
4. Operation control of DG
5. Voltage and frequency control
6. Cooling control
7. Set the common faults
8. Operation and control of Solar power plant
9. Control of slew rate
10. Remote shutdown

The proposed monitoring and controlling system block diagram are shown in figure-1 for digital terrestrial transmission for remote and rural areas.

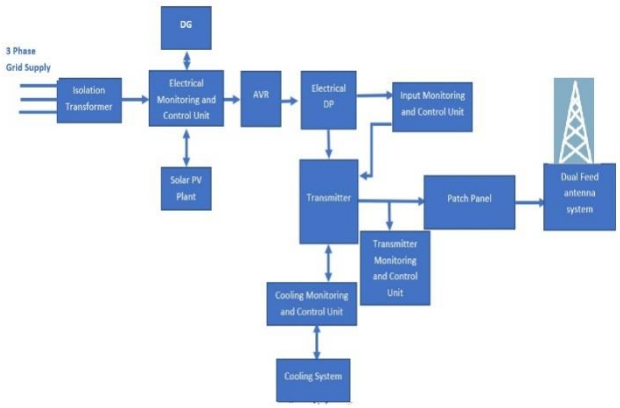

Fig. 1: Block diagram of monitoring and controlling system for DTT

4. ELECTRICAL POWER SOURCES

In rural or remote areas, the electrical power supply from the traditional electrical grid connectivity, stability and reliability is very poor due to long transmission lines. The terrestrial transmitter installed with grid connectivity along with back of DG set. In rural or remote areas, the maximum power cuts due to over electrical demand on the rural feeders, the DG set is providing the back-power generation for the transmitter. In case of power back from DG set economically operation cost increases for small transmitter and the availability of fuel also difficult in remote areas. As the government of India is promoting renewable energy sources for village and remote electrification. The solar power plant can provide the power backup for daily operation in daytime for digital terrestrial transmitter. The synchronization of solar PV power plant with grid connected mode is proposed in the study with bidirectional metering at grid side. During off grid mode the solar power plant is integrating with DG set for fulfill the electrical demand. During synchronization of Solar power plant with DG Set the fuel consumption of DG set is decreasing due to maximum load is shifting on solar power plant and only 30% of total load demand is shift on DG set. In Figure-1 the block diagram for grid, DG set and Solar power plant integration is shown. The integration of three different sources is control by power monitoring and controlling devices [7].

5. CONCLUSION

The TV broadcasting in rural area is major challenge in India due to poor video and audio quality, for improvement of visibility in remote and rural area Prasar Bharati introduce digital terrestrial television transmission. For implementation of DTT in rural area the major challenge is operation cost, stability and reliability of the transmission system due to poor monitoring and power supply from grid. In this study we are proposed different level of monitoring and power supply from solar power plant. The study is review on different parameters of monitoring and controlling of digital terrestrial transmitter in remote areas. Different control and monitoring devices are sharing the continue data with global center.

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Moving Zone Based Routing Protocol Using V2V Communication in VANETs

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Abstract: Vehicular Ad-hoc Networks (VANETs) are an emerging field where vehicle-to-vehicle communications can enable many new applications such as safety and entertainment services. Most VANET applications are enabled by different routing protocols. The design of such routing protocols, however, is quite challenging due to the dynamic nature of nodes (vehicles) in VANETs. To exploit the unique characteristics of VANET nodes, we design a moving-zone based architecture in which vehicles collaborate with one another to form dynamic moving zones so as to facilitate information dissemination. We propose a novel approach that introduces moving object modeling and indexing techniques from the theory of large moving object databases into the design of VANET routing protocols. The results of extensive simulation studies carried out on real road maps demonstrate the superiority of our approach compared with both clustering and non-clustering based routing protocols.

Keywords: Moving Zone, Vehicle Clustering, Mozo Routing Protocol, VANETs.

1. INTRODUCTION

The vehicles communicate with one another to design a large network in which the vehicles behave as the network nodes. Using VANETs different types of information such as traffic conditions, advertising news and e-coupons can be apportioned between vehicles. The V2V Communication also provides a broadcast material which is intended both to entertain and inform which is nothing but Infotainment. It makes available of multimedia services to subscribed vehicles in a specific location.

For the understanding of VANET applications the important requirement is the accessibility of efficient and effective routing protocols for message spreading. To meet these issues some of the existing protocols are broadcasting protocols [1], Route-Discovery protocols [2]-[4], Position based protocols [5]-[6], Clustering based protocols [7]-[8].The broadcasting protocols count on large message spreading ,creates high communication overhead. To avoid these, the broadcast storm reducing techniques have been developed [10]. The Route discovery protocols are not appropriate for applications which involve timing constraints because it is necessary to find a route before sending a message using these protocols. The vehicles were required to send messages to other vehicles travelling towards the final destination of the message in position based protocols. Hence the overall communication becomes of higher cost. In Clustering based protocols the vehicles were divided into clusters and require only cluster heads to enable neighboring information. All these protocols make an effort to achieve the mobility of VANET nodes in a simple way and gives comparatively stable units.

2. EXISITING WORK

In This section we first briefly review the works that are related to clustering based protocols and then we will discuss two approaches namely CDBRP(Clustering-Based Directional Routing Protocol) and BRAVE(Beacon-Less Routing Algorithm For Vehicular Environments) Since they have been used for comparison in our study. The algorithm developed by Kayis and Acraman [11] involves clustering only when the data is to be transmitted. The vehicles travelling within the similar speed interval form a cluster and a cluster head is the vehicle which claim to be the cluster first . Chen et al [12], used only the distance between vehicles as the clustering criteria. In this the vehicles which are closed to each other are grouped in the same cluster. A Priority-Based clustering algorithm proposed by Wang et al [13] calculates priority based on its approximate travel time and speed deviation. The vehicle which is having lengthy travel time and less speed deviation is given a higher priority. This method needs uninterrupted communication between vehicles. All these approaches were mainly focused on evaluating the stability of generated clusters and does not provide any routing algorithm to provide efficient message routing.

3. PROPOSED MODEL &WORK

In this section a self-organized moving-zone based architecture is formed to send messages in VANETs using pure vehicle to vehicle communication. As shown in the figure1 the moving zones were denoted by a cloud symbol and message propagation route is indicated by arrows. The moving-object techniques enables us to give a practical cluster-based representation. In this method the vehicles are assembled together based on their actual moving patterns. This approach eliminates the necessity of updating frequency in which vehicles were no longer need to send location updates to the cluster heads. The captain vehicle in this protocol has the ability to reckon vehicle positions so that the decisions were made without using constant location updates from member vehicles. The use of indexing eliminates the necessity of the captain vehicle to contact and inspect every member vehicles for each operation. This proposed method overcome those limitations which were discussed earlier. In this paper we create the following new contributions. First to the previously proposed architecture we give an extension by giving detailed algorithms for zone construction and zone maintenance. Second we compare with two representative approaches which are nothing but one clustering based and other is non-clustering based. The two representation approaches are CBDRP and BRAVE. In CBDRP protocol each road is divided into equal length segments. The vehicles are assembled in one cluster which are in the same road segment and moving in the same direction. The vehicle which is closer to centre of the clusters is the cluster head. The BRAVE protocol reduces the message overhead and this approach choose an optimistic routing method. The vehicle which has a message to send out will broadcast the message to its one hop neighbour and each neighbor receiving the message will send back a response message.

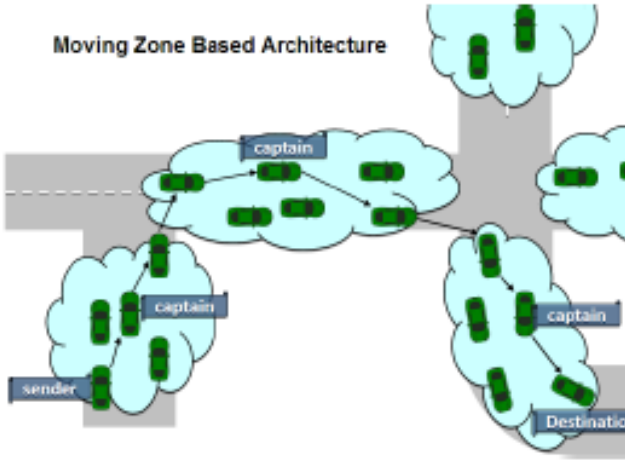

Fig.1 Moving-zone based architecture

The Moving-Zone Based architecture has several moving zones which are formed by the vehicles involving same movement patterns. For each zone a captain vehicle is selected and it is responsible for managing information of the other member vehicles and message spreading. Assume that each vehicle is provided with On-Board unit for networking and a GPS and a digital map. We represent the road network as a graph in which the edges the denote the roads and vertexes the intersections. The moving zone development begins when a vehicle enter on to the VANET. The zone forming principle is arranged based on the similarity of vehicle movement. The moving objects index which is maintained by the captain vehicle will command up-to-date information about all its member vehicles. The vehicle Vs enters the VANET and sends a hello message which consists of a unique identifier Vs, current road ID (IDr), moving direction (δ)to its one-hop neighbours. The captain vehicle receives the hello message if it is moving in the same direction and gives a reply to the corresponding vehicle which consist of its unique identifier V_{cap}, current location l,Speed v, and the next intersection where it is going to.

3.1. The Mozo Routing Protocol

If the vehicle has a bit of information (I) that is likely to share with vehicles around location l(x,y),the overall the routing protocol is as shown below

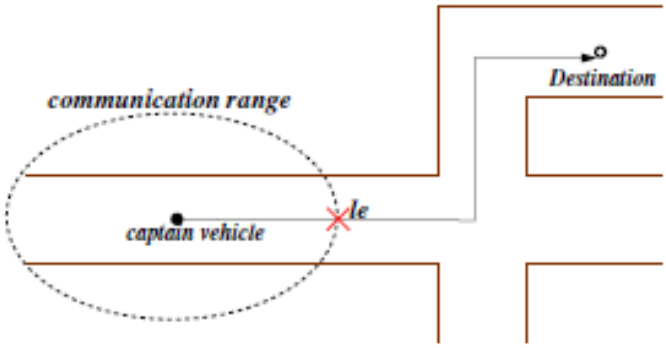

Fig. 2 Computation of Message Delivery Route

The routing protocol consists of the following steps

1. The sender vehicle sends a message to the captain vehicle in the form of (IDs I, l(x,y)) where I is the message and l(x,y) is the location of the message destination.

2. After receiving the message the captain vehicle checks the message destination. It also checks whether the message destination is within its moving zone or not. If not it searches for the member vehicle which is closest to the message destination. If the message is present in the current moving zone the captain vehicle will drop the message to the member vehicle at the location which is near the message destination.

3. The selected propagation vehicle (Vp) is responsible for sending the message to the vehicles in nearby moving zones, if the message is received. This will use the previously stored information about captain vehicles. Vp arrange the vehicles in ascending order of their distance to the message destination. As soon as Vp receives responses it selects the captain vehicle which is on the top of the sorted list and sends out the message.

4. The captain vehicle starts the functions defined in step2 in case the captain vehicle from a different moving zone receives the message from Vp.

Message Routing

Vehicle Vsender:

1. Send M =(IDs; I; l(x; y)) to its captain vehicle Vc

Captain Vehicle Vc:

2. Receive message M

3. If l(x; y) inside the zone

4.Vreceiver <- SearchCLV-tree(x,y,δ)

5. Send message M to Vreceiver

6. Else

7.compute intersection point le(x0; y0)

8.Vp <- SearchCLV-tree(x',y',δ)

9.Send message M to Vp

Vehicle Vp:

10.Receiver message M

11.Sort the captain vehicle list

12.For each V c in the captain vehicle list

13. If V c is available and move towards l(x,y)

14.Send message M to V c and done

15. Ping neighbors

16. For all responding vehicles

17. Find the V p closest to and move towards l(x,y)

18. Send message M to V p

Vehicle V p:

19.Receive message M

20.If V p is a captain vehicle

21. Conduct operations from step 2

22.Else

23.Send message M to its captain vehicle V c

24. V c conduct operations from step 2

End Protocol.

4. EXPERIMENTAL RESULTS

The tests were conducted using the Network Simulator NS-2(version 2.35) and vehicular mobility simulator SUMO (version 0.23.0). NS-2 executes 802.11 physical and MAC models for vehicle-to-vehicle communication and maximum transmission range is set to 500m. The simulation was run for 50seconds to insert all vehicles and the vehicles were allowed to move around the network for a bit. After 50s, the vehicles issue message requests and the total simulation time is 200s. The maximum attempts to deliver the message is set to 3, and each message will be kept for maximum 15s in the message queue for delivery. The beacon interval in other two approaches is set to 2s as reported in [18]. The zone splitting threshold is set to 30%, and the weight value assignment for trajectory prediction is: wc = 0.5, wm=0.3, wf =0.2, which have been identified to be the best parameters.

4.1 Effect of number of messages to be delivered

Assume that the number of messages to delivered from 100 to 500 in the VANET with 800 vehicles to evaluate the performance of routing protocols. When the number of messages increases the delivery rate decreases slightly as shown in the figure. If we send the message requests simultaneously, Mozo achieves better delivery rate.

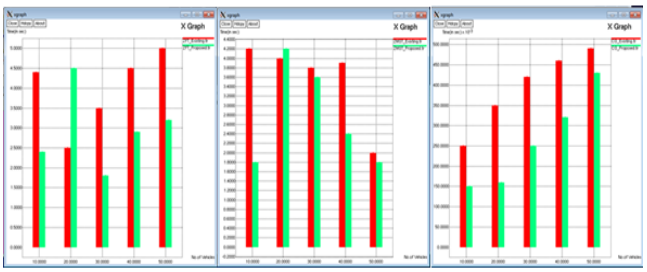

Fig. 3 Results

5. CONCLUSION AND FUTUREWORK

This paper presents Vehicle-to-Vehicle communication and Vehicle-to-Infrastructure using a moving zone based architecture and a corresponding routing protocol for message spreading. This study is applicable to moving object techniques to vehicular networks. The moving object modeling and indexing techniques have been purchased in various tasks including zone construction and preserved as well as information spreading. The proposed approach greatly

minimize communication overhead and improves message delivery rate collate to other survive methods.

6. ACKNOWLEDGEMENT

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Internet of Things (IoT) Based Smart Home Automation and Security System

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Abstract: Internet of Things is developing innovation that makes our reality more intelligent. Now-a-days, the home security is fundamental as a potential results of interference are growing well ordered. Security has turned into a significant issue everywhere. This project is easy, observing and adaptable home control by utilizing an embedded server with IP network and remotely utilizing Android-based mobile application. This project is an IoT based system and Home automation, by utilizing IoT, we can control and monitor different applications like Temperature, light intensity, humidity, gas, fire, motion and image from anywhere with the help of internet. It can identify the people who are in the home, with the assistance of the sensor. The focus of this project is to give preferable security system over the present level of security in the home.

Keywords: Internet of Things (IoT), Arduino IDE, Node MCU, PIR sensor, Temperature Sensor (DHT11), Thingspeak.

1. INTRODUCTION

Observing facilities will be essential and helpful for our day by day life, since it is significant for us to consider our security. This work created a system, which is sorted out with an incorporated web server, exceptionally verified cameras, Wi-Fi gadgets are associated with the web [1]. A particular server is situated in a focal point of our project, which is called Integrated Server, which intermittently getting the recordings from some surveillance cameras through the private system. Such recordings are transmitted from the cameras to the server [2]. The Integrated Server requires organize cameras to transmit video at an examining rate and packs the video to MPEG at that point aggregates a progression of them in the capacity. These system catches data and transmits the live video streams by means of Wi-Fi remote handset for IoT module to a Smart telephone individual application by utilizing the web [2].

1.1 Existing system

Raspberry pi works and live video streams and controls movements of the persons and records it for future playback [2]. It can detect the number of people situated with the assistance of the PIR sensor. At the point when the Motion is distinguished, the pi camera starts recording and the Raspberry pi gadget alarms and send the live streaming video to the registered smart phone.

1.2 Disadvantages

In this paper it only detects movements and number of persons present in the room and then sends the information to the mobile [2]. In my project, I additionally add modules i.e., temperature and humidity sensor, fire sensor, gas sensor, relay modules [3].

2. PROPOSED MODEL & WORK

The system consists of NodeMCU as a main processing unit for the entire system and all the sensors (DHT11, MQ2, KY-026, HC-SR501, LDR) and devices can be connected with the Node MCU. To the Node MCU the sensors are connected & operated by it and it is used to retrieve the data and processes the analysis with the sensor data and updates it to the cloud through a Wi-Fi module [4].

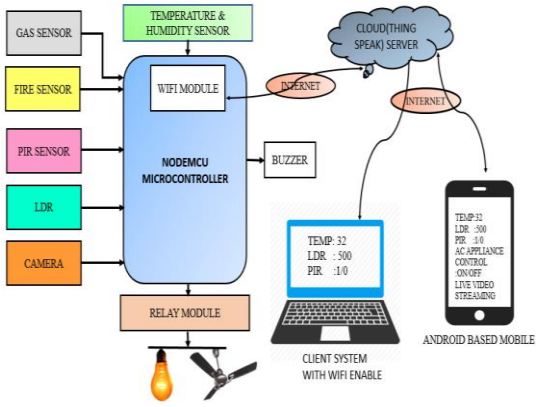

Fig. 1 Block diagram of IoT based Smart Home Automation and Scrutiny System

The main theme of this project is to monitor and control the home appliances using IoT. For security purpose, we use PIR sensor and camera. If any person enters the house, then a PIR sensor will detect the movements of that person then automatically camera ON. It captures the person image and sends to the web server through NodeMCU. Using IoT platform, Android apps we can monitor the sensor parameters from anywhere in the world with the help of Internet facility [4]. If sensor readings are abnormal and entered person is unauthorized then we can control some appliances (fan, bulb, AC, buzzer) and sends an alert to the user using IoT concept [5].

2.1 NodeMCU

The NodeMCU is a WiFi board dependent on the ESP-12E module. NodeMCU is the open source Internet of Things (IoT) stage. It fuses firmware which is continuously runs on a ESP8266 Wi-Fi SoC from the Espressif frameworks, and equipment which relies upon the ESP-12 module. The "NodeMCU" is referred to as firmware which is opposed to the advancement pack. It enables you to program the ESP8266 WiFi module with the simple Arduino IDE.

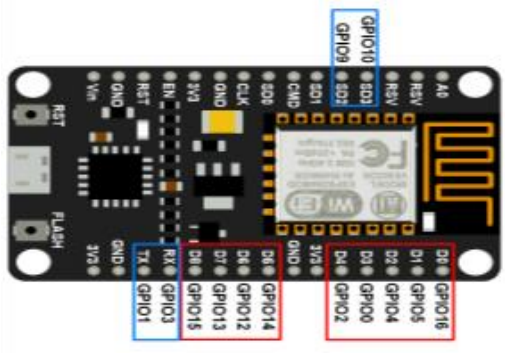

Fig 2: NodeMCU

2.2 ThingSpeak

According to its Developers, ThingSpeak is the open source, Internet of Things(IoT) application and programming interface to store and recover information from things utilizing the HTTP protocol over the Web or by means of a LAN. ThingSpeak empowers the making of area following applications, sensors logging applications and the social network of things with the status updates.

3. FLOWCHART

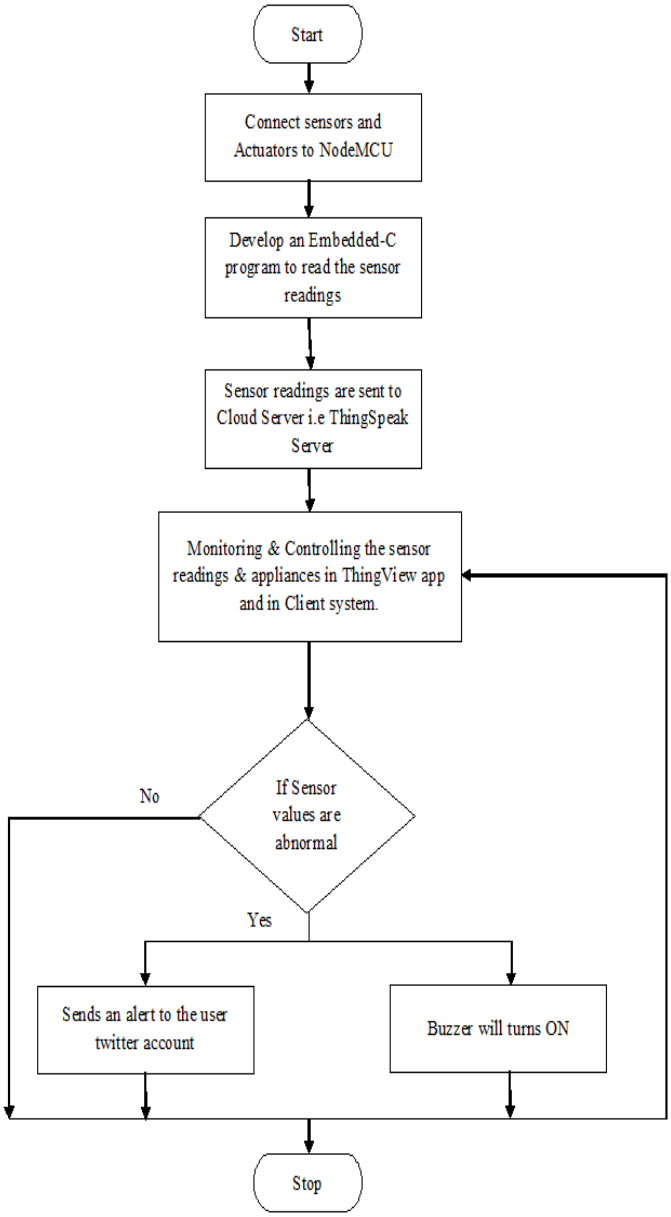

Fig. 3 Flow Chart of the Proposed System

4. IMPLEMENTATION RESULTS

4.1 Temperature and humidity Sensor

It gives current Humidity and Temperature sensor values of the room and can display on mobile phone using thingspeak app or Blynk app. Depending on the values of the sensor, we can control fan from anywhere.

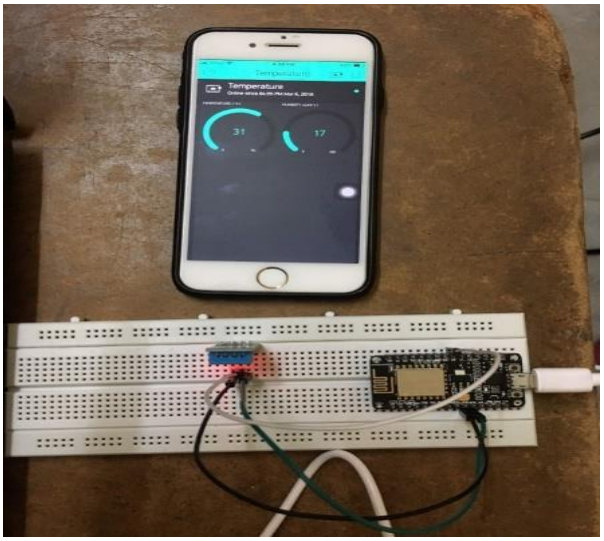

Fig. 4 Observing the current Temperature and Humidity in Arduino IDE software

4.2 Gas sensor

It detects the gas (LPG) and smoke and gives the alert when it increases the Treshold value.

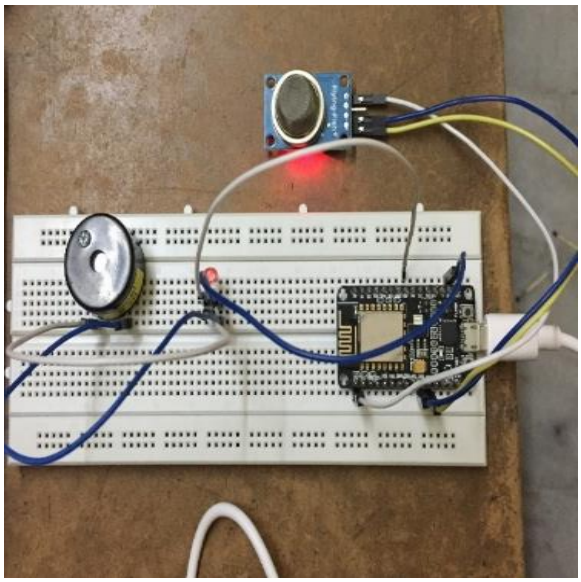

Fig. 5 Observing the Gas Leakage detection in Arduino IDE software

4.3 Fire Sensor: It detects the fire, when a fire is put near to this sensor it will gives the indication to the mobile while sending a mail through wifi module.

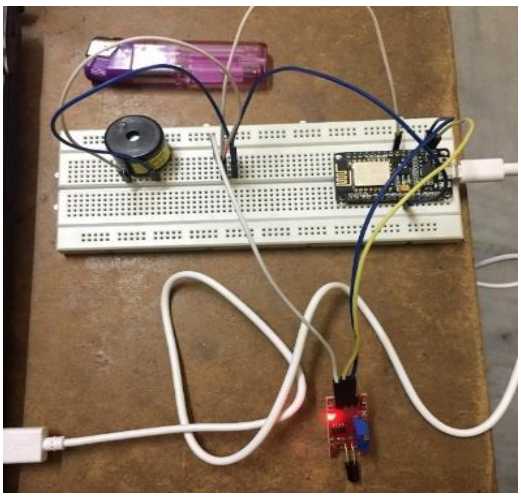

Fig. 6 Detection of fire using Fire sensor

The web service application that we use here is Thing Speak, which is an open source, Internet of Things (IoT) that enables us to collect the sensor data and to store data in the cloud.

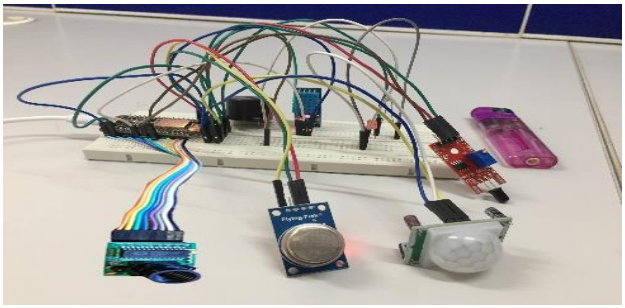

Fig. 7 All sensors and Camera are connected to the NodeMCU and observing the results

5. CONCLUSION

This system is appropriate for continuous home monitoring, controlling the AC appliances and providing security (capturing the images) to the home using IOT. Monitoring the parameters like humidity, Temperature, light intensity, gas, fire, water level, motion and image from anywhere with the help of internet. The smart security system is capable of capturing video/recording/image and transmitting to a smart phone in the presence of the internet. If data is abnormal then authorized persons to get a notification via e-mail. By using android based apps we can monitor and control the home appliances. The system might be utilized in numerous spots like banks, hospitals, labs, workplaces and so on that drastically curtailed the danger of unapproved entry.

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A Novel Framework to Detect Suspicious Packages Using Object Detection Techniques

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Abstract: One of the main tasks of security in public is to make sure no unattended articles are left anywhere, ensuring that no unwanted articles are left where they can harm people. Most of such articles are bags, boxes or other such similar articles. For a place such as a metro where every 15 minutes people depart or arrive an unattended article left behind is inconspicuous and usually not noticed. This paper devices and application to set a timer on such articles using object detection. This timer alerts if an article is in such a fast-moving vicinity for too long so as to alert the guard to fetch the article and check. This ensures not only less lost property but also people's safety. In previous papers mentioned in the literature survey the Object detection is used to di eventuate between different object. In this project is built a customized object detection system which only detects people and belongings such as a bag, backpack and other such carriers using YOLO (You Only Look Once) algorithm in a dark ow environment using python. It then sets a timer on those carriers if the timer exceeds a limit set by the user it sends an alert to the user.

Keywords: Object Detection, Dark OW, OpenCV, Classification

1. INTRODUCTION

Surveillance cameras used in modern day are cheap and multipurpose. The ad-vantage of surveying an area is that it can help achieve some measure of safety especially in public places like the station or airport. Terrorist attacks are usually carried out using unattended packages left in public area; these packages usually carry explosives which can act a large amount of people. A key feature of this surveillance system is to keep track of such unattended packages and report it to related authorities. This can also be considered a study in human behavior which is one of the most reached topics using video surveillance [3]. Especially an automated object detection using surveillance helps in increasing vigilance in aspects of consumer used software for security [1]. The primary goal of this application is to take a real-time feed and with high accuracy complete the task of object detection of unattended articles and trigger appropriate action while monitoring the area. Sometimes the computational powers can be challenged when put through surveying moving objects and ever-changing scenarios. Problems like punctuation of lighting, change in place and distance of target, frequency of people, and obstruction due to other variables involved make it into a complicated task. This paper concretes on the simplified version of these problems which maintaining an applicable solution for public surveillance.

As video surveillance can provide many clues we will try to use and keep take of people who brought the packages into the public area and the package itself and try to link them together to use for future use. And also create an alarm system which can keep track of all the triggered articles.

2. LITERATURE SURVEY

In the past few years, the real time object detection and Image processing has become an active area of research and several new approaches have been pro-posed

2.1 You Only Look Once: Unified, Real-Time Object Detection

In this paper, they exhibited YOLO, a new proposal towards object detection. Earlier, classic use to perform detection re-purposely [2]. Alternatively they drafted object detection as a regression problem to associated class probabilities and spatially separated bounding boxes. Bounding boxes and class probabilities are predicted directly from full images in one evaluation by a single neural net-work. It can be improvised peer-to-peer straightly on detection performance as it is a single network of whole detection pipeline [4].

The basic YOLO model is capable of processing 44 frames per second of real time images [6]. Whereas, smaller version of YOLO named fast YOLO can process 155 frames per second. In comparison to the artistic detection systems, YOLO is less accurate in predicting false positives on background leading to the localization errors. In the, YOLO is capable of learning object representations in general way [5]. But it dominated other methods like R-CNN and DPM in case of generalizing (natural images to

artwork).

2.2 Study on Object Detection using Open CV Python

In this paper, it is said that Object detection is very familiar computer technology. It mainly connects with image processing and computer vision (CV) focusing on detecting objects or an instance(s) of a special c class (such as cars, humans, pedestrians) in real time images and videos. Object detection has various applications like face detection, suspicious activity detection, etc. Python 3.0 library OpenCV is used to improve the accuracy and efficiency of object detection as exhibited [10].

2.3 Image Processing and Object Detection

In this paper they tried an efficient way to handle and process image character is-tics captured from a camera like web cam or CCTV using library functions [7]. This library functions mainly load an image, save image, create windows at run time to hold image, and differentiate on the basis of color. They have also decreased the distortion by applying function to threshold the output image [8].

2.4 The Darknet and the Future of Content Protection

In this paper future darknets have been analyzed and classified in technical and legal perspectives. Darknet as a distributed framework will continue to face setbacks as speculated by this paper, anyways the darknet will be into use [9]. By keeping this theory in mind, they analyzed the importance of protecting content.

3. METHODOLOGY

3.1 OpenCV

Open Source Computer Vision Library (OpenCV) is an opensource library which was a research project under Intel in year 1985.And under Berkeley Software Distribution opensource license. It is a meant to solve problems regarding computer-vision. Its structuring include high level algorithms such as pedestrian detection, face detection, feature tracking and feature matching. In 2010s update GPU acceleration support was added. A significant amount of library functions are affected by this update and is still under development. Library functionality's significant part is covered by GPU module which is still under active development; Implementation of this is done using CUDA to interact with CUDA ecosystem which includes libraries such as NPP (NVIDIA Performance Primitives). With no need of training in GPU programming user can avail the benefits of GPU acceleration from the GPU module. Adopting OpenCV (CPU version) is easy comparatively. Memory model is the most important out of all.

3.2 YOLO

YOLO is one of the methods to achieve Object Detection. In this the Object Detection is listed as a regression problem. YOLO in one evaluation using a single neural network predicts directly from full images the class probabilities and spatially separated bounding boxes. In this paper the base YOLO model processes image in real time at 25 frames per second.

3.3 Unified Detection

Object Detections separate components are unified into a single neural network. To predict the bounded boxes the network uses the all features depicted in the image. The image id rst divided into a grid of S x S where each cell is used to predict class probability C and bounding boxes B and the confidence value for all the bounding boxes.

3.4 Network Design

In this paper the implementation is done on Python while the model used is the convolutional neural network (CNN). The network has 24 layers in CNN in which two of them are fully connected. Using an alternate layer of 1 x 1 helps reduce the feature space using in the predicting layer. We half the resolution for pretrain in the layers of CNN while twofold it for the detection phase

3.5 Training

In this data-set iteration/batch training is 9798 with 0.370096 total losses. Average loss error is 0.45192. The current learning rate is 0.001000 in the .cfg file. Total time sent per process is 3.3 seconds. Total amount of images is 9778 * 64 that is 627072 images. Using 1000-class competition dataset in ImageNet on the implemented layers of CNN this paper pretrains the weights. For this pertaining this paper uses the one to twenty layers in CNN; which follows an average-pooling layer further following a fully connected layer. This paper uses this training to perform detection.

3.6 Interface

One evaluation of the network is enough for predicting detection using a test image. And because of this unlike classifier-based method YOLO is extremely fast. Using a bounded box prediction imposed by a grid design YOLO curbs the spatial diversity.

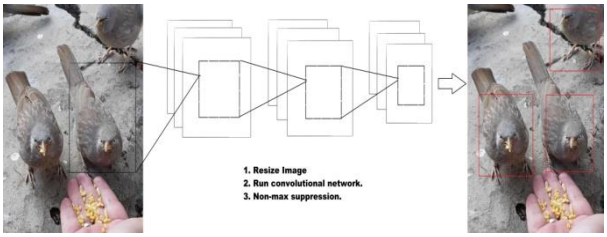

Fig. 1. YOLO Detection System

4. RESULTS

In this paper the objective is to detect objects like hand bags, back packs and other carriers which are found to be suspicious due to the fact that the objects were left for exceeding a certain period of time. This experiment was conducted on pre-trained weights available on YOLO website.

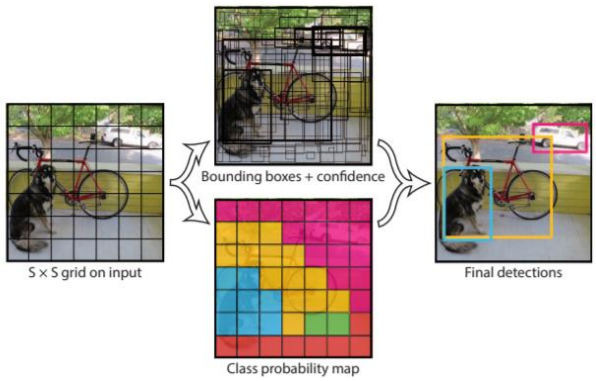

Fig-1 Model of YOLO

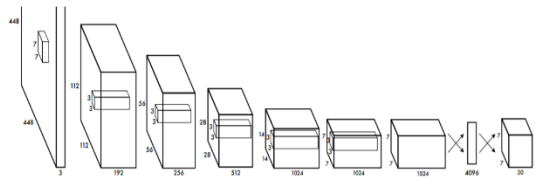

Fig-2 Architecture of YOLO

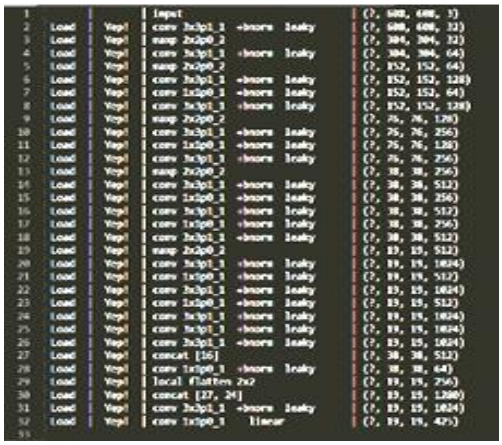

Fig-3 Configuration shown in detail

4.1 Configuration using YOLO

In this paper for YOLO we use one input proceeded by a pair of convolution layer and max pool layer. There are total of 23 Convolution layers and 5 max pool layers. This configuration also one local flatten 2x2 and two concatenation layers.

The confidence of this configuration is 77.58%.

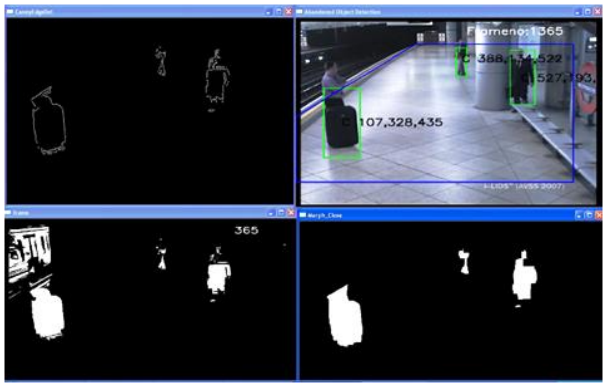

Fig-4 Showing object detection

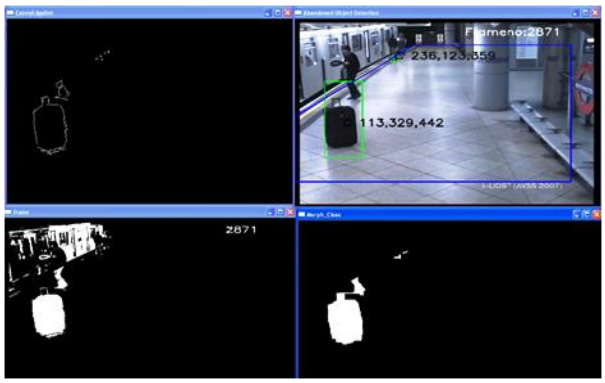

Fig-5 Showing object detection of abandoned bag

4.2 Object detection

Using a log every object is kept track of with the help of a corresponding id. Figure 5 shows object detection in one of the captured scenes.

4.3 Alert System

After an object has been detected and categorized as abandoned; the bounding box of the object on the camera flashes to show an alert. The object alert flashes as 'CheckObject' with its co-ordinates.

Fig.6 Shows alert on the camera

5. CONCLUSION AND FUTURE SCOPE

This paper explains the concept of keeping track of abandoned objects and how to implement a real time application based on this concept. This prototype uses object detector powered by deep learning and has proven high accuracy even in high complex situations like shopping malls, airports, railway stations, etc. The baggage is tracked and when it is abandoned the authorities are alerted. This leads to a safer pubic area since abandoned bags are the major tools of terrorist attacks.

Future development for this application may include a fire sensor system and an owner tracker system. The fire sensor will help in timely notification to the authority in case of fire accidents. The owner tracker system will help in easily finding lost baggage(s) and tracking terrorist activities.

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Analysis of Different Types of Code Converters Using Xilinx

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Abstract: The global technology has evolved drastically and machines are playing a major part in the development. Everything is getting digital in this fast moving world. It will not be wrong to say that human beings are co - existing with machines. However in order to operate a machine, we need a language or a code which is machine readable and acceptable. This is where we introduce the concept of coding. Coding is a process to convert the input information in a machine-readable language. It primarily protects the information from getting stolen or interrupted and makes the data user friendly. It is also done to make hardware implementation feasible.Many complicated operations take place in a machine or any performing peripheral which requires certain specific codes on which it will specifically work, code conversion is required in situations like this. This paper deals with the designing of 4-bit binary to gray code converter, 4 bit binary- to -gray, 4- bit BCD-to-excess 3 and 4 -bit gray to binary code converters by applying data flow modelling. Xilinx ISE software is used for testing the code converter.

Keywords: Coding, machines, converter, binary, gray, Xilinx

1. INTRODUCTION

The code converter is a combinational circuit i.e., a circuit whose output depend upon the input of the current time which performs interconversion between codes of one form to another. Converters has been used in concepts of digital electronics and devices like microprocessor or computers. These are basically encoders and decoders which convert data in encoded form. This paper designed the truth table and logic diagram followed by verifying the results of 4 bit binary- to -gray, 4 bit BCD-to-excess 3 and 4 bit gray to binary code converters by applying data flow modelling[1]. The work is implemented using Xilinx software. The Xilinx ISE is a software which is a platform to design and analyse HDL design.

2. TYPES OF CONVERTERS

The truth table and logic diagram of various types of code converters are given below:

Binary to gray code

The gray code is used in Karnaugh map as it differs in one bit position only. The gray code is primarily used as counter successive approximation ADC. In this conversion the logic circuit is designed using xor gate.

Table 1: Truth Table for 4-bit Binary to gray code converter

DECIMAL NO.	B(3)	B(2)	B(1)	B(0)	G(3)	G(2)	G(1)	G(0)
0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0	1
2	0	0	1	0	0	0	1	1
3	0	0	1	1	0	0	1	0
4	0	1	0	0	0	1	1	0
5	0	1	0	1	0	1	1	1
6	0	1	1	0	0	1	0	1
7	0	1	1	1	0	1	0	0
8	1	0	0	0	1	1	0	0
9	1	0	0	1	1	1	0	1
10	1	0	1	0	1	1	1	1
11	1	0	1	1	1	1	1	0
12	1	1	0	0	1	0	1	0
13	1	1	0	1	1	0	1	1
14	1	1	1	0	1	0	0	1
15	1	1	1	1	1	0	0	0

Logic Diagram:

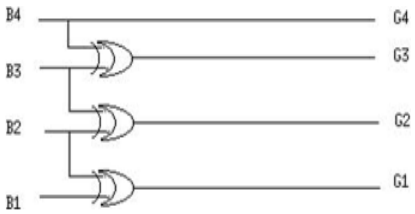

Fig. 1 Logic diagram for 4 bit Binary to gray code converter

2.1 BCD To Excess-3 Code

The excess-3 is an unweighted self complementary BCD code. Logic circuit is designed using not & and gate [6].

Table 2: Truth Table for BCD to Excess-3 code converter

	BCD Input				Excess 3 Output			
Decimal	A	B	C	D	W	X	Y	Z
0	0	0	0	0	0	0	1	1
1	0	0	0	1	0	1	0	0
2	0	0	1	0	0	1	0	1
3	0	0	1	1	0	1	1	0
4	0	1	0	0	0	1	1	1
5	0	1	0	1	1	0	0	0
6	0	1	1	0	1	0	0	1
7	0	1	1	1	1	0	1	0
8	1	0	0	0	1	0	1	1
9	1	0	0	1	1	1	0	0
10-15	All other inputs				X	X	X	X

Logic Diagram:

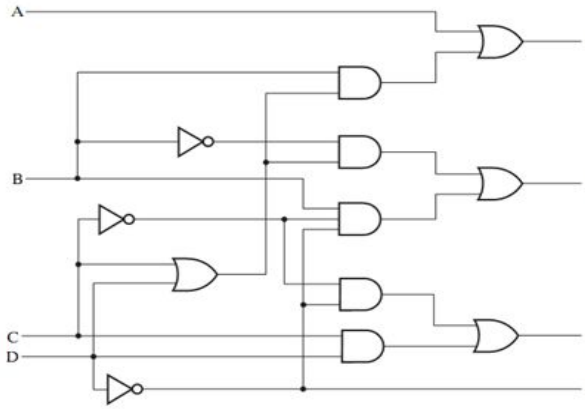

Fig. 2 Logic diagram for BCD to Excess-3 code converter

2.2 Gray To Binary Code

Binary codes are best suitable for computer applications and digital communications. Since it involves only 0 and 1 , its implementation becomes easy[3]. We have implemented this conversion using xor gate in the logic circuit .

Table 3: Truth Table for4- bitGray to binary code converter

DECIMAL NO.	G(3)	G(2)	G(1)	G(0)	B(3)	B(2)	B(1)	B(0)
0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0	1
2	0	0	1	0	0	0	1	1
3	0	0	1	1	0	0	1	0
4	0	1	0	0	0	1	1	1
5	0	1	0	1	0	1	1	0
6	0	1	1	0	0	1	0	0
7	0	1	1	1	0	1	0	1
8	1	0	0	0	1	1	1	1
9	1	0	0	1	1	1	1	0
10	1	0	1	0	1	1	0	0
11	1	0	1	1	1	1	0	1
12	1	1	0	0	1	0	0	0
13	1	1	0	1	1	0	0	1
14	1	1	1	0	1	0	1	1
15	1	1	1	1	1	0	1	0

Logic Diagram:

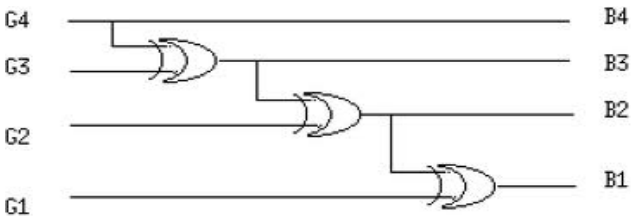

Fig. 3 Logic diagram for 4- bit Gray to binary code converter

2.3 Excess-3 To BCD Code

The BCD or binary coded decimal is a method for coding a number in which each digit of a decimal number is represented individually by its binary equivalent. It is more a accurate representation of codes [5]. We have implemented this conversion by using the and , or & not gates in the logic circuit.

Table 4: Truth Table forExcess-3 to BCD code converter

w	x	y	z	A	B	C	D
0	0	0	0	X	X	X	X
0	0	0	1	X	X	X	X
0	0	1	0	X	X	X	X
0	0	1	1	0	0	0	0
0	1	0	0	0	0	0	1
0	1	0	1	0	0	1	0
0	1	1	0	0	0	1	1
0	1	1	1	0	1	0	0
1	0	0	0	0	1	0	1
1	0	0	1	0	1	1	0
1	0	1	0	0	1	1	1
1	0	1	1	1	0	0	0
1	1	0	0	1	0	0	1
1	1	0	1	X	X	X	X
1	1	1	0	X	X	X	X
1	1	1	1	X	X	X	X

Logic Diagram:

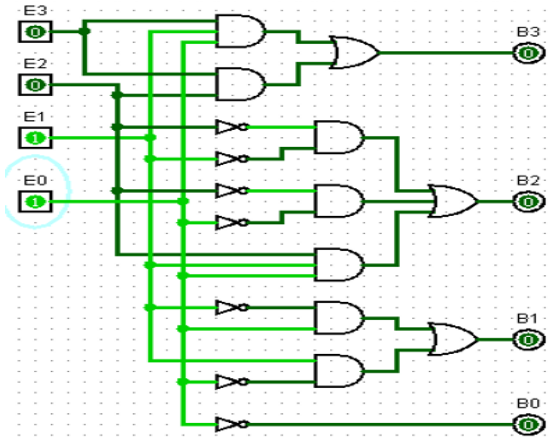

Fig. 4 Logic diagram forExcess-3 to BCD code converter

3. VHDL CODES FOR VARIOUS CONVERTERS

The VHDL code for various types of code converters are given below:

3.1 Code for Binary to Gray Code Converter

```
library ieee;
use ieee.std_logic_1164.all;
entity BTG_1 is
port (B1, B2, B3, B4: in STD_VECTOR;
G1, G2, G3, G4: in out STD_VECTOR);
end BTG_1;
architecture BTG_2 of BTG_1 is
begin
G1 <= B1;
G2 <= B1 XOR B2;
G3 <= B2 XOR B3;
G4 <= B3 XOR B4;
end BTG_2;
```

3.2 Code For BCD To Excess-3 Code Converter

```
library ieee;
use ieee.std_logic_1164.all;
entity BTE_1 is
Port ( A, B, C, D : in  STD_LOGIC;
W, X, Y, Z : out  STD_LOGIC);
end BTE_1;
architecture Behavioral of BTE_1 is
begin
W <= (A OR (B AND C) OR ( B AND D));
X <= ((NOT B)AND C) OR (B AND (NOT C) AND (NOT D));
Y <= (C XNOR D);
Z <= (NOT D);
end Behavioral;
```

3.3 Code for Gray to Binary Code Converter

```
library ieee;
use ieee.std_logic_1164.all;
entity GTB_1 is
port (G1, G2, G3, G4: in STD_VECTOR;
B1, B2, B3, B4: in out STD_VECTOR);
end GTB_1;
architecture GTB_2 of GTB_1 is
begin
B1<= G1;
B2 <= G1 XOR G2;
B3 <= G1 XOR G2 XOR G3;
B4 <= G1XOR G2 XOR G3 XOR G4;
end GTB_2;
```

3.4 Code for Excess-3 to BCD Code Converter

```
library ieee;
use ieee.std_logic_1164.all;
entity ETB_1 is
Port ( W, X, Y, Z : in  STD_LOGIC;
A, B, C, D : out  STD_LOGIC);
end ETB_1;
architecture Behavioral of ETB_1 is
begin
A <= ((W AND X) OR (W AND Y AND Z));
B <= (((NOT X) AND (NOT Z)) OR ((NOT Z) AND (NOT X)) OR (X AND Y AND Z));
C <= (Y XOR Z);
D <= (NOT Z);
end Behavioral;
```

4. SIMULATION RESULTS FOR VARIOUS CODE CONVERTERS

The above mentioned code converters can be simulated on Xilinx software . Following are the simulation waveforms:

4.1 For Binary to Gray Code Converter

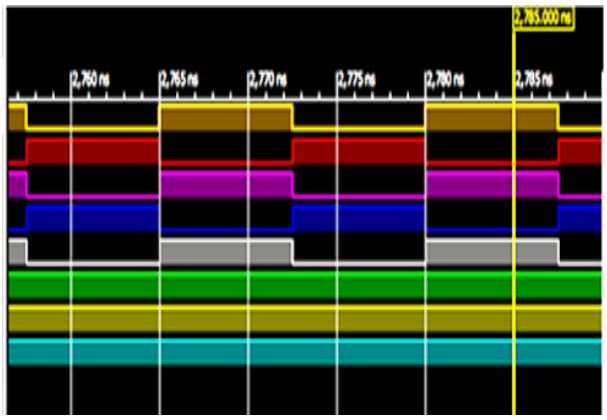

Fig. 5 Simulation results for Binary to gray code converter

4.2 For BCD To Excess-3 Code Converter

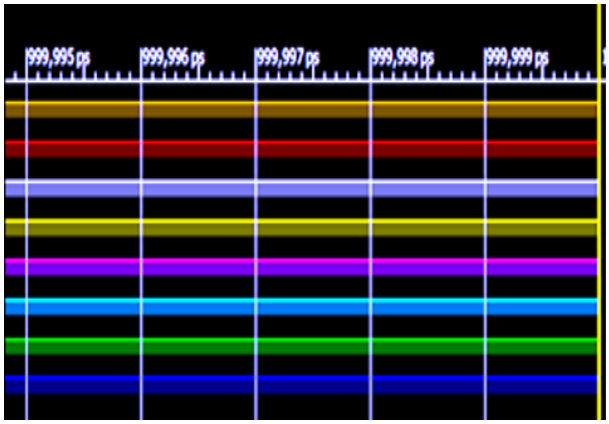

Fig. 6 Simulation results for BCD to Excess-3 code converter

4.3 For Gray to Binary Code Converter

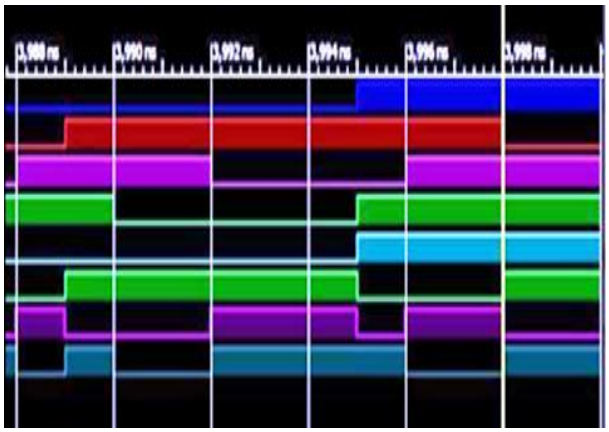

Fig. 7 Simulation results for Gray to binary code converter

4.4 For Excess-3 to BCD Code Converter

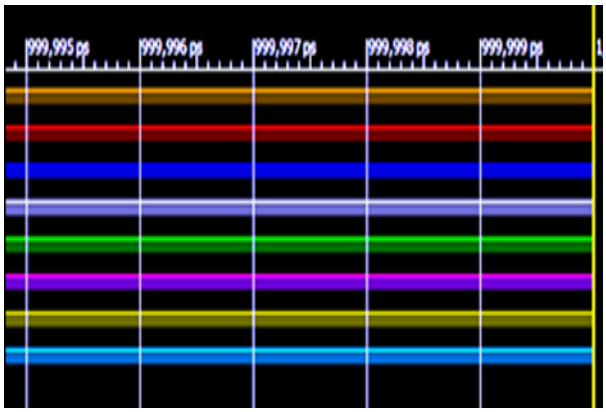

Fig. 8 Simulation results for Excess-3 to BCD code converter

5. CONCLUSION

In this paper Xilinx tool is effectively used to carried out code conversion (Placeholder1)of 4 bit binary- to -gray, 4 bit BCD-to-excess 3 and 4 bit gray to binary using data flow modelling . It is evident from the output waveforms that the conversion has been carried out successfully using the Xilinx software.The truth table and logic diagrams have been verified for all the cases respectively.These methods are conductive in concepts of digital electronics and devices like microprocessor or computers. This concept can be used in projects like quantum dot cellular data and in QCA with power dissipation analysis.

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