

## Image and Video Processing Edge Detection Technique used for Traffic Control Problem

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### ABSTRACT

The frequent traffic jam is the major problem at the main junction required an efficient traffic management system. The resulting the time-waste and increase in pollution level can be eliminated. For the implement purpose an intelligent traffic controller using a real time Image Processing. Different level of image process has been presented in order to find the best possible outcome to solve the vision problem at the night time. The problem with the emergency vehicle is that they got stuck in the traffic. So with the help of image processing the emergency vehicle is easily detected, the lane is given priority over the others. For getting best result we are using different technique like image segmentation, image enhancement, grey level transformation and different edge base methods like fuzzy logic with canny can be used as these techniques helps in for getting the best result for image processing. In this paper a study has been done on the previous techniques proposed and used for improving the efficiency of image base method.

**Keywords:**– Edge Detection, Fuzzy Logic, Emergency vehicle, Image and video processing, Traffic Management, Image Segmentation.

### I. INTRODUCTION

In modern life we are facing so many problem and one of which is the traffic congestion become more serious. It is because of the increasing number of vehicle day by day and old infrastructure and the rational distribution of the development are the main reason. Due to the weakness of the formulation of the system is leading for the problem of the traffic as the citizen are bound to those road. Or the cities can fund the new roads to everywhere then there is no problem of traffic.

Millions of car accident occur worldwide each year, and the death due to accident are in millions. Over the last 20 year the increase in the road accident kills more than 1.2 million people. 50 million people or injured and disabled [3].The

Number of crashes and of people left injured were also the highest levels since the recording of such data started in India is 4.5 lakh and 4.8 lakh respectively.

Human eyes is one of the important part of the body because it provide vision as humans are totally depend on their vision for task ranging from the basis instinctive skills to detailed and elaborate analysis of work [3]. But

sometime due bad weather conditions it became impossible for the driver to see the object on the road. So our main motive is to make the visual input remarkable trait of the human eyes because human eye are not capable to see such things due to limited function. In order to this field of image processing is introduced to the modern world.

The digital image processing is the latest technology in the modern world. In this system consist of the camera which is fixed in the traffic prone area which is continuously monitors traffic by capturing videos. The system will extract frames at particular time interval and compared with the previous data captured. In this way this system will tell the driver or the traffic management department are the density of the traffic and make a signal accordingly. This system is more reliable and cost effective and more flexible. With the help of data provided by this system can be further use for making android app and save lots of time. This application helps the driver for taking alternative. User opens the application use his own choice location and in user can

selects the location of his own choice and destiny of traffic in returned.

## **II. REVIEW OF LITERATURE**

In this section, previously proposed techniques used for improving image processing techniques and different edge base methods.

Image processing edge detection techniques used for traffic control by P.Srinivas [1] to implement an intelligent real time traffic control system. For edge detection they have use Boolean edge detector , Marr-Hildreth edge detector, Sobel operator, Prewitt Operator and Canny edge detector. Moor Neighborhood algorithm has been use to subtract background. They have successfully implemented emergency vehicle detection system.

Md. Rifat Rayhan, et al. introduced in their work [2], for the improvement of the image processing they introduced the different technique like image enhancement for improving the visual appearance of the image and use gray level logarithmic transformation. In edge base segmentation the use Sobel, Prewitt and watershed for removing the problem like edge-less, noise, smooth boundary, texture boundary and use watershed segmentation technique for getting more efficient result.

Prof. Uma Nagraj in their work[3], tell about the procedure for image processing like image analysis, object detection, object count, motion detection. They tell about the motion detection for detecting the motion of the moving object. They proposed the system which include the five major component: - Traffic management, Roadway system, Server, Android app, Camera. They also come with the idea of introducing the android application which tell the density of the traffic of the particular location and help the driver to use the way accordingly.

Poonam dhanekar in her work [4], they use the different techniques for image segmentation like Sobel, Prewitt, Roberts, Canny, Laplacian Gaussian (LoG). They compare the image segmentation techniques and find which is more efficient for getting efficient result and

canny turn out to be the more efficient technique among the all. She also gave the advantages and disadvantages of these techniques. G.T.Shrivakasham in their work [5], they use the different algorithm for the image processing technique like Laplacian, Roberts, Marr-Hildreth, Sobel, Prewitt, Canny edge detection. They compare the result of these techniques and tell both advantages and disadvantages of these techniques. They tell that although the canny is more costly among all the other tradition techniques but it is the more and efficient techniques. For removing noise Canny, LoG, Sobel, Prewitt and Robert have better performance.

Hitesh Kapoor in their work [6], they analyses the existing algorithm like Prewitt for presenting the image in gray scale, Gaussian method for noise reduction but this is not so efficient method for this. For overcome the problem of noise Gaussian canny filter is introduced. Marr-Hildreth for finding edges at the zero- crossing in the image Laplacian. In their analysis they have projected a comparative study base edge detection algorithm that works on both global and local image information. They have tried to combine the concept of both fuzzy and canny.

Dr.S.vijayarani in his work [7], they use Sobel and canny as image detection technique and compare these technique on the basis of Performance factor like accuracy and speed and check which algorithm worked perfectly in different circumstances. They find out after process these algorithm that canny work perfect in term of accuracy and speed. For checking the performance of both the algorithm they use graph representation in Accuracy measure of Edge detection and Execution time for edge detection algorithm.

Chandrasekhar in his work [8], they suggested the system for the implementation of digital image processing for controlling the traffic light efficiently. They proposed that they use the camera at each signal for capturing the image and matches with the empty road and governed the traffic accordingly. For this they use different techniques like image acquisition (Formation of image and image formed due to reflection), RGB to Gray conversion, Image enhancement, Edge detection

technique (Sobel), Image matching, Canny. Moore neighborhood and hardware like RFID tag. They calculate the Matching and time allocation.

They also studied about the Emergency traffic problem and implement the real system. They improve the quality of the different algorithm use in their work and find out which one is the best for image detection.

Tazu-Heng Henry Lee in there paper [9], they describe the different techniques for edge detection with mathematical expression. They described First order derivative edge detection in this they describe threshold selection, Second order derivative edge detection, Edge detection using Edge fitting method, Edge detector performance evaluation in this they described Edge detection probability, edge detection orientation and localization, Edge detector performance characterization, color edge detection, Line and spot detection, Improve algorithm on edge detection, Mat lab simulation for detection in this simple edge detector and two-dimensional edge fitting model simulation, Morphological image processing function. They mainly focus on the effectiveness of the performance and method of evaluation.

Zolquermine Othman in their work [10], they discussed about the effectiveness of the canny that canny give better result with smooth continuous pixels and thin edges, Sobel cannot produced the good result with the same. But both canny and soble are effected by noise because noise cannot filter perfectly, so unremoved noise effect the result of image detection. For the analysis, it was between sobel and canny image detection algorithm canny gave the best result sobel detector used in these MRI images.

M Sudarshan in their work [11], they proposed that optimal edge detection algorithm is suitable for face recognition. They mainly focus on the boost the significant edges and then applying successive thinning algorithm. The main objective is to find the missing and broken edges more accurately. Their future approach is to enhanced the thinning edges and reduce the noise from the image to get better result.

Soumya Dutta in their work [12], they tested different type of images to produce fair result. They tried to make an output which can be accepted by all type of computer vision task where extraction of edge maps is required for a large set of images for further extraction. Further they compare different algorithm of edge detection on the basic of parameter like computing time, execution and accuracy.

Abdallah A. Alshennawy in their work [13], they proposed the fuzzy logic with the digital image. They use the fuzzy logic with digital image because the remove the unwanted noise for the image which is not removed by the different edge detection techniques. For this they first measuring the object elongatedness in gray-level and binary images (thresholding), Fuzzy image processing, Fuzzy set and Member function and Inference Rules Definitions. They said that Fuzzy image processing is the best technique for extracting the knowledge and information from different sources. They came to the conclusion that FSI system provide greater robustness and it gave the straightness and smoothness for straight line and curved it gave roundness.

Aijaz Ur Rahman khan in their work [14], they proposed that fuzzy logic is capable of detecting edges efficiently form gray scale image and compare with existing techniques like Sobel, Prewitt and Robert. For this they use window mask, membership function and fuzzy sets and apply the algorithm. They compare the result between the Sobel, Prewitt and Robert and the proposed algorithm and find out that better result in finding distinct edges and provide a better visual of the image and remove the computational complexity.

### III. TECHNIQUES

There are different techniques for detecting the edge of the image like Boolean, Sobel, Prewitt, Robert, Canny, Marr-Hildreth, Moore-neighborhood, image enhancement, image segmentation, Gray level transformation.

**Boolean** it convert the window pixel into binary pattern based on local threshold which help to find the existence of the image.

**Marr- Hildert** The image is smoothen using Gaussian and laplacian function which takes the second derivative of image.

Advantages

1. It can correctly identify the places of edges.
2. This technique is establish and tested among the wider area of pixels.

Disadvantages

1. It is also inaccurate in finding out the mall functioning at the corner and orientation of edges.

**Sobel** operator is the discreet operator which help to calculate approximation of the gradient of image intensity. A pair of 3x3 convolution

Kernel are used in this operator. One kernel for each of the perpendicular orientation the soble approximation finds the edges. Those whose gradient is maximum is return.

Advantages

1. It is a simple operator, it is called so because it approximate the gradient magnitude.
2. It is use for detecting edges and their orientation.

Disadvantages

1. Magnitude of edges degraded due to increase in noise.
2. It is an inaccurate technique as the magnitude decreases its accuracy also decrease.

**Canny** In this technique the image is smoothen and then image gradient is use to highlight region with high special derivative. The pixel is suppress in those regions which are not at maximum. It is set to zero if the first threshold is more and if it is above it make an edges.

**Advantage**

1. It can effectively identify errors using the probability.
2. Signal to noise ratio is improved by non-maxima suppression method.

**Disadvantage**

1. It is difficult to compute the gradient calculation.
2. Because of complex computation this process take more time.

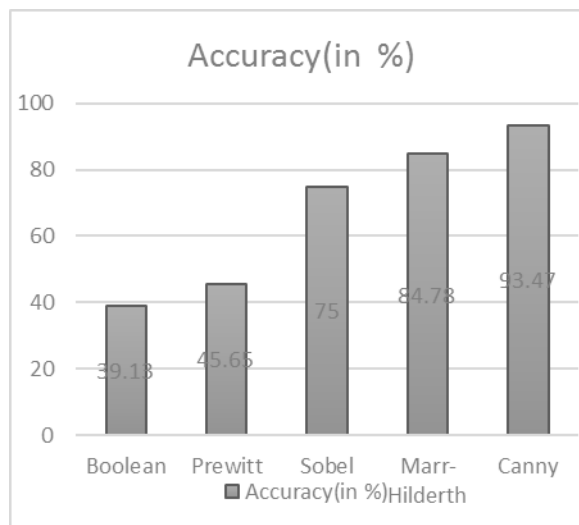
## IV. ANALYSIS

The analysis of the studied work is done and is presented in

The Table.1 and Table.2 on the basic of accuracy and time.

Table1: Accuracy of different algorithm

Algorithm	Accuracy (in %)
Boolean	39.13%
Prewitt	45.65%
Sobel	75%
Marr- Hildert	84.78%
Canny	93.47%



Graph 1: Accuracy measure of Edge detection

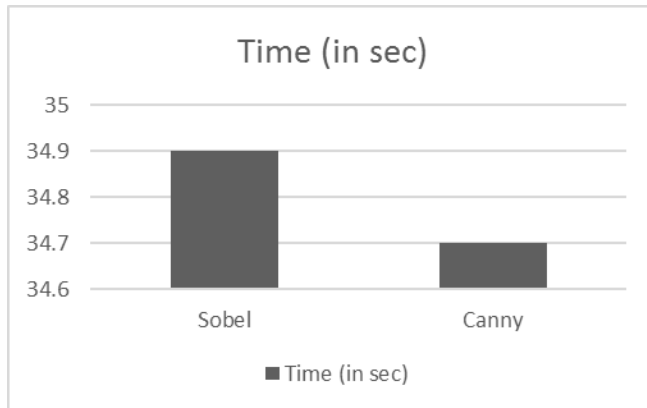
From graph 1 it is clearly shown that among all the different techniques of edge detection canny is the best technique.

From the table 2, it is observe that canny detection algorithm detects take less execution speed when compare to Sobel detection algorithm.

Table 2 Execution time for Edge detection algorithm [7]

Algorithm	Time(in sec)
Sobel	34.9

Canny	34.7
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Graph 2: Execution time for edge detection algorithm

Graph 2, it is observed that Canny detection algorithm take less time as compare to Sobel.

Fuzzy logic is basically use for conforming the edges in the image that there is a pixel in the image or not. Mainly the edge is detected by the various techniques but some time some pixel are left but with the help of fuzzy logic we can confirm that pixel and it help to improve the detection technique.

## V. CONCLUSION

In this paper, a clear overview on the implementation and performance of previously proposed techniques mainly Canny edge detection algorithm as canny turn out to be a most effective technique along all other edge base techniques. It is also observer that for the accuracy of the canny different techniques like enhancement and segmentation is use. By using canny edge detection we can deal with the traffic control problem. With help of image processing we can improve the system of traffic control as image processing is the modern technique and by detecting the image with the canny we get the most accurate result. For more improvement we can combine canny with fuzzy logic for more improved result so that it help in controlling traffic and road accidents in any conditions.

**Acknowledgments.** I wish to thank Dr. Sandhya Tarar for giving guidance and fruitful discussions and comments about the content and the structure of this brief report.

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