Ambulance Detection using Cross Correlation Technique

M.Ferni Ukrit, J.S.Femilda Josephin , A.Alice Nithya

Abstract: ***The discovery of automobiles have reduced the travelling time considerably but in recent times the outburst in vehicle usage and unprecedented planning of infrastructure activities regarding the future vehicular occupancy on road has lead to traffic accumulation on roads their by making it difficult for ambulances and other vehicles to reach the destination of time there by costing people their valuable human life. The proposed system helps in detecting the ambulance when it reaches a signal junction, their by clearing the signal in the path of the ambulance once the detection as taken place. It reduces the delay time to large extent and also ensures the safe flow of traffic when the ambulance passes the junction their reducing manual escorting efforts. The system converts the video feed provided to it into frames and takes frames at a specific interval then checks for the presence of the standard template in the given frame by using cross correlation technique and upon match the system detects the ambulance, else repeats it after specific interval of time.***

Keywords: Video, template, cross correlation

I. INTRODUCTION

Ambulance acts as one of the lifesaving factors in which there is a requirement of quick response. Delayed ambulance arrival can cause serious issues like death, more loss of blood which may also have an impact on the policy making. There exists more number of challenges for the Ambulance Service Providers (ASPs) to act with less response times. In remote rural areas more challenge is due to the distance and the less number of ambulance and in urban areas the problem arises due to increase in number of calls. The other challenges are due to the characteristics that change from time to time including change in regulations and frequent change in ambulance fleet's size and composition. Intelligent traffic system [1], along with embedded system tools are in demand now days. The authors have used an object count method and emergency vehicle detection to regulate the traffic signals considering the priority outcome. The authors claim their prototype to be more efficient and encouraging to the current traffic control system. In [2], a vision-based approach is presented for the estimation of road traffic density which is considered as the important building block of traffic monitoring system.
The computational cost is decreased by introducing a block based holistic approach which is used to estimate traffic density without relying on pixel based analysis.

A shadow elimination technique was adapted to reduce the false positives. Publicly available data sets were used to prove the systems accuracy. In order to identify the presence of ambulance on road a framework [3] is used to detect both achromatic and chromatic shadows even when the foreground regions are alike to shadowed regions. In order to detect the shadowed regions the background image values are divided be the current frame values in the RGB color space. The system is claimed to be robust and accurate over different shadow types and challenging video conditions. In most common approaches the moving objects are detected by identifying and determining the foreground pixels of the object. Cast shadow will be a major factor that can disturb the detecting algorithm [4]. The true shape and color of the foreground objects are distorted which becomes a hindrance to object identification and classification. Foreground detection is another major concern in object detections and tracking which has become a challenge due to variable weather, shadow, cluster interference and light. For long image sequence where there is a chance of more accumulate error in the foreground, the background subtract [5] method is used. It is necessary to get rid of optical flow (OF) noise which is common over long distance and long period of time. Separable Morphological Edge Detector (SMED) is used to get rid of. In [5] the authors have proposed a more accurate approach to detect the foreground and eliminate the noises. This approach is claimed to be useful for efficient crowd and traffic monitoring. A Markov random field (MRF) approach [6] is proposed to remove the shadow in an image. Firstly, a shadow model is constructed and a Gaussian mixture model is used to model the behavior of cast shadows for every pixel. Secondly, the samples should satisfy a pre-classifier which will further indicate the color feature of shadow in current frame. This classifier is considered to be accurate and adaptive to the change of shadow. Finally, MRF model is constructed for shadow removal. The paper [7] presents an approach to schedule emergency vehicles in traffic. The distance between the emergency vehicle and the intersection using visual sensing methods, vehicle counting and time sensitive alert transmission within the sensor network is calculated for comparison using Euclidean distance, Manhattan distance and Canberra distance techniques The system [8] builds an android app that connects both the ambulance and the traffic signal station using cloud network. RFID (radio frequency identification) technology is used in this system to detect if the ambulance halts due to traffic signal, then the RFID mounted at the traffic signal tracks the ambulance mounted with RFID. It then sends the data to the cloud. The user acknowledges through the mobile app, and then the particular signal is made Green for a little time.

Revised Manuscript Received on March 10, 2019.
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A system [9-11] is implemented that automatically detects accident & reduces the delay of treatment on accident victim due to distance. The stable external region edge detection algorithm is used for detection of words from given digital video. The importance of [12] is on a method to implement emergency vehicle recognition. The system [13] will detect vehicles through images instead of using electronic sensors embedded in the pavement. The Bluetooth helps the emergency vehicles in clearing the route that is stuck in traffic. In [14] the system clears the traffic congestion by spinning the red lights to green. This consists of an android application that registers the ambulance on its network. Due to emergency if the ambulance halts, the application sends an emergency command to the traffic signal server and leads the direction to travel current position with the help of Global Positioning System (GPS). The proposed research paper is organized as follows: Section II explains the methodology used and Section III explains the results and discussion for the proposed methodology. Section IV concludes the paper with the future work.

II. METHODOLOGY USED

A. Overview

The proposed system helps in detecting the ambulance when it reaches a signal junction their by clearing the signal in the path of the ambulance once the detection as taken place. It reduces the delay time to large extent and also ensures the safe flow of traffic when the ambulance passes the junction their reducing manual escorting efforts. The system converts the video feed provided to it into frames and takes frames at a specific interval then checks for the presence of the standard template in the given frame by using cross correlation technique and upon match the system detects the ambulance, else repeats it after specific interval of time.

Fig.1 shows the System Architecture. The user connects the specific video stream link to the system from which the system must detect. The standard Template is fetched from the user by manual cropping. They only need to place it in the directory from which the system fetches the templates. The system can fetch data from database or any other source of data

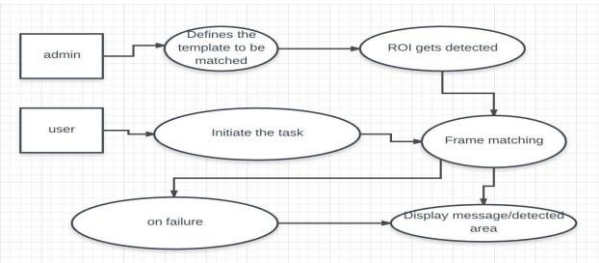

Fig1: System Architecture

The flow of data in the system is represented in Fig 2.

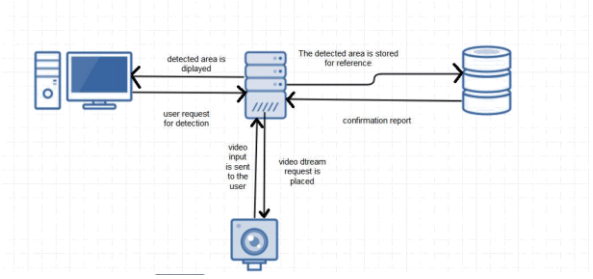

Fig2: Flow Diagram

In this image processing project, the data /image is sent to analysis components which fetches video converts it to image and calculates the correlation value and checks if the match occurs with the template .It displays the end result after each computation for each frame.

B. Standard Template Identification

- In this module the admin decides the template that must be used to detect the ambulance.
- The template is detected based on the business needs. The system is feed template by manual cropping of the template or the obtaining the image from other sources.
- The template must be such that it is uniformly present in the entire vehicle's that are meant to be detected.
- The system template selection must be based on extensive research as their might be other factors causing the inhibition to the vehicle detection.
- The template is stored in the directory from where the system is fetched automatically.

C. Video Acquisition

- The system uses GUI enabling user to detect video of choice from any directory has preferred by the user.
- The user can choose video by browsing through the directory.
- The video selected must be of Mp4 format.
- Else the system shows exception error
- The user must be careful about the format of the video selected for the analysis

D. Video To Frames Conversion

The frames are converted into frames in order to enable image processing of the video and to generate the desired output. The system inputs the video of the format mp4.
The image is converted using the inbuilt matlab function.

- On conversion the image is stored at the location specified by the user.
- The system automatically names the images based on the number of frames in the video.
- The system names each and every frame ,stores it at the desired location with the name assigned by the system

E. Correlation coefficient Detection

In the module the image and Template are converted into pixel value

- The converted pixels are stored in matrix form
- The average value of the matrix is calculated
- The individual value are subtracted from the average value
- Followed by the finding of the cross product of the matrix
- It is then followed by the calculation of covariance
- The correlation coefficient is finally calculated using the formula

$$\rho_{X,Y} = \frac{E[(X-\mu_X)(Y-\mu_Y)]}{\sigma_X \sigma_Y}$$

- If the value is one the region is considered matched with the template.

F. Display

The module displays the template that matched in the given frame and displayed to the user.

- The module also displays all the frames which fail the criteria for passing
- The template failed and reason for failure is also displayed
. • The Frame, Template and detected area are displayed as part of the output.
- In case the ambulance is not present in the given frame the system displays warning message.

III. RESULTS AND DISCUSSION

The proposed methodology has been implemented in Matlab. The system is checked for different Threshold values by checking the difference in the accuracy value by changing the threshold value of the system .The threshold value is increased by value of 0.2. The results are shown in Fig.3.

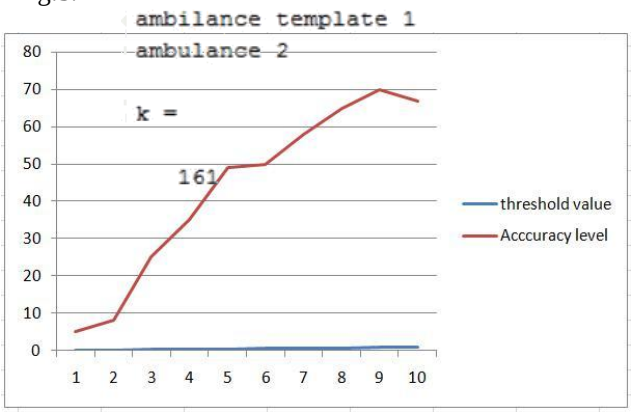

Fig3: Threshold Value Vs Accuracy Level

The user can choose video by browsing through the directory. The video selected must be of Mp4 format. The user must be careful about the format of the video selected for the analysis. The system names each and every frame, stores it at the desired location with the name assigned by the system as shown in Fig.4

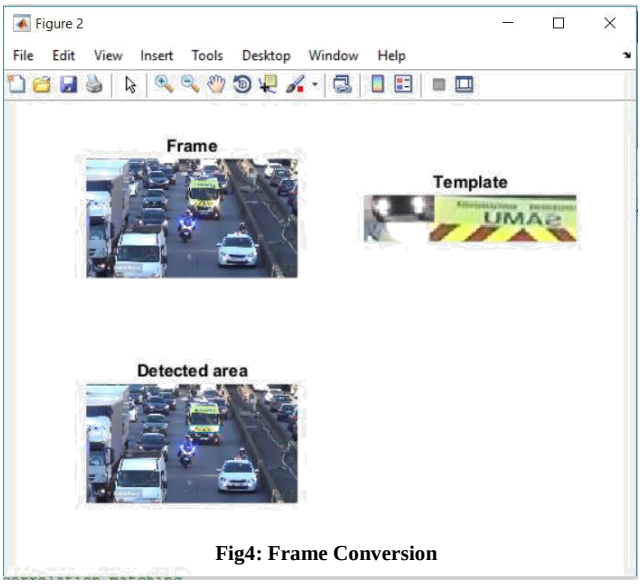

Fig4: Frame Conversion

In the module the image and Template are converted into pixel value. The converted pixels are stored in matrix form. The average value of the matrix is calculated The individual value are subtracted from the average value • Followed by the finding of the cross product of the matrix • It is then followed by the calculation of covariance. The module displays the template that matched in the given frame and displayed to the user. The module also displays all the frames which fail the criteria for passing .The template failed and reason for failure is also displayed .The Frame, Template and detected area are displayed as part of the output. In case the ambulance is not present in the given frame the system displays warning message as shown in Fig 5.

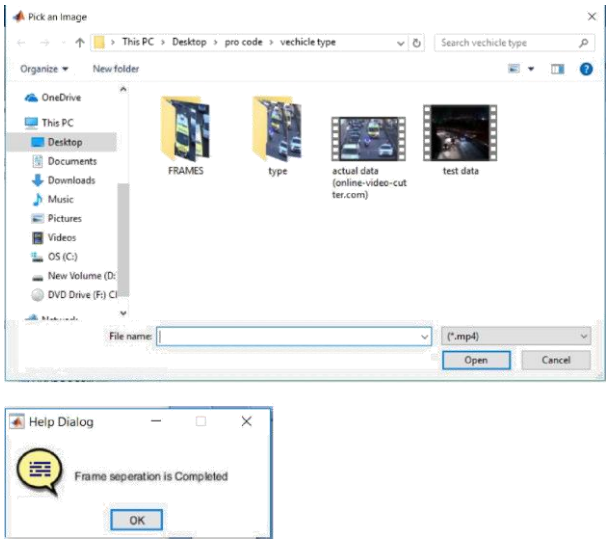

Fig5: Template Matching

IV. CONCLUSION AND FUTURE WORK

The system is more accurate in detecting the ambulance than the existing system since it uses multiple templates to detect the presence of the ambulance in the image than using single template to detect the image. The computation time of the system is faster compared to the existing system. This can be enhanced to capture an image from a live video and detect the ambulance and clearing the signal to save the life of the patients.

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