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Ambulance notification and automatic traffic management using image processing

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ABSTRACT

The matter of traffic jam will increase quickly, thanks to the growing variety of vehicles and therefore the restricted resources in our country. There is a high would like for the introduction of recent technology to enhance the control. In present scenario traffic control system uses timer for each phase and sensors to detect vehicles, and produce signals. In the previous study they don't consider about the heavy vehicle and the ambulance like vehicles in the traffic and that is must to clear the signal the vehicle is waiting. And to alert the traffic police to clear the situation in the traffic is to be considering in the proposed system. The frequent traffic jams at major junctions require AN economical traffic management system in situ. The ensuing wastage of your time and increase in pollution levels may be eliminated on a city-wide scale by these systems. The paper proposes to implement AN intelligent traffic controller victimization real time image process. The image sequences from a camera square measure analyzed mistreatment numerous edge detection and object enumeration strategies to get the foremost economical technique. Subsequently, the quantity of vehicles at the intersection is evaluated and traffic is expeditiously managed. The paper conjointly proposes to implement a period of time emergency vehicle detection system. In case an emergency vehicle is detected, the lane is given priority over all the others.

Keywords: Background Subtraction, Edge Detection, Emergency vehicles, Image Processing, Traffic Management.

INTRODUCTION

Current traffic control system involving magnetic loop detectors buried in the road, infra-red and radar sensors on the side provide limited traffic information and require separate systems for traffic counting and for traffic management.

Inductive loop detectors do provides a low cost resolution, but they're subject to a high failure rate once put in in poor road surfaces, decrease pavement life and impede traffic during maintenance and repair. Infrared sensors are affected to a greater degree by fog than video cameras and cannot be used for effective management. Video-based systems has many advantages compared to traditional techniques.

They provide a great deal of traffic information, combination of each police work and control technologies, square measure simply put in, and square measure scalable with progressing image process techniques.This paper tries to guage the method and benefits of the employment of image process for control.Implementation of our project can eliminate the requirement of traffic personnel at varied junctions for regulation traffic.Thus the employment of this technology is effective for the analysis and performance improvement of road traffic.Also priority to

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emergency vehicles has been the subject of some analysis within the past [1].

A proposed system for detection of these vehicles as in is based on Radio-Frequency Identification (RFID). However, the use of this technology necessitates unnecessary extra hardware to be installed both at every junction and in every vehicle. There have conjointly been studies to acknowledge these vehicles by analysis of the sound of their siren as shown in [2].However, this technology extraly} simply influenced by noise and needs additional hardware at each stoplight.

PROPOSED SYSTEM

System Overview

The various steps of our proposed system are described in Fig 1.A camera is fastened on polls or different tall structures to overlook the traffic scene as seen in [3].Images extracted from the video area unit then analyzed to sight and count vehicles.Then depending on the signal- cycle (we have taken it to be 3 minutes), time is allotted to each lane.For example, if the quantity of vehicles in a very multilane intersection is found to be ten, 30, 20 and 20, then time assigned to every lane is within the ratio 1:3:2:2.The system additionally takes under consideration the emergency vehicles at the intersection.If such a vehicle is detected, the lane is given priority over the others.

Background Subtracion

Static background subtraction" has been the quality technique for amount segmentation of AN object in video based totally system.The technique relies on computing the error between a continuing background frame and therefore the current one.Video- primarily based techniques for out of doors environments area unit simply influenced by factors like weather, amendment in illumination and motion.Hence, a static background proves insufficient and a robust background model is necessary to deal with change of luminance.We propose the use of the adaptive background technique as described in [4].

Generating this background image supported segmentation results extracted from differencing the image with the previous extracted background is that the basic plan of our methodology.The updated background (Bnew) is computed as a operate of current background (Bo) and current frame I through the equation:

Where RES is that the results of subtraction of consecutive frames, and the value of α is 0.5.The model hence accounts changes in background and reduces the error caused by them as shown in (1).Once we've developed associate degree adaptively dynamical background model, our next step is to separate the foreground from the background of the image.This is done by a pixel-by-pixel comparison of this frame with the background at that instant.A constituent would be a part of the foreground, once its price is completely different enough from its corresponding price within the background model.The edges and objects are then recognized on the basis of a predefined threshold.

Edge Detection

After separating the foreground objects, we want to outline their edges within the subtracted image.This is done by victimization a footing detection algorithmic rule.There area unit a spread of edge detection techniques that are employed in the past [5].Simple techniques like the Boolean edge detector converts a window of pixels into a binary pattern supported an area threshold, and then applies masks to determine if an edge exists at a definite purpose or not.In the Marr- Hildreth Edge Detector, we smooth then the image using a Gaussian and Laplacian function.This takes the second derivative of an image.

TABLE I: COMPARISON OF EDGE DETECTION TECHNIQUE

Image	Actual no.	Boolea	Marr			
1	4	2	6	2	2	4
2	3	0	4	1	1	2
3	4	2	3	2	3	4
4	5	2	3	2	3	6
5	5	2	3	3	3	5
6	7	3	5	3	2	6
7	4	1	5	1	1	4
8	5	2	5	3	2	5
9	3	0	3	0	1	2
10	6	4	3	2	3	6
Accuracy		39.13	84.78	41.30	45.65	93.47

If there's a step distinction within the intensity of the image, it will be represented in the second derivative by a zero crossing.The Sobel operator may be a distinct differentiation operator, computing an approximation of the gradient of the image intensity function.

At every purpose within the image, the result of the Sobel operator is either the corresponding gradient vector or the norm of this vector.The operator consists of a pair of 3×3 convolution kernels designed to respond maximally to edges running vertically and horizontally relative to the pixel grid, one kernel for each of the two perpendicular orientations. The method finds edges using the Sobel approximation to the derivative. It then returns edges at those points where the gradieant of the image is the maximum.Prewitt operator is comparable to the Sobel operator used for detection vertical and horizontal edges in pictures.It is a quick technique solely appropriate for wellcontrasted quiet pictures.The clever edge detector is taken into account to be one in every of the foremost wide used edge detection algorithms within the trade.It works by 1st smoothing the image and finds the image gradient to focus on regions with high abstractionderivatives.It then tracks on these regions to suppress any element that's not at the most.

Finally, through hysteresis, it uses two thresholds and if the magnitude is below the primary threshold, it is set to zero.If the magnitude is higher than the high threshold, it is made an edge and if the magnitude is between the two thresholds, it is set to zero unless there is a path from this element to a element with a gradient higher than the second threshold.That is to mention that the 2 thresholds area unit accustomed discover sturdy and weak edges, and embody the weak edges within the output providing they're connected to strong edges.

BackgroundSubtracion

After finding the sides subsequent stage is to count the amount of objects as outlined by the sides.There are several algorithms instructed for object detection and contour tracing.These embrace the usually used Radial Sweep technique, Theo Pavlidis‟ Algorithm and Square Tracing Algorithm.However, during this paper we've enforced the Moore-neighborhood algorithmic program supported an analogous technique as in [6].

The algorithmic program begins by selecting a random start purpose.When this picture element „p‟ is black, the Moore-neighborhood of „p‟ is examined in clockwise direction starting with the pixel from which „p‟ was entered and advancing pixel-by- pixel until a replacement black pel in „p‟ is encountered.The algorithmic program terminates once the beginning pel is visited for the second time.The black pel walked over are the contour of the pattern.The potency of the algorithmic program improves greatly after we stop solely when coming into the beginning pel within the same manner as entered at the start.This is known as Jacob‟s stopping criteria.

We have enforced this formula that will an honest job of distinctive the amount of cars during a given image.The contour tracing formula allows USA to outline the boundary of the thing likewise as their size.We specify totally different size ranges to classify the varied forms of vehicles.This gives us a measure of the traffic density on each road at the intersection (refer Fig. 3(d)). The traffic

light is then regulated by allotting variable time according to the measured density and size of the vehicles.

Emergency Vehicle Condition

In case a red beacon is detected, consecutive step is to identify whether or not it's from associate emergency vehicle or not.This is done by distinctive the blinking frequency of red lightweight detected within the image sequence and comparison it to the quality employed by the emergency vehicles. The conditions for detection of red lightweight beacon throughout numerous periods of the day area unit shown below.Once they're happy, we tend to scan the intermediate frames for the absence of the beacon by the condition as shown below.

Night time conditions:

For red light: R>230, G<250, B<250

In the intermediate frames: R<230, G>230, B>230

Day time conditions:

For red light beacon: R>230, G<250, B<250

In the intermediate frames: R<230, G<230, B<230

If matched, the normal system is overridden and the lane is given priority over all the others. The lane is turned green until the vehicle has passed the intersection.

RESULTS AND DISCUSSIONS

To compare between various types of edge detection algorithms we tested their performance for ten images taken from real traffic intersection.After finding the sides, the picture was subjected to an object counting algorithm.The performance of the edge detector algorithms was defined by the number of vehicles accurately detected. The results are shown in Table I.Canny Edge detector was found to be the most effective among those compared (93.47%).

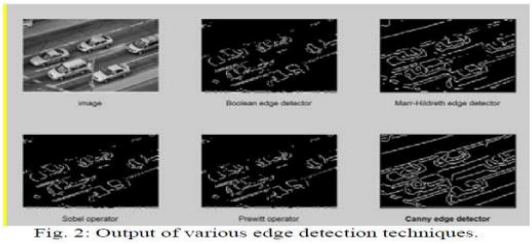

Fig. 2: Output of various edge detection techniques.

The mathematician edge detector performs an honest job of marking the locations of edges, but it did not complete the sides creating object detection troublesome.The Sobel and Prewitt operators ar enhanced at recognizing edges that ar horizontal or vertical and ar liable to noise (refer Fig 2), as additionally found in [7].The Marr-Hildreth was found to be the most susceptible to noise and gave a lot of false results. The use of two thresholds by canny edge detector makes it less likely to be fooled by noise, and more likely to detect true weak edges, providing better and fairly noise resistant technique for the detection of edges.Hence we've got used this methodology of detection within the paper, along side Moore neighborhood methodologyto count the vehicles marking the ultimate step of our system.

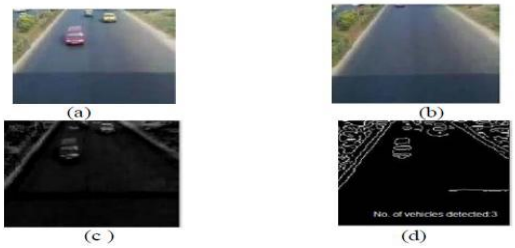

Fig. 3: (a) Real-time image (b) Background image
(c) Subtracted image (d) No. of vehicles = 3

The projected system is employed to investigate a true time traffic scene for a road (Fig three (a)).The adaptational background, updated from the scenes is shown in Fig. 3(b). The subtracted image then cont a ins only the foreground objects (vehicles) as seen in Fig 3(c). Using image processing algorithms (Fig 3(d)), the number of vehicles in the lane can be found out. In this case, the number of vehicles is 3. The video is additionally analyzed for the detection of emergency vehicles through their flashing red lights. By specifying a threshold, we have isolated the areas with high intensity of red light and comparatively lesser intensity of blue and green color. The resultant image is shown in Fig. 4(b). As we can see, the headlights of the vehicle were also detected , which led toan erroneous output.Hence the red light-weight should satisfy the extra condition of blinking.This is achieved by taking account for the actual fact that the red light-weight shall seem in each third frame solely.The other lights don't seem within the image sequence with this frequency and thus square measure eliminated.This ends up in the conclusion of the presence of associate emergency vehicle as shown in Fig.4(c).

Fig. 4: (a) Image of a vehicle during daytime
(b) Detection of all lights
(c) Emergency vehicle detected

Our model was tested for motorcar throughout varied times of the day and was found to achieve success.In addition, the beacon are often known although the emergency vehicle is in AN inclined position with regard to the camera as seen in Fig.4(c).

CONCLUSION

We have with success enforced associate rule for an image processing for traffic controller. Upon comparison of varied edge detection algorithms, it had been inferred that soble operator that is that the most effective one. On analysis of varied tracing and object tally strategies we have a tendency to came to understand that the Moore neighborhood technique to be additional strong when put next to the others. The paper conjointly disclosed that image process may be a additional economical and effective methodology of control as compared to ancient techniques. we've got conjointly enforced a advanced technique for emergency vehicle detection supported image process. Our rule removes the need for further hardware like sound sensors or RFID tags. The enlarged latency for these vehicles is crucial for the bar of loss of life.

FUTURE WORK

The focus shall be to implement the controller using DSP because it will avoid serious investment in industrial control cypher whereas getting improved machine power and optimized system structure. The hardware implementation would modify the project to be utilized in time period sensible conditions. More info concerning this technique is found. In addition, we have a tendency to propose a system to spot the vehicles as they move, giving preference to emergency vehicles and helping in police investigation on an outsized scale.

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