Anomaly Detection In Traffic Video Surveillance

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Abstract: **Nowadays, the traffic anomalies goes on increasing because of the day by day increment of numerous vehicles on the road. There are different anomalies related to the traffics such as traffic jam, vehicles on zebra crossing, etc. are recorded. The manual process to handle such traffic rule violation is difficult, time consuming and required more manpower. Hence to avoid the limitation of the existing system, an automated traffic surveillance system has been proposed.**

In the proposed system, two traffic anomalies i.e. vehicle on zebra crossing, signal detection and traffic jam (based on the density of the traffic) are consider for implementation. It visualizes the reality so it functions much better than those systems that rely on the detection of vehicles metal content. This system can be useful to capture the culprit and better for the traffic controlling. The proposed system is implemented using OpenCV an image processing library with python language. The proposed system is planned to be implemented on the raspberry Pi hardware platform which is easy to make system portable and real time.

Keywords: Surveillance, zebra crossing, Signal detection, Traffic jam, OpenCV, Raspberry Pi etc.

I . Introduction:

A vast number of reports and statistics state the vulnerable role played by pedestrians in traffic accidents, especially in those who take place in surroundings considered safe by them. Walking is a

healthy exercise with almost non-existing negative consequences except for those caused by road traffic. Walking under those circumstances is approximately ten times more dangerous than travelling as a passenger by car [1].The availability of a wide database of accident causes is considered as one of the most important building blocks in the strategy for the development of intelligent integrated road safety systems [2]. For example, 15% of the total numbers of people killed on European roads are pedestrians, and 28% are vulnerable road users [3]. It is stated that most accidents take place in urban areas where serious or fatal injuries can be produced at relatively low speeds, particularly in the case of children [4].

A new trend in expansion is the application of computer vision techniques to traffic, in particular, for the intelligent control of traffic lights. Several factors such as number of pedestrians, situation of the crossing area, number of vehicles, etc., compete for the determination of the adequate colour of the light. This can have a substantial positive effect on the reduction of vehicle-pedestrian conflicts, especially when the system is optimized to meet the users' expectations: waiting time should be reduced to minimum; duration of green light should be adapted to the users' needs. The pre-programmed signal

time allowed for pedestrians to cross a street is usually too short for some people, particularly the elderly and disabled ones, and exposes them to the oncoming traffic when the signal changes. Despite many static cameras are being used in our cities (supermarkets, banks, underground stations, railway stations, etc.), their main commitment keeps being only to help operators make the best decision concerning security or to keep users informed of traffic fluency. Some computer vision applications have already reached the great public, as the on-board systems by Daimler Chrysler [5, 6].

The population of the India grows exponentially as the population increases the number of vehicle on the road increases. The most of the accidents on the roads are due to the rule violations such as breaking traffic signals, over-speeding, driving on wrong sides etc. The traffic management is the important task to reduce the accident and traffic congestion. To detect the traffic rule violations and traffic congestion avoidance, the automatic system needs to be developed. In the proposed approach, we are going to develop the image processing and computer vision based system. In this system, we will focus on the three traffic violations

I.   Related Work:

1. Vehicle on zebra crossing:-

The project proposes a zebra-crossing detection framework based on unique geometrical features of zebra-crossing. The unique geometrical feature is zebra-crossing stripe's edges are arranged in sorted order. Various zebra-crossing images are utilized to evaluate the proposed framework and presented outcomes demonstrate the adequacy.

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Fig.1.1 Vehicle on zebra crossing

2. Traffic Congestion:-

Managing the traffic dynamically will reduce the traffic congestion. The videos are captured by stationary cameras. Then images from the live videos are retrieved one frame in a second. Image processing is performed over these retrieved frames. The output obtained from the image processing algorithm is the number of vehicles coming from a specific direction. Using this output we apply a real time traffic management algorithm which controls the traffic signal by synchronizing all the neighbouring signals and manage the time duration of the signal accordingly.

Fig.1.2 traffic congestion at traffic signal

3. Vehicles moving on footpath:-

The roads are the most important public spaces in cities and pedestrians are its largest users, but less than 30% of urban roads in India have footpaths. Grave concern can be observed regarding safety of pedestrian to see the footpaths being used by two wheelers, zebra crossing usage culture is missing and crossing any road is uphill task. Despite the laws in place, urban areas can clearly seen encroachment of footpaths by bikes with no action taken. The International Federation of Pedestrians has been explicitly advocating the right to walk in public spaces as a basic human right but yet the picture of same to be implemented in full is yet to be achieved. There is a need to build more roads, make them safer

sfor use of pedestrians throughout India. Since the law is in place, effective enforcement is required.

fig 1.3 vehicle moving on footpath.

Wrong Side Vehicle:-

Driving on the wrong side of the road is a common problem across the country. Many people opt to drive on the wrong side to save time or to cut the travel distance. But by driving on the wrong side, a person puts his and others life at risk on road be safe at road and aware form the wrong side driving vehicle.

fig 1.4 wrong side vehicle

II.   Result and discussion

Sr. no.	Auther Name	Paper	Year	Method	Advantages	Disadvantages	Result	Future Scope
1	Siddharth Shashikar and Vikas Upadhyaya	Traffic Surveillance and anomaly detection using image processing	2017	Image processing technique: 1)Explicit event rocognition 2)Anomaly detection	This technique can gives accurate result in day time as well as night time	The disadvantages are false detection of object and manual lane detection.	Using these techniques we get resultant image of object and direction anomaly of detected vehicles.	In future they can implement shadow removal technique for shadow removal and advanced algorithm for automatic lane detection.
2	S. Alvarez, D. F. Llorca and M. A. Sotelo	Camera auto-calibration using zooming and zebra-crossing for traffic monitoring applications	2013	1) Camera zooming is applied for calculate the camera optimal center. 2) Automatic two vanishing point detection by using at least one zebra crossing .	Intelligent Transportations Systems(ITS) system focuses on principal point and vanishing point which helps or gain automatic calibration of camera.	1)This system is not applicable previousaly recorded video. 2)Poor result could be projected if their camera is placed at very high	These technique can be adviced by using elements such as camera zooming and zebra-crossing.	Future works on robust multi-level able to camera calibration of traffic at most of situations.
3	Hiroaki Nakanishi and Toru Namerikawa	Optimal Traffic Signal Control for Alleviation of Congestion based on Traffic Density Prediction by Model Predictive Control	2016	1) Numerical simulation 2)Traffic density				
4	Yuan Yuan,Dong Wang and Qi Wang	Anomaly Detection in Traffic Scenes via Spatial-Aware Motion Reconstruction	2017	1)localization constrained sparse coding approach 2)Spatial-Aware Sparse Reconstruction method	1) Static camera is able to captured localy or remotely	road anomaly detection is become very difficult because of complex or complicated background.	using this approach measures the abnormal activities of Motion Orientation and Magnitude respectively.	In future there are many hints can uses for example near-infrared information, depth information and other to complete performance and robustness.
5	Ming-Ching chang, Yi Wei, Nenghui Song and Siwei Lyu	Video Analytics in Smart Transportation for the AIC'18 Challenge	2017	Deep Neural Network	Using this techniquefind visual signature in vehicle identification.	Complex to design and implimention	Track 1 is Traffic Flow Analysis, Track 2 is traffic Anomaly Detection. .	In future, include continue refinement algorithms on large real-world dataset.
6	Kanimozhi J. And Dr. M. Nandhini,	Anomaly detection of Traffic monitoring Wireless sensor networks(WSN) – a		1) Vehicular Ad-hoc Network(V	The advantages detect outlier, monitoring raffic and etect traffic		1)detect anomaly with the help of Wireless Sensor	In future,preventing from melicious attacks

6	Kanimozhi J. And Dr. M. Nandini	Anomaly detection of Traffic monitoring in Wireless sensor networks(WSN) – a survey		5) Vehicular Ad-hoc Network(VANET) 6) Traffic Monitorin in VANET 7) Anomaly Detection in Traffic Monitoring 8) Wireless Sensor Network	The advantage s detect outlier, monitoring raffic and detect traffic anomaly		1)detect anomaly with the help of Wireless Sensor Network. 2) outlier detection on TM in VANET	In future, preventing from malicious attack.
7	Vijay A. Kotkar and V. Sucharita	A comperative analysis of machine learning based anomaly detection techniques in video surrveillance.	2017	1)Convolution Neural Network 2)Recuurent Neural Network 3)Cascade Deep Learning	The main advantages of this is by studying about methods researcher get basic idea about machine learning technique to detect anomaly	disadvantages regarding detection of anomaly.	This is study about machine learning based anomaly detection techniques in video surveillance.	In future, there is more needs of algorithm for machine learning implementation.
8	JiaYi Wei, Jianfei ZhaO, YanYun Zhao, Zhicheng ZhaO	Unsupervised Anomaly Detection for Traffic Surveillance Based on Background Modeling	2017	1)MOG 2)Region convolutional neural network(R-CNN)	The advantages is reducing the impact of traffic light waiting time and traffic jam.	The disadvantages in real time if vehicle moves very slowly then it get difficult to choose.	detect vehicles in the extracted background and check if new anomalies are found or not	In future more focuses will be on dynamic process of anomalies to get better results.
9	J. A. Barria and S. Thajchayapong	Detection and Classification of Traffic Anomalies using Microscopic Traffic Variables		microscopic traffic variables	The advantages of this are getting 100% detection rates and zero false alarm rates.	The disadvantages of this is they need very big data with different parameters because the behaviour of anomaly changes frequently.	By using microscopic traffic variables like relative speed, inter-vehicle spacing, inter vehicle time gap and lane change for anomaly detection.	The future scope of this by using microscopic traffic variables on board vehicles.
10	Yue Zhou, Shuicheng Yan, Thomas S. Huang	DETECTING ANOMALY IN VIDEOS FROM TRAJECTORY SIMILARITY ANALYSIS	2007	1) trajectory clustering 2) spectral clustering algorithm.	The advantages of this is it can work on day as well as night time and can give accurate result in both time.	The disadvantages of this is if any moving car slow down speed at some point then it can be considered as anomaly.	The result of this paper is first make a system which is adaptively learn the various parameters for computing the similarityof motion trajectories.	The future scope of this is to extend anomalous event detection algorithm to utilizing feature space.

| 11 | S. Javanbakhti, S. Zinger, P. H. N. de Fast abnormal event detection from video surveillance | Fast abnormal event detection from video surveillance | | optical flow algorithm | The advantages of this they can accurately say from which frame or here block the anomalies is focused and also due to each block implement seperately it can also be said working parellaly. | The disadvantages of this is it can produce false alarms and sometimes missed abnormal events. | analyzed the object by pixel-wise motion context and identifies motion variations based on entropy of discrete cosine transform coefficient. | future scope of this more work on DCT are needed and also testing different types of scenes where human as well as other moving object present. |
| 12 | Calum G. Blair and Neil M. Robertson | Video Anomaly Detection in Real Time on a Power-Aware Heterogeneous Platform | 2016 | there are variables techniques used like field programmable gare array (FPGA), GPU and CPU to detect illegally parked vehicles. | The advantages of this we can easily parked vehicles and classification of human and cars in real time. | The disadvantages of this they implement this on smaller data sets. | Detect the illegally parked vehicles | The future scope of this by extending smaller data sets into larger size data sets can be used for many real time applications. |

I.   Conclusion:

In the proposed approach, the algorithms for three anomalies signal detection, vehicle at zebra crossing and traffic jam has been proposed. From the study it is observed that processing is a better technique to detect the traffic anomalies. It visualizes the reality so it functions much better than those systems that rely on the detection of vehicles metal content. This system can be useful to capture the culprit and better for the traffic controlling. The proposed system is planned to be implemented on the raspberry Pi hardware platform which is easy to make system portable and real time.

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