SURVEY ON TRAFFIC ASSESSMENT USING IMAGE PROCESSING AND FUZZY LOGIC

[1]Pushpalata ,[2]Dr.M.Sasikala,
[1]ASSISTANT PEOFESSOR,[2]PRINCIPAL
[1]Department of computer science and engineering,[2] Department of electrical and electronics engineering
[1]Godutai engineering college for women, kalaburagi, India.

Abstract :In India, traffic is growing multiple times quicker than the population. Wellbeing of streets has turned into a fundamental issue for governments and transport system for past twenty years. Due to increasing population, number of vehicles also have increased heavily, so vehicles traffic on street has turned into a fundamental issue. To beat these issues, in this article we study different traffic assessment techniques such as image processing, ATSC, WSN, TSR, etc. This requires to distinguishing vehicle in rush hour gridlock; identify traffic clog on a street, detect traffic congestion on a road, calculating speed of vehicle and avoid accidents on road. The primary investigation of this paper is image processing techniques. Image processing is a technique for extracting some helpful data from the image which helps to educate for further certain tasks on it. It demonstrates that image processing based strategies give precise information which reduces cost.This paper surveys different procedures and techniques for evaluation of traffic.

***IndexTerms* -Traffic Assessment, imageprocessing, WSN, ATSC vehicles.**

I. INTRODUCTION

The constant increase in number of mechanized vehicles ,creative and viable measures to be taken to handle the difficulties of high traffic volumes and congestion levels. Throughout the years, the strategies for gathering valuable traffic information have developed with the headway in innovation. This may need overhead radar sensors and fixed camcorder frameworks for screening traffic .Traffic evaluation examination model is used for dealing with the issues of the traffic management system which brought about by development/advancement focuses. Traffic lights are flagging gadgets which are utilized to improve traffic effectiveness by varying the sign stage for traffic stream control at street convergences, passerby intersections, and different spots. Conventional traffic lights typically have fixed-cycles, i.e., the lights change at standard interims. This is wasteful since traffic circumstance is always showing signs of change [3]. Traffic evaluation should be performed with the point of lessening the impacts of expanding blockage levels on transport system [5].

Traffic is one of the banes of urban life in India.In our country, even the most extravagant rich utilize open transport, there is a class partition with regards to its utilization This has prompted an extreme increment in the quantity of private vehicles prompting an expanding number of traffic growls. To beat that few systems were proposed to control the traffic appraisals by utilizing image processing techniques [6]. They give more traffic data, join both observation and traffic control advances, are effectively introduced, and are adaptable with advancement in image processing techniques [7]. Image processing is a framework for controlling the traffic assessments. The framework will identify vehicles from images instead of electronic sensors [8]. Image processing offer a generally low establishment cost with little traffic interruption. Additionally, also give wi helps in investigation of traffic streams, speed estimation, various point vehicle tallies, vehicle characterization and parkway state evaluation (for example congestion). It also helps in field of self-ruling vehicle for deciding the vehicle's relative position in the path and for obstruction recognition [9].

So as to minimize issues of traffic evaluations, strategies are expected to recognize and deal with all accessible data identifying with traffic assessments [2]. For that in this study, different procedures are discussed in this area. Here, few of the current techniques are introduced, for example, Model-based traffic expectation frameworks (mbTPS).An intelligent vehicle infrastructure co-operation system (IVICS) based on image processing is utilized for traffic congestion distinguishing proof [11]. Digital image processing is a traffic control framework which uses camera imaging along road side for regular traffic directing procedures. The upside of this framework is exactness. Since a camera more dependable, the exactness will be better compared with different frameworks. However, the framework productivity decrease during blustery season, in foggy climate because of diminished permeability [12]. PC vision is next well known method for taking care of traffic as it can gather numerous data like stream rate, speed, line length of vehicle and simple to introduce with minimal effort. This strategy isn't dependable when there is changing lighting condition and climate [13].

II. LITERATURE SURVEY

A number of researches have been proposed for traffic assessment using image processing technique. A detailed survey has been carried out to identify various research articles available in the literature for analyzing the traffic evaluation using image processing. Here, thirty papers are surveyed. The detail description of the survey is presented here.

T. Pamula [14] had developed a technique for order of street traffic conditions using information observed from video utilizing conventional neural system (CNN). The real technique depends on the neural system classifiers in particular; MLP (multilayer perceptron) and DLN (Deep learning system).In this method misclassification exactness is high and Level of Service (LOS) is low. The grouping of street traffic utilizing CNN has three stages specifically; preprocessing of the video arrangements of traffic scenes, CNN setup, CNN preparing and order tuning, where the CNN beats the genuine techniques in LOS and high precision in characterizing the traffic street conditions.

G. Mallikharjuna Rao and **Srinivas, P** [15] has implemented a methodology called LabVIEW approach for controlling the traffic utilizing image processing technique. Here four spatial areas in particular; portions to be specific Arbitrary, Laplacian, Prewitt and Sobel strategies are utilized in gained picture edge discovery. Here RMSE (Root Mean Square Error) esteem for three dimensions ofof traffic levels (traffic level 1, traffic level 2 and traffic level 3) is determined to find best area in the vehicle identification system. The Laplacian space has positive and negative administrator, where the remaining three areas (Prewitt space, discretionary area, andsober space) have vertical and even administrator separately. By comparing with the distinctive vehicle levels, the Sobel space performs well with high RMSE esteem and diminishes the labor in vehicle identification instrument utilizing picture handling technique.

P. Chowdhury,*et al.* [16] had built up a pre-preparing day and night images location model for vehicle discovery using image processing system. In real, techniques like HSV-based methodology and edge recognition are utilized in vehicle identification process, however, the productivity is low. Thus the pre-preparing day and night image identification model has been created and have two procedures to be specific; Vehicle Detection in Day Time and Night Time Image Processing. In day time vehicle discovery, the RGB images are changed over to dark scale images and the background images are subtracted from forefront images and from the image limit esteem, the negative pixels are disposed of. In night vehicle discovery, the street closer view image is removed and by utilizing the edge esteem, the headlight images were extracted. A channel was utilized to evaluate the little pixels and just the fog light pictures are extracted. By utilizing this system, the accuracy is high while distinguishing the quantity of vehicles when compared with the genuine edge discovery strategy.

The strategy for constant region based traffic thickness estimation utilizing picture preparing for wise traffic control framework was presented by **Uddin***et al.* [18]. Region involved by the edges of vehicles will be considered to appraise vehicles density. Ascertaining the territories of various live streets, the framework will consequently gauge the traffic density of every street which will decide the length of each traffic light. A shrewd traffic sign control framework with the proposed traffic density estimation method will be much better than the regular clock based arrangement . The primary commitment of that exploration lies in the improvement of another procedure that identifies traffic thickness as indicated by the region of the edges of vehicles for controlling traffic blockage. Specific calculation, morphology, and pictures caught with cameras will be utilized for the discovery of traffic density for the clever traffic control framework 2015.

A flexible framework for assessing generic traffic scenes with multiple interacting traffic participants was introduced by **Klingelschmitt***et al.* [19]. It was able to construct a fully interaction-respecting probabilistic situation assessment by using state-of-the-art. The benefits and applicability were presented on a real-world data set. The evaluation indicates that the approach is ableto reconstruct underlying interdependent probability distributions; which outperforms specially designed models, due to the reduced complexities of the single-entity-based recognition models 2016.

For the advancement of the characterization model, **Torija***et al.* [21] have shown a few machine learning algorithms which are utilized, in light of multi-layer Perceptron and bolster vector machines with successive negligible improvement. four component determination procedures, i.e., two subset assessments and two ascribe assessments were actualized to decrease the models' intricacy in this algorithm. Among every one of the potential outcomes tried, bolster vector machines based model accomplishes the better outcomes. Concerning highlight choice strategies, property assessment calculations accomplish preferable

characterization results over subset assessment calculations in decreasing the model unpredictability, thus significant ecological factors were picked for the introduced methodology. Results demonstrate that those devices can be utilized for tending to a brief appraisal of potential street traffic-clamor related issues, just as for social occasion data so as to take all the more well-established activities against urban street traffic commotion.

With a few qualities, for example, enormous scale, various consistency, and practicality, the city traffic information falls in the scope of meaning of Big Data. **Li** *et al*. [23] have presented a Virtual Reality GIS-based traffic examination and representation framework. The presented framework was promising which gives traffic enormous information. Notwithstanding the essential GIS connection works, the presented framework likewise incorporates some clever visual examination and forecasting capacities. The traveler stream determining calculation was presented in detail 2016.

Anil Rao*et al.* [24] have acquainted the USP which gauge vehicular speed independent of camera intrinsics, setup parameters dynamic adjustment to dish, tilt, and zoom. A crossbreed structure for various vehicle was utilized that uses Kalman channel and Hungarian Algorithm to determine impediments. A speed estimation procedure was depicted that was strong enough to work with camera feed from point without prior alignment.

An exact evaluation of urban traffic blockage in Central London, UK Compared with turnpikes or motorways, urban systems are generally less considered on account of its intricacy and accessibility of required traffic information. For that, **Chow** *et al*. [26] have shown a programmed number plate acknowledgment innovation to break down the normal for urban traffic clog in Central London. They additionally presented the utilization of straight relapse to analyze the observed congestion and ascribe them to various causes. Specifically, they recognize the observed clog into two primary parts: one because of repetitive elements and the other due to non-intermittent variables. That was discovered that about 15% of the watched blockage in the district was expected to non-intermittent factors, for example, accidents, roadwork, exceptional occasions, and strikes.

To improve the precision of constant traffic condition the **Khan***et al.* [27] have presented continuous traffic condition evaluation structure. Two particular AI ideal models, Support Vector Machine and Case-based Reasoning, were assessed to guarantee adequate exactness of the handled information to forecasting density in an interstate system. Notwithstanding the density estimation, a point by point steady advantage cost investigation was directed to look at advantages of the incorporated CVT-AI technique over the circle locator thickness estimation framework. This shows the AI-supported CVT gave a base 85% accuracy when the associated vehicle entrance level was half or more. Compared with a circle identifier thickness estimation calculation, the created strategy (CVTAI) gave a more noteworthy exactness in evaluating traffic conditions.

Rempe *et al.* [28] have shown Generalized Adaptive Smoothing Method (GASM) as online traffic speed estimator with Floating Car Data (FCD) as single wellspring of information was surveyed. The fundamental difficulties starting from the meager condition and deferral in gathering FCD were tend to a method utilizing the GASM was introduced that permits evaluating traffic speeds consistently. In a resulting study, the strategy was connected to genuine FCD recorded by huge fleet of privacy-aware mobile sensors during a common congestion.Focal point of the examination was to survey the exactness of traffic speed estimation utilizing the online GASM regarding shifting information densities and postponements. The consequences of their exhibited estimator beat gullible methodologies.

Mary Reeja*et al*. [29] have introduced a Relative Discriminative Histogram of Oriented Gradient (RDHOG) method for determining and following vehicles that plans to find and fragment fascinating vehicle from a video with impediments in rush hour gridlock.At first background subtraction was utilized for identifying moving vehicles from static cameras utilizing outline differencing strategy. This technique identifies the closer view articles dependent on the contrast between the reference outline and the first casing. At that point the shadows in the closer view were wiped out by the edge extraction and the edge of the moving vehicle was distinguished. The vehicle was identified utilizing Histogram of Oriented Gradient (HOG) and (RDHOG) strategy which considers to the shape and size of the vehicle and by producing direction of the moving vehicles. These strategies can distinguish the vehicle with any shape, shading and with impediment. After the discovery of vehicles in the casing, the identified vehicle was followed utilizing a molecule channel which depends on the probability estimation of the likelihood thickness work. Those techniques can identify and follow vehicles with impediments adequately.

Vehicle discovery assumes a significant job for the application, for example, traffic reconnaissance, military, wise leaving framework and become most well known research for Intelligent Transportation System. That was utilized for controlling and

overseeing traffic on street. The vehicle recognition was an extremely troublesome issue for distinctive sort of vehicle on street due to having symmetrical item from front and back .To defeat these issues **Shraddha Shukla and Rohit Raja** [30] have shown strategy for vehicle discovery process (VDP) named as (SURF) Speeded Up Robust Feature.

Memon et al. [31] have exhibited a dream based vehicle tallying and characterization framework. The framework includes catching of edges from the video to perform background subtraction all together distinguish and tally the vehicles utilizing Gaussian Mixture Model (GMM) background subtraction. The significant commitment of the work was the correlation of two order techniques. Arrangement has been actualized utilizing Contour Comparison (CC) just as Bag of Features (BoF) and Support Vector Machine (SVM) method.

Due to the increasing traffic in the cutting edge times it is required to plan a framework compelling in keeping up a record of vehicles going through a path or a street. This will diminish human obstruction with the framework and result in shrinking of broken information. To conquer these issues, **Deepak beam** *et al.* [32] have presented colour based methodology for identifying cars dependent on colour, with the goal that a legitimate data about traveling vehicles can be kept up. With the improvement of shading based following system following of vehicle will wind up simpler and will prompt further command over the vehicular mishap. That has seen that drivers end to get torpid and lose center in such situations lead to events of mishaps in present day times henceforth their system will anticipate the course of vehicle development and lead to further assistance with the goal that driver incidents can be held in line for street traffic wellbeing and passerby assurance in the paths.

El Jaafari*et al.* [33] have exhibited a novel vehicle discovery and following methodology, which depends on a vehicle location procedure beginning from, pictures or video information obtained from sensors introduced on board of the vehicle, to vehicle identification and following. The features of the vehicle were captured by their displayed Gradient data scale (GIST) image processing algorithm, and perceived by the condition of-w orkmanship Support Vectors Machine classifier. The following procedure was performed dependent nervous highlights coordinating methodology. The Kalman channel was utilized to address the estimations. Broad analysis was completed on genuine picture information and the presented methodology for on street vehicle discovery and tracking.

The table.1 shows the existing traffic assessment based techniques, aim, parameters and merits of those techniques. We analyzed articles from the year of 2008 – 2018.

Table.1 Techniques, aim, parameter and merits of articles from 2008-2018

Articles based on Traffic Assessment from 2008-2018				
Ref. No	**Aim**	**Technique**	**Parameters**	**Merits**
14	Classification of road traffic conditions.	Conventional neural network (CNN)	Accuracy	High accuracy
15	Controlling the traffic	Lab VIEW approach using image processing	Efficiency	More efficient with high RMSE value
16	Pre-processing day and night image detection model for vehicle detection	Traffic control vehicle detection system using image processing	Accuracy	Accuracy is high
18	Traffic density estimation for intelligent traffic control system	Traffic Density Estimation technique using image processing	Efficiency	More efficient
19	Fully interaction-respecting probabilistic situation assessment	Probabilistic Situation assessment flexible framework	-	Reduced complexities
21	Assessment of potential road-traffic-noise related problems	Machine learning classification algorithms	-	Reduce complexity

23	Promising and inspiring approach to manage and develop traffic big data.	Virtual Reality Geographical Information System (GIS)-based traffic analysis and visualization system	Large scale, diverse predictability, timeliness, city traffic data	-
24	Estimate vehicular speeds	Kalman filter and Hungarian Algorithm	-	-
26	Analyze the characteristic of urban traffic congestion	Automatic number plate recognition System		
27	Accuracy of real-time traffic condition assessment	connected vehicle technology integrated with the artificial intelligence paradigm (CVT-AI)	-	Better accuracy
28	Traffic speed estimator	Generalized Adaptive Smoothing Method (GASM)	Efficiency	Efficiency is high
29	Detecting and tracking moving vehicles	Relative Discriminative Histogram of Oriented Gradient (RDHOG)	Probability density, shape and magnitude	Efficient
30	Automatic monitoring system	SURF (Speeded Up Robust Feature)	Efficiency & accuracy	Efficient and higher accuracy
31	Detect and count the vehicles	Gaussian Mixture Model (GMM)	Accuracy	Better accuracy
32	Control vehicular accident	Colour based approach	Accuracy	Better accuracy
33	Tracking on road vehicles	Gradient data scale (GIST) image processing algorithm	-	-

III. CONCLUSION

In this article, widespread studies of traffic assessment methods have been discussed. Benefits and demerits of accessible techniques for vehicle in traffic, identify traffic clog on a street, detect traffic congestion on a road, calculating speed of vehicle and avoid accidents on road have been discussed in detail. Various strategies are presented in recently introduced articles on traffic assessments. We also presented a tabulation based on the analyzed techniques, aim of the articles, parameters, and merits of those techniques. This paper can give dependable vision into specific research subject and empowers future work.

REFERENCES

[1] Klosowski, Miron, "Hardware accelerated implementation of wavelet transform for machine vision in road traffic monitoring system," In 2008 1st International Conference on Information Technology, pp. 1-4, 2008.

[2] Yayat, Karda D., B. Kombaitan, and HP HeruPurboyo, "Traffic impact assesment practice in Indonesia," Procedia-Social and Behavioral Sciences, Vol. 227, pp. 75-80, 2016.

[3] da Cruz Figueira, Aurenice, Cira Souza Pitombo, and Ana Paula Camargo Larocca, "Identification of rules induced through decision tree algorithm for detection of traffic accidents with victims: A study case from Brazil," Case studies on transport policy, Vol. 5, No. 2, pp. 200-207, 2017.

[4] Liu, Jian, Jiangtao Li, Lei Zhang, Feifei Dai, Yuanfei Zhang, Xinyu Meng, and Jian Shen, "Secure intelligent traffic light control using fog computing," Future Generation Computer Systems, Vol. 78, pp. 817-824.2018.

[5] Khan, Muhammad Arsalan, Wim Ectors, Tom Bellemans, Davy Janssens, and Geert Wets, "UAV-based traffic analysis: A universal guiding framework based on literature survey," Transportation research procedia, Vol. 22, pp. 541-550, 2017.

[6] Salvo, Giuseppe, Luigi Caruso, Alessandro Scordo, Giuseppe Guido, and Alessandro Vitale, "Traffic data acquirement by unmanned aerial vehicle," European journal of remote sensing, Vol. 50, No. 1, pp. 343-351, 2017.

[7] Rane, Sagar, Aman Dubey, and TejismanParida, "Design of IoT based intelligent parking system using image processing algorithms," In 2017 International Conference on Computing Methodologies and Communication (ICCMC), pp. 1049-1053, 2017.

[8] Dangi, Vikramaditya, Amol Parab, KshitijPawar, and S. S. Rathod, "Image processing based intelligent traffic controller," Undergraduate Academic Research Journal (UARJ) 1, No. 1 (2012).

[9] Choudekar, Pallavi, Sayanti Banerjee, and M. K. Muju, "Implementation of image processing in real time traffic light control," In 2011 3rd International Conference on Electronics Computer Technology, Vol. 2, pp. 94-98, 2011.

[10] Sankhe, Nikita, Poonam Sonar, and Deven Patel, "An Overview of Image processing for traffic applications," IOSP journal of Engineering (IOSRJEN), 2014.

[11] Gomes, Gabriel, Qijian Gan, and Alexandre Bayen, "A methodology for evaluating the performance of model-based traffic prediction systems," Transportation research part C: emerging technologies, Vol. 96, pp. 160-169, 2018.

[12] Jianming, H., M. Qiang, Wentian Qi, Z. Jiajie, and Z. Yi, "Traffic congestion identification based on image processing." IET Intelligent Transport Systems, Vol. 6, No. 2, pp.153-160, 2012.

[13] Mathew, Joseph, and P. M. Xavier. "A survey on using wireless signals for road traffic detection." International Journal of Research in Engineering and Technology, Vol. 3, No. 1,2014.

[14] T. Pamula, (2018). Road Traffic Conditions Classification Based on Multilevel Filtering of Image Content Using Convolutional Neural Networks. IEEE Intelligent Transportation Systems Magazine, 10(3), pp.11-21.

[15] G. Mallikharjuna Rao, and Srinivas, P. (2018). Performance Analysis of Different Spatial Domain Methods for Traffic Control Using Image Processing: A LabVIEW Approach. 2018 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET).

[16] P. Chowdhury, Chandra Ray, T. and Uddin, J. (2018). A Vehicle Detection Technique for Traffic Management using Image Processing. 2018 International Conference on Computer, Communication, Chemical, Material and Electronic Engineering (IC4ME2).

[17] Collotta, Mario, Lucia Lo Bello, and Giovanni Pau, "A novel approach for dynamic traffic lights management based on Wireless Sensor Networks and multiple fuzzy logic controllers," Expert Systems with Applications, Vol. 42, No. 13, pp. 5403-5415, 2015.

[18] Uddin, Mohammad Shahab, Ayon Kumar Das, and Md Abu Taleb, "Real-time area based traffic density estimation by image processing for traffic signal control system: Bangladesh perspective," In 2015 International Conference on Electrical Engineering and Information Communication Technology (ICEEICT), pp. 1-5, 2015.

[19] Klingelschmitt, Stefan, Florian Damerow, Volker Willert, and Julian Eggert, "Probabilistic situation assessment framework for multiple, interacting traffic participants in generic traffic scenes," In 2016 IEEE Intelligent Vehicles Symposium (IV), pp. 1141-1148, 2016.

[20] Tang, Difei, and Peng Wang, "Nodal impact assessment and alleviation of moving electric vehicle loads: From traffic flow to power flow," IEEE Transactions on Power Systems, Vol. 31, No. 6, pp. 4231-4242, 2016.

[21] Torija, Antonio J., and Diego P. Ruiz, "Automated classification of urban locations for environmental noise impact assessment on the basis of road-traffic content," Expert Systems with Applications, Vol. 53, pp. 1-13, 2016.

[22] Gulliver, John, David Morley, Danielle Vienneau, Federico Fabbri, Margaret Bell, Paul Goodman, Sean Beevers, David Dajnak, Frank J. Kelly, and Daniela Fecht, "Development of an open-source road traffic noise model for exposure assessment," Environmental Modelling & Software, Vol. 74, pp. 183-193, 2015.

[23] Li, Xiaoming, ZhihanLv, Weixi Wang, Baoyun Zhang, Jinxing Hu, Ling Yin, and Shengzhong Feng, "WebVRGIS based traffic analysis and visualization system," Advances in Engineering Software, Vol. 93, pp. 1-8, 2016.

[24] YG, Anil Rao, Sujith Kumar, H. S. Amaresh, and H. V. Chirag, "Real-time speed estimation of vehicles from uncalibrated view-independent traffic cameras," In TENCON IEEE Region, 2015.

[25] Tomić, J., N. Bogojević, M. Pljakić, and D. Šumarac-Pavlović, "Assessment of traffic noise levels in urban areas using different soft computing techniques." The Journal of the Acoustical Society of America, Vol. 140, No. 4, pp. EL340-EL345, 2016.

[26] Chow, Andy HF, Alex Santacreu, IoannisTsapakis, GaravigTanasaranond, and Tao Cheng, "Empirical assessment of urban traffic congestion," Journal of advanced transportation, Vol. 48, No. 8, pp. 1000-1016, 2014.

[27] Khan, Sakib Mahmud, "Real-time traffic condition assessment with connected vehicles," 2015.

[28] Rempe, Felix, Philipp Franeck, Ulrich Fastenrath, and Klaus Bogenberger, "Online freeway traffic estimation with real floating car data," In 2016 IEEE 19th International Conference on Intelligent Transportation Systems (ITSC), pp. 1838-1843, 2016.

[29] Reeja, Y. Mary, T. Latha, and W. Rinisha, "DETECTING AND TRACKING MOVING VEHICLES FOR TRAFFIC SURVEILLANCE," 2006.

[30] Shraddha Shukla, Prof. Rohit Raja, "A Survey on Automated Monitoring System for Vehicle Detection Using Different Techniques," International Journal of Advanced Research in Computer Engineering & Technology (IJARCET), Vol. 5, No. 2, 2016.

[31] Memon, Sheeraz, Sania Bhatti, Liaquat A. Thebo, Mir Muhammad B. Talpur, and Mohsin A. Memon, "A Video based Vehicle Detection, Counting and Classification System," International Journal of Image, Graphics & Signal Processing, Vol. 10, No. 9, 2018.

[32] Deepak Ray, Arxhit Saxena, AyanSamal, "VEHICLE DETECTION BY IMAGE PROCESSING USING MATLAB:A COLOUR BASED APPROACH ," International Journal of Industrial Electronics and Electrical Engineering, ISSN(p), Vol. 6, No. 3, pp. 2347-6982, 2018.

[33] El Jaafari, Ilyas, Mohamed El Ansari, LahcenKoutti, Ayoub Ellahyani, and Said Charfi, "A novel approach for on-road vehicle detection and tracking," Int. J. Adv. Comput. Sci. Appl, Vol. 7, No. 1, pp. 594-601, 2016.