Designing a Model on Smart Traffic Control System

Gauri Sonawane, Sajidullah Khan

Abstract: Lots of Traffic Congestion during office hours or some special Occasion also during heavy traffic usually results in uncertainty and dispute, auto crashes, waste of time and resources, and release more carbon into the ecosystem so to avoid heavy traffic jams and to avoid them to wait on signal. Proposed idea will be given more advantage to reduce waiting time on the signals and vehicle will be easily pass with the help of speed management notification on on Digital Gadget. Each vehicle is furnished with RFID and with the help of distance sensor location of vehicle signal system can easily detected and system will provide notification to a person who drives a vehicle on their mobile phone or Digital gadget, according to that person will manage the speed of the vehicle to reduce waiting time on signals with the help of this system. It reduces everyday congestion, by regulating traffic flows and prioritizing traffic to demand in running time. Reducing the pollution throughout the urban area and polluting also in our system if the traffic density is more or if there is a traffic jam, then we would be uploading the status on the GPS which would indicate that there is a traffic jam at a particular signal. Prevent Maximum amount of traffic flow & can prevent traffic congestions. Real time measurement of speed of vehicle to control the traffic congestion is possible through image processing. Huge amount of processing algorithms are present to detect the speed of vehicle.by using image processing algorithm we easily detect the number of vehicle and speed of particular vehicle.

Keywords: Routing Optimization, Thermal Camera, RFID.

I. INTRODUCTION

Traffic congestion is a big problem in many urban cities of the world. The problem is particularly present in developing countries. In recent days scenario, this is a very important feature [3][1], especially for urban cities environments. Some systems require manual control which consist extend for human error. RFID tags consist long range, no line of vision requirement, and can with stand cruel environments and can track objects in real time. RFID [6] tags are used to detect vehicles and activate the traffic control and mange protocol. Traffic surround is a major problem in developed cities. In Proposed idea on signal each signal furnished with Infrared thermal Camera they were captured the images of Vehicle motion and number of vehicle present in each road to avoid deadlock.
II. LITERATURE REVIEW

Traffic congestion is a major issue in day to day life because of traffic congestion lots of fuels wasted, also pollution increase day by day to avoid these problems traffic solution is needed. As per this Techniques I placed RFID Sensor on vehicle which I used An OBU consisting of a sticker-type RFID tag that requires no power source. RFID readers installed in tollgates read the identification information of the RFID tag placed to the windshield of a vehicle and charges the user through the bank account associated with the identification information. The function of the RFID tag is limited to the identification of the vehicle, and it cannot announce the paid toll or a record of the payment history. Due to the low cost of RFID tags, however, this type has attracted attention recently in emerging countries such as those in Asia and Latin America. RFID tags All of the types are available in order to achieve various toll collection demands around the world. This paper describes our efforts toward the development and practical application of a toll collection system using RFID communication technologies. GDSM is an advanced of the DSM model with the use of a genetic algorithm (GA). In this method follow two steps to reduce noise. They are useful for creating the saliency map (SM), a weighted center-surround difference (CSD). The Gaussian noise around particle and object, generated by the monotonous image resizing in the Gaussian Pyramid, it minimizes the object detection performance. The sizes of the moving objects are bigger the real sizes. In this paper, the weights of CSD are optimized by using GA to get more tight object regions. GA starts by a population of randomly initialized weights that are being optimized with the lower and upper bounds, which are zero and one, respectively. The average error of moving object detection in all training images is calculated based on the flank ratio, and used in calculating the fitness function based on below equation. The overlap ratio is calculated by the ratio of the intersection area to the union area of the hand-labeled ground truth. Vehicle signal system can easily detect and system will provide notification to a person who drive vehicle to avoid waiting Time on Signal. According to that Person who drive vehicle will manage his speed.

III. PROPOSED METHODOLOGY

Block Diagram

Procedure:
1. Placed beam in between 1 km and 2 km from the Signal
2. Capture Car Path, status, distance from signal with help of camera, sensors and stored it on database Capture the vehicle speed by various image processing algorithm calculate the speed of vehicle
3. If vehicle within 1KM or 2KM from signal
4. Provide Notification of Speed on Digital Gadget of the person who drive vehicle to avoid waiting Time on Signal
5. According to that Person who drive vehicle will manage his speed.

fast moving object by calculating the pixel image found by using GDSM(Genetic Dynamic Salience Map and DSM (Dynamic Salience Map). this algorithm help us to avoid deadlock condition to detect the actual speed of vehicle.[7]
3.1 FLOWCHART

Algorithm
K-Nearest Neighbor Algorithm consist set of input images by using this classifier capable of find the Euclidean distance between images.

One of useful supervised based learning and non-parametric techniques is K-Nearest Neighbor or KNN algorithm. KNN is a wide applied method used as a classifier and regression in different field such as image processing, data mining, pattern recognition and other applications. The output result of the algorithm depends on K- nearest neighbor which implemented by finding K- number of training points closest to the required character and consider the votes among the K object. The algorithm is very easy. However, is useful of learning more complex non-linear decision boundary and regression functions. The intuition of KNN that same instances should have same class labels (in classification) or same target values (regression). On the downside, the algorithm is computationally expensive, and is prone to overfitting.

\[
\text{Euclidean} = \sqrt{\sum_{i=1}^{K} (X_i - Y_i)^2}
\]
\[
\text{Manhattan} = \sum_{i=1}^{K} |X_i - Y_i|
\]
\[
\text{Minkowski} = \left( \sum_{i=1}^{K} |X_i - Y_i|^{q} \right)^{1/q}
\]

Decision tree learning predictive modeling go from monitoring about an item data to conclusions about the item's target value. Here for the speed calculation from the signal user reach to the signal on particular time we need decision tree machine learning algorithm.

| Distance from the Signal | Speed     |
|-------------------------|-----------|
| 10m                     | Manage 50km/hr |
| 20m                     | Manage 30km/hr |
| 30m                     | Manage 50km/hr |
| 40m                     | Manage 50km/hr |

Motion Detection Algorithm: By using a Genetic Algorithm moving objects detection for Real-time traffic observation also provide smart dynamic analysis to fast moving object by calculating the pixel image found by using GDSM (Genetic Dynamic Salience Map and DSM (Dynamic Salience Map). this algorithm help us to avoid deadlock condition to detect the actual speed of vehicle.[7]

| Camera       | Approx.Min Recognition Distance(m) | Approx.Min Recognition Distance(m) | Scene          |
|--------------|-----------------------------------|-----------------------------------|----------------|
| Thermal Camera | 15                               | 50                                | Road traffic   |

Fitness function = \(E (1-\text{overlap_ratio})\)

\[
\text{Overlap ratio} = \frac{T \cap D}{A} \quad T \cup D = AC / \ AT + AD - AC
\]
IV. RESULT ANALYSIS

VEHICLE DETECTION
Simulation Model

V. CONCLUSION

The purpose of this paper by using this technology user can easily avoid heavy traffic jams and to avoid them to wait on signal. Proposed idea will be given more advantage to reduce waiting time on the signals and vehicle will be easily pass with the help of speed management notification on Digital Gadget. It’s a step towards our country become smart country.

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REFERENCES

1. Krzysztof Halawa, MarekBazan, “Road traffic predictions across major city intersections using multilayer perceptions and data from multiple intersections located in various places,” Ophthalmology. IET Intell. Transp. Syst., 2016, Vol. 10, Iss. 7, pp. 469–475.
2. S. V. Kumar and L. Vanajakshi, “Short-term traffic flow prediction using seasonal ARIMA model with limited input data,” Eur. Transp. Res. Rev., vol. 7, no. 3, pp. 1–9, 2015.
3. B. Pan, U. Demiryurek, and C. Shahabi, “Utilizing Real-World Transportation Data for Accurate Traffic Prediction.”
4. M. Tan, S. C. Wong, J. Xu, Z. Guan, and P. Zhang, “An Aggregation Approach to Short-Term Traffic Flow Prediction,” vol. 10, no. 1, pp. 60–69, 2009
5. X. Pang, C. Wang, and G. Huang, “A Short-Term Traffic Flow Forecasting Method Based on a ThreeLayer K-Nearest Neighbor Non-Parametric Regression Algorithm,” no July, pp. 200–206, 2016.
6. J. He, W. Shen, P. Divakaruni, L. Wynter, and R. Lawrence, “Improving Traffic Prediction with Tweet Semantics,” pp. 1387–1393.
7. A. A. Shafie, M. H. Ali, F. Hafiz, and R. M. Ali, “Smart Video Surveillance System for Vehicle Detection and Traffic Flow Control,” vol. 6, no. 4, pp. 469–480, 2011.
8. A. Wibisono, W. Jatmiko, H. A. Wisesa, B. Hardjono, and P. Mursanto, “Knowledge-Based Systems Traffic big data prediction and visualization using Fast Incremental Model Trees-Drift Detection (FIMT-DD),” Knowledge-Based Syst., vol. 93, pp. 33–46, 2016.
9. AnujaNagare , Shalini Bhaitia , “Traffic Flow Control using Neural Network”, International Journal of Applied Information Systems (IJAI), Volume 1– No.2, January 2012
10. Jian-Mei1 Xiao, Xi-HuaiWang,”Study On Traffic Flow Prediction Using Rbf Neural Network”, 26–29 August 2004
11. Adel Abdennour,”Evaluation of Neural Network Architectures for MPEG-4 Video Traffic Prediction",IEEE Transactions On Broadcasting, VOL. 52, NO. 2, JUNE 2006
12. Corinne Ledoux," An Urban Traffic Flow Model Integrating NeuralNetworks", TranspRes.-C, Vol. 5, No. 5, pp. 287-300, 1997
13. Kranti Kumara, ManoranjanParida&Vinod Kumar Katiyara,”Short term traffic flow prediction in heterogeneous condition using artificial neural network",2013
14. Jason Hall and Philip Mars"The Limitations Of Artificial Neural Networks For Traffic Prediction"
15. J. David Schaffer , Darrell Whitley ‘Larry J. Eshelman “Combinations of Genetic Algorithms and Neural Networks:A Survey of the State of the Art”,1992

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