

Intelligent Speed Violation Detection System

Sukhdeep Singh, Rishma Chawla, Harpal Singh

Abstract— As growing population the Traffic also increasing on roads day by day. The roads are full of the vehicles all time. When the traffic increases on road traffic violation increased due to heavy traffic. The drivers do not obey the rules like speed limit. The reason is high speed of vehicle increases violation. The speed of the vehicles is beyond the expected speed limit is called speed violation. The speed of the vehicle is more than defined limit is dangerous because it increases the chances of accidents. Speed violation is a major reason behind on road accidents. These violator's vehicles are not tracked by human eyes. So, various systems have been developed for the detecting speed of vehicles. But these systems are suffered from the problems that occur due to bad weather condition and bad light condition. In this paper we introduced a system, based on RFID technology, which is capable of work properly even in bad lighting and weather conditions.

Index Terms— Speed limit, Violator Vehicles, vehicle Speed Violation, RFID

I. INTRODUCTION

Traffic control is an outdoors occupation, night or day for long hours in all weathers, and is considered a dangerous occupation due to the high risk of being struck by passing vehicles. The traffic control process usually starts with a traffic control plan. The traffic sign used to convey traffic rules and regulations such as speed limit. The speed of vehicle means on which speed vehicle moves on the road. Vehicle speed detection is very important for observing speed limitation law and it also demonstrates traffic condition. The speed of the vehicle more than defined limit is dangerous which

makes the chances of accidents. When vehicles speed violation increased the accidents increased time to time. Video and image processing have been used for traffic supervision, analysis and monitoring of traffic condition in many cities and urban areas. Extract reliable and precise traffic parameters have been one of research objectives in last three decades. For the traffic planning and management, obtaining the traffic parameter is the critical step. Traffic parameter must be carried out at different environments where the traffic condition changes as well as the light illumination. [1] The intelligent Transportation system (ITS) is a new approach to manage traffic vehicles. These systems are becoming more important due to their advantages of

Manuscript received January 20, 2014.

Mr. Sukhdeep Singh received the B.Tech Degree in Information technology from Lovely school of Engg. & Tech, Lovely Professional University, Jalandhar, India in 2010.

Miss. Rishma chawla received M.Tech Degree in Computer Sci. & Engg. from Guru Nanak University, India. Currently working as Assistant Professor in Computer Science & engg. at Ramgarhia institute of Engg. & Tech.

Mr. Harpal Singh. received the M.tech degree in Computer Science & Engg. from Lovely Professional University in 2012. Currently working in GKU as an Assistant Professor in Computer Science Department.

saving lives, money, and time. Acquiring traffic information, such as lane width traffic volume (the number of travelling vehicles per time period through a position in a lane), traffic density (the number of total vehicles in a given area at a given time) and vehicle speed, these are the key part of Intelligent transportation systems and such information is used to manage and control traffic. It focuses on vehicle speed since reducing speed can help to reduce accidents. [2]

II. RELATED WORK

The lot of work and efforts has been done for vehicle detection and speed measurements. Ferrier et al. (1994) introduced vehicle detection based on frame difference, un-calibrated camera (Pumrin and Dailey, 2002), motion trajectories (Melo et al., 2006), geometric al optics (Jianping et al., 2009), and digital aerial images (Fumio et al., 2008; Wen and Fumio, 2009) are already introduced. Also, Huei-Yung and Kun-Jih (2004) used blur images to find out the vehicle speed and Pumrin and Dailey (2002) utilized camera motion detection for automated speed measurements. Shisong et al. (2006) took advantage of feature point tracking for vehicle speed measurements. [3] Vision-based vehicle speed measurement (VSM) is one of the most convenient methods available in intelligent transportation systems. A new algorithm for estimating individual vehicle speed based on two consecutive images captured from a traffic safety camera system. Its principles are first, both images are transformed from the image plane to the 3D world coordinates based on the calibrated camera parameters. Second, the difference of the two transformed images is calculated, resulting in the background being eliminated and vehicles in the two images are mapped onto one image. Finally, a block feature of the vehicle closest to the ground is matched to estimate vehicle travel distance and speed. [4] The other techniques for vehicle speed measurement technologies are radar, speed measurement by Laser, Speed Measurement by Lights, Speed measurement through technographs etc. [5]

III. RESEARCH WORK

The RFID technology has been incorporated to commercial transportation systems. A Radio Frequency Identification (RFID) system consists of one or more tags (or transponders) that store data and transfer the data to one or more readers (or interrogators) over a wireless interface. In practical RFID systems the readers are networked to a wider enterprise computer system. The main function of an RFID system is to enable tagged items or persons to automatically state their identity to other systems wirelessly. A well known example is the RFID-based highway toll collection systems which are now routinely employed in many countries, like the Telecast system in Italy or the Auto pass system in Norway. Other uses include monitoring systems to avoid vehicle theft [6], access control to car parking or private areas [7], and embedding of

RFID tags in license plates with specially coded IDs for automatic vehicle detection and identification [8]. Radio Frequency Identification (RFID) technology shows a continuous growth in various application fields, like logistics, medical science, security, access control etc. The RFID system is a three component system consisting of: tag, reader and database. The access control, specifically, is detection of IDs entry to or exit from the range area of the RFID reader. [11] The RFID technology is a means of gathering data about a certain item without the need of touching or seeing the data carrier, through the use of inductive coupling or electromagnetic waves. The data carrier is a microchip attached to an antenna (together called transponder or tag), the latter enabling the chip to transmit information to a reader (or transceiver) within a given range, which can forward the information to a host computer. The middleware (software for reading and writing tags) and the tag can be enhanced by data encryption for security-critical application at an extra cost, and anti-collision algorithms may be implemented for the tags if several of them are to be read simultaneously. [9] An RFID system consists in a set of emitters or tags which, periodically or upon interrogation, transmit a short digital radiofrequency message containing an identification code (unique to each tag) as well as some data stored in the tag's memory. These data can be obtained remotely by a computer equipped with an RFID reader.

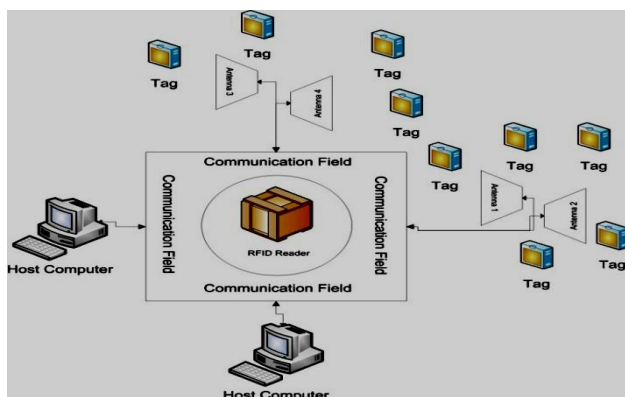


Figure 1: Components of an RFID System [12]

The main advantage of RFID systems—with respect to other RF technologies, which could be used for infrastructure-to-vehicle (I2V) communications—is its low cost and minimum infrastructure maintenance, which results in a high scalability and easy deployment of the infrastructure. [10] The RFID based System uses the Radio frequency identification technology. In this system used the 2 RFID Readers for reading the RFID Tag enable vehicle. The RFID Reader mounted on the Road within the few distance. The RFID tag placed in the vehicle. The System used passive tags which store the vehicle information. Passive Tag obtained power from the reader.

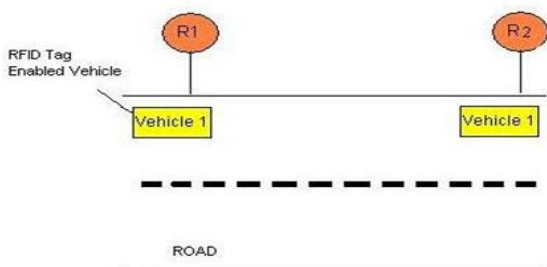
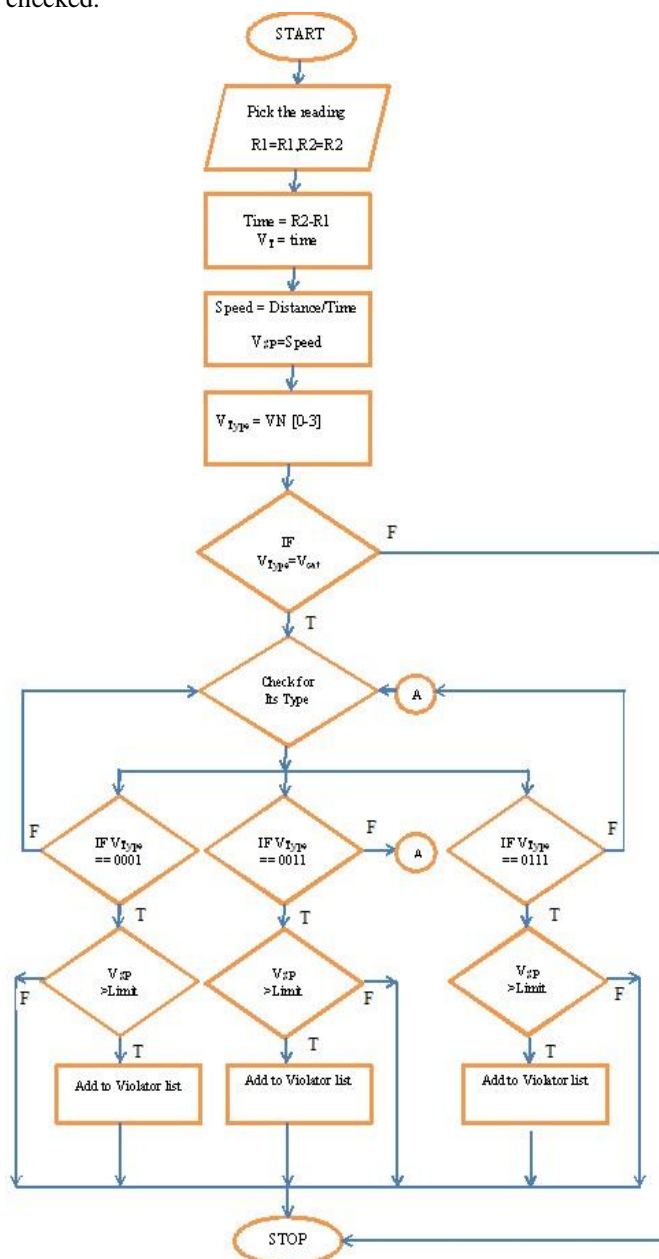


Figure 2: RFID based System environment.

In RFID based system when tag enabled vehicle (V1) comes under in the range of Reader 1 (R1) the vehicle information read by the R1 from the vehicle tag, the entry of the vehicle stored in the database with time, date and vehicle number. After this the vehicle travelled from R1 to R2. When vehicle comes in the range of Reader (R2) the entry about vehicle store again in database with outing time. After this system calculate the difference between entries of vehicle form both readers. The time is calculated by time taken for travelled by vehicle from R1 to R2 ($R_2, T - R_1, T$). Speed is calculated by Distance/Time. Distance between the Readers predefined. After speed calculation, the current speed is compare with existing speed limit if the current vehicle speed is more than given vehicle limit it declared as "Speed Violator". In this system vehicles are divided in different categories like light weight vehicle, heavy weight vehicle and two wheelers. According to vehicle type the speed limit is compared or checked.



Flow Chart of RFID Based System. ALGORITHM

Step1: Pick the reading of two Readers (R1 & R2) of the vehicle.

Step 2: Calculate the difference between the readings of R1 & R2 and Store it into variable Time.

$$\text{Time} = R2 - R1, V_T = \text{Time}$$

Step 3: Next, Calculate the speed

$$\text{Speed} = \text{Distance}/\text{Time}, V_s = \text{Speed}$$

(Distance is predefined)

Step 4: Extract the type of the vehicle from vehicle number (VN) and store it into a variable TYPE VEHICLE.

Step 5: Now compare the vehicle type with vehicle category after this according to category and check its type.

Step 6: Now compare the current speed with given speed limit of vehicle type.

Step 7: If the current speed greater then speed limit then vehicle declared as Violator. The information about violator vehicle is stored in the database.

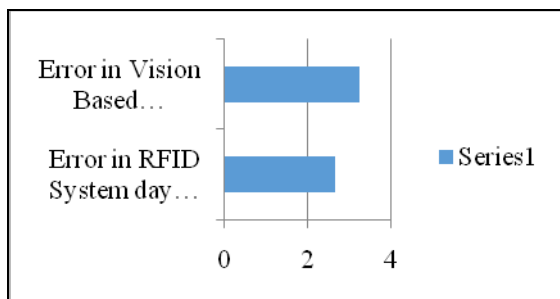
Step 8: End

IV. RESULTS

The RFID based system improves the performance of speed violation system as shown in the following tables and charts.

Table 1: Compression table of error rate in RFID based system and Vision based system during day time.

Error in RFID System day time	Error in Vision Based System day time
2.67	3.27

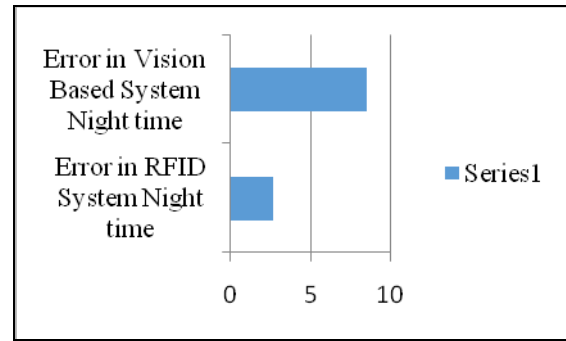


Compression Chart of error rate in RFID based system and Vision based system during day time.

The error rate of Vision based detection system is 8.51 during night and 3.27 during day time. Where the error rate of RFID based speed violation detection system are 2.67 during day time as well as during night time. On the basis of results given above it's prove that RFID based system perform well even in night time. There is no effect of bad weather and bad lighting condition on RFID based speed violation detection system.

Table 2: Compression table of error rate in RFID based system and Vision based system during Night time.

Error in RFID System Night time	Error in Vision Based System Night time
2.67	8.51



Compression chart of error rate in RFID based system and Vision based system during Night time.

V. CONCLUSION

The multiple technologies used for speed violation detection like Radar Based Technology, Laser Light System, Average speed computer System, Vision Based System etc. Each of them suffer from the problem like Less Accuracy; don't work in bad weather or light condition, High Cost, Limited Range, Line of sight, problem to Focus on a particular vehicle etc. With the help of RFID reader and tag communication, the system can track the violator vehicles even in bad weather conditions and bad lighting conditions. The Radar and Vision based vehicle system the averaged estimation errors for day time cases is 3.27%, while for night time cases is 8.51%. [2]Using the RFID based system the error rate is 2.67 even in day time as well as during night time so its accuracy is better than vision based system and radar system. In the RFID based system the multiple vehicles can be detected at same time.

REFERENCES

- [1] Arash Gholami Rad* and Mohamed Rehan Karim " A robust traffic quantity measurement with video surveillance", International Journal of the Physical Sciences Vol. 6(5), pp. 962-970, 4 March, 2011
- [2] PrakashV, Devi.P (2012) in "Vision Based Vehicle Speed Measurement System" Journal of computer applications, ISSN: 0974-1925, Volume V, Issue 3, 2012
- [3] ArishThalami Rad,Abbas Dehghani "Vehicle speed detection in video image sequences using CVS method" International journal of the Physical Sciences, Vol 5(17), pp 2555-2563, 18 december, 2010
- [4] Prakash V,Devi.P (2012) in "Vision Based Vehicle Speed Measurement System" Journal of computer applications, ISSN: 0974-1925, Volume V, Issue 3, 2012
- [5] "Traffic measurement technology" Federal Office of Metrology METAS, ISBN 978-3-9523289-6-5, January 2010
- [6] Fan, X.H.; Zhang, Y.L.A Design of bi-verification vehicle access intelligent control system based on RFID. In Proceedings of the Ninth International Conference on Electronic Measurement & Instruments (ICEMI'2009), Beijing, China, August 16-19, 2009.
- [7] Hsieh, W.H.; Ho, C.J.; Jong, G.J. Vehicle Information Communication Safety Combined with Mobile RFID. In Proceedings of International Conference on Intelligent Information Hiding and Multimedia Signal Processing, Harbin, China, August 15-17, 2008.
- [8] Zhou, Z.G.; Li, W.Y.; Deng, C.Y.; Li, T.; Li Y.W. Secure Design of RFID Tags in the New Type License Plates Automatic Identification System. In Proceedings of International Symposium on Computer Sciences and Computational Technology. TBD, Shanghai, China, December 20-22, 2008; Volume 1, pp. 694-697.
- [9] Elisabeth ILIE-ZUDOR, Zsolt KEMENY, "The RFID technology and its current applications", ISBN 96386586 57, pp 29-26 MITIP 2006.
- [10] Joshue Perez, Fernando Seco "An RFID - Based intelligent Vehicle speed Controller Using Active Traffic Signals ", Sensors 2010, ISSN 1424-8220.
- [11] AteethKumarThirukkavulur,Harikrishnanandagopal "RFID technology for smart vehicle control using traffic signal & speed limit tag

communication”,International journal of computer applications (0975-8887),Vol 43- No14, April 2012.

- [12] Kamran AHSAN, Hanifa SHAH and Paul KINGSTON “ RFID Applications: An Introductory and Exploratory Study”IJCSCI International Journal of Computer Science Issues, Vol. 7, Issue 1, No. 3, January 2010,ISSN (Print): 1694-0814.



Mr. Sukhdeep Singh received the B.Tech Degree in Information technology from Lovely school of Engg. & Tech, Lovely Professional University, Jalandhar , India in 2010.He had presented various papers in international journals. His area of interested is networking.



Miss.Rishma chawla received M.Tech Degree in Computer Sci. & Engg. from Guru Nanak University , India. Currently working as Assistant Professor in Computer Science & engg. at Ramgarhia institute of Engg. & Tech.She has 3 year teaching experience. She has presented 3 national papers and 7 international journals.Her area of interest is Digital Image Processing & networking.



Mr.Harpal Singh. received the M.tech degree in Computer Science & Engg. from Lovely Professional University in 2012.Currently working in GKU as an Assistant Professor in Computer Science Department. He has two year teaching experience. He has presented more than 10 national and international research paper/journals in various conferences. His area of interest is VANET and other Adhoc network technologies.