Designing a Advanced Technique for Detection and Violation of Traffic Control System

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ABSTRACT

The main intention of this paper is to design a framework for detection and analyzing the activity of drivers violating the traffic rules. Advanced system monitors the activities of drivers, if the violations of traffic rules happen then immediately report to the control room and give the assistance to the drivers. The proposed system track the activities of drivers and then faults are stored in the database, which may be used for the future investigation. Radio frequency identification (RFID) is used to gather the information about the violation of drivers. The RFID tag is embedded with two components, first one is computer vision mainly used to recognize and identify the traffic sign for the whole day. Event recorder is used to record the activities of traffic violation and stored in the database. This architecture is used as effective tool for detecting and analyzing the activities of drivers violating.

Keywords: Radio frequency identification, Charge coupled device, Global System for Mobile

INTRODUCTION

Road accident in the world has been increasing dramatically with the rate of 0.46%. Nearly 1.5 lakhs people in India lost their lives due to the road accident [1]. The purpose of the techniques is to identify the persons those who are violating the rules of traffic. Most types of accidents happen due to the rules of traffic is not properly followed. With the help of this method, guidelines/assistance will be provided and this process helps the drivers to follow the principles of traffic system [2]. For example, if the driver is driving the car in over speed or not properly follows the rules, immediately alert is produced that make the driver to avoid the accidents [3].

Most of the accidents happen, when the driver is travelling first time in any new location, people may not familiar about the speed breaker, school and some other dangerous curve. This kind of information is transferred to the driver prior before reaching the designation. Alert information will assist the drivers while travelling in the dangerous zone [4]. During in the night time, or due to the bad weather, it is very much difficult to drive and to follow the traffic rules. At that time this type of warning and guidelines helps the drivers to avoid the dangerous accidents [5]. The proposed system not only giving the reminders also violation of drivers, incidents/accidents are gathered and stored in the local database for the future investigation purpose. Computer vision used in the system records all the activity in terms of video proof to identify the misbehaviour of drivers who have involved and to gather the information about the vehicle is used to the control room [6]. The proposed system acts as better tool for detection and identification of drivers involving in the accident by violating the rules and also give the prior reminder for the avoiding the dangerous accidents.

RELATED WORKS

Chen et al. [7] used the sensor approach for detecting the motion and shapes of an object. Laser sensor is used for the detection the activity of the user and it is given as input to the further processing. Infrared camera is used for capturing the object of the background portion for the analyze purpose. The portion detected by the infrared camera is used for matching the objects in the database. Kalman filter is used to extract the exact information in terms of images is affected by the noise. The limitations of the suggested techniques is that time required is little bit more for reaching the destination

Sawant et al. [8] recommended the traffic detection system based on the RFID technology. RFID is used to gather the information about the vehicle. First the computer vision is used to identify the traffic condition and then information is shared to the drivers for further assistance. Background subtraction information is used for recognize the number plate of vehicle. With the help of number plate, automatically the user information can be captured very easily. Dynamic behaviour of moving object is captured very easily through the background subtraction method. The limitation of the suggested technique based on the captured images, the pattern is recognized and matched and can be used for the identification purpose.

Breitenstein et al. [9] used CCD surveillance cameras for the recognition and tracking of vehicle. The image of vehicles are captured the CCD camera and it can be used for the investigation purpose. Vehicle information such as size, length and number plate is captured by the suggested method. Recognition and segmentation process is applied for the filtering the exact information of vehicle. This work is mainly designed to count the number of vehicles crossing all over the toll gate and for gathering the information about the vehicle. If any misbehaviour activities is suspected in the next toll gate then immediately information is shared based on the input obtained. Vehicle information is used for investigation purpose and drawback based on the images captured by the camera used for the tracking purpose.

Chattaraj et al. [14] used the un-calibrated camera for tracking and detection of multi user in the traffic. The main intention of suggested technique is to capture the dynamic moments of the vehicles. Based on the predefined shapes and already information stored in the database, the content is matched and recognition performed. Particle filtering is used for identify the shapes of target objects based on the predefined shapes, the data associated between original and identified objects. Similar coincidence of the two objects have been considered and matched to identify the detected object. The misbehavior activity of drivers is immediately reported to the nearby health center.

Wong et al. [15] formulated the concurrence matrix is constructed between the original and detected objects. First the images are captured in the static environment and co variation between the two objects is calculated. Classifier is used to classify the data according to the match constraints. Fore ground and back ground is find out for the detected images and then subtraction process is applied based on the requirement of the data required for the investigation purposes. The limitation of this techniques is that the clarity of image can be processed very easily but the blurred image is very much difficult to segmented and recognize the object.

Mariya et.al [16] suggested the violation system for the traffic based on the liquor sensor. Activities of drivers are continuously monitored from the beginning. The footage of video is used to gather the information of vehicle as well as the owner details. Liquor sensor is used to identify the user inhaled the liquor while driving in the vehicle. Because most of the accidents happening violating the rules, deinked driving is always dangerous, sometime they may not have conscious. Liquor sensor immediately gathers and transferred the information to the nearest control room to alert, and then the vehicle may stop before crossing the nearest toll gate. The limitation of this technique lot manual process is involved and alert information should reach to the control room at the exact time.

After made a through survey based on the related works, there is need of the automatic detection and violation, alert system used for analyzing, alert message should reach driver for paying attention to avoid the accidents.

METHODOLOGY

The proposed system receives the signals from the vehicle with the help of RFID receiver for determining the current location. Position of vehicle is tracked using the radio frequency generated by the RFID and for the monitoring purposes. For example, any user entered in the restricted area like coastal or forest area. This information is immediately passed to the nearby base station when the user crossed the limit; alert is sending to the control room. Warning alert message is indicated for the drivers also, LCD screen is used to display the current location while entered to the dangerous zone and this system is used for the fisherman for providing the alert information while crossing the border of the own country. If they crossed then the position of the vehicle is shared to the registered number and also for the family members.
Step 1: The RFID is used to track the distance of the present vehicle by sending the radio frequency signal. After trace the vehicle, the information is immediately shared to the control room for analysis purpose.

Step 2: GSM is used to locate the exact position of vehicle by determining the coordinate of location, when the driver crossed the limit of the dangerous zone and position is shared to the control room.

Step 3: The micro controller process the information received from the RF receivers as well the data received from the sensors. Based on the traffic sign and predefined shapes and signature is used in the

database. Similarity features is identified and mapped with the original and detected image.

Step 4: The unwanted behaviour of the incidents is captured by the computer vision used in the instruments. For example the vehicle is crossed the limit or travelling in the over speed. All the activities are captured and immediately forwarded to the control room.

Step 5: The LCD is used to display the vehicle information to the control room by alerting the location and user information about the vehicle violating the user framed by the traffic control system.
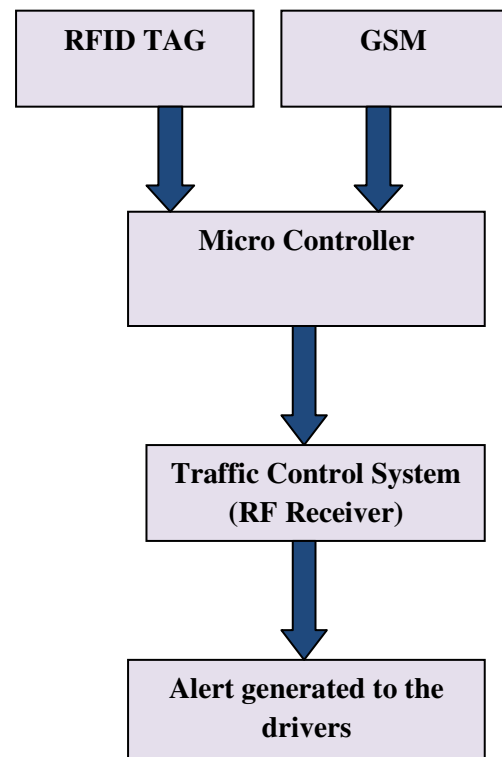

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Figure 1. Block diagram for the proposed system

Results and Discussion
A. Arduino
The Arduino is one of the best open source tools for integrating the hardware and software components in the single platform based on the micro controller [10]. This device can easily integrate all the components and to sense and control the different objects from the single place. There is no license provision problem anyone can use the software in the less economic rate. Both the analog and digital signals can be interface with Arduino board also use as bread board. Two types of communication are supported, one is serial communication and another one is universal bus interface for uploading and downloading the programs from the computers. The main advantage of the Arduino is used as the best integrated development environment for the real time projects [11].

B. RFID Receiver
The RFID (Radio Frequency Identification) is used in the proposed system to collect the information detected by the RFID tag. RFID tag

stick is mainly used to track the objects and based on the radio waves generated tag is transferred to the RFID device. Based on the RFID tag, the vehicle information of the user is collected by scanning the RFIF tag attached in that place [12].
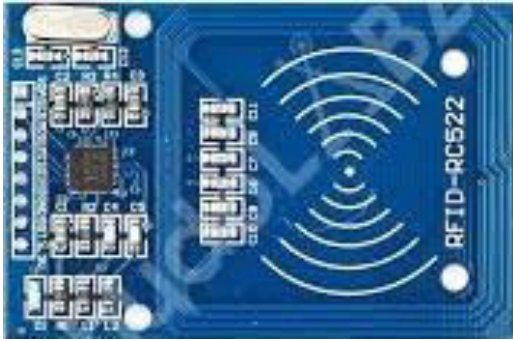

Figure.2 Circuit diagram for the RFID receiver

RFID tag can be scanned directly and no overhead is required. The RFID tag could be used as sender and transmitted to the RFID receiver for the particular range. For collecting the emergency information very fast also the scanning process is more reliable for performing the task.

C. RFID Tag

The RFID tag is used as scanner for collecting the user information such as owner name, vehicle number and region of the vehicle all the data are stored in the database. Once the RFID tag is scanned, automatically the information can fetched and used for the analysis purpose.

The identity of the individual item can be easily track and information is gathered with the help of RFID tag.
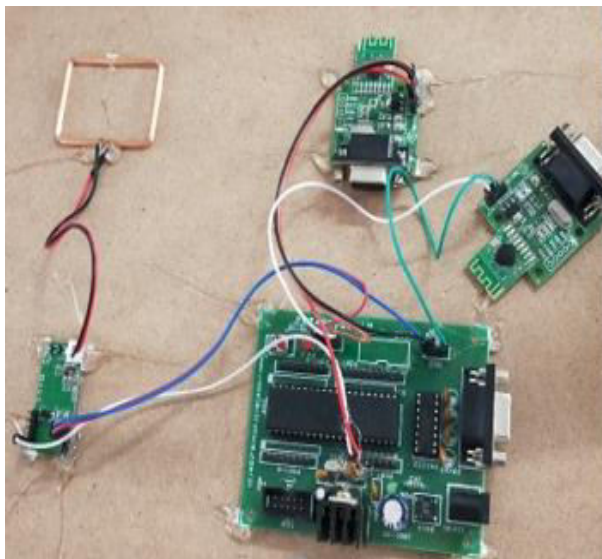

.Figure 3.Sample diagram of RFID tag

D. GSM Module

GSM module is used to locate the position of the vehicle, it can use in the places like sea or in the dense forest [13]. The antennas in the satellite is used for transmitting the messages, while vehicle crossing the border, the information stored in the RFID tag is transferred to the RFID receiver with the longitude and latitude positions shared to the nearest control room.
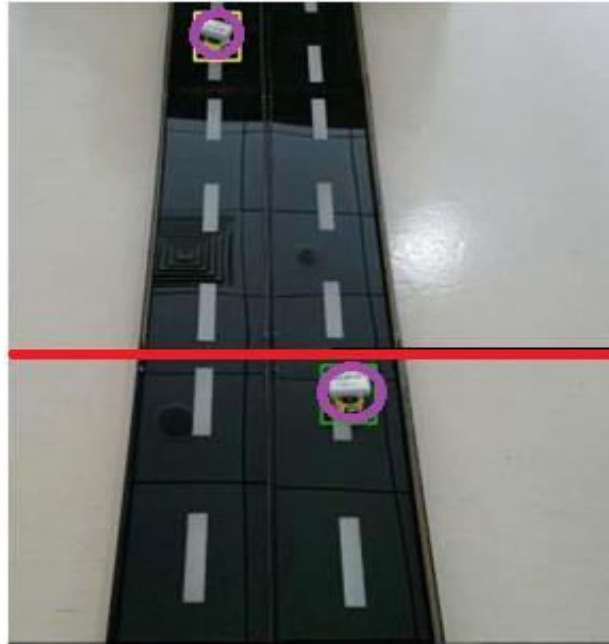

Figure 4.Prototype Model of GSM

The prototype model of the proposed traffic detection and violation is shown in the figure .5 RFID tag collect the information and transferred to the RFID receivers and immediately alert information transferred to the control room as well as to the users [17].

Figure 5.Prototype model of traffic violation and detection System

Figure 6.Simulation of the project

Figure 7.Simultion result of the technique

The warning message delivered to the drivers for altering that travelling in the dangerous zone also the travel ion over speed, the violation of traffic happened [18]. The sensors are fixed on the corners of the road side for tracking the user activities of vehicle and shared to the control office [19].

While analyzing the simulation result in the figure.7, when the vehicle is crossed the border of the dangerous zone. The red line indicating the border line of the restricted area, when the vehicle crossed the border, RFID tag present in the vehicle sense and share the vehicle and user information to the nearby control room for altering and the position of the vehicle will be tracked. Once the vehicle crossed the limit or the traffic rules is violated, the RFID tag slicked in the vehicle is scanned and GSM immediately start to track the location of vehicle to the station.

E. Accuracy
The accuracy of the proposed technique is calculated based on the number of images correctly classified and number of image misclassified. Based on the two aspects the accuracy is calculated, based on the below mentioned formula

$$\text{Accuracy} = \frac{\text{Number of image classified correct (True positive)}}{\text{Number of images classified correct (True positive)} + \text{Number of images classified wrongly (FP)}} \quad (1)$$

The table 1 illustrates the accuracy of the proposed techniques with the related techniques carried out in the same aspects. The suggested techniques delivered more accuracy results in finding the correct object and rate of false negative is also less compared to the related works. Based on the predefine shapes and structure stored in the database, the classification process is applied for the proposed technique.

The accuracy of the proposed system has been calculated based on the number of images correctly classified. The proposed system finds accurately more than the competitive techniques used for the classification purpose. The figure.8 clearly show the efficiency of the

proposed techniques with the existing used for the similar kind of purpose.

Table 1. Evaluation and accuracy of proposed system with the state-of-art-technologies

Dataset	Accuracy	False Negative (FN)
Mariya et.al [11]	72.9	26.2
Wong et al.[10]	78.3	22.2
Chen et al. [6]	79.1	20.2
Mane et al.[1]	80.5	18.3
Chiu et al.[4]	86.7	11.5
Proposed Technique	96.7	2.8

CONCLUSION
The proposed system identifies the activity of vehicles violating the traffic rule as well as the vehicle entered in the restricted area. RFID tag collects the information of vehicle and transferred to the control room, there RFID receiver is used for receiving the message. The radio frequency signal is used by the RFID tag to transfer the message to the RFID receiver. Like the barcode scanning system, the RFID tag is scanned very easily and immediate action will be taken. The proposed system take only less time for completing the task and overhead involved in the process is also minimal. The suggested technique acts as an efficient tool for identify and detecting the activities of vehicle that violating the rule or entering the restricted area. This process help the control room for tracking the vehicle and providing the alert information to the drivers for avoiding the accident happen all over the world
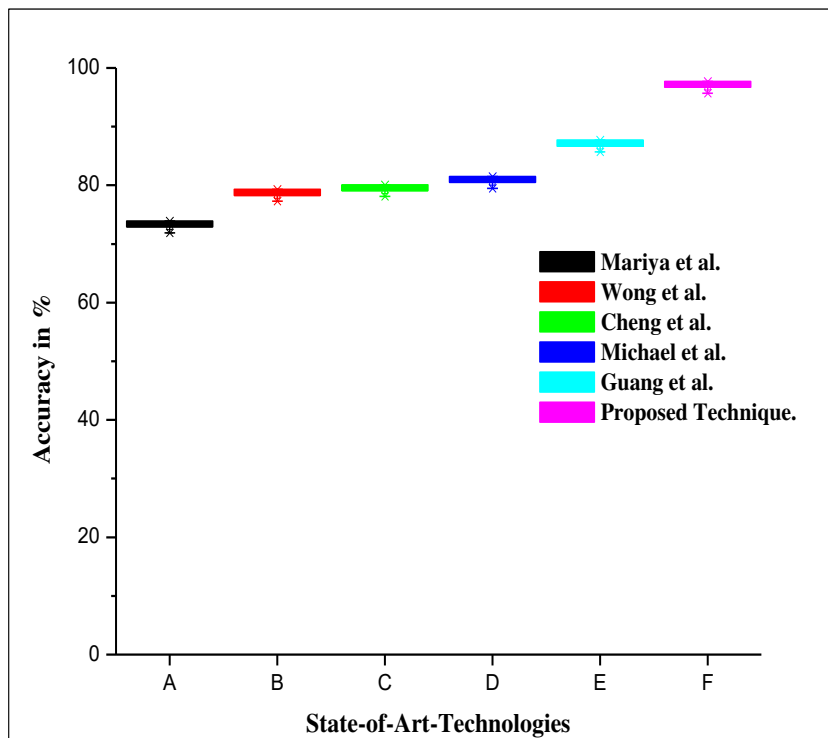
Figure.8 Accuracy of the proposed system with Competitive techniques

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