

Detection of rash driving on highways

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Abstract- In India Road accidents on highways are increasing day by day and so there is a need to design a system that allows detecting over speeding cars or rash driving on highways. Manually checking speed of car is time consuming task and so to overcome this problem a new proposed system is designed which does not need any human interception and measures car speed and displays on the screen and also raise an alarm to alert the police personal, to take necessary actions immediately on highways to reduce the chance of accidents. The system calculates the time needed by the specific car for moving from the first point to the second on highways. Using this data it calculates the car speed. The mechanism consists of two IR sensors which are calculating the speed of a car which are passing on highways. If the speed of the car passed between two infrared sensors placed on highways is more than the threshold speed of the car, then an alarm is raised to alert the concerned person. The data collected from the infrared sensor is sent to Arduino Uno to processed the data and calculate the time required by the vehicle to travel from one point to the other. Using this time it calculates vehicle speed as well as displays the result on screen. It raises a buzzer alarm if an over speed vehicle is detected

Index Terms— Infrared sensors, Arduino Uno, Buzzer, Speed, Distance

I. INTRODUCTION

In India, most of the accidents on highways occur due to rash driving. In order to prevent accidents, a system is designed using the Internet of things technology, which is using two infrared sensors, which is placed on highways. Whenever a car is passing from a point where an infrared sensor is placed and when it reaches another point where another infrared sensor is placed, the distance is measured and also time calculated as how much time a car takes to pass through two sensors and send to Arduino UNO, for further calculation. The speed of the car is calculated and if the set threshold speed is more than the speed of the car, then an alarm is raised to make the concerned authority alert to take necessary action immediately.

The advantage of this proposed rash driving system is that it is easy to carry and easily gets installed on highways for monitoring the speed of the car. It will display the speed of car passing on highways and will also raise an alarm if the vehicle exceeds the threshold speed for the highway. The proposed system checks rash driving by calculating the speed of a vehicle using the time taken to travel between the two points on highways. A set point consists of a paired of an infrared sensor consisting of an IR transmitter and an IR receiver, each of which is installed on both sides of the road. The speed limit is set by the traffic police who will use the system depending upon the traffic at any given location. The time taken by the vehicle to travel from one set point to the other is calculated by Arduino UNO. Based on that time, it then calculates the speed and displays on the screen. Moreover, if the vehicle crosses the speed limit, a buzzer sounds alerting the police to take action.

II. LITERATURE SURVEY

In paper [1], the author designed an android application which gathers data from sensors like, the accelerometers, GPS and along with those records sounds using a microphone. Collected data is processed and the result is obtained to detect rash driving. The various patterns like speed breaker, sudden braking, and sudden acceleration were analyzed.

In paper [2], the author designed an application using a mobile Smartphone which was integrated inside an automobile to evaluate driver behavior. They are analyzing the movement of the vehicle by reading the variations from the accelerometer provided in the smartphone. They are marking the dangerous roads which may be difficult to drive or accident prone places where extra precautions need to be taken. A graph is plotted on a 2D model using X-axis and Y-axis as a coordinate which keep records of the steer, brake and accelerate applied by the driver of the vehicle.

In paper [3], the author designed an android application which gathers data from sensors like, accelerometer, GPS, and video recording was done through phone default camera to assign the rating to the driver. The feedback was used to notify the driver to increase his performance while driving. The range of acceleration or deceleration values is given for the safe driving. Whenever the accelerometer values exceed the default value an event is recorded.

In paper [4], the author proposed a method for predicting driving style. They divided the entire driving styles into three types of styles, such as normal, aggressive and very aggressive. The system gathers data from the accelerometer and adds it to a single classifier based on Dynamic Time Warping (DTW) algorithm. The system is known as Mobile-Sensor-Platform for Intelligent Recognition of Aggressive Driving. The system gives feedback in audio form if a driver's style becomes aggressive.

In paper [5], the author proposed an efficient system for detecting and alerting the authority if drunk driving is noticed on highways. They integrated the detection system on Android G1 phone.

In paper [6], the author designed the system which was detecting and alerting if any dangerous vehicle driving patterns related to rash driving was observed. The whole implementation requires only a mobile phone placed in the vehicle and with the accelerometer. If any confirmation of rash driving is detected, the mobile phone was automatically alerting the driver first and if same driving persists then calls 100.

III. SYSTEM AECHTECTURE

The system consists of the following component and they are:

1. Infrared Sensor

An infrared sensor (IR) is an electronic device that sends rays in order to sense some particular part or feature of something of the surroundings. An IR sensor has the capability to measure object heat and along with that, it can detect motion of the object. These sensors can measure only infrared radiation without emitting it. in the range of wavelengths of electromagnetic radiation, objects radiate thermal radiations, which is not visible to human eyes, it can easily be detected by IR sensors. IR sensor contains Transmitter and Receiver, where Transmitter acts as a Light Emitting Diode and IR Receiver is photodiode which reacts to IR light of the similar wavelength which is sent by IR LED..

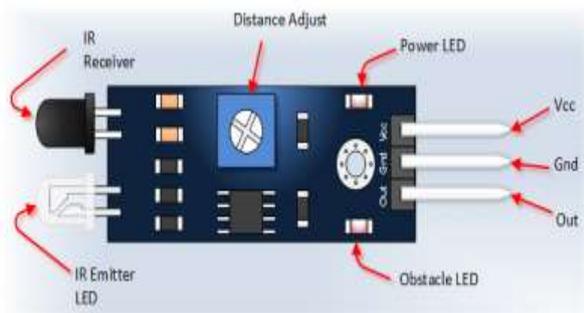


Figure 1: IR sensor pin



Figure 2: IR sensor

2. Arduino uno

Arduino Uno is a microcontroller based on the ATmega328P where the data is collected from the sensor and sent. Received data is analyzed to calculate the speed of the car and then the result is displayed on the screen. Arduino Uno consists of 14 digital input/out pins, 8 pin Analog to Digital converter. It consists of the port to power it up through USB cable or power adaptor. In order to visualize the data or upload the compiled program to the microcontroller USB need to be connected to the computer.

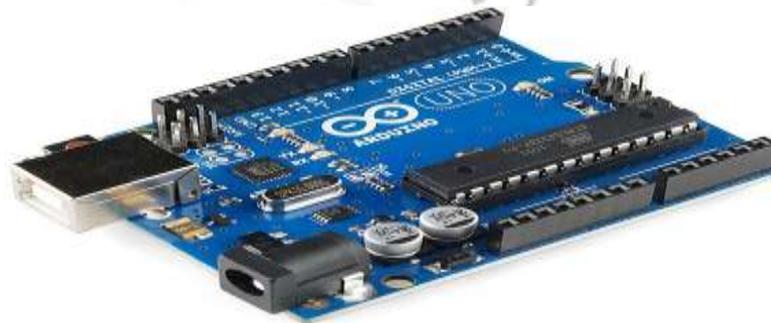


Figure 3: Arduino Uno

3. Buzzer

A buzzer is a battery powered electronic device, which produces a beep as long as power is supplied to it on any event occurrence. The buzzer in this paper is used to alert the traffic police of rash driven vehicle.



Figure 4: Buzzer

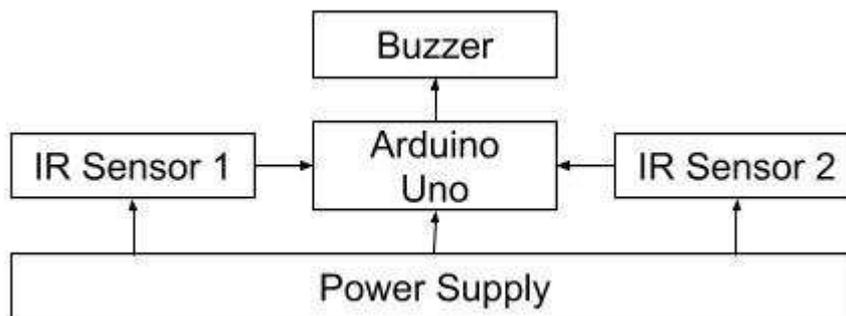


Figure 5: Rash driving detection system

In this system, two infrared sensors (IR) are used, termed as IR1, IR2, when a vehicle crosses IR1 timer starts and it ends as soon as the vehicle crosses IR2. Sensors are placed at a fixed distance of 30 cm. usually; highways have a speed limit of 60km/s or near schools or accident-prone areas to 40km/s. This system is designed in such a way that it generates alert as soon as any vehicle which is crossing threshold speed which is limited at the particular place. Speed is calculated using the mathematical formula.

$$\text{Speed} = \text{Distance} / \text{Time} \quad \text{Distance in this case is } 37.25\text{cm}$$

Time taken is calculated by time started by crossing at the 2nd sensor, the time taken started by crossing 1st sensor. If the car passing on highways speed is more than the threshold speed set by traffic police authority, then the speed is displayed on the screen and also alarm is raised to take actions immediately.

IV. FLOW CHART

This whole process goes under the following steps:

Step 1- Apply the power supply by flipping the switch to ON.

Step 2- IR sensor setup is ready to detect any object passed by it and activates the timer.

Step 3- Select the threshold speed limit to say 80 kmph.

Step 4- When any vehicle crosses the first IR sensor, the light will glow during that period.

Step 5- When the vehicle crosses the second IR sensor, light, will again glow for that time.

Step 6- If the vehicle crosses the distance between the IR sensor set-ups at more than 80 kmph, the buzzer sounds an alarm.

Step 7- The counter starts counting when the first IR sensor beam is intercepted and stops when the second IR sensor beam is intercepted.

Step 8- The speed taken by the vehicle to cross both the IR sensor beams is displayed on the screen.

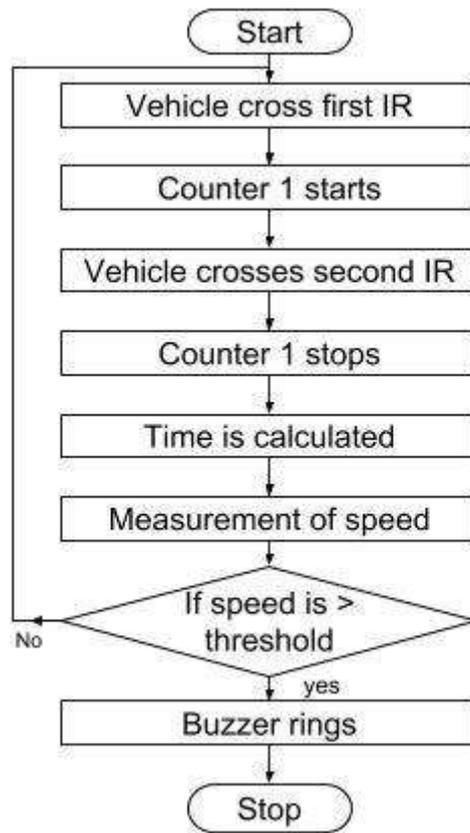


Figure 6: Flowchart of rash driving detection

V. RESULTS

While driving on Indian highways, drivers should not exceed the maximum set speed limit allowed for the vehicles. However, accidents are occurring due to speed violations as many drivers exceed the set threshold speed. A highway speed checker is used which is easy to carry and install in monitoring rash driving on highways without human intervention. The traffic police take immediate action if the speed limit crossed as this system provides the digital display as well as the alarm to detect any vehicle speed if the vehicle exceeds the threshold speed limit. To overcome this problem, we have implemented a circuit called as a rash driving detection using sensors on highways. This system is cheaper and it is easy to install and no need to monitor manually. If threshold speed is crossed an alarm is raised to alert the traffic police authority to take immediate action.



Figure 7: When car crosses IR sensor 1



Figure 8: When car crosses IR sensor 2

Speed of car = 100km/hr
 Rash driving detected...
 Alarm is raised to alert the authorities...

Figure 9: speed displayed on screen

VI. CONCLUSION AND FUTURE WORK

The main aim of this system is to detect rash driving on highways using IoT which is cheaper and easy to carry and install. As a number of accidents on Indian highways increase day by day so it is necessary to monitor the speed of the vehicles passing on highways so as to reduce the accident cases. It also reduces the difficulties of traffic police department and makes them easy to control the rash driving on highways without human intervention. This concept can be enhanced in the future by integrating a camera with the system which could capture the image of the number plate of the vehicle to send that to the traffic authorities.

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