SMART DRIVER ASSISTANCE SYSTEM USING IOT.

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ABSTRACT

Road traffic accidents claims over a million lives every year in the world. Road traffic injury take the lives of nearby 1.3 million people every year at the same time injure 20-50 million people as increasing number of vehicles on the road shows an economic growth of a country. It has also caused traffic congestion and road accidents thus becoming more difficult to control. So high density traffic increases the waiting time of vehicles, but the emergency vehicles such as Ambulances, Fire disasters, VIP cars are required to reach their destiny as quickly as possible. Our proposed system is an indication system that indicates accidents may occur so that we can take necessary majors to avoid these accidents and also reduces these problems into significant level. It also focusses on providing the smart way to control the traffic when emergency vehicles are arriving towards the signal. and also alerts the driver before collision occurs and eliminates the delay time between accident occurrence and emergency personnel arrival thus use of this system will save more lives from road hazards and decrease mortality.

Index terms- *Accident detection, Accident prevention, collision control, Emergency vehicle detection*.

1. INTRODUCTION

Road accidents are a serious threat to human lives. Speed is the key factor liable for many of the accidents. The statistics which have been formed according to the recent surveys are really horrific. According to a recent survey by WHO published in Times of India, India is on 1st position globally in terms of casualties due to road accidents. Despite many safety measures and programs launched by the government as well as nongovernmental organizations to make people aware of safe driving concepts, life claimed by these accidents are increasing at an alarming rate. In a study it has been uncovered that fifty percent of casualties occurred due to road accidents could have been stopped if they received immediate medical help. As in most of the cases the accidents result into medical attention, delay in getting the medical help is one the major reasons for the casualties. On road, accident is a major issue of concern. Even with all modern developments in the field of vehicle design, road lane design and management, accidents do occur. Timely accident detection and taking immediate action with respect to emergency health care of victims by informing an emergency centre such as a hospital or a police station about the accident on time plays a vital role in human safety and road traffic management. Accident detection can be done under various domains. Most of the papers surveyed use application of sensor technology, besides trying to detect accidents automatically using machine learning and computer vision from surveillance systems. Any kind of accident detected is automatically sent as an alert to the required destination. Each of these methods has different percentages of accuracy and their own limitations. This system presents a real time solution for this problem by providing an alert system and notification to police and ambulance drivers. This is

done by using commonly available electronic devices that are mobile phones to detect the fall. An Android smartphone with an integrated accelerometer is used for fall detection. Accelerometer will evaluate the frequency with which the phone has vibrated to detect the fall. The threshold is evaluated based on parameters such as height and frequency of vibrations. If it's higher than the set threshold then a pop-up message is raised for the user's response. Based on the user's response, further action is taken. The system detects the vehicle traffic accident and roadsides barrier that may likely cause accident with earlier warning or alertness before collision occurrence and notification message. It then complements the effort made by several researches in the notification of immediate accident occurrence, detection of roadsides barrier before collision and remote message send to the emergency unit. Emergency vehicles are required to reach their destination as quickly as possible. The main constraint is time which is been consumed by the vehicle's high density traffic signal.

This method focuses on providing smart way of controlling the traffic when ambulances are arriving towards the signal. A vehicle accident detection system using GPS, GSM module, wireless sensors, and short-range wireless communication technology (Bluetooth module) embedded as a system unit. It adopts the existing technology of mobile phones to get the coordinate geo-location with an SMS alert message sent to the emergency relief unit. The false alarm situation was addressed by increasing the accuracy of accident detection using more than one detection sensor, and the use of a manual switch to cancel false alarm within 10 seconds of activation. An Accelerometer sensor was placed on the car bumper to detect the impact rate of collision and accuracy of the location of the accident, an encoder sensor was used to calculate the acceleration of the car and the resultant change when the accident occurs. The prospective limitation of this approach is the battery life of the mobile phone. Mountain curves are often built when a route climbs up or down a steep slope, so that it can travel mostly across the slope with only moderate steepness and are often arrayed in a zigzag pattern. Highways with repeating curve roads allow easier, safer ascents and descents of mountainous terrain than a direct, steep climb and descent, at the price of greater distances of travel and usually lower speed limits, due to the sharpness of the turn. Highways of this style are also generally less costly to build and maintain than highways with tunnels. Mountain curves are used when the terrain is very steep.

1.1 PROBLEM STATEMENT

The number of vehicles used by the people is constantly increasing due to rapid growth in population leading to high density traffic which increases the waiting time of vehicles. Emergency vehicles such as ambulances, fire disaster prevention vehicles, VIP cars are required to reach their destinations as quickly as possible. Accidents are the major cause for loss of lives. These may sometimes lead the people for a long-time hospitalization also. In many cases due to late response shown by the people around in the accident location will lead to the death of the victim. Realtime solution for this problem by providing an alert system and notification to police and ambulance drivers. This is done by using commonly available electronic devices that are mobile phones to detect the fall. The main purpose of our project is to get rid of these problems or at least reduce them to significant level. Several efforts were made to develop systems that can discover accident location and fall of the vehicle in real time. We are also focusing on providing smart way of controlling the traffic when emergency vehicles are arriving towards the signal.

3.1 OBJECTIVES

- To facilitate smart road safety and vehicle accident prevention system
- To provide vehicle traffic accident detection and alerting system
- To assist the emergency vehicles during traffic

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1.2 REQUIREMENT SPECIFICATIONS

Requirement specifications are divided into two categories based on the nature. Those are hardware and software requirements. Requirement specification is a description of a software and hardware system to be developed. It lays out functional and non-functional requirements, and may include a set of use cases that describe user

interactions that the software must provide. The requirements of the device on which the application will be running. The application runs on both the Android and IOS devices.

Software Requirements
Browsers: Chrome, Mozilla Firefox, Operamini.
Front End Coding Language : HTML, JavaScript, CSS
Back End Coding Language :PHP,
Database : MYSQL

Hardware Requirements
ESP8266 Wi-Fi Module
Vibration Sensor
Ultrasonic Sensor
IR Sensor
LED
Power Adapter 12volt
GPS Modem
DC Motor Driver

2. MODULES

2.1 STUDY AREA AND METHODOLOGY

The main purpose of our project is to get rid of these problems or at least reduce them to significant level. Several efforts were made to develop systems that can discover accident location and fall of the vehicle in real time. We are also focusing on providing smart way of controlling the traffic when emergency vehicles are arriving towards the signal.

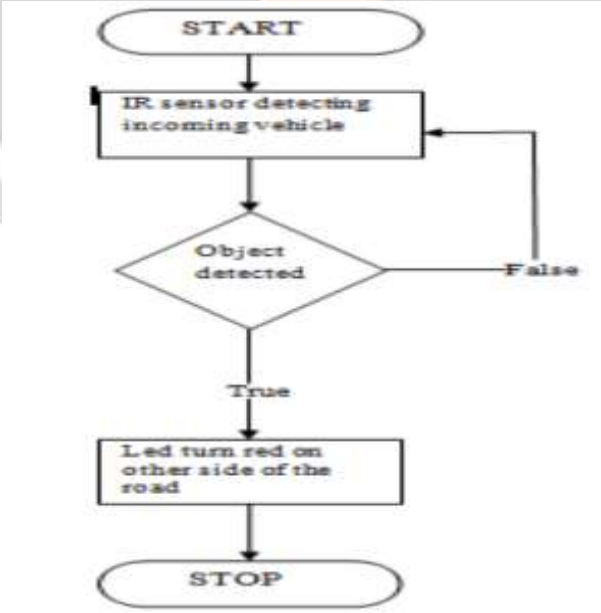

Fig 1: Flow diagram of accident prevention system

The proposed system will start the process, it uses two IR sensors, which are placed on either side of the turn. One sensor ir1 is installed by the left side of the curve section of the road, similarly one sensor ir2 is installed by

the right side of the curve section of the road. When vehicle enters into the curve road it will be detected through the IR sensors, once the object is detected then the LED turn red on other side of the road. If the IR sensor failed to detect the object, then it goes back for searching the objects. This same process will be continued on the other side of the curve road.

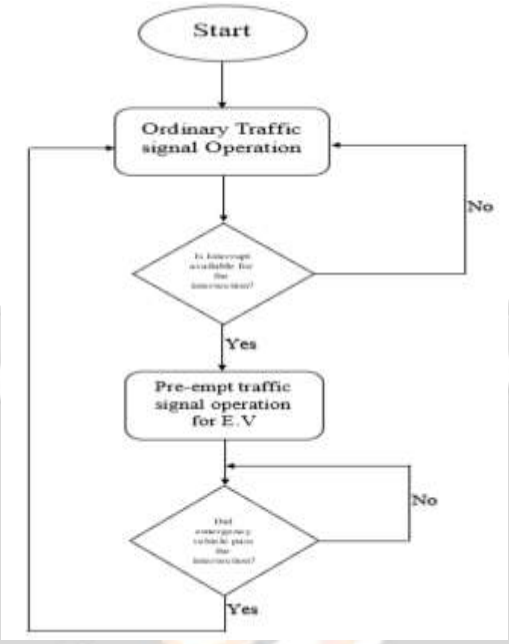

Fig 2: Flow diagram to detect emergency vehicles during traffic

The proposed system will start detecting the emergency vehicles like ambulances, fire disasters, VIP cars through their siren sounds with the help of ultrasonic(sound) sensor. Once the sound sensor detects the object the respective traffic signal lane will turns to green within 10-15 seconds and other remaining signal lanes will turns to red. So that the emergency vehicles pass the traffic signal as soon as possible.

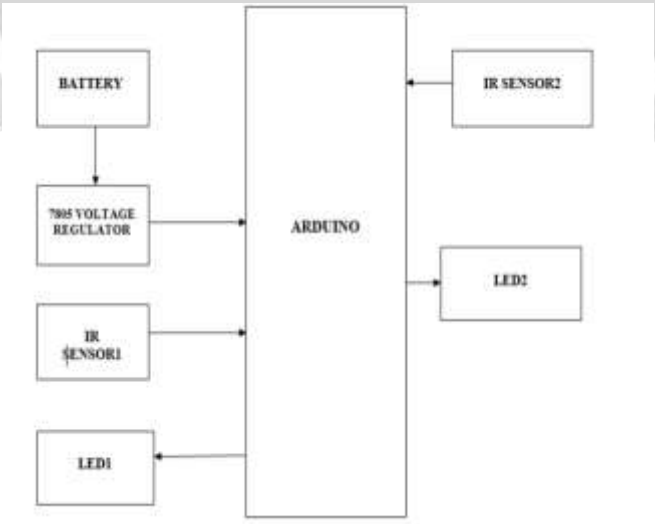

Fig 3: Block diagram of accident prevention system

The figure 3.3 uses two IR sensors, which are placed on either side of the turn. One sensor ir1 is installed by the side of the uphill section of the road, similarly one sensor ir2 is installed by the side of the downhill section of the road. The sensors are connected to ATmega328P microcontroller through wires. Based

on the output of sensors, position of vehicles on either side of the bend is detected which is provided as an input to the microcontroller.IR sensor has pins +5V VCC, GND, IR emitter led and IR receiver led. IR sensor sends the signal in the form of pulses from emitter led. When this signal hit the object, it will get reflected back and is received by the echo receiver led. From echo the signal is sent to microcontroller Arduino UNO.

Microcontroller Arduino UNO processes this data and operates the LED which is connected to output pin of the microcontroller Arduino UNO. LED is operated according to the command i.e.; LED will glow if the signal is reflected back. In the absence of the object the signal will not reflect back. Hence the LED will not glow.

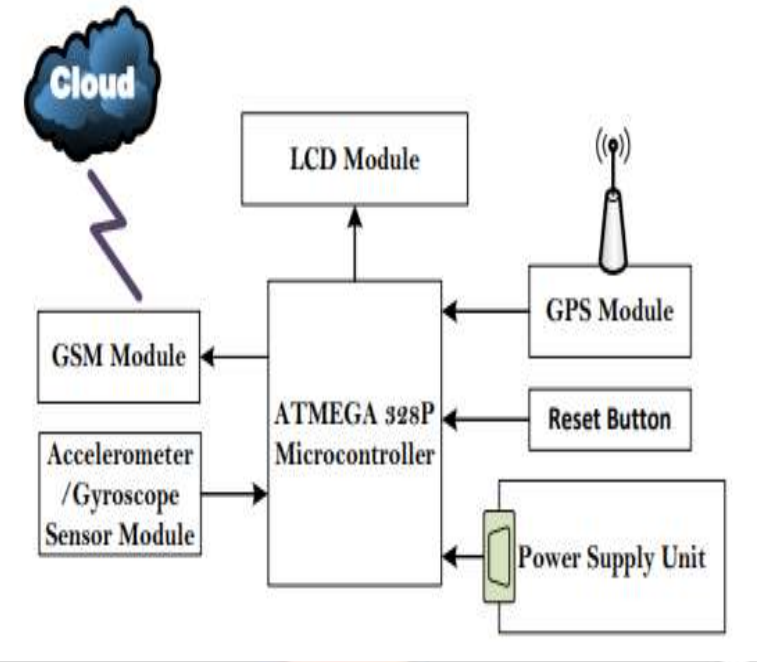

Fig 4: Block diagram of vehicle traffic accident detection and alerting system

The figure 3.4 shows the design and implementation of this embedded vehicular accident detection and notification with an alert system use the At--mega 328P microcontroller. This controller is responsible for the control and processing of all the activities involved in the system design. The system unit comprises of the integration of some wireless sensors devices (such as micro-electro-mechanical system accelerometer, radar range detector sensor, carbon monoxide sensor, an infrared sensor). The wireless communication module includes Global Positioning System (GPS) and Global System for Mobile Communication (GSM). The other integration component includes display unit using Liquid Crystal Display (LCD), reset button, and power supply unit as illustrated in Figure 3. The configuration and programming of the proposed system are achieved in Arduino IDE using C-language.

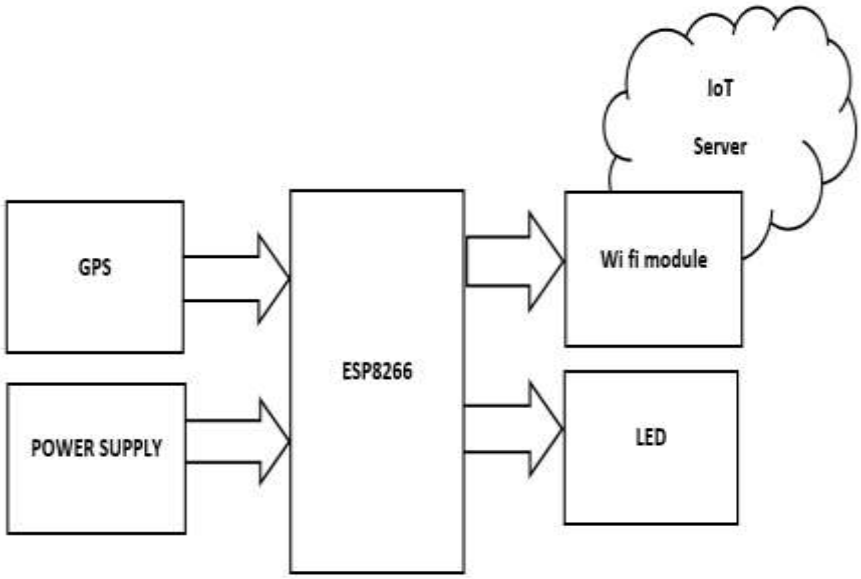

Fig 5: Vehicle accident unit

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi-ability as a Wi-Fi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost-effective board with a huge, and ever growing, community.

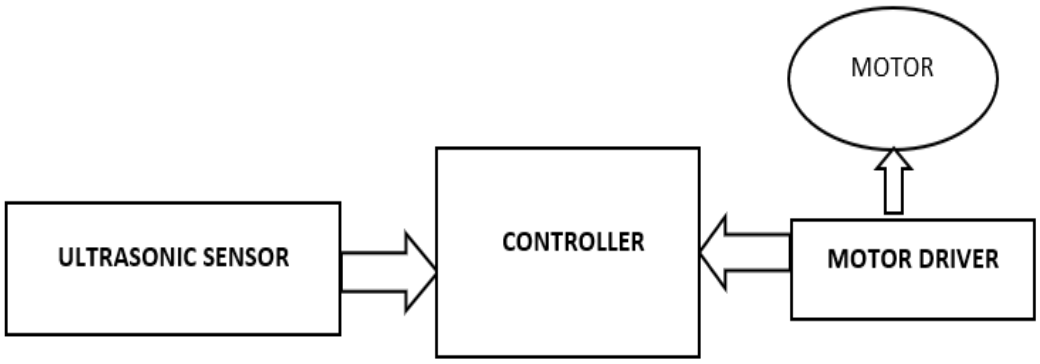

Fig 6: Vehicle speed control unit

Generally, L293D motor driver can control two motors at one time or called is a dual H-Bridge motor driver. By using this IC, it can interface DC motor which can be controlled in both clockwise and counter clockwise direction.

ARDUINO IDE

Arduino board acts as the heart of the required system. Entire functionality and processes of the system depend on this board. Arduino reacts in response to the 5V supply given by the Opto-coupler and keeps on counting the supply and then calculates the cost and also the power consumed. This data, it continuously stores on the webpage, so that users can visit anytime and can also check their consumption. It even reacts accordingly as per programmed, to the situations like message passing/sending during threshold values etc.

Internet of Things (IOT):

Internet of things has become heart of data transfer and communication. It is a network for inter-linking physical devices or objects with embedded platforms, sensors, actuators to exchange data from any part of the world. The devices which are linked through IOT can be controlled and monitored from anywhere and at any time.

POWER SUPPLY:

The ARDUINO and other devices get power supply from AC to DC adapter or from direct AC lines through voltage regulator. The adapter output voltage will be 12V DC non - regulated.

LCD:

An LCD (Liquid Crystal Display) screen is an electronic display module and has a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data.

ESP8266 WI-FI MODULE

The ESP8266 WIFI Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WIFI network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WIFI-ability as a WIFI Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost-effective board with a huge, and ever growing, community.

VIBRATION SENSOR

Whenever the tilt is applied to the vibration sensor, then a balanced mass makes a difference within the electric potential. This can be measured like a change within capacitance. Then that signal can be changed to create a stable output signal in digital, 4-20mA or VDC. These sensors are fine solutions to some applications which do not demand the maximum accuracy like industrial automation, position control, roll, and pitch measurement, and platform levelling. By far the most common types of vibration sensors, accelerometers measure the changes of velocity of a given component. When attached to a piece of equipment, any vibration will reflect a change in velocity, which will cause the accelerometer to produce an electrical signal.

ULTRASONIC SENSOR

Ultrasonic transducers and ultrasonic sensors are devices that generate or sense ultrasound energy. They can be divided into three broad categories: transmitters, receivers and transceivers. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound. Ultrasound can be used for measuring wind speed and direction (anemometer), tank or channel fluid level, and speed through air or water. For measuring speed or direction, a device uses multiple detectors and calculates the speed from the relative distances to particulates in the air or water.

IR SENSOR

An infrared sensor (IR sensor) is a radiation-sensitive optoelectronic component with a spectral sensitivity in the infrared wavelength range 780 nm … 50 µm. IR sensors are now widely used in motion detectors, which are used in building services to switch on lamps or in alarm systems to detect unwelcome guests. These sensors are good for detection between 100cm-500cm (1-5 meters / 3-15 feet). The long range makes them a good alternative to sonar sensors. There are two types of infrared sensors: active and passive. Active infrared sensors both emit and detect infrared radiation. Passive infrared (PIR) sensors only detect infrared radiation and do not emit it from an LED.

LED

A light-emitting diode (LED) is a semiconductor device that emits light when an electric current flows through it. LED find applications in various fields, including optical communication, alarm and security systems, remote-controlled operations, robotics, etc. It finds usage in many areas because of its long-lasting capability, low power requirements, swift response time, and fast switching capabilities.

POWER ADAPTER 12VOLT

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. In this project, a +5 V DC regulated power supply is derived from the power supply unit designed and implemented. The Figure shows the circuit diagram designed to get the +5 V DC regulated power supply for the project. A full-wave rectifier is a device that has two or more diodes arranged so that load current flows in the same direction during each half cycle of the ac supply.

GPS MODEM

The GPS (global positioning system) is used to get positional data on earth, which depends on the satellites movement around the Earth. GPS is an electronic system. We get the exact location coordinates of the area. A global positioning system used for the purpose of navigation and detection of objects and places typically works on the basic principle of exchange of radio waves between the ground stations, satellites, and the receivers. This transmission and reception of data prefer a trilateration mechanism of operation.

DC MOTOR DRIVER

Generally, L293D motor driver can control two motors at one time or called is a dual H-Bridge motor driver. By using this IC, it can interface DC motor which can be controlled in both clockwise and counter clockwise direction. When kept in a magnetic field, a current-carrying conductor gains torque and develops a tendency to move. In short, when electric fields and magnetic fields interact, a mechanical force arises. This is the principle on which the DC motors.

3.TESTING

Software testing is an investigation conducted to provide stakeholders with information about the quality of the product or service under test. Software Testing also provides an objective, independent view of the software to allow the business to appreciate and understand the risks at implementation of the software. Test techniques include, but are not limited to, the process of executing a program or application with the intent of finding software bugs.

3.1 TYPES OF TESTING

There are numerous types of software testing techniques that you can use to ensure changes to your code work as expected. Not all testing is equal though, and we explore how some testing practices differ.

3.1.1 UNIT TESTING

In computer programming, unit testing is a software testing method by which individual units of source code—sets of one or more computer program modules together with associated control data, usage procedures, and operating procedures—are tested to determine whether they are fit for use. Unit testing is an important step in the development process, because if done correctly, it can help detect early flaws in code which may be more difficult to find in later testing stages. Unit testing is a component of test-driven development (TDD), a pragmatic methodology that takes a meticulous approach to building a product by means of continual testing and revision. In our proposed system we have tested each and every component that are working properly.

3.1.2 INTEGRATION TESTING

Integration testing is the phase in software testing in which individual software modules are combined and tested as a group. Integration testing is conducted to evaluate the compliance of a system or component with specified functional requirements. It occurs after unit testing and before system testing. In our proposed system each and every module is properly connected together and they have well communication between them.

3.1.3 SYSTEM TESTING

System testing, also referred to as system-level tests or system-integration testing, is the process in which a quality assurance (QA) team evaluates how the various components of an application interact together in the full, integrated system or application. System testing verifies that an application performs tasks as designed. This step, a kind of black box testing, focuses on the functionality of an application. System testing, for example, might check that every kind of user input produces the intended output across the application. Our overall proposed system functionalities are working properly.

3.1.4 PERFORMANCE TESTING

Performance testing is a testing measure that evaluates the speed, responsiveness and stability of a computer, network, software program or device under a workload. Organizations will run performance tests in order to identify performance-related bottlenecks. Without some form of performance testing in place, system performance will likely be affected with slow response times, experiences that are inconsistent between users and the operating system, creating an overall poor user experience. Determining if the developed system meets speed, responsiveness and stability requirements while under workloads will help ensure a more positive user experience. Performance testing can involve quantitative tests done in a lab, or in some scenarios, occur in the production environment. Performance requirements should be identified and tested. Typical parameters include processing speed, data transfer rates, network bandwidth and throughput, workload efficiency and reliability. Through the performance testing we conclude that our proposed system is accurate and time being.

4.RESULTS

- The purpose of the **Smart road safety and vehicle accident prevention system** is to decrease the number of accidents occurring on hilly and curved roads.
- **Vehicle traffic accident detection and alerting system** alerts the driver before collision occurrence and eliminates the delay time between accident occurrence and emergency personnel arrival.
- The main aimed at designing the **Density based traffic signal system** where the timing of signal will change automatically on sensing the traffic density at any junction.
- **Control traffic system for emergency vehicles** works on providing the solution for emergency vehicles heading towards the traffic signals.

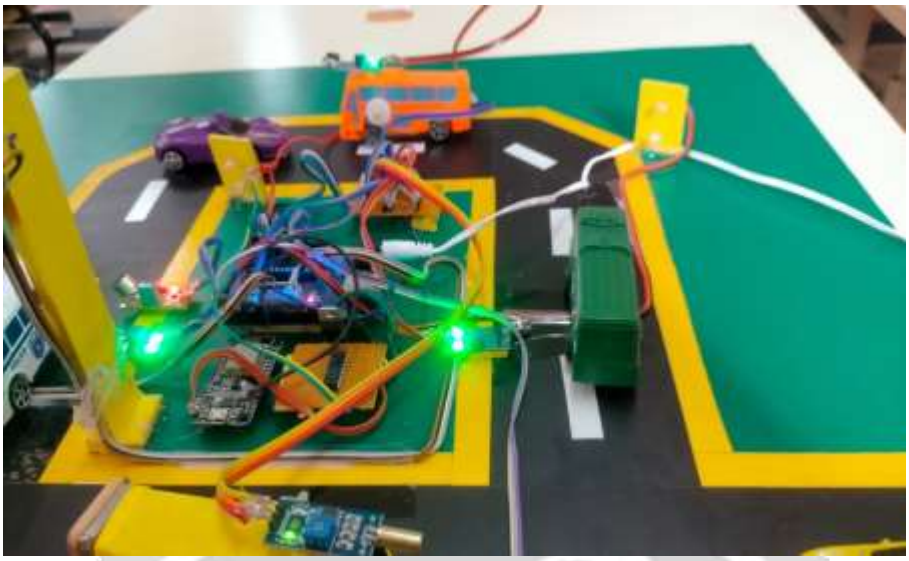

Fig no 4.1: Smart road safety in curve roads

Fig no 7: Facilitating emergency vehicles during traffic

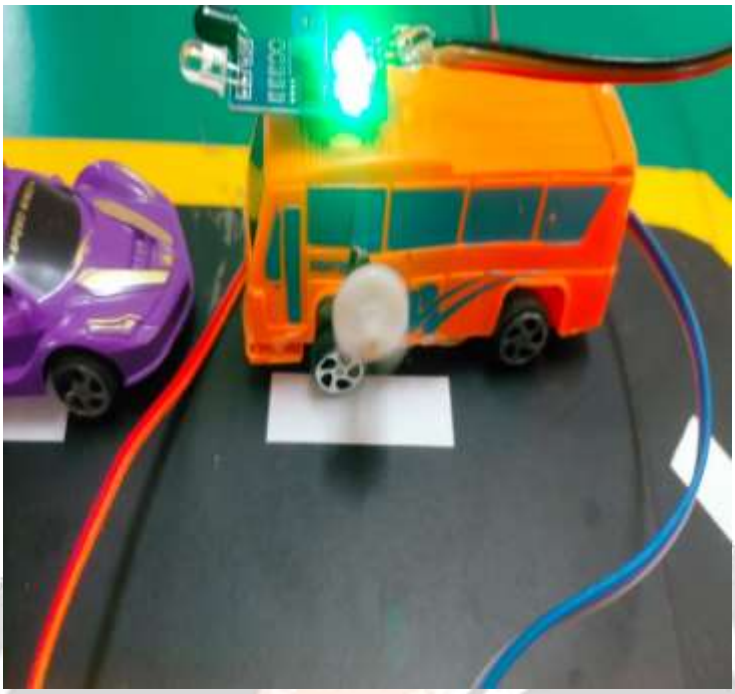

Fig no 8: Collision prevention system

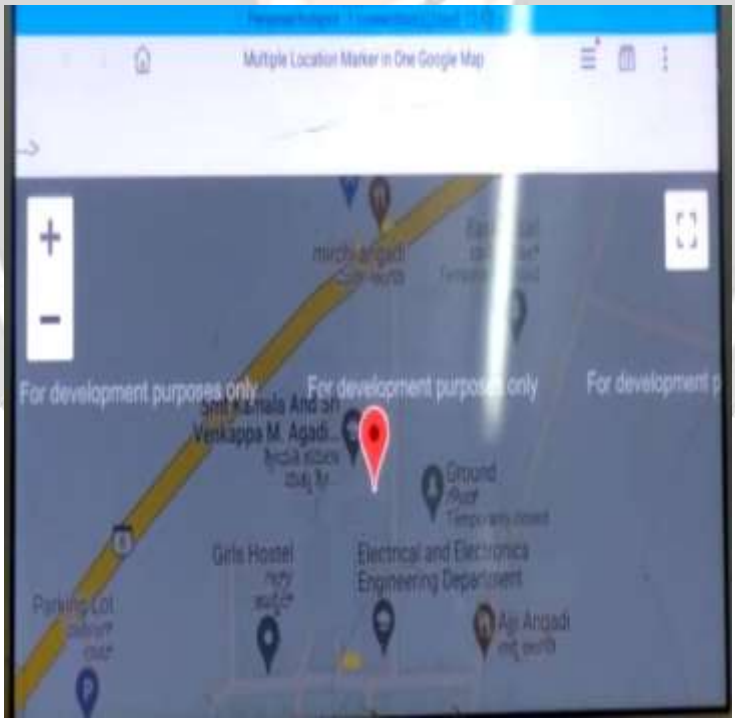

Fig no 9: Sending accident location to nearby rescue team

Fig no 10: Overview of smart driver assistance system

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