

# Secure Road Barrier

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**Abstract**— Secure Road Barrier is an automated speed breaker, which works on the real-time speed detection. Problem for the traveling vehicles on the roads are Speed Breakers and the installed hurdles i.e. Cat eyes and barriers. These are the most annoying things on the road disrupting the flow of traffic on the roads, which cause the damage to the vehicles and sometimes resulting in the fatal accidents. Secure road barrier will detect the speed of vehicles by using smart sensors and acts in reaction. If the speed of the vehicle is greater than the set-up speed limit the breaker will move up and if speed is less than speed limit the speed breaker will stay at its initial position which is down the road (at the road level). Our system is an Arduino based system which uses the state-of-the-art Infrared Sensors (IR. Sensor) for detecting the speed of the vehicle on the road.

**Index Terms**— Cat eyes; Real time speed detection; smart sensors, Infrared, Electric Motor, Pneumatic Pump, Secure road barrier (SRB).

## 1 INTRODUCTION

Roads are the most important means of communications around the world. South Asia i.e. India and Pakistan have faced the highest numbers of road accidents around the world. According to a research, India has witnessed one accident in one minute in the year 2011 [1]. In year 2013 1.24 million masses had died in the road accidents [2]. The Ratio is far too high which cannot be acceptable by any mean. The majority of the accidents are due to over speeding which is drivers' fault. The Speed of the vehicles on the roads can be controlled by Secure Road Barrier. Secure Road Barrier will use the latest technologies i.e. IOT and speed capturing sensors to detect the speed of the vehicles and embedded systems for the process of decision making. Secure Road Barrier will help in maintaining the flow of traffic at a certain pace. The Secure Road Barrier consists of the following key components which will be needed to be developed in order to develop the system.

- Autonomous Speed Breaker embedded with speed capturing sensor.
- A real-time mechanism for speed capturing.
- Development of an accurate warning system so that driver can control the vehicle.
- Making the system capable enough so that it can work in adverse environments.

## 2 RELATED WORK

Recently a lot of efforts have been made in order to make the roads safe and secure. Multiple ways have been proposed to handle this dilemma. Speed Humps are the smaller sized Speed Breakers. The Automated Speed Humps are designed and will work on RTC (Real Time Clock), which will help in sustained flow of traffic on the roads making them safe and secure as well. The Speed Humps are very useful in areas like Schools, Markets and Parking Lots. The Real time Clock is a Computed Clock System that maintains the foot prints of the current Time. The Key Components of the proposed system

are an Electric Motor, a Scissor Jack and Arduino [1].

The one of the major reasons of the road accidents is that the drivers are unaware of the approaching hurdles on the roads. According to the report published by the Ministry of Roads and Highways transports of India, the number of casualties on roads due to humps are 4276, and due to Potholes and Speed Breakers are 6672. Lack of the early warning system for the approaching Speed breakers is also a factor causing accidents on the roads. This Research Work will suggest and propose a real time detection and warning system for the approaching speed breakers on the highways. The Speed Breakers will be flocked up on the routes according to their Longitude and Latitude. This Research Work Involves the development of

- Data Collection Units of the Speed Breakers.
- Speed Breakers Detection Unit.
- Warning System [2].

A Radio Frequency based notifying system for the drivers have been proposed in [3]. Radio Frequency can be said as the next generation technology. Since its induction from early 1900s, it has impacted our lives in many positive ways. The Radio frequency uses Radio Frequency Transmitter to fruitage the waves and Radio Frequency Receiver to cluster the Radio Frequency waves. The proposed system will help the drivers to be notified once they enter in the areas having schools, hospitals etc. so that they can reduce the speed of the vehicles [3].

In Research work [4], the researcher has proposed a time demand speed breaker. In this research work a time dependent speed breaker is designed with embedded system. This Research work suggests that time can defined in which speed breaker may appear on the road and other than that timing speed breaker goes downward lying flat on the road. The Speed Breaker can be opened and closed as per rush hours, the timing can be stored in the non-volatile memory so that it can be further used for decision making i.e. in terms of keep-

ing the speed breaker up or down.

### 3 SYSTEM COMPONENTS

The two major components of our proposed system are

- a. Hardware Components
- b. Software Components

#### a. Hardware Components

##### 1. Electric Motor

An electric motor is an electricity operated machine which transforms the electrical energy into mechanical energy [5]. The inverse of this scenario is with electric generator. The electric motors have been used in every filed of life from space shuttles to the toys for the children. The Electric Motors can be ignited from the Direct Current Sources such as batteries, solar cells and fuel cells as well as from the Alternating Current Sources such as Grid Stations etc. The general-purpose motors are used provide the mechanical energy for industrial purposes. The electric motors are used in every area of life, the biggest electric motor in use till now is in propulsion system of a ship which is off 100 Megawatt (1 Mega Watt = 1000000 Watts). The Electric motors can be characterized on the base of their power sources and their internal structures.

Electric Motors are used to generate the rotatory and linear forces [5]. The 12watt Servo motor is used in the research work.



Fig 1 Showing the Micro Servo Motor.

##### 2. Arduino

Arduino is an open source computer hardware and software company that designs and develop the single board micro controllers and micro controller's development kits which are used in development of the digital devices and the sensing devices that can control the objects in the real world. The reason why the Arduino is said to be the open source is that it is licensed under GNU General Public licence, allowing the development, manufacturing and distributing it by any willing person. Arduino Boards are available in DIY's (Do It Your Self) from in which the person has to burn the code according to his will so that he can get the desired output from the device. The Arduino Uno R3 is used in the research work [7].



Fig .2 Showing Arduino Uno.

##### 3. Buttons with an LCD display

Push Buttons or Buttons are used to give some input to the microcontroller i.e. Arduino device. It connects any two points in your desired designed circuit where you press them and takes the desired output. The LCDs have a parallel interface which means that the microcontroller has to control many pins at a time in order to control the display. The LCD has following key components

1. Read Write Pin
2. Enable Pin
3. 8 Data Pins
4. Register Pin

Register Pin Controls that in which allocated space memory of LCD you are writing on. Read Write Pin selects the read write mode of the LCD. Enable Pin allows to write on the registers. The LCDs to be attached with Arduino comes in 4 Bits and 8 Bits Mode.4-bit has seven input output Pins while 8 Bit has eleven. The 8-bit LCD is used in development of the prototype [7].



Fig. 3 Showing the 8-Bit LCD Display.

##### 4. Infrared Sensors

Infrared technology is one of the most advanced technology of the current era. This technology is widely used in wireless controlling and sensing. The infrared region is divided into 3 categories

1. Near Infrared Region
2. Mid infrared Region
3. Far Infrared Region

For Detection systems Mid Infrared Region is used. The working of Object detection sensor using infrared is shown below in figure. The Infrared transmitter transmits the waves, which returns back to the infrared receiver after colliding back to the body of the objects [7]. The Infrared Sensor 1838B is used in the research work.

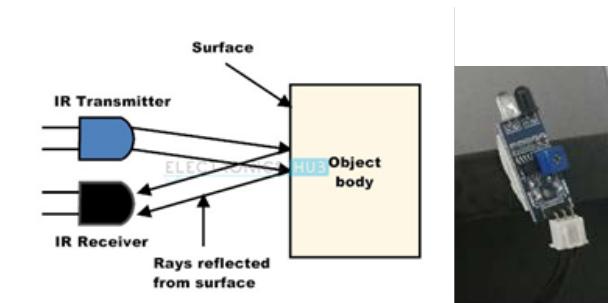


Fig. 4 Showing the infrared Sensor 1838 B and Its working.

## b. Software Components

### 1. Asp.net

Asp.net is a web development platform which is used for the development of the Web. Applications for PCs as well as for mobile phone devices. According to Microsoft "ASP.NET is a technology for building powerful, dynamic Web applications and is part of the .NET Framework" [8]. Asp.net is regarded as one of the most stable platform for the web development. Asp.net is the basic technology used in developing the web interface of the SRB.

### 2. Visual Studio

Visual Studio is one of the most advanced and well reputed tool for development of applications. Visual Studio is one of the most dynamic development tool as it supports 36 different programming languages and posses the state of the art intelligence features which assists the developer in terms of choosing the right library and other associated things [9]. Microsoft visual studio is the basic tool used for the development of Web interface of the system.

## 5. Indigenously Developed Speed Breaker

One of the key Component of our research work is the indigenously developed speed breaker. The Speed Breaker is enforced with a structure frame. The up and down position of the speed breaker is controlled by a pneumatic cylinder which will be controlled by an electric control circuit and gives it the signal to move up or down. The up and motion takes place with the help of a Pneumatic cylinder. The Pneumatic pump is a state-of-the-art technology which is best in terms of load bearing, reliability and maintainability.

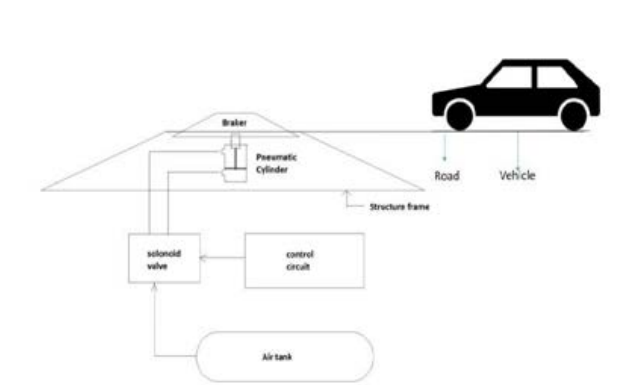


Fig. 5 Showing the architecture of the proposed Speed Breaker.

## 4 SYSTEM ARCHITECTURE

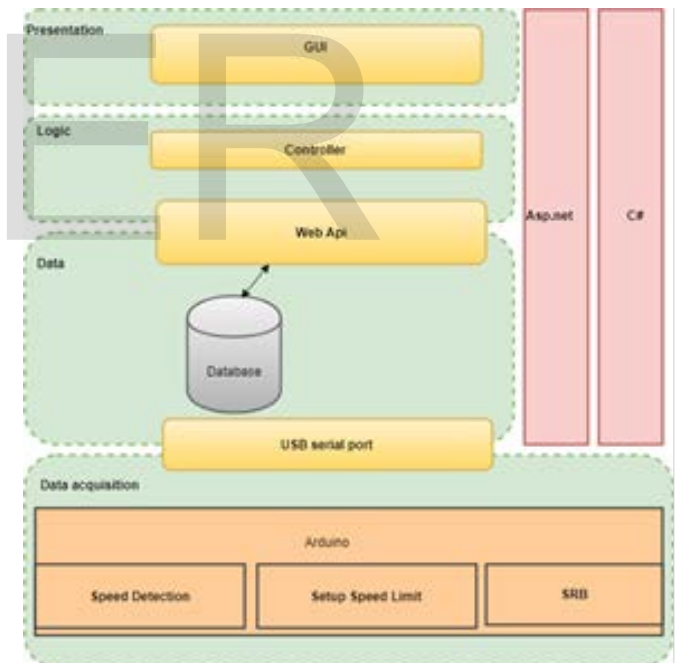


Fig. 6 Showing the System Architecture.

The architecture of our proposed system is shown in the fig.6. The Arduino is the main data source as it contains the-modules of speed detection, setup speed limit and SRB. First of all, in Setup Speed Limit module the administrator setups the maximum allowed speed of the vehicle, as the proposed system is an automated system, the speed detection takes place. The speed of the vehicle is detected by using the smart sensors. The collected speed data is passed on to the Desktop app by using the USB serial data and data is stored into the database. For Database services the SQL-Server is used.

The system contains the web-interface on which the data of the vehicle i.e. vehicle i.d., detected speed of the vehicle and speed limit is shown. For displaying the data on the website, A Web-API. Is called which passes the data to the web from the local host to the server site.

The Proposed system is developed on the Asp.net platform and C# as the mother development language for the development of the desktop app and web-site. The Arduino is configured and programmed in simple C programming language.

## 5 THE WORKING ENVIRONMENT OF THE EXISTING PROTOTYPE

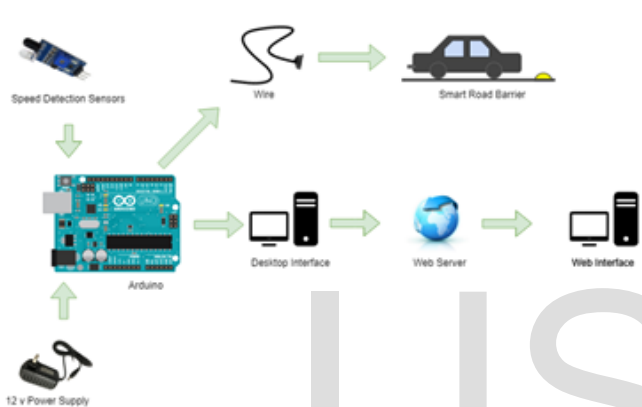


Fig.7 Showing the working environment of the existing prototype.

The fig. 7 shows the working environment of the existing working prototype. The Arduino is the main nucleus of the existing system. The speed detection sensors are basically the IR. Sensor which detects the speed of the vehicle and passes the data to the desktop application. The data is stored on the desktop, which is passed on to the Web-interface by using webserver.

If the system detects that the vehicle is exceeding the setup speed limit, signal is passed on to the indigenously designed speed breaker by using a wire which is connected to the electric control circuit of the speed breaker and moves it up or down.

## 6 FUTURE WORK

The existing prototype uses the wire to communicate between the Arduino and the Secure road Barrier.

In near future the wire is going to be replaced by the wireless communication. The future working scenario can be shown as

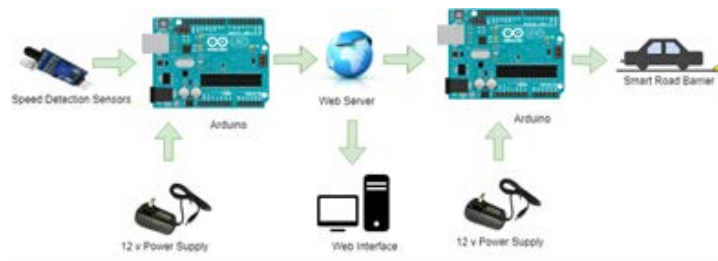


Fig.8 showing the future working environment.

In future, the proposed system will contain the two Arduino devices i.e. Primary and Secondary devices. The primary device will be responsible for the speed detection and data transformation to the web. And the secondary device will be connected with the SRB. The key advancement in this context will be that the two devices will communicate on the real time. The real communication between the devices will take place with the help of WIFI modules attached with both the devices. This advancement will help to increase the working range of the whole system ensuring the “advancement for the solution”.

## 7 CONCLUSION

Road Automation and safety are interrelated to each other. Many efforts have been made to make the roads safe and secure, but many actions are needed to be taken. Our proposed work has used the latest existing technology to automate and secure the existing road barriers such as road breakers. Our research work has a social and moral boosting factor as well, because it encourages the people to obey the law, to develop an ethical and morally good society.

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