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Automatic vehicle speed control

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ABSTRACT

Internet of things technology enables all the physical devices to be connected through the network and exchange data among themselves over the internet. Road accidents are the most dangerous things to happen to a road user especially due to over-speeding. One of the possible ways of controlling speed to prevent accidents is by applying the applications of IoT. The objective of Automatic Vehicle Speed Control is to develop a system which automatically controls the speed of the vehicles at specific areas such as school zones, hospital zones, speed limited areas, etc. Encoders are mounted at the zones which continually transmit codes that are different in different zones. When the vehicle reaches the zone, the decoder present in the vehicle decodes the data transmitted by the encoder and sends the decoded data to the programmed micro-controller which in turn is responsible for decreasing the speed of the vehicle and keeping vehicle speed constant until it moves out of the zone. Later on, the vehicle can regain its original speed. Apart from speed detection this system also has an inbuilt object detector unit (with 555 IC, TSOP 1738, IR) that is the vehicle comes to halt when it detects any object in front. Thereby avoiding most of the accidents. Automatic Vehicle Speed Control also consists of a unit (with LDR) that automatically illuminates the street lights in the absence of light.

Keywords— *Internet of Things, automatic speed control, specific areas, Encoders, Decoders, programmed micro-controller, object detection*

1. INTRODUCTION

The Internet of Things describe about 2 parts, Internet – a keystone for connectivity, and Things – objects / devices. The devices that uses the applications of IoT is basically the computational intelligence, but also network connectivity. With the network connectivity you can add another set of features on top of that, that you couldn't have added without the network connectivity. Advancements in medicine, power, gene therapies, agriculture, and smart cities are just a very few of the categorical examples where IoT is strongly established. IoT has many applications such as smart homes, wearable's (Apple-watches, etc), smart cities, connected cars, smart grids, industrial internet, connected health, smart environment, smart water, security and emergencies, logistics, smart agriculture, home automation, etc. Road accidents are a major cause of deaths and disabilities all over the world for the past few decades. The numeral count of road accidents is increasing due to over speeding, negligent driving, drunk driving, poor vicinity of roads, etc. Among these reasons, speeding is the major cause of accidents. The problem of over speeding becomes more dangerous in the rainy, winter and spring season. To avoid these accidents, this project is developed to control the speed of vehicles in accident-prone zones such as schools, hospitals, temples, etc. This is achieved by using the applications of the Internet of Things (IoT). In this project, we will be using communication between encoders in the zone, decoders in the vehicle and the monitoring system.

2. EXISTING SYSTEM

A Vehicle Speed Detection using Image Processing [6] was developed to detect the vehicle speed using the image processing technique. The existing system includes the software which requires a video scene that consists of the following components:

moving vehicle, starting reference point and ending reference point. The system is designed to detect the position of the moving vehicle in the scene and the position of the reference points and calculate the speed of each static image frame from the detected positions. Fig. 1 shows the process of speed detection of a vehicle.

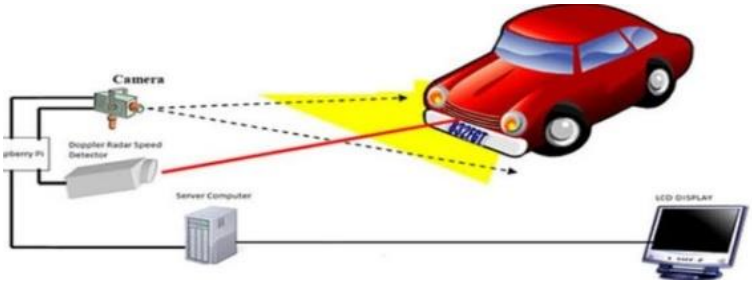

Fig. 1: Vehicle speed detection using image processing

3. PROPOSED SYSTEM

The above-specified system (Fig. 1) is designed only to detect the speed of the vehicle. But, in many cases, we must control the speed before it is sent to the monitoring authorities to prevent the accidents. So, to overcome this drawback we propose the system that not only detects but also controls the speed of the vehicle at accident-prone areas such as hospital, school and temple zones. This system consists of encoders placed at different zones which emits different codes and these codes are detected by the decoder present in the car which conveys the microcontroller that the car has entered the specified zone and hence the car speed gets reduced by the microcontroller.

3.1 Modules in the system

AVR Microcontroller: AVR is also known as Advanced Virtual RISC. Its main features include High Performance, Low Power AVR 8-Bit microcontroller, Advanced RISC Architecture, High Endurance Non-volatile Memory Segments, Peripheral Features, etc. A microcontroller is used to control the operation of various machines and devices according to the program or given instructions in the memory or ROM of the microcontroller.

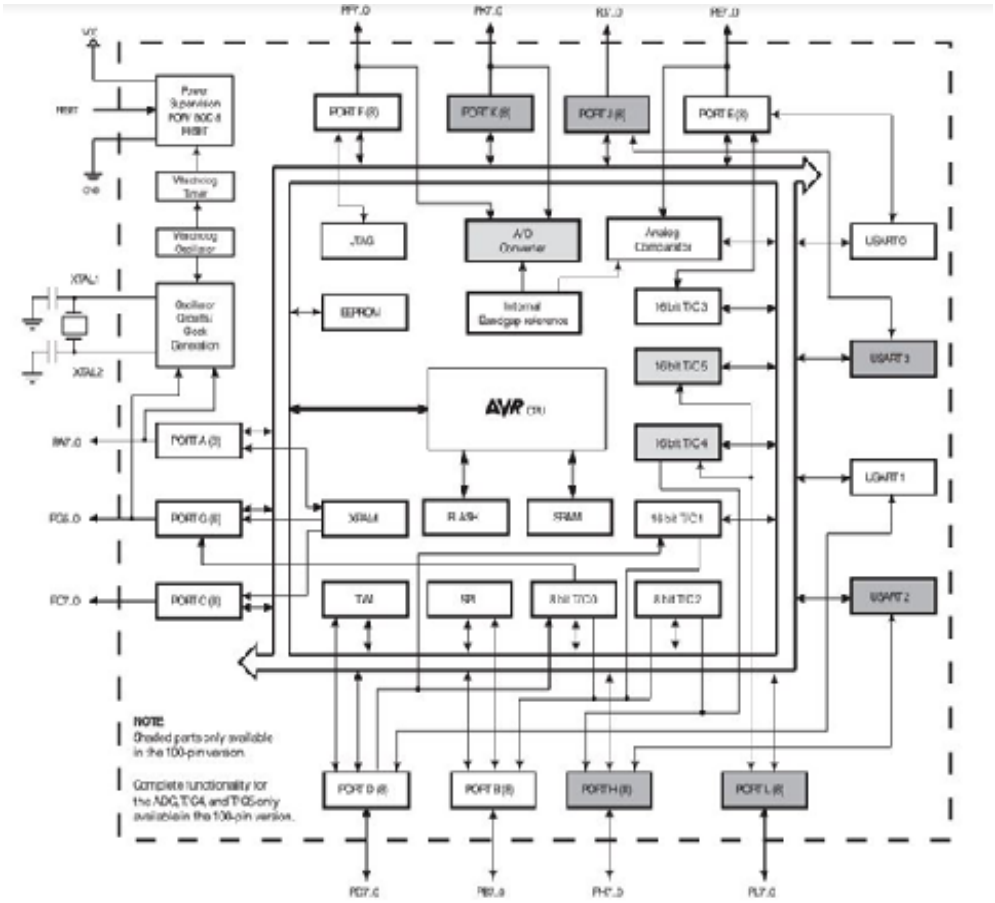

Fig. 2: Architecture of AVR microcontroller

555 TIMER IC: This IC is used for the generation of oscillations/frequency. Fig. 3 shows the pin diagram of 555 timers. This is an integrated circuit used in a variety of timer, pulse generation, oscillator. It includes 25 transistors, 3 diodes, 15 resistors on a silicon chip installed in an 8 pin (DIP-8).

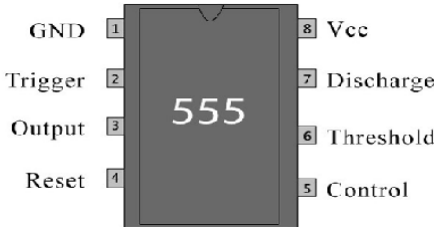

Fig. 3: 555 Timer pin diagram

TSOP 1738: This is the IR Receiver. It can read output signals from remotes like a TV remote, AC remote, home theatre. This is connected to the microcontroller to analyze IR received. It receives a frequency of 38khz operates under 5mA. Fig. 4 shows the sensor TSOP 1738.

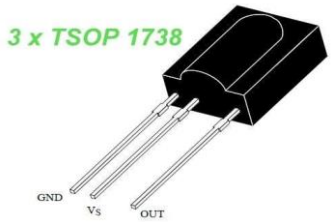

Fig. 4: TSOP 1738

L298D (MOTOR DRIVER IC): This IC allows DC motor to drive on either direction clockwise or anticlockwise. It consists of H-bridge which allows the voltage to be flown in either direction. For driving motors +9v given. Fig. 5 shows the outlook of L298D.

Fig. 5: L298D

LM393(a): This IC is used as a voltage regulator which restricts the output voltage to 5v for various range of input voltages. It can deliver up to 1.5A of current with a heat sink. It has internal current limiting and shutdown feature. Fig. 6 shows the outlook of LM393.

Fig. 6: LM393

LDR (Light Determinant Resistor): LDR is the light sensor. It is also known as photo-resistor. It decreases resistance concerning receiving luminosity on component sensitive surface. It is made of semiconductor materials which have high resistance. Fig. 7 shows the LDR. When light falls on devices, the measure of energy of light which is equal to gap between the valence and conduction band then electrons move to conduction band and current flows as a result resistance decreases.

Fig. 7: LDR

4. WORKING PROCEDURE

Automatic Vehicle Speed Control System consists of a vehicle with a programmed microcontroller to control the speed of vehicles especially in specific zones such as schools, hospitals, temples, etc. We used sensors as mentioned in the module for detecting the obstacles. Initially, the vehicle is moved on the setup made as a road. The zones consist of encoders which continuously transmits different codes which are detected by the decoder present in the car, intimating the microcontroller the car has entered the specified zone. Now the microcontroller which is responsible for controlling the car decreases the car speed. This project even consists of street lights that automatically illuminate when sunsets. This system also has the advantage of detecting the obstacles using an object detection sensor which acts as an aid to stop the vehicle automatically when an object is detected in front of the vehicle.

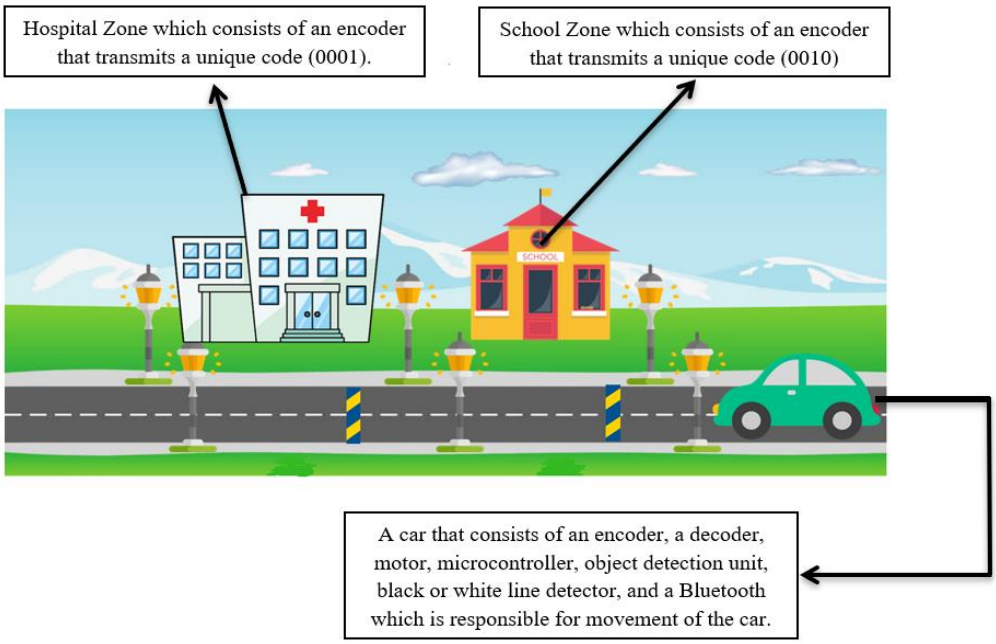

Fig. 8: Working procedure- without encoders and decoders

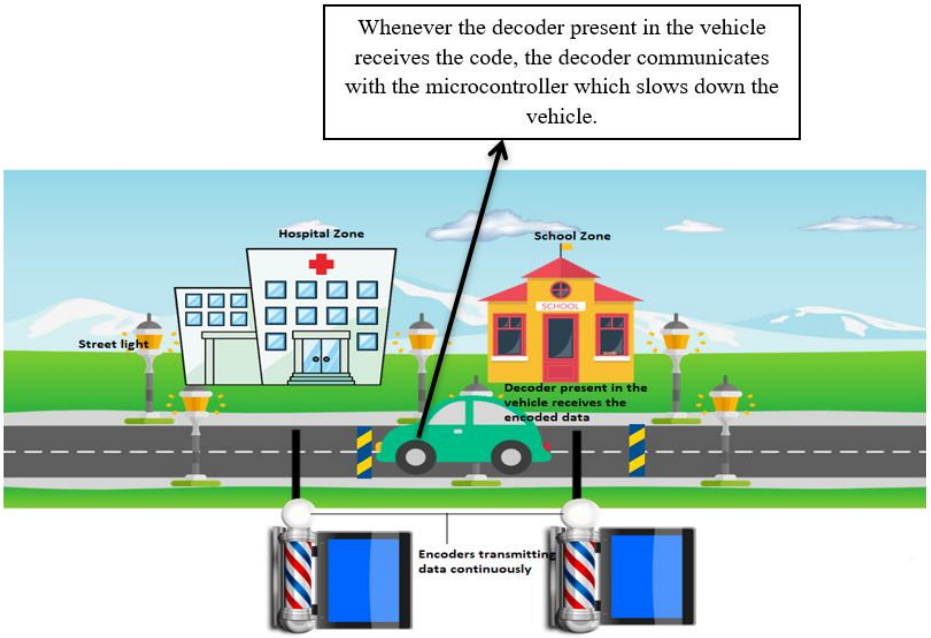

Fig. 9: Working procedure-using encoders and decoders

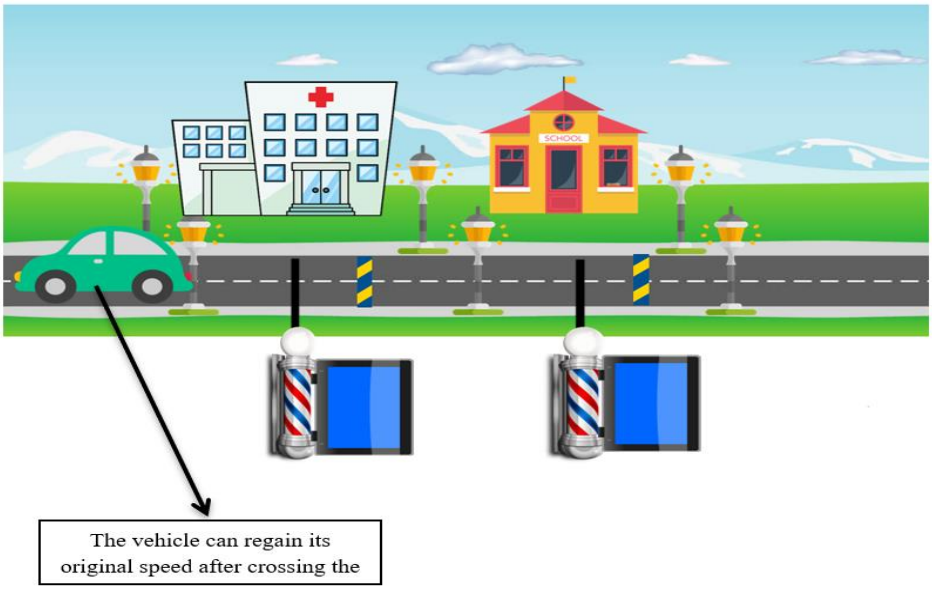

Fig. 10: Working Procedure- after using encoders and decoders

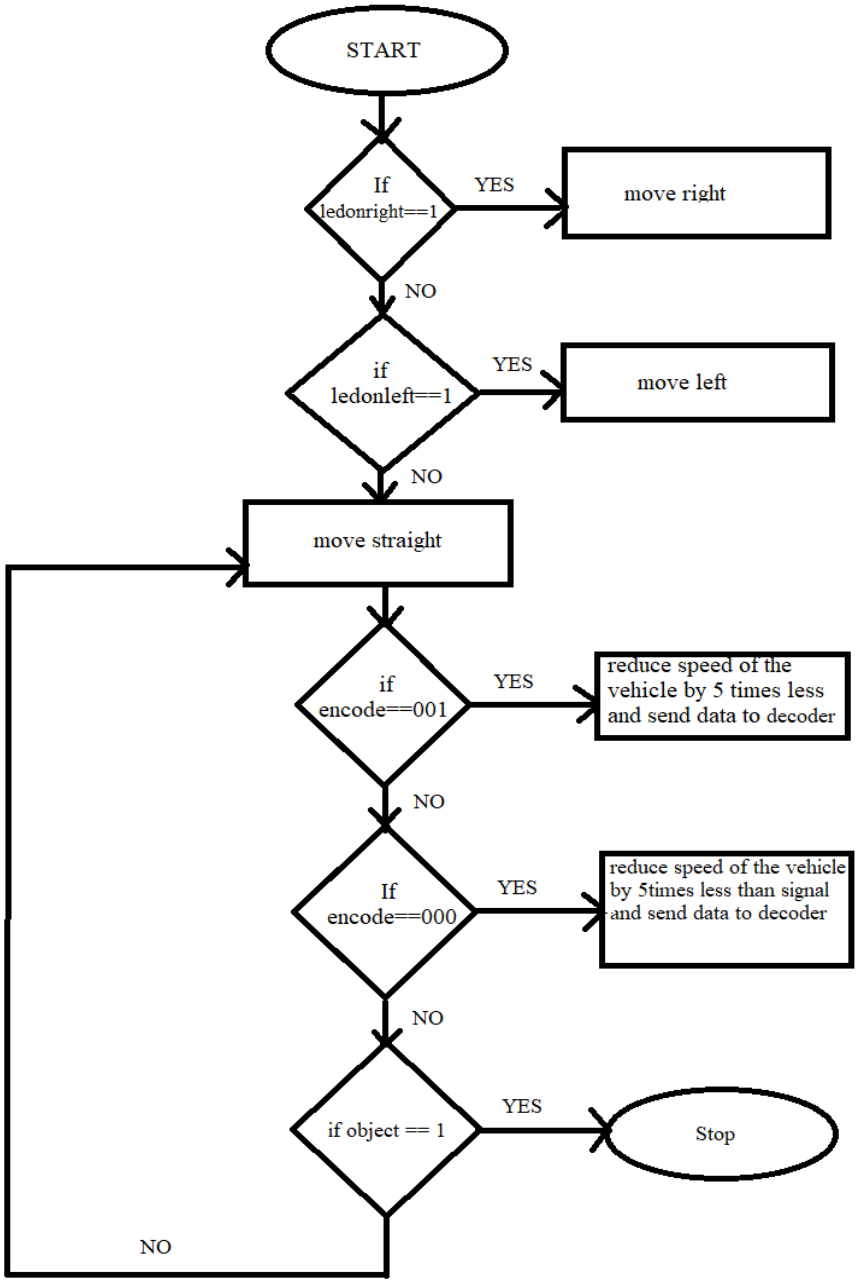

Fig. 11: Flowchart of vehicle

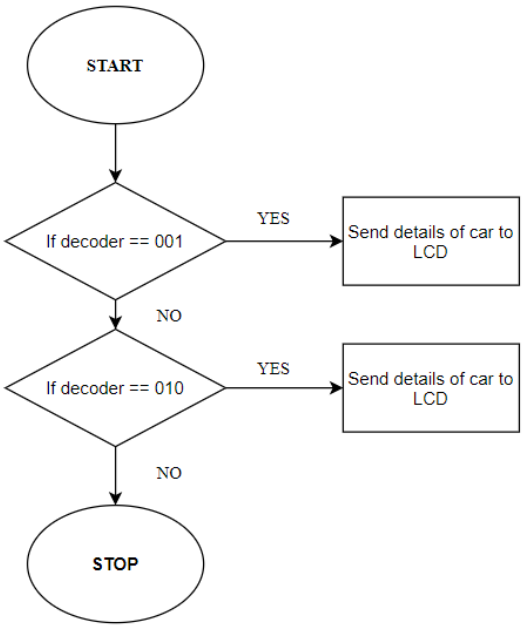

Fig. 12: Flowchart of platform

4.1 Object Detection

The object detection is done by object detection senor. The below circuit diagram shows the object detection sensor (Fig.13). In the below Fig.ure 10, 555 timer is used to generate the frequency (multi vibrating) 38kHz.Pin7 is given +5v and Pin 6,2 are grounded. A diode is used to remove ripples on high-speed switching. Pin 1 is made ground by the manufacturer, pin5 is used for timing purposes. The frequency is used to generate IR. It is used to transmit light signals as IR rays. TSOP is the receiver. It receives the IR rays and converts to electrical signals which is a digital level (0 or 1). Then this is sent to the microcontroller. Pin 3 is the output for TSOP as well as 555timer.

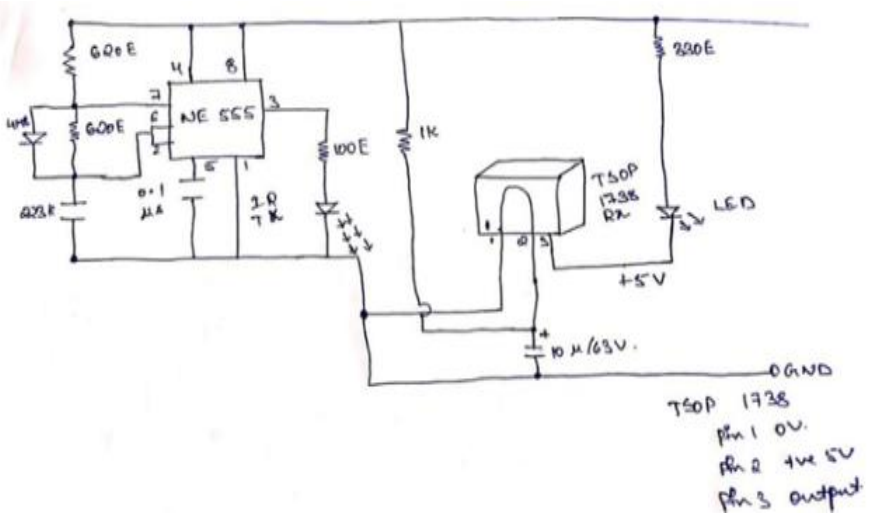

Fig. 13: Circuit diagram for object detection sensor diagram

4.2 Street Light System

The below circuit diagram gives the details about how the street lights in our project are connected (Fig. 14).

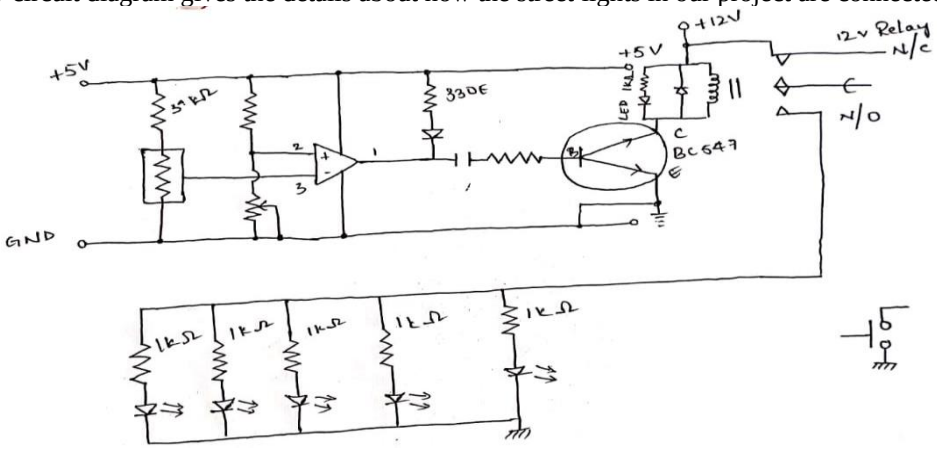

Fig. 14: Circuit diagram for street light

Here we are using LM393(a) as the comparator for voltage. The transistor is the part of relay circuit. Whenever the voltage changes the relay connects and the street lights turn on. The street lights are made of a diode and the resistor which are connected in forward biasing mode.

5. CONCLUSION

The above-specified system (Fig.1) is designed only to detect the speed of the vehicle. But, in many cases we must control the speed before it is sent to the monitoring authorities to prevent the accidents. So, to overcome this drawback we proposed the automatic vehicle speed system that not only detects but also controls the speed of the vehicle at accident-prone areas such as hospital, school and temple zones. This system consists of encoders placed at different zones which emits different codes and these codes are detected by the decoder present in the car which conveys the microcontroller that the car has entered the specified zone and hence the car speed gets reduced by the microcontroller.

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