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Zigbee Based Speed Sensing System and Providing Alarm of Over Speed

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ABSTRACT: In the present day scenario accidents are increased due to the frequently violation of traffic rules by the people and over speeding occur due to immoral driving behavior. The purpose of this paper is to give an alternative technological solution to achieve effective speed control. The main objective of the paper is to design and develop a new model that can efficiently sense speed violations on the road and supports the driver to follow traffic rules thereby he can maintain the speed prescribed in the rules. So, a driver support model is provided to prevent over speeding, violation of road rules. This paper contains combination of solar energy, zigbee and arduino to sense over speed of a motor. Hall sensor is placed near the zigbee transmitter by which the zigbee transmitter senses the speed. The Zigbee transmitter unit sends the speed limit to the transmitter Arduino and then to Zigbee receiver of the particular speed of motor and the receiver unit placed near the motor receives the messages and sends to the receiver Arduino. When speed of the motor exceeds the limit, the microcontroller records the violated speed and the alarm buzzes the sound as a warning of over speed.

KEYWORDS: Solar Panel, Zigbee, Arduino, Hall sensor, Alarm of over speed.

I. INTRODUCTION

There has been a terrific growth in the traffic because of progression of the urbanization, automation and population. With growth in traffic, there is existence of more of problems includes traffic jams, accidents and traffic rule violation at the heavy traffic signals. During 2016, in India a whole of 2, 46,133 people were died in road accidents because of lack of speed control and violating the road rules. Road accidents can be minimized by implementing actions such as advanced Traffic management, civilizing the quality of road infrastructure and safer vehicles. To Safeguard decline in accidents and to progress road safety, speed control techniques such as speed control in school and college zones by using RF tranceiver, automatic braking systems, Camera monitoring and control system, active control management system and RFID technology based detection are implemented. The current techniques still doesn't able to reduce the number of accidents. Hence a new system has designed by using zigbee technology. This Zigbee module can be connected with the computer by using RS 232 protocol and speed is sensed by transmitter Arduino, which violation management provides efficient monitoring, registering and buzzing the system of speed of the vehicle which exceeds the limit. The driving behavior of the driver is monitored based on which penalty amounts are calculated thereby speed violation can be reduced.

II. OVERVIEW OF WORKING MODEL

This model gives a reliable, accurate and efficient way of speed control of a DC motor. The Transmitter Module of system by which we can transmit the data at the rate of 250mbps, near about 10 to 100 meters distance. In this module we are using Zigbee technique to control the speed as well as direction of motor. This Zigbee module can be connected with the computer by using RS 232 protocol and speed is sensed by transmitter Arduino. Now At the Receiver side we

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have receiving module by which transmitted data can be received. Again at receiver side we are using Zigbee receiver module by which we are receiving the transmitted signal to the receiver Arduino, and based on the speed limit the alarm buzzes if it exceeds the speed.

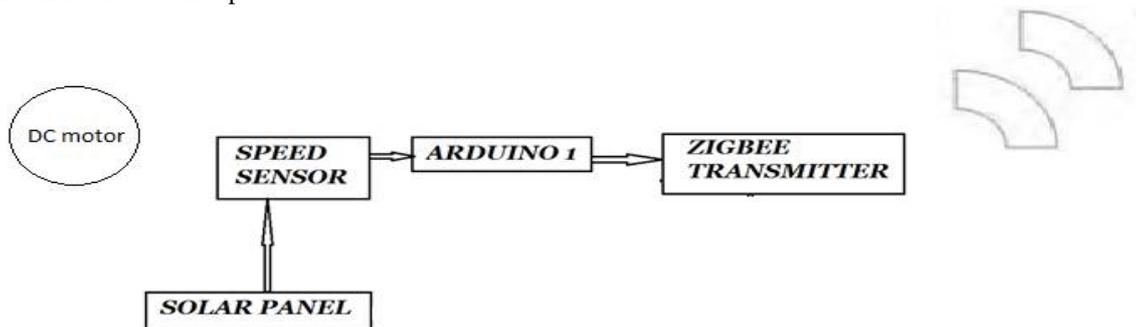


Figure 1. Block diagram of Transmitter section

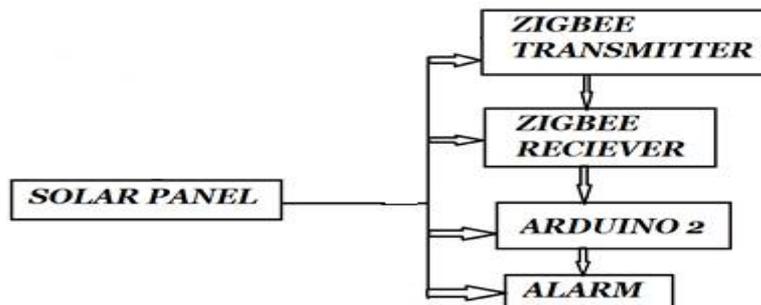


Figure. 2. Block Diagram of Receiver section

COMPONENTS USED:

i) **SOLAR PANEL:** Solar panel is designed to absorb the sun's rays as a source of energy for generating electricity. The capacity to generate electrical energy by means of solar radiation is called Photovoltaic. Photovoltaic is the field of technology which directly converts sunlight into electricity using semiconductors that exhibit the photovoltaic effect. A photovoltaic (PV) module is a package; connect assembly of typically 6×10 photovoltaic solar cells. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential application.

Photovoltaic modules use light energy (photons) from the Sun to generate electricity through the photovoltaic effect. Modules electrical connections are made in series to achieve a desired output voltage and/or in parallel to provide a desired current capability.

ii) **ZIGBEE:** Zigbee full form is zig-zag bee. ZigBee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios, such as for home automation, medical device data collection, and other low-power low-bandwidth needs, designed for small scale projects which need wireless connection.

The ZigBee specification is intended to be simpler and less costly than other wireless personal area networks (WPANs), such as Bluetooth or Wi-Fi. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that require short-range low-rate wireless data transfer.



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Figure.3.Zigbee

ZigBee is a low-power, wireless mesh network standard targeted at the wide development of long battery life devices in wireless control and monitoring applications. ZigBee operates in the industrial, scientific and medical (ISM) radio bands: 2.4 GHz in most jurisdictions worldwide; 784 MHz in China, 868 MHz in Europe and 915 MHz in the USA and Australia. Data rates vary from 20 Kbit/s (868 MHz band) to 250 Kbit/s (2.4 GHz band). Zigbee network consists of coordinator, router and end devices as shown. This wireless technology is used for variety of applications viz. home automation, smart grid, remote monitoring and control etc.

iii) ARDUINO: Arduino is an open source, computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.



Figure.4.Arduino UNO

The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits. The current Uno provide 14 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs, which can also be used as six digital I/O pins. These pins are on the top of the board, via female 0.1-inch (2.54 mm) headers. Several plug-in application shields are also commercially available. The Arduino Nano, and Arduino-compatible Bare Bones Board and Boarduino boards may provide male header pins on the underside of the board that can plug into solder less breadboards.

iv) HALL SENSOR:

A Hall Effect sensor is a transducer that varies its output voltage in response to a magnetic field. Hall Effect sensors are used for proximity switching, positioning, speed detection, and current sensing application. In its simplest form, the sensor operates as an analog transducer, directly returning a voltage. With a known magnetic field, its distance from the Hall plate can be determined.

Hall sensors are commonly used to time the speed of wheels and shafts, such as for internal combustion engine ignition timing tachometers and anti-lock braking systems. They are used in brushless DC electric motors to detect the position of the permanent magnet. In the pictured wheel with two equally spaced magnets, the voltage from the sensor will peak twice for each revolution. This arrangement is commonly used to regulate the speed of disk drives.

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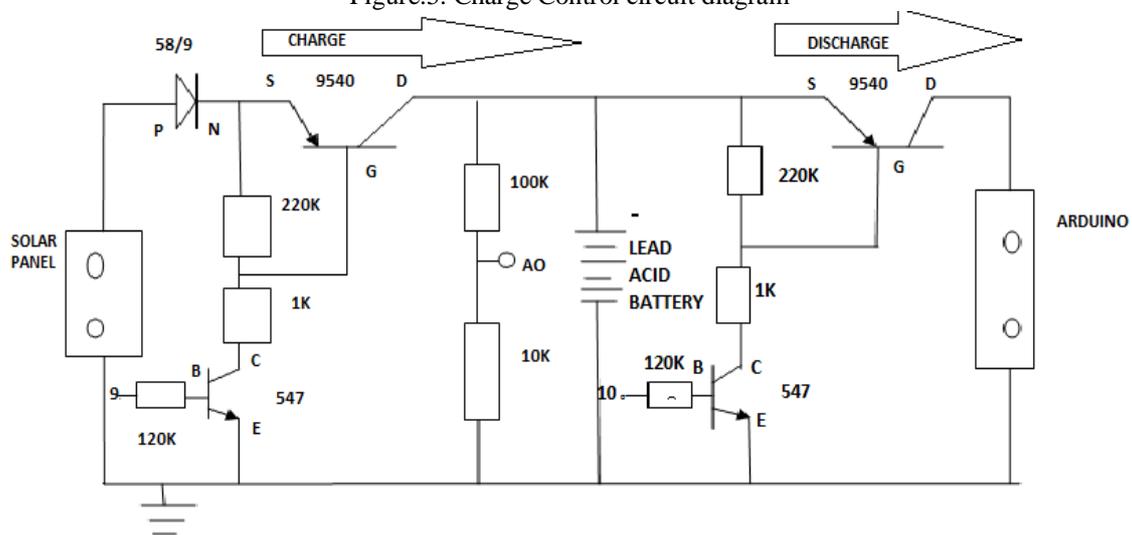
When a beam of charged particles passes through a magnetic field, forces act on the particles and the beam is deflected from a straight path. The flow of electrons through a conductor is known as a beam of charged carriers. When a conductor is placed in a magnetic field perpendicular to the direction of the electrons, they will be deflected from a straight path. As a consequence, one plane of the conductor will become negatively charged and the opposite side will become positively charged. The voltage between these planes is called Hall voltage.

v) CHARGE CONTROLLER:

A charge controller, charge regulator or battery regulator limits the rate at which electric current is added to or drawn from electric batteries. It prevents overcharging and may protect against overvoltage, which can reduce battery performance or lifespan, and may pose a safety risk. A series charge controller or series regulator disables further current flow into batteries when they are full. A shunt charge controller or shunt regulator diverts excess electricity to an auxiliary or "shunt" load, such as an electric water heater, when batteries are full.

Simple charge controllers stop charging a battery when they exceed a set high voltage level, and re-enable charging when battery voltage drops back below that level. Pulse width modulation (PWM) and maximum power point tracker (MPPT) technologies are more electronically sophisticated, adjusting charging rates depending on the battery's level, to allow charging closer to its maximum capacity.

Figure.5. Charge Control circuit diagram



Charge controllers may also monitor battery temperature to prevent overheating. Some charge controller systems also display data; transmit data to remote displays, and data logging to track electric flow over time.

III.IMPLEMENTATION

Solar panel refers to a panel designed to absorb the sun rays as a source of energy for generating electricity or heating. A photovoltaic (PV) module is a packaged; connect assembly of typically 6×10 photovoltaic solar cells. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity.

In this we are using two 6v solar panels which are connected in series. Solar panels are mainly used as the power supply. Solar panels are connected to the charge controller which requires 12v supply to operate.

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Figure .6. Working Model

Charge controller is connected to the Arduino transmitter, Arduino receiver and battery. In the arduino we have 7805 voltage regulator which convert 12v into the required voltage. Hall sensor and zigbee transmitter are connected to Arduino transmitter. Zigbee receiver and buzzer are connected to Arduino receiver. Near the hall sensor D.C motor is placed along with the magnet on it.

As the D.C motor rotates hall sensor senses the speed of motor with the help of magnet which is placed on the motor, and gives signal to the arduino transmitter which are then transferred to the zigbee transmitter, from the zigbee transmitter signals caught by the zigbee receiver and then the signal are read by the arduino receiver. Already the programs are dumped in the arduino ,in that program minimum speed is mentioned .

If the motor runs above the speed which has been mentioned in the program then the alarm buzzes.

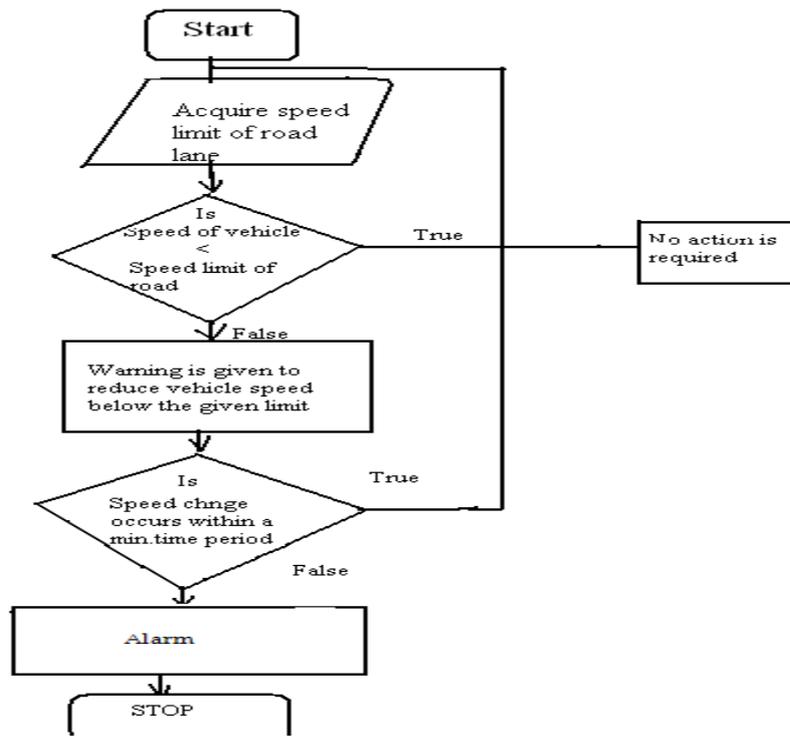


Figure.7.Flow chart



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If the speed limit is less than the speed mentioned in the program, then no action is required. If the speed is greater than the prescribed speed, then warning will be given to the vehicle. If the speed is controlled within the minimum time no need to take any action else alarm buzzes. Based on the alarm penalty will be decided.

IV. APPLICATION

- This implementation will be very useful for traffic personnel to regulate the speed control
- Traffic signs and information about alerts can be intimated to the vehicle users
- Insurance schemes can be implemented based on the driving behavior
- Comparing earlier implementations, this is a low cost method which is practically feasible

V. CONCLUSION

The project succeeded in implementing a model to reduce the traffic rule violations. It is succeeded in detecting the over speed of motor and sending signals and receiving signals through the zigbee through a wireless communication which is mounted on the Arduino and through the sensing the signals buzzer beeps at the over speed. The driver is made aware of his driving behavior and violations made so that careful and conscious driving can be achieved. Repeated violations lead to increase in penalty amount which effects in reduction of violations by the vehicle user.

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