Time Based Smart Speed Breaker using Embedded Systems

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ABSTRACT

The road plays major role in today's transportation. The number of vehicles are also increased. Due to this road jamming and traffic occurs. To handle this traffic in intelligent way the automatic speed breaker is used. When there is no need of speed breaker it disappear from the road and when there is need it comes on the road from the ground. In implementation of this project iron made hemi-cylindrical pipe is used as speed breaker which is capable of rotating itself by using control circuitry of embedded system. In this project RTC is connected to control circuitry. When the control circuitry receives the RF signal the RTC will start and speed breaker comes on the road it remains until the countdown gets zero. We can adjust the time according to our requirement. It is also called as dynamic traffic control system. It provides priority to the emergency vehicles. So this type of speed breaker are very useful before any schools and organization.

Keywords: RF Transmitter and receiver, Embedded system, RTC, Speed breaker model

INTRODUCTION:

In the fast moving world the speed has major role in human's life. There are two main perspectives one is safety and another one is speed. At present, accidents occur due to over speed in road. To avoid such accidents the speed of the vehicles should be reduced.

The concept of this research work is to have a Time-based smart speed breaker using embedded system. Here, we use an iron made hemi-cylindrical rod. The speed breaker is constructed by a half semi-shape long metallic pipe. To adjust the close and open point of the speed breaker, two magnetic sensors are connected across them. The control circuitry is used which is capable of rotating itself from the flat position. It is also used to reduce the speed of the vehicle. In the system, real time clock is used to the required time for having the speed breaker comes on the road. When time started, the speed breaker appears on the road and remains until countdown gets zero. After particular time period, the speed breaker automatically disappears from the road. So, this type of speed breaker is very useful before any buildings, schools, or any organization.

Here, we use a wireless sensor network which provides monitor and control multiple humps at the same time. Further we use an Internet of Things (IOT) which provides better handling capability from the remote areas. For any emergency cases, RF receiver is used to receive the signal strength then the control circuitry will command the system to disable speed breaker at the time.
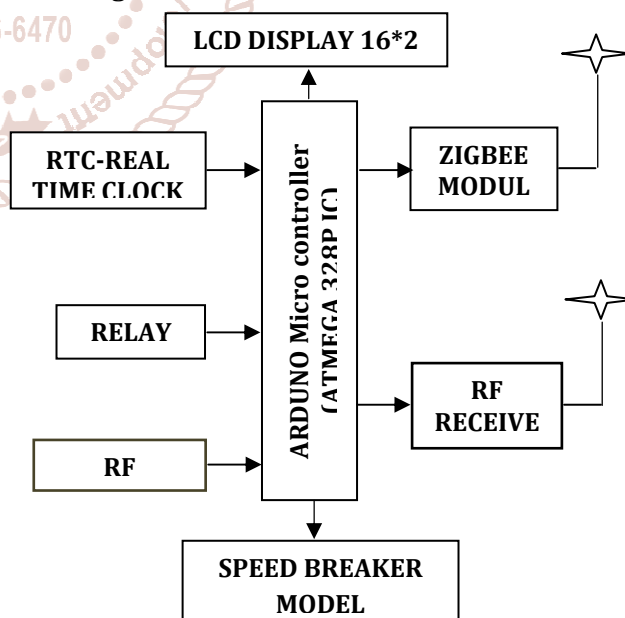
Block diagram

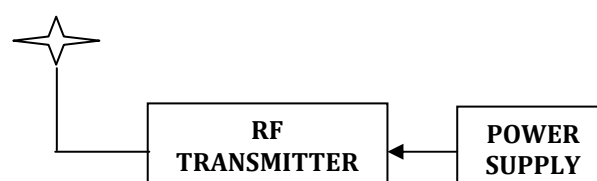**Figure1.1 Block diagram of receiver**

Figure1.2 Block diagram of transmitter

ZIGBEE MODULE

Zigbee is primarily used for two-way communication between sensor and control system. It is a short-range communication and provides connectivity up to 100 meters like Wi-Fi and Bluetooth. Zigbee supports the transfer of media files, software, etc. Zigbee will carry small amount of data over a short range while consuming little amount of power. The security provided by the Zigbee technology can be considered as very strong and robust. Zigbee encryption is based on AES (Advanced Encryption Standard) algorithm for data encryption and data authentication. This standard specifies operation in the unlicensed ISM bands including 2.4 to 2.4835GHz,902 to 928MHz and 868 to 868.6MHz.
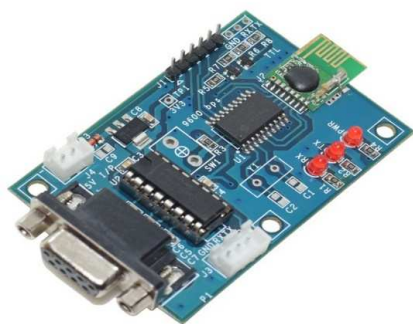

Figure1.3 Zigbee module

ATMEGA 328P IC

The ATmega328 is a single chip microcontroller invented by Atmel in the mega AVR family. It has a modified version of Harvard architecture 8-bit RISC processor core. ATmega328 is found on Arduino Uno boards. It has 32K of flash memory,1K of EEPROM and 2K of internal SRAM.It is widely used in many embedded system applications. The device operates at 1.8-5.5 volts. The throughput achieved by this device is 1MIPS per MHz It is a 28-pin microcontroller with four ports i.e., Port A(PA0-PA7), Port B(PB0-PB7), Port C(PC0-PC7), Port D(PD0-PD7). It has 3 Timers out of which two are 8-bit timers and the third one is 16-bit timer. It also has 32 general purpose register. These are the part of a Static Random Access Memory. ATmega 328 pins are connected to the corresponding Arduino pins. Its features include the low power dissipation, cost efficiency, programming lock for security purpose, real time counters and oscillators. A complete package including ATmega 328 and Arduino can be used in several different real time application. It can also be used in robotics, power monitoring and management systems.
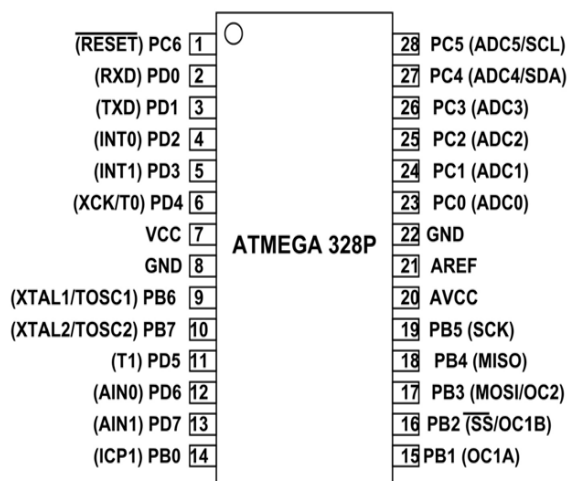

Figure1.4 Pin diagram of ATMEGA 328P

LCD Display

A **liquid crystal display** (**LCD**) is one of the display devices. It is a thin, flat electronic display that uses the light modulating properties of liquid crystals combined with polarizer. Liquid Crystal display does not emit light directly. Liquid crystal display is a passive device.

Figure1.5 LCD Display

It is used in a wide range of applications including computer monitors, television, aircraft, cockpit displays, signage, etc. They are also used in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones. LCDs are used in the most of the applications. It is more compact, lightweight, portable, less expensive, more reliable, and easier on the eyes. It is a wider range of screen size, more energy efficient and safer disposal compare than CRT and plasma display, and since they do not use phosphors. It is low electrical power consumption enables it to be used in battery-powered electronic equipment. It is a one of the electronically-modulated optical device. It is made up of many number of pixels filled with liquid crystals and arrayed in front of a light source or reflector to produce images in color or monochrome.

Real Time Clock

Figure1.6 Real Time Clock

A **real-time clock** (**RTC**) is a computer clock (most often in the form of an integrated circuit) that keeps track of the current time. Although the term often refers to the devices in personal computers, servers and embedded systems, RTCs are present in almost any electronic device which needs to keep occur.

Relay

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches.

Figure1.7 Relay

Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plastic case of the relay.

RF Transmitter Receiver

Radio frequency (RF) radiation is a subset of electromagnetic radiation with a wavelength of 100km to 1mm, which is a frequency of 3 KHz to 300 GHz, respectively. This range of electromagnetic radiation constitutes the radio spectrum and corresponds to the frequency of alternating current electrical signals used to produce and detect radio waves. RF can refer to electromagnetic oscillations in either electrical circuits or radiation through air and space. Like other subsets of electromagnetic radiation, RF travels at the speed of light.

Speed Breaker Model

Smart speed breaker is a speed breaker which is helpful to reduce the speed of the vehicles in dynamic manner.

Figure1.8 Prototype of smart speed breaker

RESULT AND DISCUSSIONS

On completion the concept of having an automatic speed breaker on time demand using Embedded Systems tool; it can be seen that the idea is very innovative and useful for the requirements of today's speedy life. The concept of the mentioned idea is to give the performance to vehicles as well as to make them slow. The microcontroller is a very important and useful in today's electronic environment. This can be used in a very wide range of applications or it can be said that the electronics world is not possible without microcontrollers. Where; this demo of the idea to have such a speed breaker in practical life, shows us how to reduce the speed of vehicles; maintaining the performance as far as possible. So it becomes a very descriptive research work for the details of the practical.

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