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Road Accidents Reduction and Monitoring Using PIC Controller at Junction of Highways and Roads Connecting Rural Areas

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ABSTRACT:Detection of the vehicles and generating the alarm Signals are done at the junction of highway and road that connects two villages and possibility of accidents are reduced. And also camera is installed at that place to monitor. Whenever accidents occur at that spot, location of that spot will be sent to a control room.

KEYWORDS:PIC,GSM,SPEB,SENSORS

I.INTRODUCTION

In india,Road accidents are considered as a major issue and it is a disaster.Nearly 1.25 million people die each year globally as a result of road traffic crashes,According to NDTV survey,over 1,37,000 people were killed in road accidents in 2013 alone,that is more than the number of people killed in all our wars put together[1][2].there is one death every four minutes due to a road accidents in india.In these road accidents[1][2],accidents at highways are being more hazardous.the number of people killed increases every year.development of technologes helps in reduction of these accidents.Many projects are being done by government,students and research scholars to reduce the road accidents.Advanced technologies helps for the successful implementation of ideas to reduce such accidents.Controllers are playing a vital role in such projects.

II.RELATED WORK

The occurrence of accidents at the junction of highways and cross roads connection two rural areas are also a part of these accidents which kills many people. Reduction of such accidents are discussed in this paper.Sensors plays major part in this paper.pic controller is used for the control of the system.And gsm is used to send the location of junction where accident occurred.

III.DIAGRAM

In fig 1.A1 and A2 are the sets of one red and one green light with a buzzer and a SPEB.S1 and S2 are object detection sensors.These are used for alarm,that alert the human trying to cross the road.S1 and s2 can be any object detection sensor.The fig 1 explains the need for this project.It also represents the real time situation that may lead to accident.

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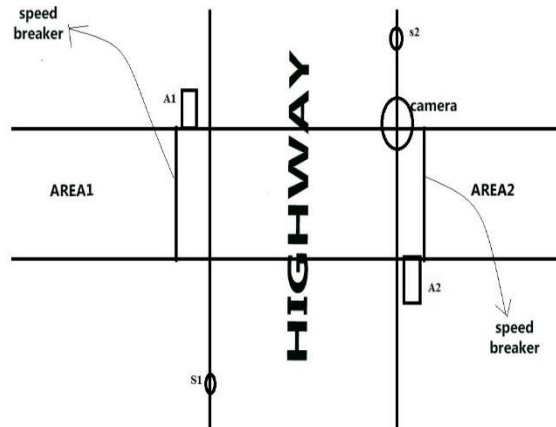


Fig. 1

IV.EXPLANATION

The speed of the vehicle travelling in the highways need not to be controlled as highways are provided for fast transportations. When a vehicle tries to reach area2 from area1 by crossing through highway, there may be possible of accident occurrence in the following case. When a vehicle tries to cross the highway, the vehicles in the highway is seemed to be slow by the driver at the area1 or area2..but, the vehicle in the highway is travelling with high speed. When he cross the road, there is a possibility of the vehicle in highway and vehicle that tried to cross the highway get crashed by each other. So, keeping a sensors on both side of road. In fig 1, As per indian standards of road, vehicles follows left side. So s1 and s2 are placed on the basis of left side for the travellers from a distance from that junction of highway and normal road. When the sensor detects a vehicle, then it sends signal to the pic controller. Then, pic sends signals to red light to glow and buzzer to generate sound alarm. It will be automatically get reset. If no vehicle is detected by this sensor, green light will be glowing and no buzzer alarm is generated by pic. SPEB is single press emergency button. It is a normal push button. If accident is occurred in that junction, anyone (human) near that spot can press this button. The location of that place is stored. And when this button is pressed then this location information will be sent to control room and any other emergency number through GSM (global system for mobile communication) with the help of PIC controller. There will be a camera installed to monitor that spot. If there is no people in that spot. There is another SPEB at control room that sends location of the spot of accident occurred to emergency number (108 used in tamilnadu for ambulance). When there is no accident occurred, but a person pressed SPEB, at that time worker at control room can cancel this sending of information. The controller is programmed like this.

V.BASIC BLOCK DIAGRAM

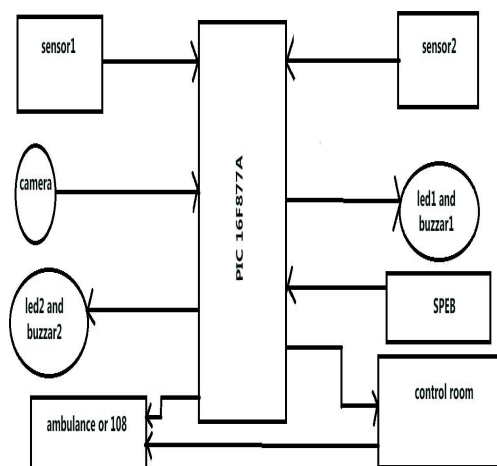


Fig. 2-basic block diagram



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IV.COMONENTS

Pic is a family of modified Harvard architecture microcontrollers made by microchip technology, derived from the pic1650 originally developed by general instrument's microelectronics division. The name pic initially referred to peripheral interface controller. The first parts of the family were available in 1976; by 2013 the company had shipped more than the twelve billion individual parts, used in a wide variety of embedded systems. Early models of pic had read-only memory (ROM) or field-programmable EEPROM for program storage, some with provision for erasing memory. All current models use flash memory for program storage, and newer models allow the pic to reprogram itself. Program memory and data memory are separated. Data memory is 8-bit, 16-bit and in latest models, 32-bit wide. Program instructions set also varies by model, with more powerful chips adding instructions for digital signal processing functions. The hardware capabilities of pic devices range from 8-pin DIP chips upto 100-pin SMD chips, with discrete i/o pins, ADC and DAC modules and communications ports such as uart, i2c, can and even usb. Low – power and high-speed variations exist for many types. The manufacturer supplies computer software for development known as MPLAB assemblers and c/c++ compilers and programmer/debugger hardware under the MPLAB and PICKIT series. Third party and some open-source tools are also available. Some parts have in-built circuit programming capability/low cost development programmers are available as well as high production programmers. PIC devices are popular with both industrial developers and hobbyists due to their low cost, wide availability, large users base, extensive collection of application notes, availability of low cost or free development tools, serial programming and re-programmable flash-memory capability. PIC16f877a is used as the controller. SIM900a is used as GSM module. IR sensor can be used for object detection (vehicle detection). PIC16f877a is a 8-bit microcontroller that has 35 single word instructions and has 40 pins – 44 pins. It has 2 comparators, 8 channels of 10-bit ADC, a USART (universal Asynchronous receiver transmitter). It needs 5v as supply.



Fig. 3-pic16f877a

A crystal oscillator (fig5) is an electronic oscillator circuit which uses inverse piezoelectric effect, i.e. when electric field is applied across certain materials it produces mechanical deformation. Thus it uses mechanical resonance of a vibrating crystal of piezoelectric material to create an electric signal with very precise frequency.

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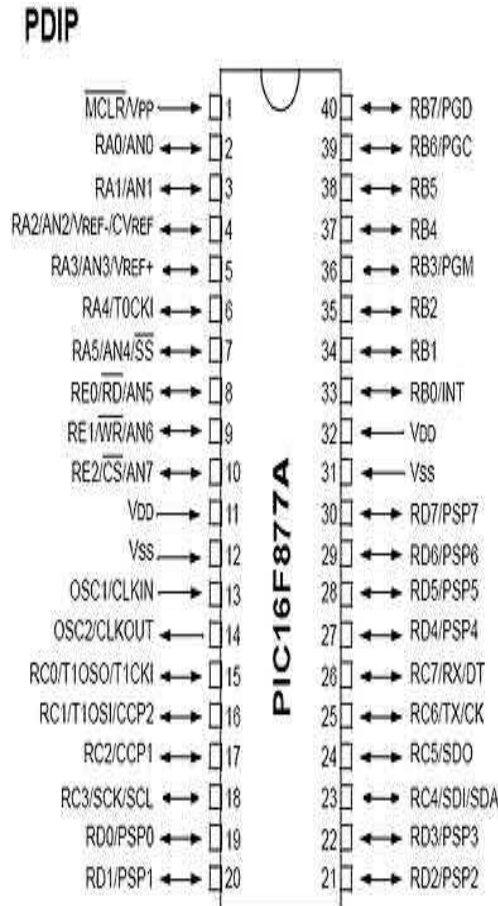


Fig. 4-pin diagram of pic16f877a

They have high stability, quality factor, small size and low cost and this makes them superior over other resonators like LC circuit, ceramic resonator, turning forks etc. This fig5 show a 8MHz crystal oscillator commonly used in microcontrollers and microprocessors.



Fig.5- crystal oscillator

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IR sensor module(fig6) has one IR signal transmitter and a receiver.It sends the ir rays and detects the object.[3][4]



fig. 6-IR sensor module

GSM SIM900a(fig 7) is a circuit that makes use of a sim to send the messages or call.It has a transmitter and a receiver.It acts like a modem.it can be connected with PIC16f877a(interfacing) through the pins.It gets 12v as input supply.Gsm module is a breakout board and minimum system of sim900 quad-band/sim900a dual-band gsm/gprs module.it can communicate with controllers via AT commands(GSM 07.07,07.05 and SIMCOM enhanced AT command).tis module supports software power on and reset.It has gprs multi-slot class 10/8gprs 2/2+class 4(2 w @ 850/900 mhz),class 1(1w @ 1800/1900mhz).it has control via AT commands.it has low poer consumption of 1.5mA.operation temperature is -40 degree Celsius to +85degree Celsius.It uses communication protocol as UART.It is given power supply of 5v.It can be powered on by pulling down the PWR button or the P pin of control interface for atleast 1 second and release.This pin is already pulled up to 3v in the module internal,so external pull up is not necessary.when power on procedure is completed,gsm module will send the message to indicate that module is ready to operate at fixed baud rate.There are LED and buttons.if the led is off,then sim900 is not running 64ms on/800ms.If it is same off,sim900 is not registered to any network.if led is 64ms on/300ms off then sim900 is registered to the network.there is a reset button to reset the gsm.



Fig. 7-GSM module

Gsm interfacing makes the use of AT commands for sending and receiving messages.



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A camera is used for normal video monitoring. There is possibility of human pressing the spsb without occurrence of accident. so it is helpful at the time of SPEB pressing to make sure that accidents have been happened or not. in case of no accident occurred, but spsb is pressed, then control room operator can send a sms stating that no accidents are occurred. fig8 is the image shown just as an example of camera.



Fig. 8-camera

Leds(fig9) used are of red and green colour like a traffic signal. LED needs 2v. red light is for the condition that human could not cross the road. and green signal denotes that there is no vehicle is passing by. so vehicle from normal to normal road can cross now. LED has two pins. one is anode(A). and other is cathode(k). the cathode can be found by length. It is shorter than anode.



Fig. 9-LED

A buzzer(fig10) or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke. The first electric buzzer was invented in 1831 by Joseph Henry. They were mainly used in early doorbells until they were phased out in the early 1930s in favor of musical chimes, which had a softer tone. This buzzer has two wires. It gives beeps like sound as output. It needs 5v as supply voltage. It generates at time of detection of vehicles with the red led glowing.

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Fig. 10-buzzer

Push button(fig 11)has 4pins. A push-button (also spelled pushbutton) or simply button is a simple switch mechanism for controlling some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal. The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed. Buttons are most often biased switches, though even many un-biased buttons (due to their physical nature) require a spring to return to their un-pushed state. Different people use different terms for the "pushing" of the button, such as press, depress, mash, hit, and punch.



Fig. 11-push button

VI.CONTROL ROOM

In fig 12,control scheme is shown.Like this junction,there are many junctions in highways in india.Each and every junction is provided with the above system.thereis a control room which is connected to all theses junctions.Each and every spot has another SPEB in control room.A human is needed in the control room to operate and monitor the roads.Display screen is nothing but a TV or computer screen or anything else which can be used for displaying video.And power supplies for components can be given through solar panel.

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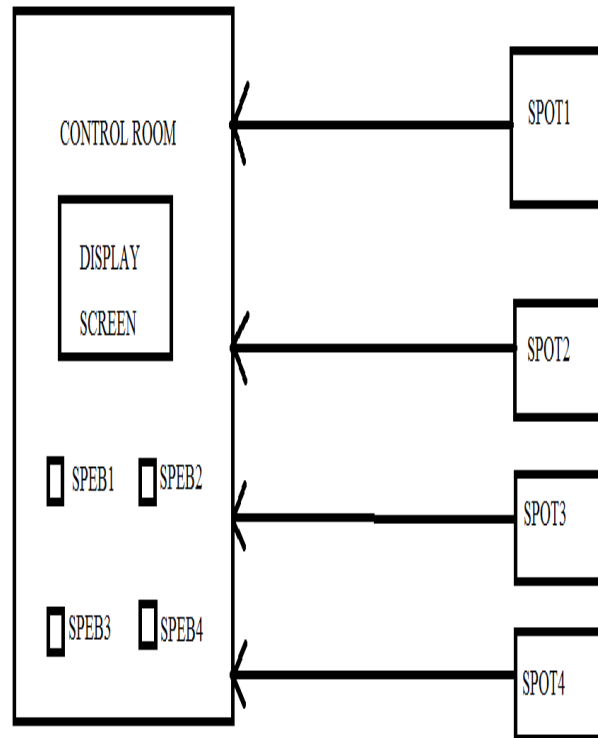


Fig. 12

VII.CONCLUSION

A prototype and idea for reduction of such accidents are discussed in this paper. This work is based on an embedded system equipped with sensors, GSM, and camera. This work will help for the reduction of such accidents at junctions. Our team will work for real-time implementation of this project.

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