Accident Detector Using Wireless Communication

Mian Muhammad Kamal[1], Syed Waleed[2]

[1]Department of Information and communication engineering Northwestern Polytechincal University Xi an China

[2]Department of Electrical Engineering University of science and Technology Bannu Pakistan

Abstract: **Life is precious and short. Lifetime is the opportunity given by God to show ourselves. But our lifetime is further getting short because of some natural and artificial disasters. An accident is a specific, identifiable, unexpected, unusual and unintended external event which occurs in a particular time and place, without apparent or deliberate cause but with marked effects. Accidents of particularly common types (auto, fire, etc.) are investigated to identify how to avoid them in the future. Though accident cannot be stopped but we can save the one who is injured. This paper is here presented to call the ambulance automatically to the place where accident has occurred. This circuit uses Microcontroller PIC16F877A in the Transmitter as well as in Reception to transmit and receive the signal.A vibration sensor and an auto dialer is also used along with this. The vibration sensor has the certain range of vibration and if this exceeds it activates the auto dialer. The device is placed in the center of the vehicle and the same set up is used in the reception(Hospitals). As soon as the detection, the auto dialer gives the alarm to the hospitals nearby. By using this technique, the lives of many people can be saved. As this device automatically calls the ambulance, the loss of lives due to the time lag between the arrival of ambulance and treatment can be avoided totally.**

Key Word: **GPS, GSM, Emergency call system**

I. INTRODUCTION

The automatic accident detector is used to make an automatic call to the ambulance as soon as the accident has occurred. The auto dialer and the Microcontroller play a vital role in this detection. The main working is that the circuit is connected to the vehicle and as soon as the accident has occurred there is a great vibration in the vehicle .The vibration makes the auto dialer to activate. The auto dialer then makes a call to the number saved in its memory. The number saved may be the contact number of the nearest hospital. Then the ambulance can be able to arrive to the desired location as soon as possible. The microcontroller helps the auto dialer in transmitting and receiving the signals.

Main components used:

- Micro controller PIC16F877A
- 3202 Vibration sensor
- Auto dialer.

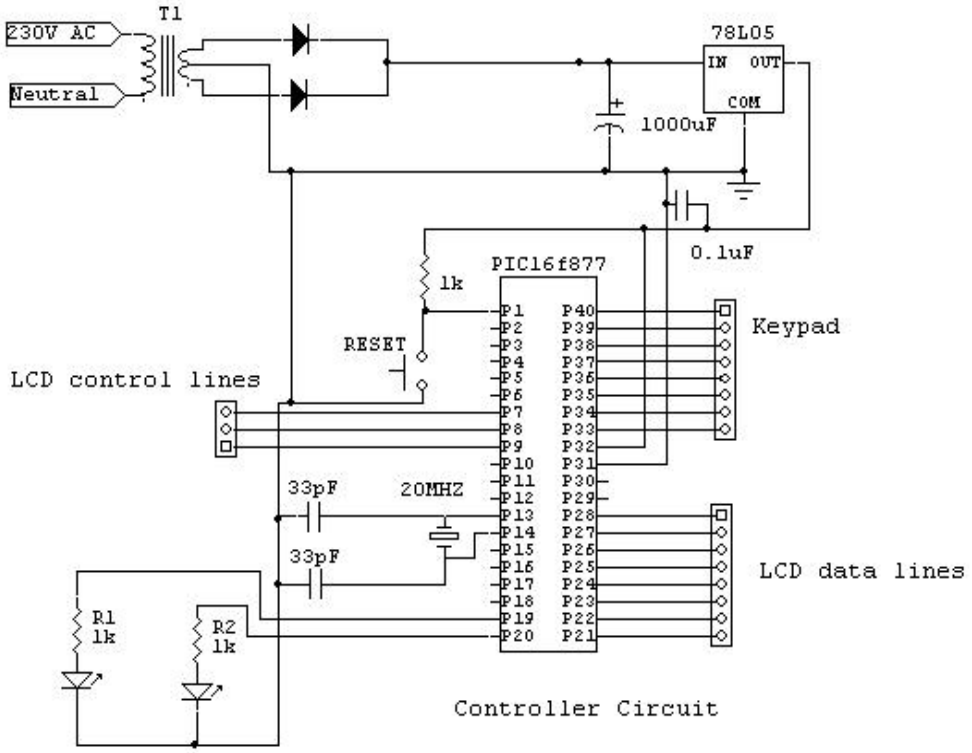
II. WORKING:

Accident Detection Using Vibration Sensor:

The vibration sensor with certain range of acceleration is fixed in the vehicle. In this project 3202Vibration sensor is used which operates at the frequency of 315Mhz.

When the vehicle is dashed with another or to any other obstacle,the vibration sensor detects whether the vibration is within the range or not.If it is greater, it reports as accident and activates the auto-dialer. It also consist of a switch which is placed in our convenient place. The vibration sensor waits for one minute to confirm the accident. If the person inside the car does not get injured, they can press the switch and stop the function of auto-dialer. This will helps us to avoid calling the ambulance when not needed. The range of the vibration sensor is 215-350Mhz. If the acceleration crosses this range, it detects the accident. For better operation this is placed in the center of the vehicles.

III. Circuit diagram:



IV. MICROCONTOLLER PIC16F877A:

The term PIC, or Peripheral Interface Controller, is the name given by Microchip Technologies to its single – chip microcontrollers. These devices have been phenomenally successful in the market for many reasons, the most significant ones are mentioned below. PIC micros have grown in steadily in popularity over the last decade, ever since their inception into the market in the early 1990s. PIC micros have grown to become the most widely used microcontrollers in the 8- bit microcontroller segment. The PIC16F877 is 40 pin IC. There are six ports in this microcontroller namely PORT A, PORT B, PORT C, PORT D and PORT E. Among these ports PORT B, PORT C and PORT D contains 8-pins, where PORTA contains 6-pins and PORT E contains 3-pins.

Each pins in the ports can be used as either input or output pins.Before using the port pins as input or output, directions should be given in TRIS register. For example setting all the bits in TRIS D register indicates all the pins in PORT D are used input pins. Clearing all the bits in TRIS D register indicates all the pins in PORT D are used as output pins. Likewise TRIS A, TRIS B, TRIS C, TRIS E registers available for PORT A, PORT B, PORT C and PORT E.

V. P1C6F877:

The architecture of PIC16F877 contains 4-banks of register files such as Bank 0, Bank 1, Bank 2 and Bank 3 from 00h-07h, 80h-FFh, 100h-17Fh and 180h-1FFh respectively. And it is also having program FLASH memory, Data memory and Data EEPROM of 8K, 368 and 256 Bytes respectively.

Features:

- Speed:
- Instruction set simplicity
- Integration of operational features
- Flexibility in clock sources
- High current capabilities of ports
- Serial programming via two pins
- On chip EEPROM
- Harvard Architecture

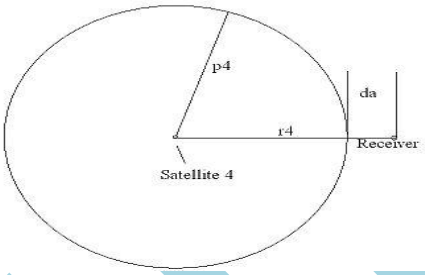
Apart from these features are reasons of non technical nature like the availability of free development software, low cost device programmers, and availability of free datasheets and application notes.

VI. LOCATION IDENTIFICATION USING GPS:

A GPS receiver calculates its position by precisely timing the signals sent by the GPS satellites high above the Earth. Each satellite continually transmits messages which include

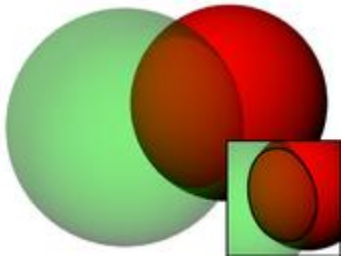
- the time the message was sent
- precise orbital information (the ephemeris)
- the general system health and rough orbits of all GPS satellites (the almanac).

The receiver measures the transit time of each message and computes the distance to each satellite. Geometric trilateration is used to combine these distances with the satellites' locations to obtain the position of the receiver. This position is then displayed, perhaps with a moving map display or latitude and longitude; elevation information may be included. Many GPS units also show derived information such as direction and speed, calculated from position changes.

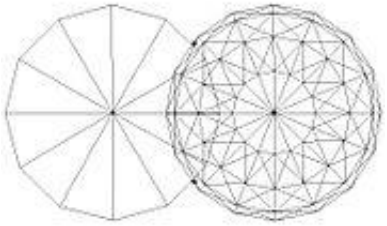


A satellite's position and distance from the receiver define a spherical surface, centred on the satellite. The position of the receiver is somewhere on this surface. Thus with four satellites, the indicated position of the GPS receiver is at or near the intersection of the surfaces of four spheres. (In the ideal case of no errors, the GPS receiver would be at a precise intersection of the four surfaces.)

If the surfaces of two spheres intersect at more than one point, they intersect in a circle. The article trilateration shows this mathematically. A figure, *Two Sphere Surfaces Intersecting in a Circle*, is shown below.



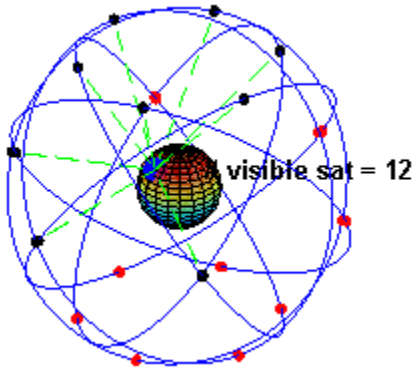
The intersection of a third spherical surface with the first two will be its intersection with that circle; in most cases of practical interest, this means they intersect at two points. The two intersections are marked with dots.



Surface of Sphere Intersecting a Circle (not disk) at Two Points

For automobiles and other near-earth-vehicles, the correct position of the GPS receiver is the intersection closest to the earth's surface. For space vehicles, the intersection farthest from Earth may be the correct one.

The correct position for the GPS receiver is also the intersection closest to the surface of the sphere corresponding to the fourth satellite.



Precise monitoring

The accuracy of a calculation can also be improved through precise monitoring and measuring of the existing GPS signals in additional or alternate ways.

After SA, which has been turned off, the largest error in GPS is usually the unpredictable delay through the ionosphere. The spacecraft broadcast ionospheric model parameters, but errors remain. This is one reason the GPS spacecraft transmit on at least two frequencies, L1 and L2. Ionospheric delay is a well-defined function of frequency and the total electron content (TEC) along the path, so measuring the arrival time difference between the frequencies determines TEC and thus the precise ionospheric delay at each frequency.

Receivers with decryption keys can decode the P(Y)-code transmitted on both L1 and L2. However, these keys are reserved for the military and "authorized" agencies and are not available to the public. Without keys, it is still possible to use a *codeless* technique to compare the P(Y) codes on L1 and L2 to gain much of the same error information. However, this technique is

slow, so it is currently limited to specialized surveying equipment. In the future, additional civilian codes are expected to be transmitted on the L2 and L5.Then all users will be able to perform dual-frequency measurements and directly compute ionospheric delay errors.

A second form of precise monitoring is called **Carrier-Phase Enhancement** (CPGPS). The error, which this corrects, arises because the pulse transition of the PRN is not instantaneous, and thus the correlation (satellite-receiver sequence matching) operation is imperfect. The CPGPS approach utilizes the L1 carrier wave, which has a period one one-thousandth of the C/A bit period, to act as an additional clock signal and resolve the uncertainty. The phase difference error in the normal GPS amounts to between 2 and 3 meters (6 to 10 ft) of ambiguity. CPGPS working to within 1% of perfect transition reduces this error to 3 centimeters (1 inch) of ambiguity. By eliminating this source of error, CPGPS coupled with DGPS normally realizes between 20 and 30 centimeters (8 to 12 inches) of absolute accuracy.

Relative Kinematics Positioning (RKP) is another approach for a precise GPS-based positioning system. In this approach, determination of range signal can be resolved to a precision of less than 10 centimeters (4 in). This is done by resolving the number of cycles in which the signal is transmitted and received by the receiver. This can be accomplished by using a combination of differential GPS (DGPS) correction data, transmitting GPS signal phase information and ambiguity resolution techniques via statistical tests—possibly with processing in real-time (real-time kinematics positioning, RTK)

VII. GPS RECEIVER:

The user's GPS receiver is the user segment (US) of the GPS. In general, GPS receivers are composed of an antenna, tuned to the frequencies transmitted by the satellites, receiver-processors, and a highly-stable clock (often a crystal oscillator). They may also include a display for providing location and speed information to the user. A receiver is often described by its number of channels: this signifies how many satellites it can monitor simultaneously. Originally limited to four or five, this has progressively increased over the years so that, as of 2007, receivers typically have between 12 and 20 channels. A typical OEM GPS receiver module measuring 15×17 mm.

GPS receivers may include an input for differential corrections, using the RTCM SC-104 format. This is typically in the form of a RS-232 port at 4,800 bit/s speed. Data is actually sent at a much lower rate, which limits the accuracy of the signal sent using RTCM. Receivers with internal DGPS receivers can outperform those using external RTCM data. As of 2006, even low-cost units commonly include Wide Area Augmentation System (WAAS) receivers.

Thus the location of the accident spot has been identified using GPS. The latitude, longitude and altitude is measured and the spot is detected.

VIII. AUTO DIALER:

An auto dialer or automatic calling unit is an electronic device that can automatically dial telephone numbers to communicate between any two points in the telephone, mobile phone and pager networks. Once the call has been established (through the telephone exchange) the auto dialer will announce verbal messages or transmit digital data (like SMS messages) to the called party. A Smart Auto dialer is an auto dialer capable of personalizing messages and collecting touch tone or speech feedbacks. A speech engine is usually included for converting text to speech and recognizing speech over the phone.

To customize or personalize messages, a smart auto dialer system uses message template, which contains variables that can be replaced later by actual values. For example, a time variable included in the message template can be replaced by the actual time when a phone call is made.

A Community Alarm

Then the name and address as well as others bits of information stored on the control centres data base are displayed on the control centre operators screen so that she knows as much detail as possible about the source of the alarm. The base station also transmits the source within the house of the alarm so the operator will know if the pendant has been pressed or the button on the alarm or if a smoke alarm has been triggered.

This auto dialer may be connected as a switch to all the hospitals (nearly 12 switches per hospital), so that we can detect 12 accidents at a time. This can be

implemented effectively over large scale and with relative frequency variations.

IX. FUTURE OUTLOOK:

This paper mainly deals with the control measures taken to save the lives due to accidents**.** This research has shown how the importance of the human lives. However, it should be also pointed out that the implemented systems are far from nature's sophistication. An approach to prevent the accidents were made and many things gone failure. As the accidents are unexpected event,we shall go to the treatment rather than the prevention. Due to the advancement of technology, several kinds of vehicles are invented. Parallely, the accident rates and loss of lives also getting increased. It has been noted that an accident takes place once in a micro-second.

This paper has proven that calling an ambulance in a fraction of second is feasible today utilizing the recent advanced technology. Thus "ACCIDENT DETECTOR USING AUTO DIALER" is an wonderful way to communicate between the accident spot to the hospitals automatically. This has to be implemented in far future inorder to save mankind

X. REFERENCES:

[1]. A.Rajkiran , M.Anusha Intelligent Automatic Vehicle Accident Detection System Using Wireless Communication International Journal of Research Studies in Science, Engineering and Technology Volume 1, Issue 8, November 2014, PP 98-101 ISSN 2349-4751 (Print) & ISSN 2349-476X

[2]. Purva Javale, Shalmali Gadgil, Chinmay Bhargave, Yogesh Kharwandikar , Prof. Vaishali Nandedkar IOSR Journal of Computer Engineering (IOSR-JCE) e-ISSN: 2278-0661, p-ISSN: 2278-8727Volume 16, Issue 2, Ver. X (Mar-Apr.2014),PP38-43

[3]. Hajer Salim Humaid AL-Farsi, Malathi B. N Accident Notification System by using Two Modems GSM and GPS International Journal of Applied Information Systems (IJAIS) – ISSN : 2249-0868 Foundation of Computer Science FCS, New York, USA Volume8–No.3,February2015

[4]. Wireless Accident Information System Using GSM and GPS Victor Olugbemiga MATTHEWS (Ph.D), Emmanuel ADETIBA, Vehicle Accident Alert and Locator (VAAL)International Journal of Electrical & Computer Sciences IJECS-IJENS Vol: 11 No: 02

