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Emergency Call for Help Wrist Module

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Abstract: SOS- The distress signal as defined by the Morse code is used by stranded ships to call for help and support. .Life expectancy, self-support, security risks, emergency crises are all on the rise. We define a novel approach to SOS by designing an embedded system to send out the request for help to the responsive organizations of the Government forces. The proposed system has the capability of seeking immediate assistance from the Emergency Services in situations of critical emergency. The module exhibits pure automation by seeking assistance from Emergency Services automatically, in the case of accidents while allowing manual control in the event of a crime. This compact wrist module is capable of tracking the location of the victim and informing the Emergency Services as well as the victim's family in seconds making it an all-in-one solution to the emergency crises.
Keywords: Atmel Microcontroller AT89C52, GPS, GSM, National Instruments LabVIEW software

I. INTRODUCTION

In today's fast-paced world, where people are in a hurry, they tend to miss small things that often lead to mishaps. Though this can avoided, there comes situations where they are caught unaware. Consider the real-life situation wherein a person meets with an accident and is nearly immobilized. In such cases of critical emergencies, the victim requires immediate access to assistance. In the present scenario, the victim can inform his near and dear or an emergency service. But due to the accident, the victim enters a subconscious state which does not support him/her to do so. The maximum the victim can get is the help from the public which costs him crucial time, since assistance can be obtained only through a phone call. Our application aims at bridging this time gap!

II. THE PRESENT CHALLENGE

The current system of seeking assistance in case of any emergency proves to be ineffective as there is a certain delay in the process of identifying the accident spot and informing the Emergency Services through a phone call. As a result, the victims succumb to their injuries and eventually die. This is evident from the pie chart provided by the WHO organisation, indicating the cause of global mortality.

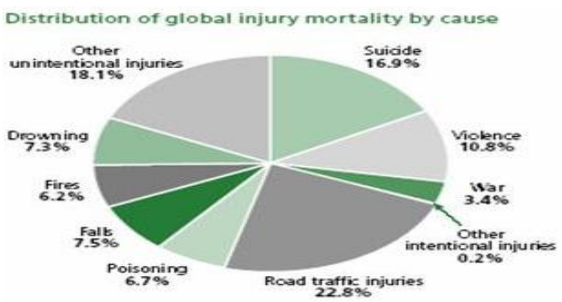

Fig 1: WHO Report on global mortality

III. THE PROPOSED SYSTEM

The proposed system provides assistance from Emergency Services in a matter of a few seconds making it a perfect solution to the present challenge. The module consists of a transmitter and receiver sections. The transmitter is made up of GPS module, GSM transmitter, LCD display and a microcontroller and it is the actual module possessed by the user. The receiver section consists of a GSM receiver and a computer with the mapping module and it is located at the Master Control Room (MCR), monitored by the Police. When an accident occurs, the module automatically sends the GPS co-ordinates to the MCR through the SMS feature of GSM. A receiver circuit at the MCR maps the location of the victim using the National Instruments' LabVIEW module and hence the accident spot is identified. Further, the victim's family is informed about the accident by sending a SMS with the location to a number provided by the user at the time of registration of the product. The event of occurrence of an accident is detected by using a blood pressure (BP) sensor. The transmitter is triggered when the BP falls below the desired BP range value and hence the automation of accident spotting is achieved. In case of any crime such as a kidnap or robbery, the service is provided by the press of a button.

IV. EMERGENCY PROCESS MODEL

Our algorithm is aimed at dispatching the victim's location to the Emergency Services with the least delay possible. Hence, we present an Emergency Process Model which describes how we do that. The model elucidates the rationale of process and the components that we put to use.

1.1 TRANSMITTER SECTION

The transmitter section consists of a GPS, GSM transmitter, BP sensor and a microcontroller. The internal structure of the transmitter section is described by the Fig 2.

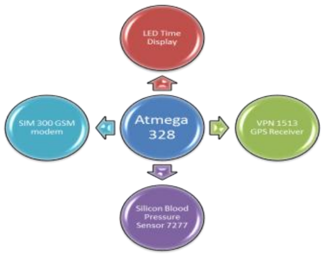

Fig 2:Transmitter Section

1.1.1 GPS TRACKING

Our module is primarily based on the Global Positioning System (GPS) which is a space-based satellite navigation system that provides location and time information in all weather, anywhere on or near the Earth using the concept of 3D-trilateration. In simple terms, GPS is simply used to track the location of an object with a GPS receiver on the earth.

Fig 3: 3D-trilateration

Our module uses a VPN1513 GPS Receiver Module which provides a SiRF Star III chipset capable of tracking up to 20 satellites. The module supports both "raw" output mode for raw NMEA 0183 strings and the default "smart" mode for specific user-selected data through a serial interface. The module contains 32 I/O pins with fast acquisition time, position accuracy of +/- 10 meters and high tracking sensitivity (-159 dBm).

Fig 4: VPN1513 GPS Receiver

GPS modules typically put out a series of standard strings of information, under something called the National Marine Electronics Association (NMEA) protocol and here we use the $GPRMC string to obtain the location data (latitude and longitude) of the victim.

1.1.2 GSM TRANSMITTER

the Global System for Mobile Communications(GSM) is used to dispatch the victim’s location data obtained from the GPS receiver, to the master control room for mapping . The GSM is a digital mobile telephony system uses a variation of time division multiple access (TDMA) to communicate over a long distance.

Fig 5: SIM 300 GSM modem

It is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). It digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band. The SIM 300 module is a highly flexible plug and play tri-band module that works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS1900 MHz. It is a tiny module which support voice and text. We use only the SMS features of the GSM module.

1.1.3 BLOOD PRESSURE SENSOR

The Silicon Blood Pressure Sensor 7277 is used to monitor the blood pressure in the case of any accident. The normal BP of a healthy person is 120/80 mmHg. The GPS is triggered when the BP falls below 90/60 mmHg indicating serious body injury and bleeding. The 7277 sensor is a Miniature DIP Package with an excellent static accuracy of ±0.3%.

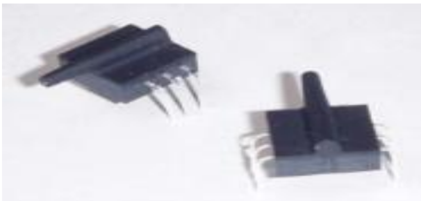

Fig 6: Silicon BP Sensor

1.1.4 MICROCONTROLLER

The ATMEGA 328 microcontroller is used to carry out the operations intended to be performed by our wrist module. We have chosen the coding platform as Arduino as it bags a lot of features with minimal programming.

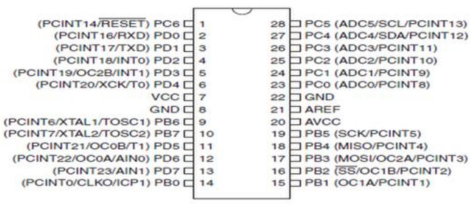

Fig 7: Atmega 328 Pinout

The ATMEGA 328 is an 8-bit AVR RISC-based microcontroller with 32KB ISP flash memory with read-while-write capabilities, 1KB EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. We wanted minimum power consumption and maximum performance at reduced cost and hence we opted to this microcontroller which has a throughput of 1 MIPS per MHz, thereby balancing power consumption and processing speed.

1.2 RECEIVER SECTION

The receiver section consists of a GSM receiver interfaced to a LabVIEW module in a computer. The configuration is given by Fig 8.

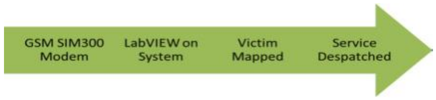

Fig 8: Receiver Section

1.2.1 FRONT-END MAPPING USING NI LabVIEW

The raw data needs to be transformed into a form that can be interpreted by humans. Hence we put to use the National Instruments' LabVIEW software to map the user's location from the location data obtained through the GSM.

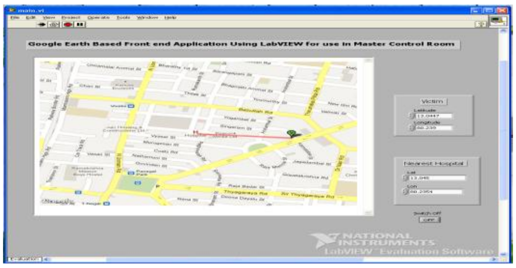

Fig 9: Location mapping using LabVIEW

We designed a LabVIEW module (.vi) to map the location data (latitude and longitude) on the Google Maps automatically with a view to eliminate the time involved in manual entry.

V. ALGORITHM

The data flow of our algorithm is depicted in the form of a flow chart as given in Fig 10.

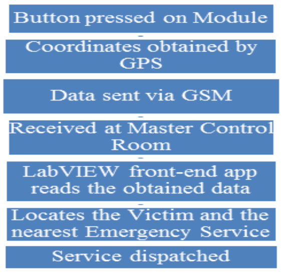

Fig 10: The Algorithm

VI. CONCLUSION

In India, over the years, there has been a prolific increase in the number of accidents occurring daily. As a common man, we have noticed many incidents, where people have succumbed to their injuries just because of the mere time delay in the traditional way of seeking assistance from the Emergency services. So, as Engineers we thought we could do some help to the society by reducing the delay in seeking assistance and in turn preserve the most precious human life! We believe that our Emergency "Call For Help" Wrist Module has everything in it to be a Life-saver!. The principle advantage of our module lies in its compatibility to offer assistance to any kind of an emergency situation, be it an accident, a theft, or a kidnap. The module can be considered as a perfect substitute to the watch. As nature's rule, if something has a positive then there is sure to be a negative side of it. Power consumption and the cost of fabrication are the limitations that we face. We look forward to reduce the power consumption as well as the cost in the near future.

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