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Accident Detection and Rescue System

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Abstract: An accident does not only result in the death of one person but it affects the life of several other people who are related to the victim. The main reasons are late response from hospitals and driver's carelessness. Thus we propose an effective model that can hopefully save lives. Our system will send messages that contain information like accident location to ensure no life is lost due to late response time. Thus in this paper we propose a system that focuses on this aspect of the problem and tries to solve it with help of IOT. IOT stands for Internet of Things which involves M2M (Machine to Machine Communication) with the help of sensors that make use of GSM and GPS technologies, vehicular & mobile applications we make sure that help reaches in time and lives are saved. The implementation of an automatic road accident detection & information communication system in every vehicle is very crucial. save affected persons.

Keywords: M2M (Machine to Machine Communication), GSM and GPS technologies, IOT (Internet of Things).

I. INTRODUCTION

The advancement in the field of science and technology has led to huge growth in the demand and production of automobiles across the globe. This increase in demand for automobiles has also increased the traffic collisions and road accidents. Life of people is under high risk since these road accidents often result in loss of lives.According to the recent reports road accidents are n the leading cause of death for people aged 5-29 years. The delay in reaching an ambulance to the accident location due to traffic congestion increases the chances of death of the victim. Therefore, an automatic ambulance rescue system can be developed to overcome this problem. This proposed IOT based accident detection system helps to reduce the loss of life and the time taken by the ambulance to reach the hospital. Automobiles are of great importance in today's life. Automobiles are used to go to the workplace, keep in touch with friends and family, and deliver the goods. But if not handled properly automobiles can also bring disaster which can result in loss of lives through accidents. Speed is one of the most important and basic risk factors in driving. It not only affects the severity of a crash, but also increases the damage if you get in an accident without it being your mistake. Despite many schemes introduced by different governmental and private organizations all around the world by various programs to be aware of careless driving, yet accidents are taking place every now and then. However, many lives could have been saved if the emergency service could get the crash information in time. As such, an efficient system with automatic accident detection with an automatic notification to the emergency service with the location is required to save precious human life. The data generated by this system can be used to study and analyze the acceleration waveforms generated during accidents.

II. SYSTEM FEATURES

A. System Architecture

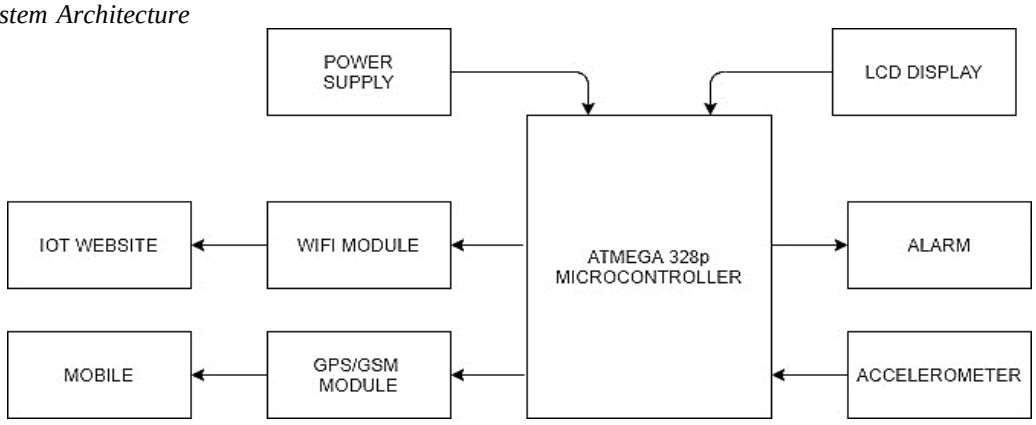

Fig. 1. Architecture of The Proposed System

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Our aim is to develop a system for instant detection of accident with rescue system. There is accelerometer sensor implemented in the system with a combination of a GSM/GPS module to send messages about the location. With the help of accelerometer, the severity of the accident can be recognized. Microcontroller makes use of the GSM module to send the alert message which includes the location to the emergency contact. Atmega 328P microcontroller is used as controlling unit, it reads the values from accelerometer, when the microcontroller observes any abnormal values, it reads the current location from GPS module, and sends it to given mobile no over SMS by using GSM module.

B. Fall detection module

We have based the fall detection module on the accelerometer which will constantly monitor the tilt that will occur in the vehicle. For the proposed system we have used ADXL335 in this system. It can quantify the static rate of gravity from various algorithms, in Addition to lively acceleration which is caused by shock, motion or vibration. This analog voltage signal is fed into the ADC module of ATMEGA 328 microcontroller and mapped corresponding to the angle of the tilt. If the angle changes by 30 degree is considered as an accident. Once breaking condition is met we location of the victim is sent to the registered mobile number.

III. MATH

A. Measuring Tilt Using One Axis

As in the case of a dual axis accelerometer (XY) is fixed and perpendicular to gravity, the tilt algorithm is restricted to one axis of sensitivity. The accelerometer is tilted along the X-axis and Y-axis remains at 0g output during the full rotation of the X- axis.

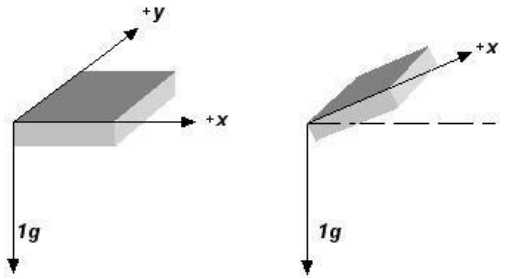

Fig. 2. Dual axis accelerometer with one axis of tilt

If one axis (X-axis) is used to analyze the tilted angle of the accelerometer the following trigonometry association is used.

$$V_{OFF} = V_{OUTX} + S \times Sin\theta$$

where, VOFF is the offset voltage, VOUTX is the voltage output from the X-axis of the accelerometer and S is the sensitivity of the accelerometer. The accelerometer output on the X-axis due to gravity is equal to the following,

$$A_X = \frac{V_{OUT\,X} - V_{OF\,F_S}}{}$$

In order to solve for the angle of tilt (1) becomes, $\theta = sin^{-}1(A_X)$

B. Measuring Tilt Using Two Axis

The resolution problems and tilt orientation problems can be addressed by mounting the accelerometer vertically. So that the Y-axis is parallel to gravity or by using a tri-axis accelerometer using at least 2 of the 3 axis. Using more than one axis to calculate tilt produces a more accurate solution.

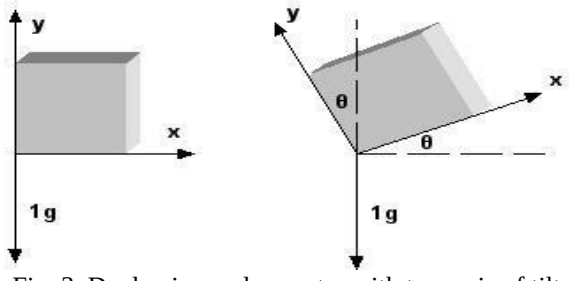

Fig. 3. Dual axis accelerometer with two axis of tilt

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The first major benefit of using a second axis is due to the orthogonality of the axes. As in the single axis solution, the acceleration detected by the x-axis is proportional to the sine of the angle of inclination. The Y-axis acceleration, due to the orthogonality, is proportional to the cosine of the angle of inclination. One method, to convert the measured acceleration to an inclination angle is to compute the inverse sine of the X-axis and the inverse cosine of the Y-axis, similar to the single-axis solution. However, an easier and more efficient approach is to use the ratio of the two values, which results in the following,

$$\frac{A_{OUT\,X}}{A_{OUT\,Y}} = \frac{sin\theta \times 1g}{cos\theta \times 1g} \quad \theta = tan^{-1}\frac{A_{OUT\,X}}{A_{OUT\,Y}}$$

C. Analysis Of Accelerometer

The tilt of the accelerometer is compared with three different ways like actual value, theoretical value and displayed value. As the theoretical value calculated describes the conversion of ADC output to the corresponding angle which actually the microcontroller does, hence the error between the actual value and displayed value is obtained. The error obtained was acceptable and is minimum. Hence, with the obtained results of 3-axis accelerometer has proven that effective in measuring the tilt angle and can be used to detect accidents.

IV. ALGORITHM FOR ACCIDENT DETECTION AND ALERT

We use various technologies like GPS, GSM(SIM 808 GSM GPS module) to locate the victim and we employ IOT services(IOT GECKO) to maintain a database of the location .We are using ATMEGA 328(Arduino based) Micro-controller as the heart of the system which is doing all the work. We use a 3 axis accelerometer (ADXL 335) to measure change in static or dynamic acceleration to detect accident in out system. If the accident is detected and SMS with google maps location is sent to the registered mobile no so help can reach in time.

Below is the flowchart explaining the working of the proposed model

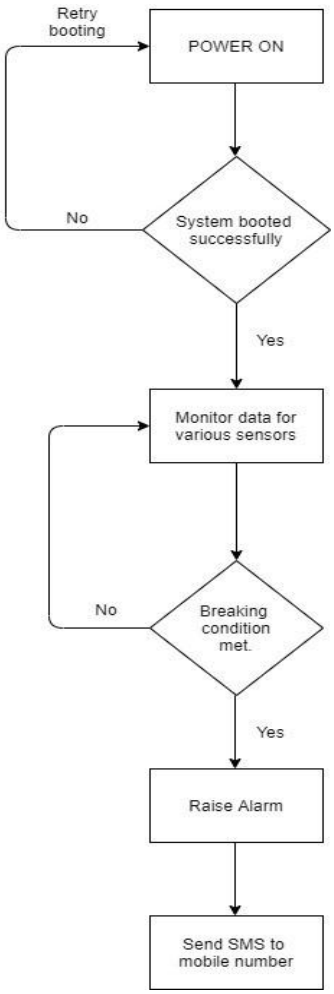

Fig. 4. Flowchart of The Proposed model

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V. TESTING AND ANALYSIS

Testing performs a very crucial role for quality assurance and for ensuring the reliabilities of the software, Thus each modules in the system is tested thoroughly. This view pre- supposes there are defects in the software waiting to be discovered and this view is rarely disproved or even disputed.

A. Microcontroller

The microcontroller we have used in the model is AT- MEGA328 which ensures high performance and is based on AVR RISC-based architecture and bolsters 32KB ISP flash memory with both read and write capabilities. It has a 2KB SRAM,1KB EEPROM,32 general purpose working Regis- ters,23 general purpose I/O lines, internal and external inter- rupts, three adjustable timer/counters, serial programmable USART, a byte-oriented 2-wire sequential interface, SPI serial port, 6-channel 10-bit A/D converter programmable watchdog timer, and five power saving modes which can be selected through software.

B. Why ATMEGA 328

1) A 6-channel 10-bit ADC (analog input):
2) 6 output PWM channels(analog output):
3) A serial programmable USART:
4) Very fast start-up:
5) Low power consumption:
6) Easily available in Market:

C. Accelerometer

In the proposed model we have used the ADXL335 which is a 3-axis accelerometer. Accelerometer measures acceleration with a minimal full-scale assortment of 3 gram. This can be used to quantify the rate of gravity from various algorithms, in Addition to lively acceleration Caused by motion, shock, or vibration

D. GPS and GSM Module

For the system we have chosen SIM808 module which combines as GSM and GPS two-in-one capacity module. It is based on SIM808 from SIMCOM which a Quad- Band network and consolidates GPS technology for satel- lite navigation. You can utilize all AT commands for BT functions at the present time. It features an ultra-low power utilization in rest mode. The GPS module gets affectability with 22 following and 66 procurement recipient channels. In addition, it also has A-GPS which is used for indoor confinement

VI. CONCLUSION

The proposed system deals with the problem of untimely detection of accidents which may lead to late arrival of medical services which in turn results in the loss of life.Our system uses the tilt angle measured with the help of ac- accelerometer values as a criteria to detect the accident. If the tilt angle exceeds the threshold value which is set up by the trial and error method, an accident has occurred and the location is sent to the emergency contact who in turn acts on the received information.

REFERENCES

[1] C. Thompson, J White, B Dougherty, A. Albright, and D. C. Schmidt, "Using Smart phones to Detect Car Accidents and Provide Situational Awareness to Emergency Responders," in 3rd International ICST Conference on MOBILE Wireless MiddleWARE, Operating Systems, and Applications (Mobilware 2010), 2010
[2] D. A. Whitney and J. J. Pisano TASC, Inc., Reading, Massachusetts, "Auto Alert: Automated Acoustic Detection of Incidents", IDEA project
[3] H. Poor, An Introduction to Signal Detection and Estimation. New York: Springer-Verlag, 1985, ch. 4.
[4] L. Chuan-zhi, H. Ru-fu, Y.E. Hong-wu, "Method of Freeway Incident Detection Using wireless Positioning," in Proceedings of the IEEE International Conference on Automation and Logistics, 2010.
[5] Tilt Angle Detector Using 3-Axis Accelerometer by R. Rajesh1 and Baranilingesan