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VEHICLE WATCHDOG USING MEMS, GPS AND GSM.

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Abstract: Our project aims at developing a Vehicle Monitoring System which alerts the driver when there is a chance of collision and if accident occurs it finds the accident spot at any place and intimates it to the 'Ambulance service' and 'police control room'. It also allows overriding by the driver for preventing false alarms. Microcontroller is the main component of this system. Systemalso contains MEMS, GSM module, GPS modem, LCD and sensors connected to the microcontroller. SENSORS are placed at each side of the vehicle. During collision MEMS converts mechanical vibration of the vehicle into an electrical signal which is compared with the threshold level by the Micro controller. It waits for the manual input which is obtained from a PUSH BUTTON SWITCH. If there is no response till the wait time then the SMS is sent to Ambulance /policeservice. The SMS is sent with the help of a GSM module connected to the micro controller. SMS contains latitude and longitude coordinates of the location of the accident these co- ordinates are obtained from the GPS modem. The status of the system is displayed on the LCD screen. An additional loop is used in the beginning to check the working state of the components.

Keywords: MEMS accelerometer, GPS, GSM, LCD, Push button switch.

I. INTRODUCTION

The largest cause of unnatural deaths in the world today is road accidents. With increase in population and thus in the number of vehicles, accidents are only going to increase. Most of these deaths are due to delay in medical attention to the injured. The major cause of this delay is lack of intimation or delayed intimation of the accident to emergency services. Main causes behind these road accidents include: lack of traininginstitutes, unskilled drivers, poor road conditions, use of cell phone during driving, over loading and poor governmental plans in this regard. This paper provides a solution to this problem by finding the accident spot and intimating it to emergency services through GPS and GSM networks. This vehicle accident identification module contains IR sensors, LCD Display, MEMS accelerometer, GSM module and a GPS modem connected to the microcontroller. IR sensors are used to detect the presence of obstacle. MEMS is used to sense the vibrations and send the information to microcontroller. GSM technology is used to establish cellular connection. GPS is used to trace the position of the vehicle. LCD is used to display the status of the system.

II. LITERATURE SURVEY

Pankaj Verma and J.S Bhatia [1], developed a tracking system with google map based monitoring that provides accurate localization of vehicle. SIM 300 is the GSM module used in this system. CMOS 8- bit microcontroller with 16k bytes of flash program memory, 1K byte internal SRAM and 512 bytes EEPROM is used. MAX232 is used for GSM, GPS and microcontroller to communicate serially. 16x2 LCD is used for displaying location values. Monitoring unit consists of a GSM module and a Web application. The application will run on

WAMP server and will run only if the internet is in use. Rashida Nazir, ET.AL: [2], described an Accident Prevention and Reporting System which works in four steps: alarming system, initialization of message circuitry, detection and information transmission. Alarm system circuitry consist of five SRM-401 SONAR ranging modules from which four modules placed at the corners of the vehicle to keep an eye on the blind corners and one at the front of the vehicle. LM317 with the combination of a resistor and regulator knob is used for providing the desired voltage which is needed for operation LCD, GPS and microcontroller. Vibration sensor is connected with microcontrollerthrough 7400IC. GSM most commonly operates at either the 900 MHz or 1800 MHz frequency band. Atmel AT89S52 microcontroller is used for our control unit and it is a heart of detection system. Shaik Abdul Mubeena and Imthiazunnisa begum [3], developed a system which is similar to the above two except it doesn't have range alerting unit. The hardware circuit is mainly composed of six parts: MCU(Micro Controller Unit) unit, alarm indicating circuit, alarm signal input interface circuit, GSM communication module interface circuit, wireless transmitter and receiver circuit and power supply. The entire alarm system is mainly designed in accordance with the 3.3V interface circuit level, while the RS232 circuit requires 5V input and output level. Therefore MAX232 is used to achieve interconversion of levels (5V~3.3V or 3.3V~5V). TC35i of the Siemens's TC35 series is used for GSM module interfacing circuit. The paper presented by Ms. Anju M. Vasdewani [4], developed 8051 Based Accident Alert System. ADXL 335 a three axis accelerometer module detects the force producing an output corresponding to the amount of force developed during collision. To quantify this g force, the output of the accelerometer is fed to an ADC via a unity gain amplifier which actually works as an impedance matching unit so that the sensor is not loaded by the ADC. The ADC used is ADC0804 from National Semiconductors. The controller used is the 89s52 which has a standard 8051 core of the very popular series of microcontroller series from Intel. This controller has 8kB of internal ROM and 256 bytes of RAM. The GPS module used is from iWave. The module has a 20 channel receiver with a tracking sensitivity of -159dBm and an accuracy of 10m

III. BLOCK DIAGRAM

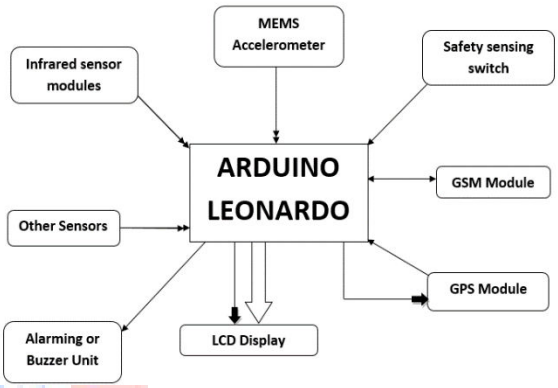


Fig 1. Block Diagram of the proposed system.

Vehicle Monitoring System is used to alert and notify the emergency services. The Sensors primarily used in this system are IR Sensors and MEMS Accelerometer. Microcontroller performs required operations based on the signals from the sensors. IR Sensors are used to detect the obstacles closer to the vehicle and it sends information to microcontroller accordingly. MEMS Accelerometer is used to sense the collision and force produced is sent to the microcontroller in terms of milli-g's. Alarming unit is used to alert the driver when required. It is activated by the Microcontroller. GPS Module is used to obtain the latitude and longitude of the current location. GSM Module helps in sending the co-ordinates through SMS to emergency services. Safety sensing switch is used to get the manual response to prevent false alarm. LCD display is used to display the status of the system to the driver.

IV. HARDWARE

A. MEMS Accelerometer (ADXL335)

Micro Electronic Mechanical System (MEMS) is a device which is used to convert mechanical signal into an Electrical signal.MEMS based accelerometers are devices that measure the proper acceleration. In relativity theory, proper acceleration is the physical acceleration experienced by an object. The psychical acceleration is measurable by sensors. These sensors are part of the sensing cluster of ubiquitous technologies. Sensing technologies make use of physical parameters from the environment, such as temperature, pressure, force and light. An accelerometer measures weight per unit of mass, a quantity also known as specific force, or g- force. Measuring g-forces allows users to for instance interact with products by means of gesture recognition. MEMS-based accelerometer with capacitors is typically a structure that uses two capacitors formed by a movable plate held between two fixed plates. Under zero net force the two capacitors are equal but a change in force will cause the movable plate to shift closer to one of the fixed plate, increasing the capacitance, and further away from the other fixed reducing that capacitance. This difference in capacitance is detected and amplified to produce a voltage proportional to the acceleration. The dimensions of the structure are of order of microns.

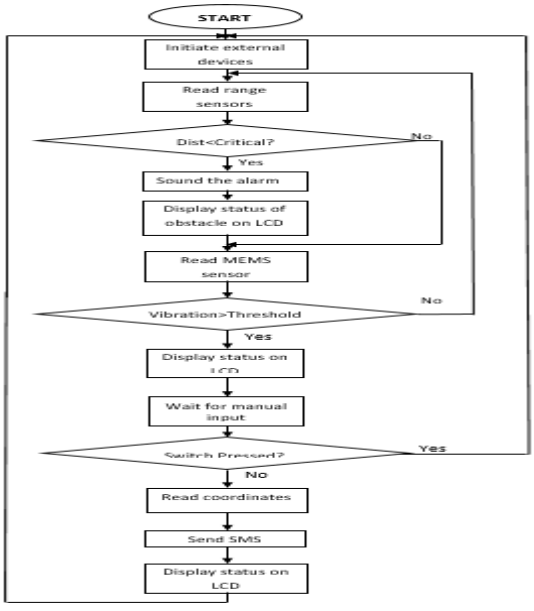
B. GPS (G-TOP019)

GPS receivers use a mathematical process called trilateration, the global positioning system (GPS) is a fleet of 29 satellites that are orbiting our planet approximately 11,000 miles above Earth's surface. A position can be calculated using three satellites, plus a fourth because of clock imprecision. The GPS receiver gets a signal from each GPS satellite. The satellite transmit the exact time the signal are sent. By subtracting the time signal was transmitted from the time it was received, the GPS can tell how far it is from each satellite. The GPS receiver also knows the exact position in the sky of the satellites, at the moment they sent their signals. So given the travel time of the GPS signals from three satellites and their exact position in the sky, the GPS Receiver can determine your position in the sky, the GPS receiver can determine your position in three dimensions – east ,north and altitude.

C. GSM SIM 900A

This means the module supports communication in 900MHz band. The module is managed by an AMR926EJ-S processor, which controls phone communication, data communication (through an integrated TCP/IP stack), and (through an UART and a TTL serial interface) the communication with the circuit interfaced with the cell phone itself. Specification: Dual-Band 900/ 1800 MH. Dimensions: 24*24*3 mm. Weight: 3.4g. Control via AT commands (GSM 07.07, 07.05 and SIMCOM enhanced AT Commands). Supply voltage range: 12V. Power consumption: 1.5mA (sleep mode). Operation temperature: -40° C to +85°C

V. FLOWCHART



VI. RESULTS

The results of the system were up to the mark. The sensors used in all the sides of vehicles provide better intimation of obstacles. The use of three axis accelerometer increased the performance by sensing accelerations in all three axes. This system immediately responds to the collision and informs emergency services. Addition of safety sensing switch worked perfectly as expected.

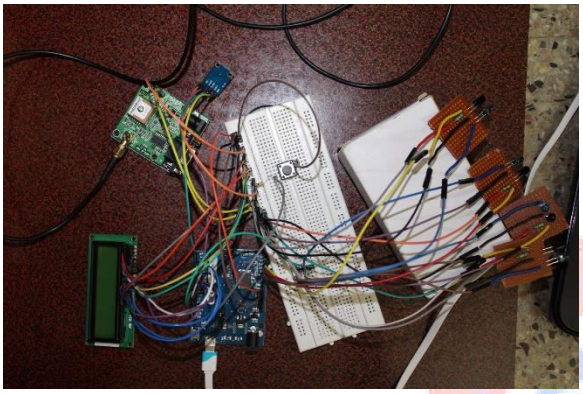


Fig 2. Working Model of the proposed system.

VII. CONCLUSION AND FUTURE EXPANSION

Through the implementation of this project efficiency of vehicular safety system can be improved. At the start of the engine an initial checkup of all the components is made, this ensures the safety system is working throughout. Accidents can be avoided in most cases and appropriate indications to the driver is given. The project can be expanded with the addition of few other sensors for future implementation.

VIII. REFERENCES

[1] Pankaj Verma 1, J.S Bhatia 2, Centre for Development of Advanced Computing, Mohali, Punjab, India. "DESIGN AND DEVELOPMENT OF GPS-GSM BASED TRACKING SYSTEM WITH GOOGLE MAP BASED MONITORING", International Journal of Computer Science, Engineering and Applications (IJCSEA) Vol.3, No.3, June 2013.

[2] Rashida Nazir, Ayesha Tariq, Sadia Murawwat*, Sajjad Rabbani, Department of Electrical Engineering, Lahore College for Women University, Lahore, Pakistan. "ACCIDENT PREVENTION AND REPORTING SYSTEM USING GSM (SIM 900D) AND GPS (NMEA 0183)", Int. J. Communications, Network and System Sciences, 2014, 7, 286-293.

[3] Shaik.abdul.mubeena#1, M.Tech(ES) STUDENT &Imthiazunnisa begum, Hod, Ecedept , Vif college. "THE DESIGN OF THE SCENE OF THE ACCIDENT ALARM SYSTEM BASED ON ARM AND GPS", International Journal of Engineering Trends and Technology (IJETT) - Volume4 Issue7- July 2013.

[4] Ms. Anju M. Vasdewani Asst. Prof., Department of Electronics and Communications VVP Engineering College,Rajkot, Gujarat, India. "MICROCONTROLLER 8051 BASED ACCIDENT ALERT SYSTEM USING MEMS ACCELEROMETER, GPS AND GSMTECHNOLOGY", International Journal of Engineering Trends and Technology (IJETT) – Volume 18 Number 8 – Dec 2014.