



JDEBM

Journal of Digital Engineering and Business Management

Journal of Digital Engineering and Business Management



Volume-1, Issue-1, July 2025
Inaugural Edition
Published by: D3 PUBLISHERS

INTELLIGENT ACCIDENT MONITORING AND ALERT MECHANISM VIA VEHICLE TELEMETRY SYSTEMS

Dr. KALLAM NIRANJAN REDDY, *Professor & HOD,*
Department of ECE,
CMR INSTITUTE OF TECHNOLOGY(AUTONOMOUS), HYDERABAD.

ABSTRACT: Advancements in technology have contributed to the escalation of road accidents, which frequently result in injuries. Individuals who require assistance typically have restricted financial resources. In an effort to optimize safety and response times, novel methodologies are currently being examined. Software that is based on accelerometers can detect hazardous driving behaviors and record accident details, such as the date and whether a vehicle overturned. Signals are detected by accelerometers during emergencies. This method utilizes a vibration sensor to notify an ATMEGA 8A controller of a vehicle rollover. Rescue teams and authorities receive GSM warnings from the microcontroller. These alerts furnish law enforcement with GPS data to pinpoint the location of the accident. After the site has been verified, subsequent actions will be taken. If there are no significant injuries or hazards, the motorist may deactivate the alert notification to conserve the rescue team's time and resources. Subsequently, the vibration sensor is implemented to confirm the location of the accident.

Keywords: *ARM controller, Accelerometer, Vibration sensor, GSM module.*

1. INTRODUCTION

The rising incidence of road accidents is yielding tangible effects in several places. The majority of fatalities arise from conditions beyond personal control. The situation could become problematic if an accident transpires on a national highway and no emergency services or rescue personnel are there to aid the injured. Considering the possibility of disastrous delays, our research strongly advocates for the adoption of an autonomous signaling system for vehicular accidents. This approach is both simple and effective in ensuring the safety of persons participating in disasters. This device can detect an accident and swiftly alert the police and emergency services. The exact site of the collision can be ascertained through the use of GPS tracking devices mounted in

the car. The ARM controller on the EE PROM authenticates the pertinent mobile phone number and dispatches an SMS in the occurrence of an accident. In emergencies, such as heat exhaustion or disease, a medical facility is always available. The system's GPS module swiftly determines the exact position of the vehicle's accident and relays the information to the GSM modem upon activation of the assistance button. A system is implemented to inhibit the transmission of communications unless there is a substantial probability of harm. This method could significantly reduce the length of the rescue operation. Accelerometers are utilized in the identification of accidents. This would enhance the operational efficiency of the emergency facility during a traffic disaster.

Accelerometer sensors are utilized in numerous applications, including car security systems. Technological breakthroughs have allowed this sensor to detect perilous traffic conditions. Precise vehicle positioning, improved data transmission capabilities, and software autonomy are of paramount importance.

2.EXISTING METHOD

The accident location can be accurately determined using a smartphone and a 3G network. Emergency services or authorities can be reached with a smartphone. An alternate method is to recover vehicles that have been stolen. The vehicle's exact location is swiftly conveyed to the owner over GSM. The vehicle's automated accident detection and reporting system is enhanced by the Cr Alert app's accelerometer in highlighting reckless driving. The vibration sensor may facilitate the identification of the disaster's source. In the event of an accident, an ARM controller with a phone number programmed in an EEPROM may send a message. The GPS technology determines the vehicle's exact location, while the message is relayed to the police station and the rescue system using GSM.

3.PROPOSED METHOD

A car may persist in functioning following a collision with another vehicle. To address these restrictions, we devised an approach for accident retrieval and identification. Additionally, Bluetooth is pre-installed. Bluetooth technology may communicate data from the impaired car up to a distance of 10 meters. Other vehicles would possess the ability to autonomously transmit essential data, like

the vehicle's identify, the owner's information, and other relevant attributes, to aid in the identification of the colliding vehicle. This allows researchers to identify the vehicle that caused the crash.

The system identifies a sudden reduction in the vehicle's elevation as a signal of an impending accident. When the vehicle's deceleration surpasses a specified threshold, the accelerometer transmits data to the microcontroller via an analog-to-digital converter (ADC). The controller will immediately send an SOS message to the specified phone numbers via SMS when the value drops below the predetermined threshold. The controller periodically receives the vehicle's GPS coordinates from the module and subsequently transmits them over this connection. This technique will provide substantial benefits when applied in search and rescue missions involving damaged vehicles.

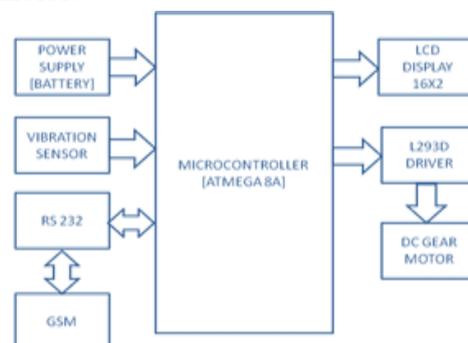


Fig1:Block diagram for accident detection and rescuing

4.METHODOLOGY

We will develop a prototype model of an automated system that can recognize and alert users regarding traffic events using a GSM and GPS modem. The following procedures must be executed during the development process: A block diagram will illustrate the system's overall configuration. Upon the occurrence of an accident, piezoelectric

sensors can transfer data to microcontrollers. The exact position of a vehicle can be ascertained by employing the global positioning system (GPS). The GSM network conveys a message with the vehicle's geographic coordinates to precisely delineate both latitude and longitude. The EEPROM has already obtained the number. The specified phone number is immediately alerted in the occurrence of an accident, and the exact location is determined.

Atmega 8a Microcontroller

The ATMEGA 8A was chosen for this application because it can generate a high output with minimal input, despite the availability of several microcontroller families. The ATMEGA is among the most power-efficient devices available, featuring minimum input current usage and an operational voltage range of 2.2 to 5.5 volts. The system utilizes nonvolatile memory components and modern RISC architecture. The system can attain a maximum instruction count of 130 by employing an 8-bit data structure and a 16-bit address. The ATMEGA 8A has a data retention period of 20 years at 85 degrees Celsius and 100 years at 25 degrees Celsius, contingent upon the temperature. Additionally, two 8-bit Timers/Counters with a distinct pre-scaler are incorporated, along with a Compare Mode. The 16-bit timer/counter is versatile, functioning in pre-scalar, compare, and capture modes. The controller's most significant attributes are its configurable brown-out detection and power-on reset. These operations rely on an internally calibrated RC oscillator. In addition to power conservation, idle, ADC noise reduction, cutoff, and standby, five supplementary sleep modes are provided.

ATMEGA 8APIN CONFIGURATION

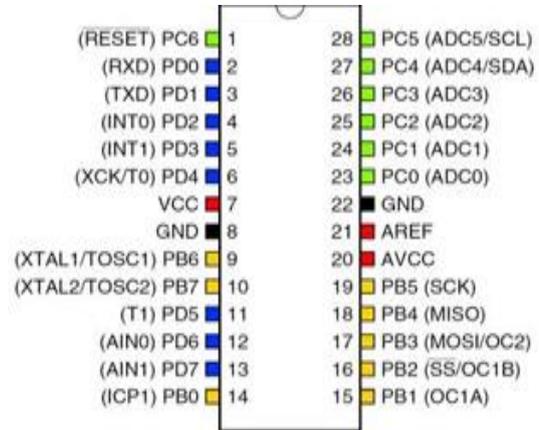


Fig2:PIN settings for the ATMEGA 8A

Gsm Module

The SIM900A Dual Band GSM/GPRS module powers the GSM/GPRS Modem-RS232, functioning within two specific frequency bands: 900 and 1800 MHz. The procedure for interfacing a microcontroller, an RS232 processor (MAX232), and a PC through the RS232 interface on the modem is uncomplicated. The AT command adjusts the baud rate between 9600 and 115200. The GSM/GPRS Modem, due to its TCP/IP design, can provide GPRS internet connectivity. It is efficient for M2M data transfer, SMS forwarding and reception, and telephonic calls, among other uses. A diverse array of unregulated power sources may be linked to the integrated regulated power supply. This modem may execute a variety of activities with a single AT command, including internet connectivity, answering incoming calls, sending and receiving SMS messages, and making and receiving audio calls.

Power Supply

A transformer is an electromagnetic apparatus that transmits electrical energy

between circuits at the same frequency, irrespective of voltage levels. A rectifier primarily acts to convert alternating current (AC) voltage or current into direct current (DC). Rectifier circuits are widely utilized in full-wave bridge rectifiers.

Rectifier:

The filter's main purpose is to reduce the erratic AC current. Inductors and capacitors are utilized in filter circuits. The principal role of a capacitor is to obstruct the flow of direct current (DC) and alternating current (AC) through it. The inductor's function is to facilitate the passage of direct current while obstructing the flow of alternating current. Director of the Energy Resources Authority Appliances utilize voltage regulators, which are vital components of the electrical system. The primary advantage of regulator integrated circuits is their ability to maintain a stable output despite variations in the input power source.

Rs232

Serial communications are extensively utilized in the electronics sector due to their intrinsic simplicity and significantly reduced hardware demands relative to parallel connections. The EIA/TIA-232-E standard is presently the most often utilized standard for serial communications. The TIA and EIA jointly developed the "RS-232" standard. The acronym "RS" signifies "recommended standard." Recent modifications to the suffix of "EIA/TIA" have enhanced the discernment of the standard's origins. The designation "RS-232" is commonly utilized as an abbreviation.

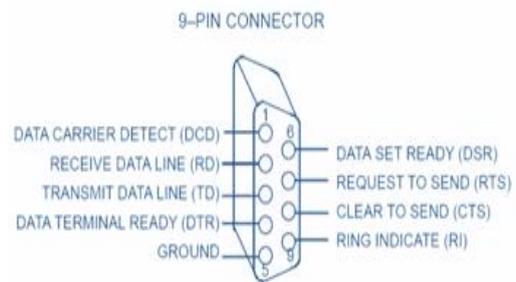


Fig4.DB-9Connector

5.CONCLUSION

Upon a vehicle accident involving this company, the user's specified mobile phone is activated via SMS. The Tmega 8A microcontroller is employed to develop and implement algorithms for the embedded system that rely on GPS tracking and GSM notifications. The Vehicle Accident Detection System is engineered to incessantly monitor positional data and transmit a text message alert in the occurrence of an accident. The experimental work was conducted with exceptional precision. The findings indicate that this initiative has successfully enhanced the system's sensitivity and accuracy. An EEPROM interface serves as the enduring storage for mobile phone numbers. This enhances the reliability and functionality of the endeavor. The proposed methodology has produced significant advantages for the automobile sector.

REFERENCE

- [1]. G. Acampora, D. J. Cook, P. Rashidi, and A. V. Vasilakos, "A survey on ambient intelligence in healthcare," Proc. IEEE, vol. 101, no. 12, pp. 2470–2494, Dec. 2013.
- [2]. P. Rashidi and A. Mihailidis, "A survey on ambient-assisted living tools for older adults," IEEE J. Biomed. Health Inform., vol. 17, no. 3, pp. 579–590, May 2013.

- [3]. M. Mubashir, L. Shao, and L. Seed, "A survey on fall detection: Principles and approaches," *Neurocomputing*, vol. 100, pp. 144–152, 2013.
- [4]. T. Shany, S. J. Redmond, M. R. Narayanan, and N. H. Lovell, "Sensors-based wearable systems for monitoring of human movement and falls," *IEEE Sensors J.*, vol. 12, no. 3, pp. 658–670, Mar. 2012.
- [5]. B. M. Mirmahboub, S. Samavi, N. Karimi, and S. Shirani, "Automatic monocular system for human fall detection based on variations in silhouette area," *IEEE Trans. Biomed. Eng.*, vol. 60, no. 2, pp. 427–436, Feb. 2013.
- [6]. M. Yu, Y. Yu, A. Rhuma, S. M. R. Naqvi, L. Wang, and J. A. Chambers, "An online one-class support vector machine-based person-specific fall detection system for monitoring an elderly individual in a room environment," *IEEE J. Biomed. Health Inform.*, vol. 17, no. 6, pp. 1002–1014, Nov. 2013.
- [7]. M. Yu, A. Rhuma, S. M. Naqvi, L. Wang, and J. A. Chambers, "Fall detection using video surveillance: A comprehensive review," [Title/Journal missing — please confirm].
- [8]. C. Rougier, J. Meunier, A. St-Arnaud, and J. Rousseau, "Robust video surveillance for fall detection based on human shape deformation," *IEEE Trans. Circuits Syst. Video Technol.*, vol. 21, no. 5, pp. 611–622, May 2011.
- [9]. Y. Li, K. C. Ho, and M. Popescu, "A microphone array system for automatic fall detection," *IEEE Trans. Biomed. Eng.*, vol. 59, no. 5, pp. 1291–1301, May 2012.
- [10]. S. Ariani, S. J. Redmond, D. Chang, and N. H. Lovell, "Simulated unobtrusive falls detection with multiple persons," *IEEE Trans. Biomed. Eng.*, vol. 59, no. 11, pp. 3185–3196, Nov. 2012.