TRANSIT FLOW IOT – DRIVEN SMART TRANSPORTATION SYSTEM AND ENHANCED MOBILITY AND TRAFFIC MANAGEMENT

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Abstract *: Initially, the GPS records the latitude and longitude values in the buffer of the AT89s52 microcontroller by continuously receiving data from the satellite. The GSM device receives a message and activates if vehicle tracking is needed. A shock sensor attached to the car can also be used to trigger the GSM device. A relay is used to simultaneously deactivate the GPS and trigger the GSM device in the event of an accident. After being turned on, the GSM sends a message to a designated phone number or laptop by retrieving the most recent latitude and longitude positions from the buffer. The GPS reactivates and the GSM deactivates when the message is sent. Improving vehicle security is the main goal of the tracking system. The purpose of the accident alert system is to save those who have been in accidents. This technology allows car owners to follow and monitor the movements and history of their vehicle by utilizing contemporary technologies like GPS. The accident warning system sends GPS coordinates to a designated computer or mobile device, locates the incident, and detects it. With this enhanced car security system, accidents are promptly detected and reported, allowing for quicker response times and rescue efforts.*

Keywords: GPS, **SIM900A GSM Module, accelerometer, traffic safety**

1. INTRODUCTION

These days, there are a lot of traffic accidents in our nation. One of the main causes of many accidents is a lack of traffic education. Many drivers operate cars without having had the necessary training in traffic legislation. To put an end to them, the government must take proper action. Large cities have a high volume of trucks, buses, auto rickshaws, cars, and other types of vehicles, which increases the risk of traffic accidents. Road accidents are primarily caused by infractions of traffic laws. For this reason, it is imperative that traffic laws be followed. But they are often violated, especially by those who know that they are rarely apprehended by the police. Even while individuals who break the law and get away with it are lucky not to get caught, every time they do so, they endanger their lives. We need to stop traffic accidents if we want to lower the death rate. Every year, thousands of individuals pass away in traffic accidents. Children need to learn traffic laws at an early age. Life's value and preservation techniques need to be taught to them. Government regulations for violators of traffic laws also need to be more stringent. They have to discipline people who breach these norms or require more practice, regardless of age or gender.

2. LITERATURE SURVEY

Traffic the board frameworks are essential for keeping up with smooth and safe traffic stream in metropolitan regions. With the rising number of vehicles and the developing intricacy of metropolitan framework, compelling traffic the board has turned into a critical test. This writing overview investigates different parts of traffic the executives frameworks, including conventional methodologies, keen transportation frameworks and arising innovations. Conventional Traffic The executives Frameworks Customary traffic the board frameworks essentially depend on manual mediations and static foundation. A few normal techniques include: Traffic Signs and Signage: The utilization of traffic signals, signs, and street markings to control and direct traffic stream. Street Plan and Format: Planning streets to improve traffic stream, including the execution of traffic circles, single direction roads, and assigned paths for various sorts of vehicles. Traffic Authorization: Utilizing policing oversee traffic, including speed limits, stopping guidelines, and infringement punishments. Traffic the board frameworks are advancing quickly with the appearance of new innovations. Customary strategies, while still being used, are being increased by clever transportation frameworks and arising advancements like simulated intelligence, IoT, and independent vehicles. The eventual fate of traffic the executives lies in making interconnected, productive, and feasible frameworks that can adjust to the unique idea of metropolitan traffic.

K. Jyothi and K. Neelima, published in the Global Diary of Logical and Designing Exploration in 2014, likely builds upon the growing field of Intelligent Transportation Systems (ITS) and their application to vehicle safety.

Continuous Vehicle Mishap Recognition and Announcing Framework Utilizing Versatile Applications" by Wei Shi and Jianhua He, published in IEEE Exchanges on Vehicular Innovation, 2016. likely builds upon previous work in the field of vehicular safety systems and mobile technology integration.

The research paper "GateGuardian: Secure And Automated IoT Door Access Control System" by Dr. Praveen Banasode, Swati Sangolli et al., likely contributes to the rapidly evolving field of IoT-based security systems.The system may also address privacy concerns, energy efficiency, and scalability. Overall, GateGuardian appears to represent a comprehensive approach to IoT-based door access control, potentially advancing the field in terms of security, usability, and smart home integration.

"EcoHome+ Pro: Advanced IoT Solution for Sustainable and Energy-efficient Homes" by Dr. Praveen Banasode, Bhakti Marathe et al., in a concise paragraph format. The research on EcoHome+ Pro likely builds upon a foundation of IoT-based smart home solutions focused on sustainability and energy efficiency. This research likely contributes to the growing body of knowledge on smart, sustainable living spaces and may offer insights into scalable solutions for reducing residential energy consumption and carbon footprints.

3. SYSTEM DESIGN

Purpose : This module aims to reduce the number of accidents and raise awareness of the value and application of GPS in automobiles.

Product Function : The GSM module is used to send alert SMSs with the coordinates and a link to a Google Map, while the GPS receiver is utilized to determine the location of the car.

Environment of Operation

- OS: Windows 7 or a later version.
- Memory: 1 GB

Interface Software

- Android IDE

Hardware

- SIM900A GSM Module - Arduino Uno
- SIM28ML GPS Module
- ADXL335
- Accelerometer
- LCD
- Wire Connectors - Ten K-POT
- PCB or breadboard - 12 volt, 1 amp power supply

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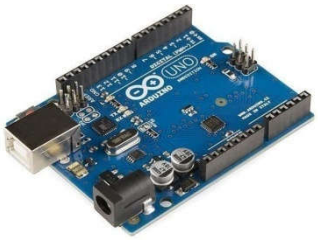
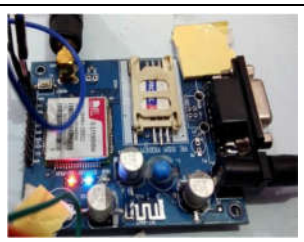
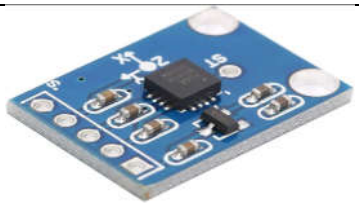
3.1 Hardware Requirements

SL NO	NAME	IMAGE	DESCRIPTION
1	Arduino Uno		An ATmega328P-based microcontroller board is the Arduino Uno. It features a 16 MHz ceramic resonator, 6 analog inputs, 14 digital input/output pins (six of which can be used as PWM outputs), a USB port, a power jack, an ICSP header, and a reset button. Everything required to sustain the microcontroller is contained in it.
2	SIM900A GSM Module		The SIM900 is a comprehensive quad-band GSM/GPRS module that consumers and enthusiasts may use with ease. It offers a low-power, industry-standard interface for data, SMS, and voice calls

3	SIM28ML GPS Module		The Global Positioning System, or GPS, measures the latitude and longitude of any place on Earth together with the precise UTC time. Every second, it gets the coordinates from the satellite and transmits the information in NMEA format.
4	Accelerometer		The pins of the accelerometer are labeled Vcc, X-OUT, Y-OUT, Z-OUT, GND, and ST, which stand for power supply, ground connection, analog output in the x, y, and z directions, and sensor sensitivity setting, respectively. .
5	16x2 LCD		Coordinates and status information are shown on a 16x2 LCD. A potentiometer is needed to adjust the brightness or contrast.

4. METHODOLOGY

Fig. 1: Flow Diagram

The flow chart shows how an Arduino, GPS receiver, and GSM module are used to control the complete system. Accidents are detected by the accelerometer, and GPS coordinates are provided and relayed over GSM.

This algorithm outlines the main steps that the vehicle mishap discovery and reporting system likely follows:

- System Initialization: The algorithm starts by initializing all necessary hardware components, including the GPS module, GSM module, accelerometer, and microcontroller.

- Continuous Monitoring: The system enters a continuous loop where it constantly monitors the vehicle's state, including its location (via GPS) and acceleration/orientation (via accelerometer).

- Accident Detection: The algorithm checks if the acceleration exceeds a predefined threshold (set to 4G in this example) or if the vehicle's angle indicates a potential rollover (45° in this example). These thresholds would likely be determined through extensive testing and calibration.

- Confirmation Delay: To reduce false positives, the system waits for a short period (10 seconds in this example) after detecting a potential accident. This allows for manual cancellation if the detection was a false alarm.

- Alert Composition and Transmission: If no cancellation occurs, the system composes an alert message containing crucial information like the vehicle's location, acceleration at impact, vehicle angle, and the time of the incident. This message is then sent via GSM to a predefined emergency number.

- Local Alarm Activation: The system activates local alarms (visual and/or audible) to alert nearby people and potentially aid in locating the vehicle.

- Wait for Response: The system continues to monitor for either a manual override (if the occupants are able to cancel the alert) or confirmation of the alert receipt from emergency services.

- Alarm Deactivation: Once a response is received or the alert is manually cancelled, the local alarms are deactivated.

This algorithm demonstrates how the system integrates GPS and GSM technologies with sensor data to provide an automated, reliable method for detecting and reporting vehicle accidents.

5. RESULTS AND DISCUSSIONS

Circuit Layout

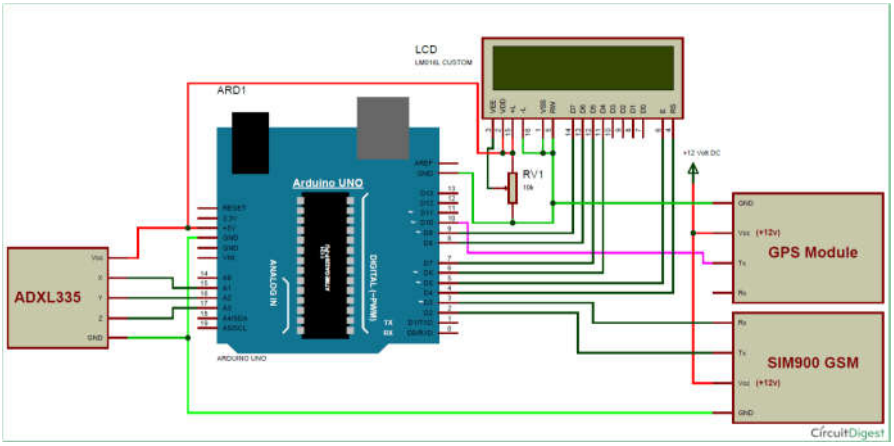


Fig. 2: Circuit Layout

The GPS module is connected to digital pin 10 on the Arduino, the GSM module to pins D2 and D3, and the LCD to pins 4, 5, 6, 7, 8, and 9 according to the circuit diagram. The modules receive the necessary voltage from the power supply.

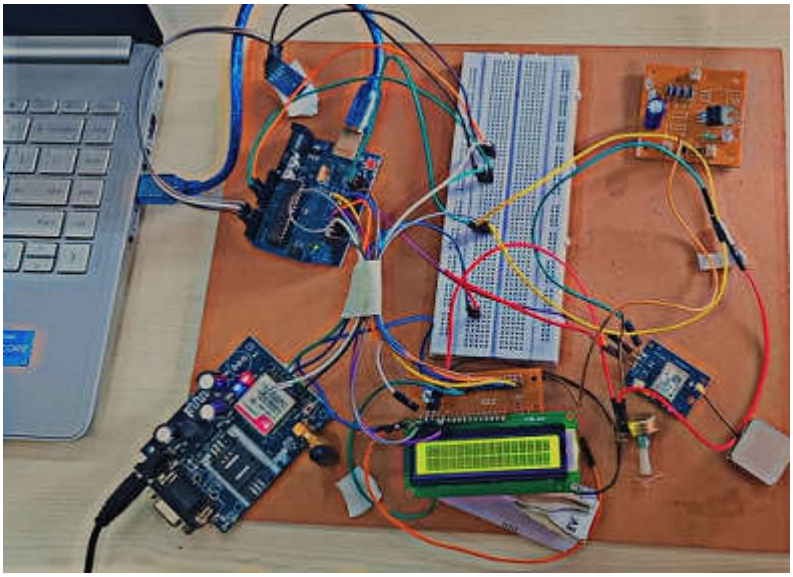


Fig. 3: Prototype circuit design

The road accidents and the importance of rapid emergency response, emphasizes how automated detection and reporting can significantly reduce the time between an accident occurring and emergency services being notified, potentially saving lives in the process.

The hardware components of their system, which may include a GPS module for precise location tracking, a GSM module for wireless communication, accelerometers or impact sensors for detecting sudden changes in velocity or force, and a central processing unit to manage these components and run the accident detection algorithms. The GPS continuously tracks the vehicle's location, while the sensors monitor for signs of an accident. When the system detects a potential accident – perhaps through a sudden deceleration or impact force exceeding a predetermined threshold – it triggers the GSM module to send an alert.

The reporting mechanism is another key focus of the work carried out. When an accident is detected, the system presumably composes a message containing crucial information such as the exact GPS coordinates of the accident, the time of the incident, and possibly some indication of the severity based on sensor readings. This message is then sent via GSM to predetermined emergency contacts or directly to emergency services.

The research is conducted extensive testing of system, and the work includes a detailed methodology section describing their testing procedures. This might involve simulated accidents in controlled environments, as well as real-world testing. The results section would present data on the system's accuracy, response time, and reliability.

The work addresses both the strengths and limitations of the system. Strengths might include the automatic nature of the reporting, the accuracy of location data, and the potential for

faster emergency response. Limitations could involve issues like potential false alarms, the need for consistent power supply and network connectivity, and privacy concerns related to constant location tracking.

Overall, this research work is a comprehensive exploration of using GPS and GSM technologies to create an automated system for detecting and reporting vehicle accidents, with the ultimate goal of improving road safety and emergency response times.

4. CONCLUSION

This IoT-driven smart transportation system presents a promising solution for the growing mobility challenges faced by modern cities. It not only enhances the efficiency of transit systems but also contributes to the broader goals of smart city development. Future research should focus on further improving the system's predictive capabilities, enhancing its resilience against cyber threats, and exploring innovative ways to incentivize public adoption of smart mobility solutions. As cities continue to grow and evolve, the implementation of such intelligent transportation systems will be crucial in ensuring sustainable, efficient, and user-centric urban mobility.

RFERENCES

1. Programmed Mishap Discovery and Notice Framework utilizing GPS and GSM Modems by S.P. Bhumkar, Distribution: Global Diary of PC Applications, 2012.

2. Vehicle Mishap Discovery and Detailing Framework utilizing GPS and GSM by Aboli Ravindra Wankhede, Pratibha Vishnu Mohite, Manisha Ramesh Wankhede Distribution: Global Diary of Designing Exploration and Innovation, 2012.

3. Shrewd Transportation Framework (ITS) Way to deal with Vehicle Mishap Recognition and Notice by K. Jyothi, K. Neelima Distribution: Global Diary of Logical and Designing Exploration, 2014.

4. Continuous Vehicle Mishap Recognition and Announcing Framework Utilizing Versatile Applications By Wei Shi, Jianhua He Distribution: IEEE Exchanges on Vehicular Innovation, 2016.

5. Dr. Praveen Banasode, Dr. Poorna Chandra S et al., "RideGuard: IoT-Enabled Smart Helmet with Ride Tracking, Navigation, Accident, and Alcohol Detection Features" GIS Science Journal, Volume 11 Issue 7 2024, Page No: 882 - 890, DOI:20.18001.GSJ.2024.V11I7.24.41185673.

6. Dr. Praveen Banasode et al., "Aquawatch: Iot Liquid Level Monitoring System For Industrial Applications" GIS Science Journal, Volume 11 Issue 7 2024, Page No: 813-819, DOI:20.18001.GSJ.2024.V11I7.24.41185667.

7. Dr. Praveen Banasode, Milind Rao Pawar et al., "Smart Night Watch: Intelligent Night Patrol Robot with Real-time Mobile Alerts and Streaming Surveillance" GOYA Journal, Volume 17 Issue 07 2024, Page no : 405 – 415, DOI:12.163022.Gj.2024.v17.07.034.

8. Dr. Praveen Banasode, Dr. Poorna Chandra S et al., "Mobility Guard Plus: Advanced IOT Smart Wheelchair with Remote Monitoring and Fall Detection" GOYA Journal,Volume 17 Issue 07 2024, Page no : 339 – 344 DOI:12.163022.Gj.2024.v17.07.028.

9. Dr. Praveen Banasode, Bhakti Marathe et al., " Ecohome+ Pro: Advanced Iot Solution For Sustainable And Energy-efficient Homes",GIS Science Journal VOLUME 11 ISSUE 8 2024 ,Page No: 64-70, DOI:20.18001.GSJ.2024.V11I8.24.41185687

10. Dr. Praveen Banasode, Swati Sangolli et al., " Gateguardian: Secure And Automated Iot Door Access Control System", GIS Science Journal, VOLUME 11 ISSUE 8 2024, Page No: 71-78 , DOI:20.18001.GSJ.2024.V11I8.24.41185688.