TECHNICAL ANSWERS FOR REAL TIME PROBLEMS

IOT BASED COLLISION DETECTION SYSTEM

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OBJECTIVE

- Our proposal aims to address the rise in road accidents and lack of emergency facilities. We plan to detect accidents using an impact sensor on the vehicle's bumper and determine the vehicle's orientation using an MPU6500.
- The system will communicate the accident location to the rescue team and emergency contacts of the rider.
- This will enhance emergency response time and potentially save lives.
- The focus is on accident detection and informing the appropriate authorities of identification.
- An alarm message will be sent to the authorities to pinpoint the accident's location using a GPS module.
- The system incorporates technology to enhance emergency response in the event of an accident. The impact sensor and MPU6500 will be used to determine the accident's location, and the rescue team and emergency contacts will be notified.
- The system's goal is to increase the survival rate after accidents by reducing response time.

SCOPE AND MOTIVATION

- Road accidents are a leading cause of death and injury globally. Rapid response can save lives and minimize injuries.
- IoT-based accident detection systems can reduce response time by detecting and alerting emergency services.
- The system can be used in urban and rural areas and integrated with existing emergency services. This proposal aims to address the issue of road accidents and the lack of emergency services.
- The system is motivated by the increasing number of accidents in India and the impact on middle-class people.
- The traffic police and medical services are often unavailable in remote areas, which further highlights the need for the proposed system.
- This project seeks to reduce response time and potentially save lives in the event of accidents.

INTRODUCTION

- Automobile accidents are increasing due to human and technological errors.
- The government is working to reduce accidents through initiatives.
- Rescuing injured individuals in remote locations is difficult.
- To address this issue, an IoT system is being developed.
- The system will detect accidents and notify emergency services and contacts.
- The system will use an MPU6500 and impact sensor to identify the accident.
- Authorities will receive an alarm message and use GPS to locate the accident.
- The system aims to improve emergency response times.
- The system can potentially save lives.
- The system can be integrated with existing emergency services.

LITERATURE REVIEW

Author	Title	Methodology	Limitations
A. Shaik et al.	Smart Car: An IoT Based Accident Detection System	Proposed an IoT-based system to detect accidents in vehicles using sensors such as accelerometer, gyroscope, and GPS, and sending alerts to emergency services through a GSM module.	Limited analysis of costs and scalability, potential privacy and security concerns, and limited detection capabilities.
P. Karmokar et al.	A Novel IoT based Accident Detection and Rescue System	Proposed an IoT-based system to detect accidents in vehicles using sensors and sending alerts to emergency services through a cloud-based system. The system also included a mechanism for rescue operation management.	Limited discussion on the cost and scalability of the system, and the effectiveness of the rescue operation management mechanism.

S. Nanda, H. Joshi, and S. Khairnar	An IoT Based Smart System for Accident Prevention and Detection	Proposed an IoT-based system to prevent and detect accidents in vehicles using sensors and a cloud-based system. The system includes features such as lane departure warning, collision warning, and automatic emergency braking.	Limited discussion on the effectiveness and accuracy of the proposed system, and the cost and scalability of the system.
N. Kumar, D. Acharya and D. Lohani	An IoT-Based Vehicle Accident Detection and Classification System Using Sensor Fusion	The authors propose an Internet of Things (IoT) based system that utilizes sensor fusion to detect and classify vehicle accidents. The system integrates data from multiple sensors such as accelerometers, gyroscopes, and GPS to accurately identify the type of accident, its severity, and location. The system also includes an emergency response system to notify the concerned authorities and provide assistance to the victims.	The proposed system is evaluated through simulation and limited field testing, thus further validation in real-world scenarios is needed. The system's accuracy may also be impacted by the availability and reliability of sensor data, as well as the quality of communication channels in remote areas.

S. P. Shubham, M. Kumar, Rajkishor and S. Jain	A Survey on IoT based Automatic Road Accident Detection	The authors conduct a survey of existing IoT-based automatic road accident detection systems. They analyze the various components of these systems, such as sensors, data processing, communication, and emergency response, and compare their strengths and limitations. The authors also discuss the challenges in implementing such systems in real-world scenarios and provide recommendations for future research.	The survey is limited to IoT-based systems and does not cover other types of accident detection systems. The survey is also focused on technical aspects and does not consider the social, ethical, and legal implications of implementing such systems. The authors also note that some of the surveyed systems may not have been extensively evaluated in real-world scenarios.

ISSUES IN EXISTING SYSTEM

- Existing accident detection systems have several issues that need to be addressed. Some of the main issues include high false positive rates, unreliable communication, and high cost.
- The high false positive rates can lead to unnecessary alerts and waste of emergency services' resources. The unreliable communication can delay the response time to accidents, and high cost can limit the system's deployment in low-income areas.

PROPOSED LAYERED ARCHITECTURE

A general three-layered architecture for an IoT-based detection system can be structured as follows:

PERCEPTION LAYER

This layer is responsible for acquiring data from various sensors and devices connected to the IoT system. The sensors could be temperature sensors, pressure sensors, motion sensors, cameras, etc. The perception layer processes the sensor data and sends it to the next layer for further processing.

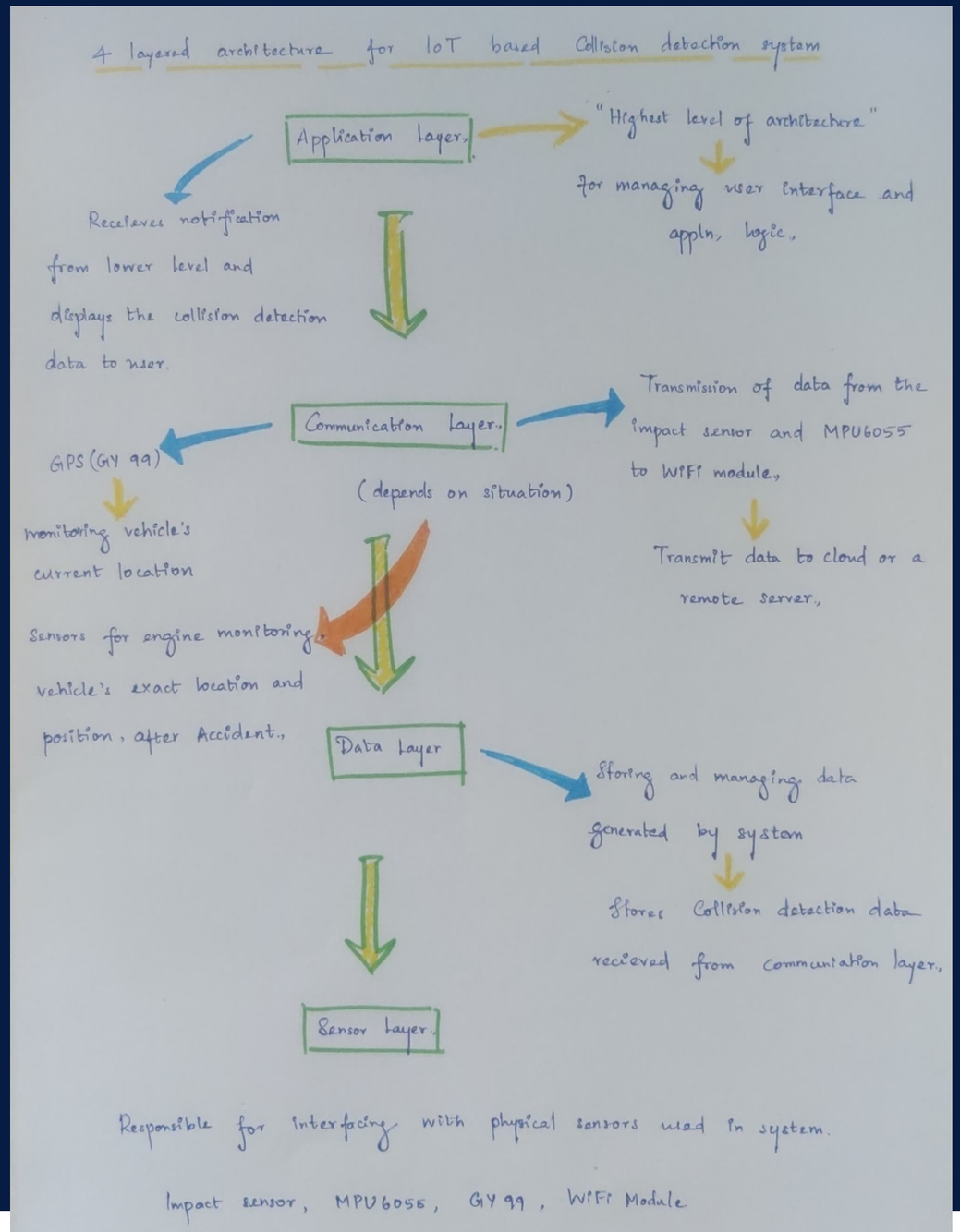
NETWORK LAYER

This layer is responsible for data transmission and communication between different devices in the IoT system. The network layer could include gateways, routers, switches, and protocols such as MQTT, CoAP, HTTP, etc. The network layer receives data from the perception layer and sends it to the application layer or other devices.

APPLICATION LAYER

This layer is responsible for processing and analyzing the data received from the perception layer and network layer. The application layer could include machine learning algorithms, data analytics tools, and decision-making modules. The application layer generates insights and actionable information that can be used to improve system performance, optimize resources, or trigger alarms and notifications.

LAYERED ARCHITECTURE FOR IOT BASED COLLISION DETECTION SYSTEM



METHODOLOGIES

- The accident detection system uses an impact sensor and MPU6055 sensor to detect accidents. The impact sensor detects sudden changes in acceleration, while the MPU6055 sensor measures the angular velocity and orientation of the vehicle.
- The sensor data is processed by the embedded software on the microcontroller, which determines whether an accident has occurred.
- If an accident is detected, the system sends an alert to emergency services using the Wi-Fi module. The cloud-based software receives the alert and sends it to the emergency services.
- The user interface allows users to view and manage alerts and system settings.

HARDWARE SOFTWARE REQUIREMENTS

- The hardware components required for the system include an MPU6055 sensor, microcontroller, GMS 800A, and power source.
- The software components required include embedded software for the microcontroller, cloud-based software for the server, and user interface software.
- The microcontroller used in this system is Arduino, and the cloud-based software is hosted on a web server.
- The user interface can be accessed through a web browser or a mobile application.
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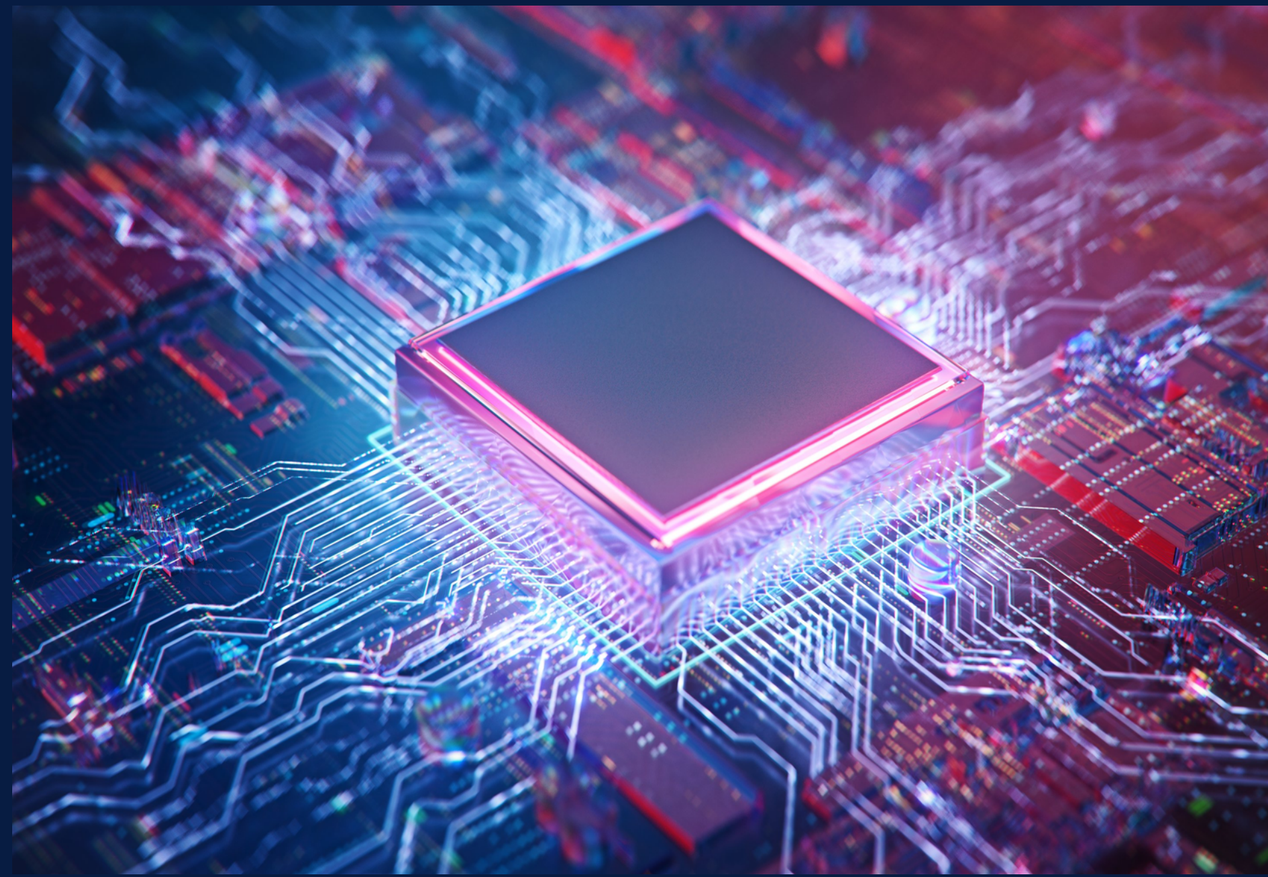
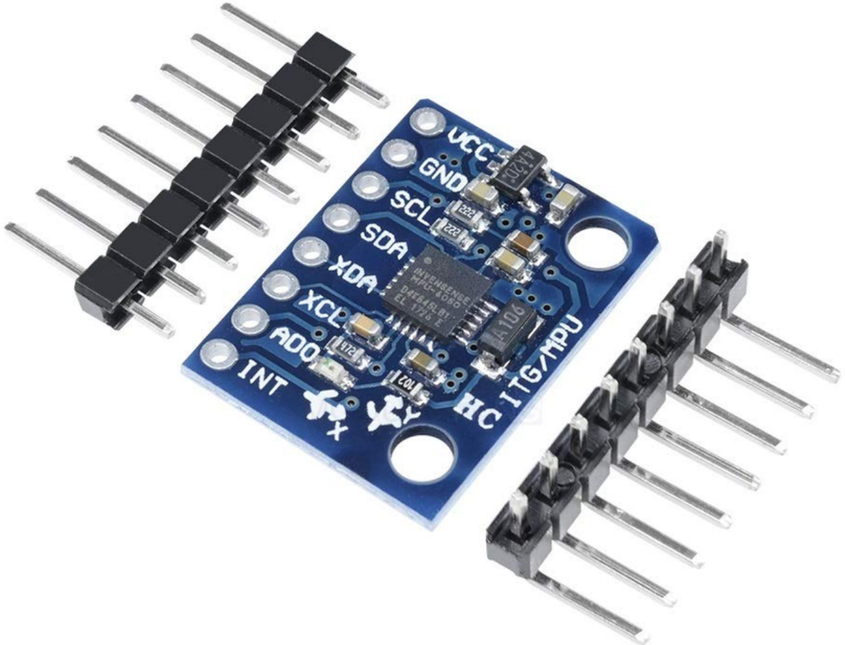


HARDWARE SOFTWARE REQUIREMENTS

MPU6050 :

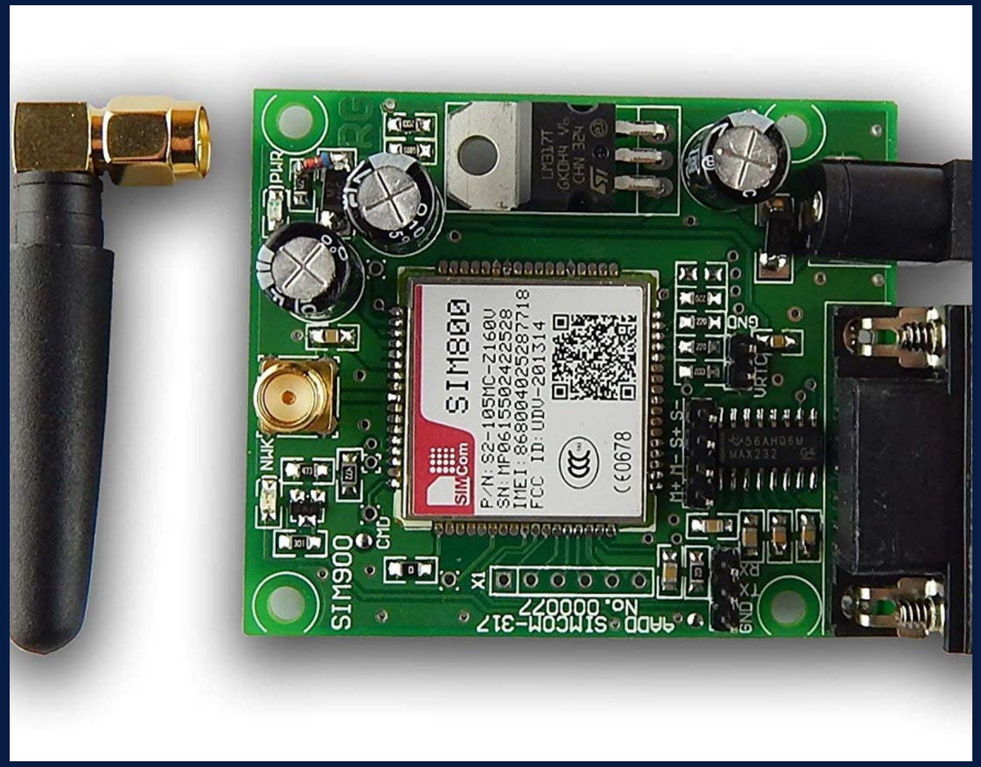
- The MPU6050 is a popular and versatile sensor module that combines a 3-axis accelerometer and a 3-axis gyroscope in a single chip.
- It communicates with microcontrollers using the I2C interface and includes a Digital Motion Processor (DMP) for sensor fusion, enabling accurate motion tracking.
- With programmable sensitivity, low power consumption, and a built-in temperature sensor, the MPU6050 is ideal for various applications, such as robotics, drones, gaming controllers, and fitness trackers.
- Additionally, the firmware of the DMP is upgradable, allowing for performance improvements or new features.
- Its wide range of features and reliability make the MPU6050 a favored choice among hobbyists, researchers, and developers.



HARDWARE SOFTWARE REQUIREMENTS

GSM 800A :

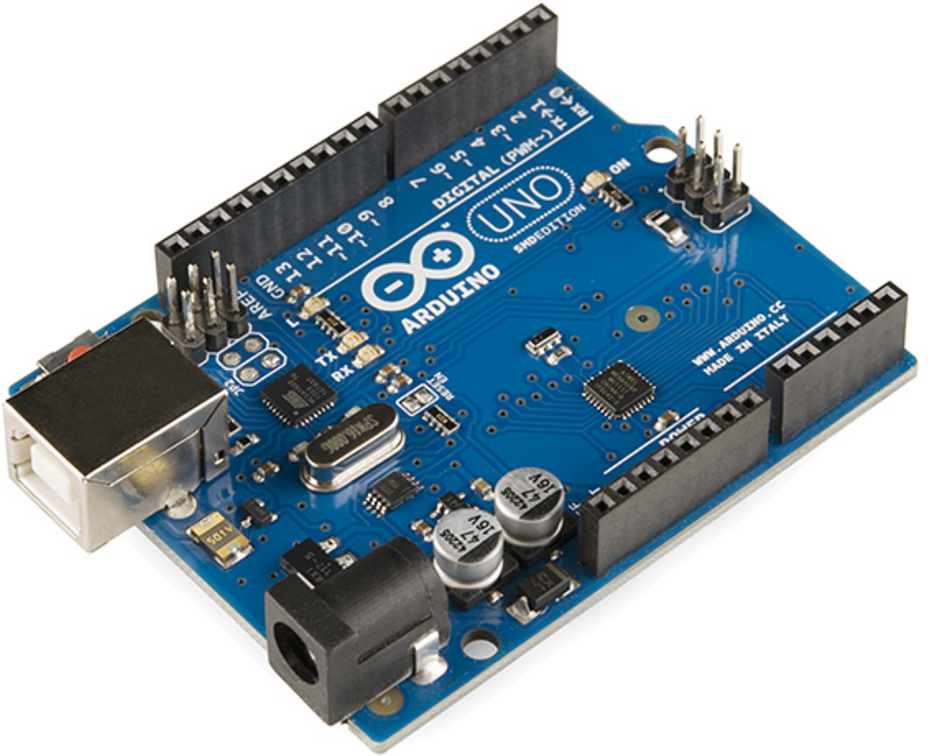
- The GSM800A is a quad-band GSM module that enables wireless communication via cellular networks, operating on the 800 MHz frequency band.
- It supports voice and data communication, requires a SIM card for authentication, and communicates with microcontrollers using AT commands.
- With digital audio interfaces, GPIO pins, and low power consumption, it is suitable for remote communication, IoT devices, and mobile communication systems.
- The GSM800A's versatility, including quad-band operation, AT command set, digital audio interface, and low power consumption, make it a favored choice among developers for wireless communication solutions in a wide range of applications.



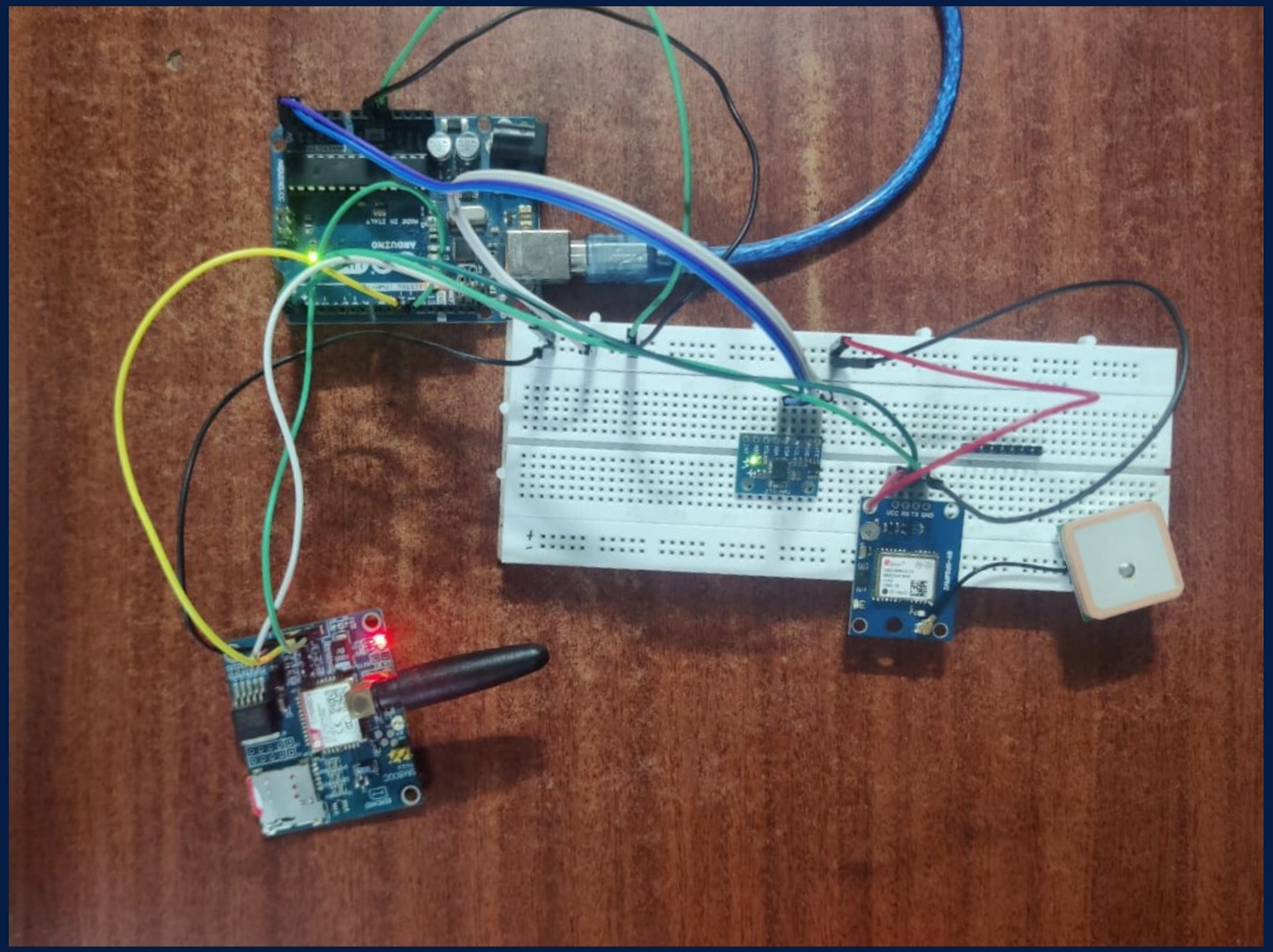
HARDWARE SOFTWARE REQUIREMENTS

ARDUINO UNO

- The Arduino Uno is a widely used open-source microcontroller board based on the ATmega328P.
- It features digital and analog I/O pins, a USB interface for programming and communication, and compatibility with various shields and libraries for easy expansion.
- With its simplicity, versatility, and community support, the Arduino Uno is popular among hobbyists, students, and professionals for DIY electronics projects, prototyping, and educational applications.
- It offers features such as a 16 MHz clock speed, 14 digital I/O pins, 6 analog input pins, and a vast library of pre-written software.
- Its open-source nature allows for customization, making it a powerful tool for creative and innovative electronic projects.



FINAL PRODUCT



RESULTS AND ANALYSIS

```
00:41:02.396 -> ------------------------------------------------------------------------------------
00:41:02.491 -> -5846
00:41:02.491 -> asdf
00:41:02.491 -> 150.00
00:41:02.539 -> Car Flipped
00:41:06.833 -> EMERGENCY: The Car is flipped, call the medical authority and a rescue team immediately to save the person
00:41:29.064 -> ------------------------------------------------------------------------------------
```

CAR FLIPPED

RESULTS AND ANALYSIS

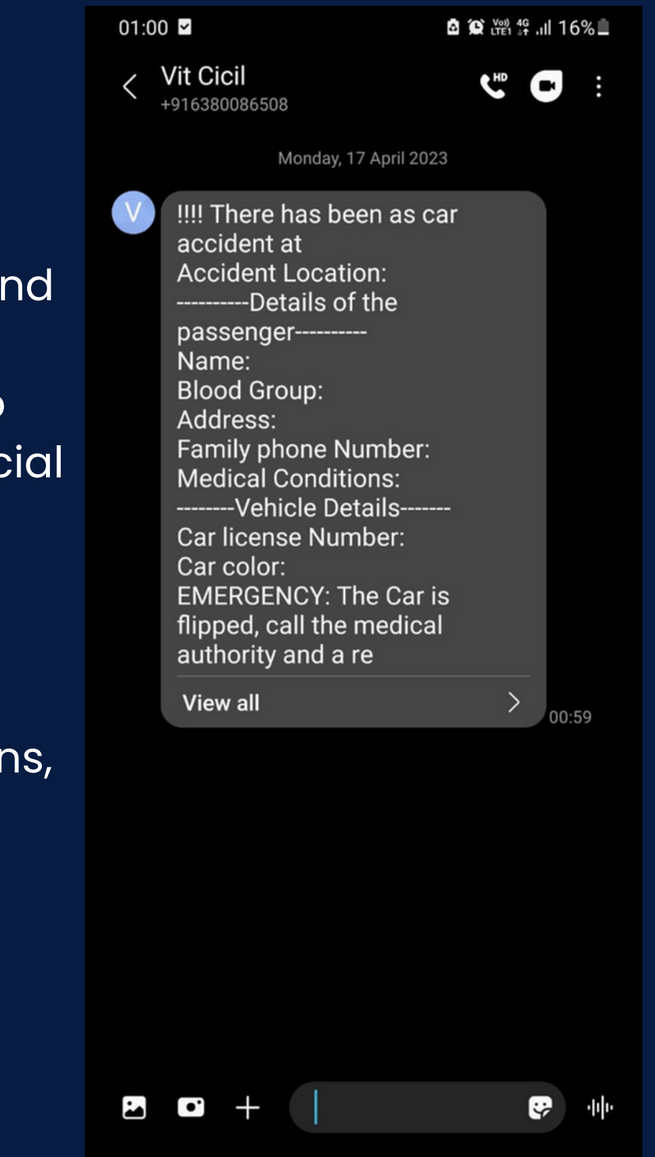
```
00:42:47.861 -> 21582
00:42:47.861 -> 210.00
00:42:47.908 -> Car isnt Flipped
00:42:48.853 -> ------------------------------------------------------------------------
```

CAR NOT FLIPPED

RESULTS AND ANALYSIS

- Results and analysis are critical components of any research or project. It is through the analysis of the results that meaningful insights can be gleaned, and conclusions can be drawn.
- In the context of IoT-based collision detection using MPU 6050 sensor, Arduino UNO, GPS module, GSM 800A, and alert sensor, results and analysis play a crucial role in determining the effectiveness of the system.
- To conduct a proper analysis, the system needs to be tested in different scenarios and conditions. The tests should be designed to mimic real-world situations where collisions are likely to occur.
- The tests should be conducted on different types of roads and traffic conditions, such as highways, urban roads, and rural roads.

MESSAGE INTIMATION



CONCLUSION

The IoT-based accident detection system can help in reducing the response time to accidents by automatically detecting and alerting the emergency services. The system uses an impact sensor, MPU6055 sensor, and Wi-Fi module to detect and transmit information about the accident to the cloud. The proposed layered architecture allows for modular development and easy integration of different components. The system can be used in both urban and rural areas and can be integrated with existing emergency services to provide a more efficient.