GOOD SAMARITAN TRACK: A Comprehensive GPS Tracker with SOS Button for Personal Safety

An Engineering Project in Community Service

Phase – II Report

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Certified that this project report titled

“GOOD SAMARITAN TRACK: A Comprehensive GPS Tracker with SOS Button for Personal Safety” is the Bonafide work of “**PrabhakarReddy-21BCY10231,ManaswithaReddy-21 BCE10181,SarthakAtre-21BCE10638,SaiLalitha-21BAS10020 ,SohailAhmed21BCE11074,Praneeth21BCY10243,EeshaPranav-21BCE11680, Revanth-21BAI10373,K.Himaja-21BAI10379”**who carried out the project work under my supervision. This project report (Phase II) is submitted for the Project Viva-Voce examination held on 12-03-2024

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1. INTRODUCTION

Introduction: Safeguarding Individuals with a Software-Driven GPS Tracker and SOS Button

The ever-present need for personal safety, particularly for vulnerable populations and those venturing into unfamiliar environments, fuels the continuous development of innovative solutions. This project delves into the design of a **GPS tracker with an SOS button**. This portable device aims to provide a comprehensive safety solution by integrating two crucial functionalities:

- **Real-time Location Tracking:** Utilizing GPS technology, the tracker continuously pinpoints the user's location, offering a clear picture of their whereabouts.
- **Emergency Alert System:** A dedicated SOS button serves as a distress signal, triggering the immediate transmission of an emergency alert containing the user's location coordinates.

This report focuses on the software architecture that drives the functionality of the GPS tracker with SOS button. We explore the gap in existing solutions and how our proposed software design addresses these limitations.

Motivations and Significance:

The prevalence of situations where personal safety becomes a concern underlines the importance of this project. Scenarios like:

- **Outdoor Enthusiasts:** For explorers venturing into remote areas, the tracker provides a safety net in case of emergencies.
- **Elderly Individuals:** The device offers peace of mind for caregivers and allows for quick assistance if needed.
- **Individuals in Unfamiliar Environments:** Whether traveling or exploring new areas, the tracker becomes a valuable safeguard.

By leveraging software to facilitate real-time location tracking and a user-activated emergency alert system, this project's potential to enhance personal safety is significant

2. MOTIVATION

Integrating a safety alarm feature into an app for community care and recognition can greatly enhance its Purpose. The motivation behind such a project could be driven by the desire to not only foster community Support and recognition but also prioritize the safety and well-being of its members. This combined Approach aims to create a holistic platform that not only celebrates community efforts but also ensures Immediate assistance in times of danger or emergencies.

3. OBJECTIVE

1. Enhance Public Safety: To improve road safety by providing a platform for quick reporting and notification of traffic accidents, helping authorities respond promptly.
2. Reduce Response Time: Minimize emergency response time by notifying relevant Authorities, such as law enforcement and medical services, as soon as an accident occurs.
3. Real-time Information: Ensure that real-time accident information, including location, Severity, and the number of casualties, is available to both first responders and the General public.
4. User Engagement: Develop a user-friendly mobile application that encourages people to report accidents, making them active participants in traffic safety.
5. Public Awareness: Raise awareness about safe driving practices and the importance of Reporting accidents promptly.

4. Existing Work / Literature Review

Accident Detection and Alert System:

The main idea of this paper is to Build an application that makes use of the sensors present in mobile phones like GPS and Accelerometer and detect any collision if there is a sudden external disturbance in the speed with the help of the Sensor Fusion Based Algorithm. With the help of the data obtained from the accelerometer Sensor, when there is a sudden disturbance to the mobile phone, the user is notified with an alert message before sending the request help signal. If no emergency is required, they can cancel it within10 seconds. But, if they press the" Call Help" button or if the alert message is unattended for more than 10 seconds, the "request for help" message will be sent to the emergency services as well as the family members the users provide. In this system, the external disturbances are detected by the accident detection module and when it is Detected, a function is called to Find the current location of the user with the help of GPS in the Location Detection Module. The location data obtained from the GPS is sent to the Emergency services to request help. For the detection of vehicle accidents accelerometers are installed and for reporting, GPS module and GSM module are used. Motor (control switch) is used for engine control And buzzer, led lights etc. are used for warning during prevention. All these devices are interfaced with the Central microcontroller unit. Accelerometer detects the occurrence of accident and sends signal to the Microcontroller for further functioning.

Development of location tracking system via short message service (SMS)

The development of technology has increasingly sophisticated and has a positive influence on human life. The location tracking system that is currently overgrowing in the world of technology is required to be able to serve consumers until consumers can benefit from the technology. Given the number of thefts in Indonesia is currently increasing and the need for a security system that can work continuously automatically. Therefore, the purpose of this research is to make the location tracking system as expected by the community. Based on the testing that has been done on the tool and see the purpose of this research, it can be concluded that this tool has been tested and can be used to help secure systems to track valuable tools such as motorcycles, bags, cars, etc. based on Global Positioning System (GPS) coordinates sent by SIM800L module to numbers destination of cell phone

Development of a wearable global positioning system for place and health research

This study focuses on the design of a wearable global positioning system (GPS) data logger for the purpose of objectively measuring the temporal and spatial features of human activities. Person-specific GPS data provides a useful source of information to operationalize the concept of place.

Feasibility and Validity of a Wearable GPS Device for Measuring Outings after Stroke

Self-report diaries are a low-cost method of measuring community participation but may be inaccurate, while the "gold standard," observation is time consuming and costly. This study aimed to investigate the feasibility and validity of a global positioning system (GPS) for measuring outings after stroke. *Design*. Cross-sectional cohort study. *Methods*. Twenty ambulant people with stroke wore a GPS device and kept a diary for 7 days, and 18 were observed for half a day. We recorded recruitment rate, user perceptions, and data extraction time. GPS data were analysed against Google maps. Percent exact agreement (PEA) with observation was calculated for GPS and diary. *Results*. Of 23 eligible participants, 20 consented (mean 3.6 years after stroke). GPS data recovery was high (87%). Some participants had difficulty operating the on/off switch and reading the small screen. Data extraction took an average of 5 hours per participant. PEA with observation was high for the number of outings (GPS 94%; diary 89%) but lower for the purpose of outings (GPS 71%; diary 82%). *Conclusions*. The GPS device and dairy were both feasible and valid for measuring outings after stroke. Simultaneous use of GPS and diaries is recommended for comprehensive analysis of outings.

GPS Navigation and Tracking Device

Since the introduction of GPS Navigation systems in the marketplace, consumers and businesses have been coming up with innovative ways to use the technology in their everyday life. GPS Navigation and Tracking systems keep us from getting lost when we are in strange locations, they monitor children when they are away from home, keep track of business vehicles and can even let us know where a philandering partner is at all times. Because of this we attend to build a GPS tracking device to solve the mentioned problems. Our work consists of the GPS module that collects data from satellites and calculates the position information before transmitting them to the user's PC (of Navigation system) or observers (of Tracking System) using wireless technology (GSM).

Design and Development of an IoT based wearable device for Safety and Security of women and girl children

Increase in rape issues since past decade, GSR & EDA body parameters showing variations in dangerous and stressed situations. Incorporate the advancement s made in the field of wearable electronics to develop a more compact device that could possibly be integrated into clothing.

Human Location Tracking Device using IoT

Women's safety is a pressing and pervasive issue in many parts of the world, and India is no exception. In fact, according to the National Crime Records Bureau (NCRB), crimes against women in India are recorded every 16 minutes, including acid attacks, murder, attempted rape, rape, cruelty by husbands or in-laws, kidnapping, trafficking, dowry deaths, and assault. Shockingly, this statistic indicates that a staggering 87% of women in India face safety issues. To address this urgent issue, there is a need for a comprehensive solution that can help women

extricate themselves from potentially dangerous situations quickly and effectively. One such solution is the Safety H-Shield, a wearable device designed specifically for women's safety. This device is equipped with a button control system that sends an alert message through the device and transmits the location to the nearby police station, family members, and close friends. In addition to its alert system, the Safety H-Shield also has several other features that make it an incredibly powerful tool for ensuring women's safety. The device can passively track a user's live location, which is enabled once the emergency module is triggered. The Safety H-Shield device has been designed with machine learning (ML) algorithms to enhance its ability to detect and respond to emergency situations . The ML algorithms enable the device to learn from past emergency situations to better identify potentially dangerous situations, such as identifying areas with high crime rates. The fall detection module is another state of-the-art feature of the Safety H-Shield, specifically designed to detect and alert emergency contacts in the event of a fall. The fall detection module has also been enhanced with ML, allowing the device to differentiate between different types of falls and respond accordingly. In the event of a more severe fall, the device will contact emergency services automatically, while for less severe falls, an alert will be sent to a trusted contact. Furthermore, the device is designed with a web app support system that will be based on the MERN stack, providing a user-friendly interface for users to access emergency data and location tracking.

Real Time Tracking System: An IoT Based Application

An Internet of Things based application will be develop, which can track down the position of your bag or vehicle in real-time and display that same position on Google Map. The end-user will be able to see the real-time position of his/her lost or stolen bag or stolen vehicle on a web portal, which is deploy on cloud platform (Microsoft Azure/AWS) and also have developed an Android Based App, which will show the same real-time position of bag or vehicle on their smartphone, ease to use.

Build a real-time tracking system using GPS. In which, they use the GPS module to get exact location of the bag or vehicle and we also use GSM module to upload the data to the open source cloud via GPRS. Using cloud APIs services, we send data to the google map and show it in our app or web portal. While traveling, user can put this tracker in his/her bag or vehicle. Our device tracks the exact location of the bag and send the location to our app and web portal. User can use our tracking android app or web portal to track down the location of the bag. In our research work, have also deployed a direction feature. By clicking the direction button on our android app/web portal, it will show the shortest route to the lost /stolen bag. Similarly, in this way our tracking system function for vehicles also. User can put our tracking device in trunk and leave it. If the vehicle got stolen, the user not need to worry. He/She can track the vehicle using our app or web portal. Our research work is not limited to the baggage and vehicle. Our research work can used for also various scenario like tracking lost pets, small children’s etc.

IoT Based GPS tracking system with SOS Capabilities

This paper offers a concept for a battery-powered, GPS-based tracking system with continuous tracking and an SOS function that is based on IoT. The device when triggered uses a micro-controller and a GPS module to extract location data and send it to a group of registered users and a central server using a GSM module via SMS and AT commands. The central server will store the location periodically in a MongoDB and NodeJS based database. This data will be accessible to the user presented on a map using Open Layers via an HTML pages-based website hosted on AWS using registered credentials. The SMS received by registered guardians will also have the triggered location of the device formatted in a link that opens the location in google maps. During the SOS mode, all nearby devices whose location is stored in the database will also be alerted creating a community of secure users.

DEVELOPMENT OF A BUS TRACKING AND MONITORING DEVICE USING ARDUINO NODE MICROCONTROLLER

The goal of this research is to develop a bus tracking and monitoring system for the UiTM-SAC. Arduino node microcontroller unit and global positioning system (GPS) sensors were used to send and receive GPS location information. The data retrieved from these sensors were displayed on an organic light-emitting diode and stored in a web-based software spreadsheet. For the experimental test, only one bus was used for collecting and analysing data. Data were immediately presented on the user interface. The results indicate that the system was able to track and monitor the bus by providing the bus's latitude, longitude and speed. The results also revealed some key factors that affect the time required for a bus to complete a route based on users' demands at that time. The difference in demand was 76.2%, as most students use the UiTM bus service in the morning than in the evening. In conclusion, by using the proposed bus campus tracking and monitoring system, users can easily find the exact location of buses running at the UiTM-SAC.

Vehicle Tracking System Using GPS

The project describe a practical model for routing and tracking with mobile vehicles in a large area outdoor environment based on the Global Positioning system (GPS) and Global system for mobile communication(GSM). The supporting device GSM modem GM862, are controlled by a 32 bit microcontroller LPC2148 implemented a new version ARM cortex M3 core. The device will collect position to supervised center by the SMS (Short Message Service) or GPRS (General Package radio service) [1]. A hardware device mounted on the vehicle is connected to the engine. Once, the vehicle is being stolen, the information is being used by the vehicle owner for further processing. Sitting at a remote place, a particular number is dialed by owner to the hardware kit which is installed in the vehicle. By reading the signals received by the mobile, one can control the ignition of the engine; say to lock it or to stop the engine immediately. We can modify this concept such that the vehicle owner also can lock the vehicle from his mobile phone.

Vehicle Tracking System using GPS and GSM Technology

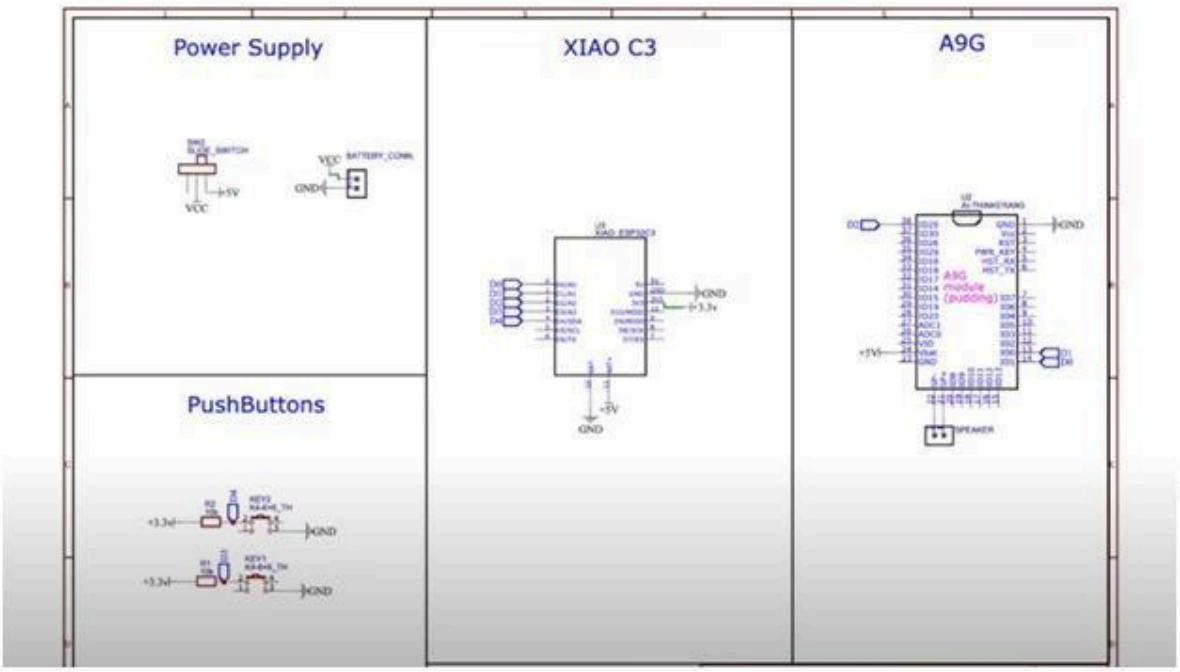
The vehicle tracking system is a device installed during a vehicle to enable the owner or a 3rd party to trace the vehicle\'s location vehicle tracking system that works using GPS and GSM technology, which might be the most cost- effective source of auto tracking and it might work as anti- theft system. It is an embedded system which is employed for tracking and positioning of any vehicle. This design will continuously monitor a moving Vehicle and report its status as and when requested. A GSM modem is employed to send the position (Latitude and Longitude) of the vehicle from a foreign place. The GPS modem will continuously give the info i.e., the latitude and longitude position of the vehicle. The same data is shipped to the mobile at the opposite end from where the position of the vehicle is demanded. When the user request is sent to the GSM modem, the system automatically sends a return reply thereto mobile indicating the position of the vehicle in terms of latitude and longitude in real time.

5. System Architecture

The multipurpose GPS tracker project utilizes advanced hardware components to create a robust and adaptable system. At its core are the Seeed Studio XIAO ESP32C3 and the Ai Thinker A9G GSM/GPRS+GPS/BDS Development Board, meticulously pre-soldered for precision. Together, they form the backbone of the system, enabling both tracking and SOS functionalities.

Functioning as the brain of the system, the Seeed Studio XIAO ESP32C3 microcontroller processes data and oversees various operations. Teamed with the Ai Thinker A9G board, which seamlessly integrates GSM/GPRS and GPS/BDS technologies, the system achieves real-time location tracking and communication capabilities. With the inclusion of a 300mAh 3.7V battery, the device ensures uninterrupted operation, enhancing its portability and versatility.

In addition to the core components, the system design features essential elements like pre-soldered 10kΩ resistors, 2-pin JST XH connectors, tactile switches, bug strip, and a custom-designed PCB. These components are strategically positioned to facilitate smooth communication among the microcontroller, GPS module, and GSM/GPRS module.



6. Working Principle: A Software-Centric Approach to Enhancing Personal Safety

This project delves into the core functionality of a GPS tracker with SOS button, focusing on the software that governs its operation. Here's a breakdown of the key principles:

1. Real-Time Location Tracking:

- The device leverages a **GPS module** to continuously gather location data. This module interacts with the Global Positioning System, receiving satellite signals that pinpoint the user's position.
- The software within the device processes this raw GPS data, extracting latitude and longitude coordinates.
- These coordinates are constantly updated within the software, providing a real-time picture of the user's whereabouts.

2. User Interaction and SOS Activation:

- The device incorporates a dedicated **SOS button** readily accessible to the user.
- When pressed, the SOS button triggers a specific action within the software.
- This action typically involves initiating an emergency alert sequence.

3. Emergency Alert Transmission:

- Upon SOS activation, the software initiates a pre-programmed sequence for sending emergency alerts.
- This sequence often involves the following steps:

- **Extracting Location Data:** The software retrieves the most recent, real-time location coordinates stored from the GPS module.
- **Alert Message Construction:** The software constructs an emergency alert message that may include the user's location coordinates, a distress signal, and potentially additional information like a predefined user ID.
- **Communication Module Activation:** The software interacts with a communication module, such as a cellular network component (if integrated), to facilitate message transmission.
- **Sending the Alert:** The constructed emergency message, containing the user's location and distress signal, is sent to pre-configured emergency contacts or designated emergency response systems (depending on the software design).

Software's Role in Ensuring Functionality:

The software plays a critical role in orchestrating the entire process. It continuously tracks location, interprets user input from the SOS button, creates emergency messages with crucial information, and interacts with communication modules to ensure timely alerts reach designated recipients.

Benefits of a Software-Driven Approach:

- **Flexibility:** The software can be adapted and customized to integrate with various hardware components and communication protocols, allowing future iterations to incorporate new technologies.
- **Scalability:** The same core software principles can be adapted for different device configurations, potentially catering to diverse user needs.
- **Upgradability:** Software updates can introduce new features and enhance functionalities over time, ensuring the device remains relevant with advancements in technology.

Hardware

A9G

The A9G is a versatile and compact GSM/GPRS module developed by Ai Thinker. It integrates GSM, GPRS, GPS, and BDS (BeiDou Navigation Satellite System) functionalities into a single module, making it suitable for various communication and tracking applications.Here are some key features of the A9G module:

1. GSM/GPRS Communication The A9G module supports GSM (Global System for Mobile Communications) and GPRS (General Packet Radio Service) communication standards, allowing it to connect to cellular networks for data transmission and voice communication.

2. GPS/BDS Positioning: It incorporates GPS (Global Positioning System) and BDS (BeiDou Navigation Satellite System) capabilities, enabling accurate positioning and navigation functionalities. This feature is particularly useful for applications requiring real-time location tracking.

3. Compact Design: Despite its advanced functionalities, the A9G module is designed to be compact, making it suitable for integration into small-scale electronic devices and IoT (Internet of Things) applications.

4. Low Power Consumption: The module is optimized for low power consumption, making it suitable for battery-operated devices and applications requiring prolonged operation without frequent recharging.

5. Versatile Applications: Due to its combined GSM, GPRS, GPS, and BDS functionalities, the A9G module can be used in a wide range of applications, including vehicle tracking, asset monitoring, remote sensing, IoT devices, and wearable technology.

Overall, the A9G module offers a comprehensive solution for communication and positioning requirements in various IoT and tracking applications, thanks to its integration of multiple functionalities into a compact and efficient package.

Xiao c3

The Xiao c3 board is a development board based on the ESP32 microcontroller. It provides various functionalities including WiFi, Bluetooth, GPIOs, and more. When combined with the A9G module, which contains GSM and GPS modules, you can create a tracking device capable of sending location data via GSM network.

Here's a basic outline of how you can use these components together for tracking:

Hardware Setup: Connect the A9G module to the Xiao c3 board using appropriate interfaces, such as UART or SPI, depending on the module's communication protocol.

GSM Functionality: Utilize the GSM functionality of the A9G module to establish a cellular connection. This allows your device to communicate over the cellular network, enabling features like sending SMS, making calls, and accessing the internet.

GPS Functionality: Utilize the GPS module within the A9G module to obtain location data. The GPS module receives signals from satellites to determine the device's geographical coordinates (latitude and longitude).

Data Processing: Use the ESP32 microcontroller on the Xiao c3 board to process the data obtained from the A9G module. This may involve parsing GPS data, formatting it for transmission, and performing any additional logic required for your application.

Data Transmission: Send the processed data, which typically includes the device's location information, over the GSM network using the A9G module. This can be done through SMS, GPRS, or other communication protocols supported by the module and your application requirements.

Tracking Application: Develop a tracking application or service that can receive and interpret the location data sent by the device. This could involve displaying the device's location on a map interface, storing historical location data, setting up geofences, and providing alerts or notifications based on predefined criteria.

Overall, the combination of the Xiao c3 board and the A9G module provides a powerful platform for building tracking devices with GSM and GPS capabilities. With proper integration and programming, you can create custom tracking solutions tailored to specific use cases and requirements.

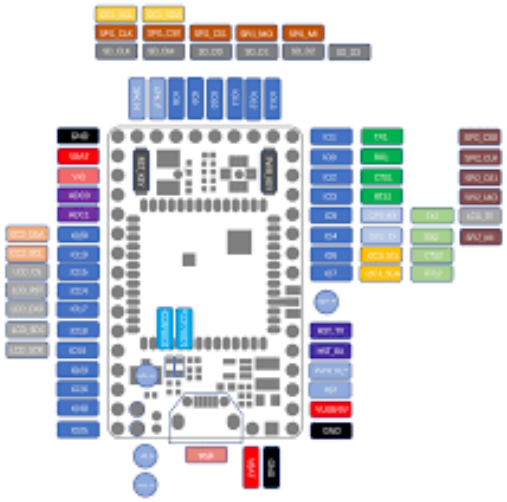
The A9G board and the Seeed Studio XIAO ESP32C3 are fundamental components in the development of the "GPS Tracker with SOS Button" project, each contributing unique functionalities that are crucial for the successful operation of the device.Starting with the A9G board, it serves as the cornerstone for enabling communication and location tracking capabilities. The A9G integrates GSM/GPRS and GPS/BDS technologies, making it a versatile platform for real-time tracking and data transmission. Its GSM/GPRS capabilities allow for seamless communication with external devices or servers, facilitating the transmission of location data, SOS signals, and other critical information.Moreover, the A9G's GPS/BDS module plays a pivotal role in accurately determining the device's location. By leveraging satellite positioning systems, the A9G can provide precise location data, essential for tracking the movements of school-going children or individuals with Alzheimer's. This capability ensures that the device can fulfill its primary objective of real-time monitoring and immediate distress signaling, enhancing the safety and security of its users.Furthermore, the A9G board's integration with the Seeed Studio XIAO ESP32C3 microcontroller enhances the device's intelligence and processing capabilities. The ESP32C3 microcontroller acts as the brain of the system, responsible for managing data processing, controlling various functions, and interfacing with the A9G board and other hardware components.One of the key advantages of the ESP32C3 microcontroller is its efficiency and versatility. Equipped with a powerful RISC-V core, the ESP32C3 offers high-performance computing capabilities while maintaining low power consumption. This is particularly crucial for a battery-powered device like the GPS tracker, where energy efficiency is paramount to ensure prolonged operation and reliability.Additionally, the ESP32C3's compact form factor and integration-friendly design make it an ideal choice for embedded applications such as the GPS tracker. Its small footprint allows for seamless integration into the device's hardware architecture, optimizing space utilization and overall system efficiency.Moreover, the ESP32C3's support for various communication protocols and interfaces further enhances its versatility. Whether it's interfacing with the A9G board, handling GPS data, or communicating with external sensors, the ESP32C3 provides the necessary flexibility to accommodate diverse hardware requirements.The A9G board and the Seeed Studio XIAO ESP32C3 microcontroller form a symbiotic relationship within the "GPS Tracker with SOS Button" project, combining advanced communication capabilities with intelligent processing and control functionalities. Together, they enable the device to deliver on its objectives of enhancing child safety, providing real-time tracking, and offering immediate distress signaling for individuals facing Alzheimer's-related challenges. By leveraging the strengths of these components, the project embodies the convergence of cutting-edge technology and compassionate innovation, with a focus on fostering a safer and more secure community.

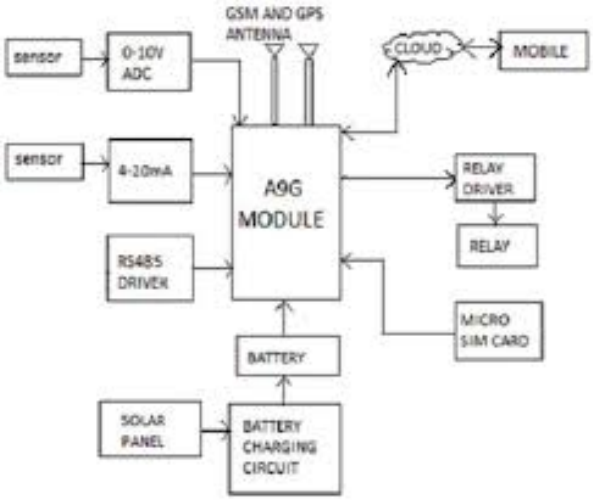
Explanation of the code

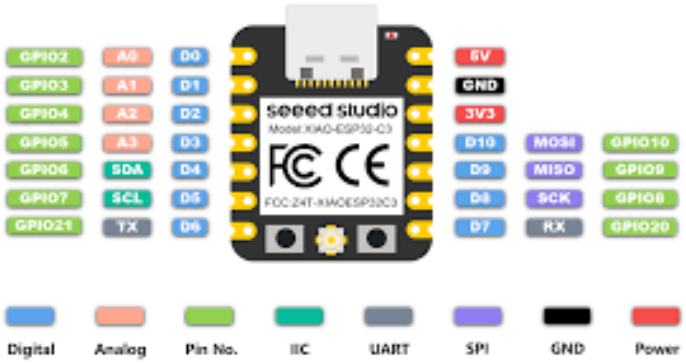
An Arduino sketch refers to a program or code written specifically for an Arduino microcontroller board. The term "sketch" is used in the Arduino IDE (Integrated Development Environment) to describe the code that you write and upload to an Arduino board. Arduino sketches are written in a language that is similar to C/C++, making it accessible to both beginners and experienced programmers. The sketch typically includes setup and loop functions. The setup function is where you initialize variables, set pin modes, and configure the initial state of your Arduino board. The loop function contains the main code that runs repeatedly as long as the Arduino is powered on.Arduino sketches can interact with various components such as sensors, actuators, displays, and communication modules like GSM or WiFi modules. They can perform tasks like reading sensor data, controlling motors, displaying information on an LCD screen, and communicating with other devices over networks.Overall, an Arduino sketch is a piece of code that defines the behavior and functionality of an Arduino-based project, allowing you to create interactive electronic systems and prototypes.

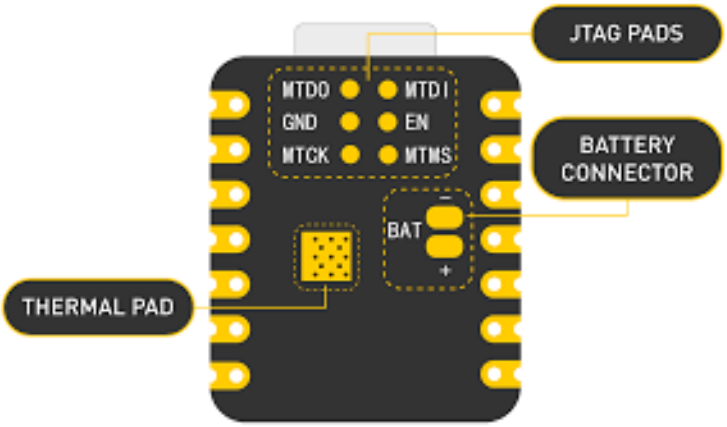
The Arduino sketch we provide is aimed at configuring and utilizing the A9G GSM module for SOS functionality. The process begins with the initialization and pin configuration, where necessary libraries are included, debugging options are defined, and pins for controlling the A9G module and SOS button are configured. Following this, variable declarations are made to handle communication and store the SOS phone number. The setup function initializes serial communication, sets pin modes, powers on the A9G module with a delay for initialization, and sends AT commands to configure its functionalities such as GPS, SMS settings, and sleep mode. Testing and initialization confirmation sections ensure that the setup is successful by sending AT commands to test GPS, SMS, etc.. Once initialized, a ready message is sent to the predefined SOS number to indicate operational readiness. Additionally, the code includes sleep mode activation to conserve power when the A9G module is idle.A GSM module acts as a crucial component in this setup, enabling communication over cellular networks and facilitating data transfer, calls, and SMS. It serves as a bridge between electronic devices and the mobile network, allowing for seamless communication and functionality.The main working of the code involves an initialization phase where parameters and pins are set up for communication, followed by a main loop that continuously listens for commands from the GSM module. These commands are parsed and executed accordingly, such as sending location information, checking battery status, answering incoming calls, or ending calls. Key functions like Get_gmap_link retrieve the device's location using AT commands, format it as a Google Maps link, and send it via SMS using the Send_SMS function. Emergency call handling is also implemented, where the system monitors an SOS button, initiates a timer when pressed, and triggers an emergency call with location information if the button is held down for a predefined duration of five seconds. Sleep mode management ensures that the GSM module enters a low-power state when not actively communicating, conserving power for prolonged operation.Specific functions within the code perform crucial tasks, such as retrieving location information, sending SMS messages, indicating module readiness, and handling AT commands and responses. These functions work together seamlessly to provide location tracking, emergency communication, and power

management capabilities within an embedded system context, showcasing the versatility and efficiency of utilizing a GSM module like the A9G for such functionalities.









The given code is a function named Get_gmap_link that takes a boolean parameter makeCall. The function performs the following steps:

Flow of the code:

1. It sets a digital pin A9G_LOWP to LOW.

2. It introduces a delay of 1000 milliseconds.

3. It sends the command "AT+LOCATION = 2" to a Serial1 port and also prints the same command to the Serial port.

4. It enters a while loop that waits until data is available on the Serial1 port.

5. Inside the loop, it reads the available characters from the Serial1 port, concatenates them to the res string, and introduces a delay of 1 millisecond after each character read.

6. It extracts a substring of res from index 17 to 38 and assigns it to the response variable.

7. It prints the received data in lowercase characters to the Serial port.

8. It checks if the response contains the substring "GPS NOT". If it does, it prints "No Location data" to the Serial port, sets a custom message, and calls the Send_SMS function with the custom message.

9. If the response does not contain "GPS NOT", it extracts the latitude and longitude values from the response string and constructs a Google Maps link using these values.

Algorithm

1. Start

2. Set digital pin to LOW

3. Introduce a delay

4. Send AT command to Serial1

5. Print AT command to Serial

6. Wait for data on Serial1

7. Read data from Serial1

8. Extract substring from data

9. Print received data

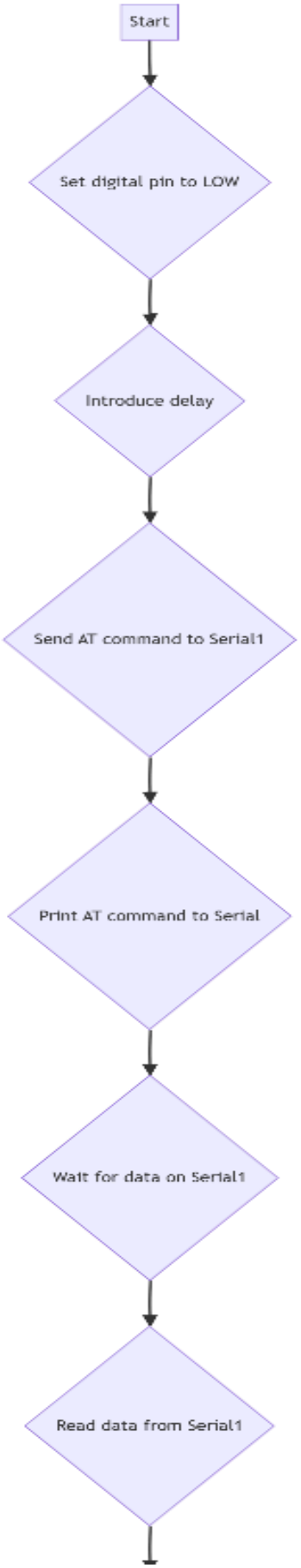
10. Check for "GPS NOT" in response

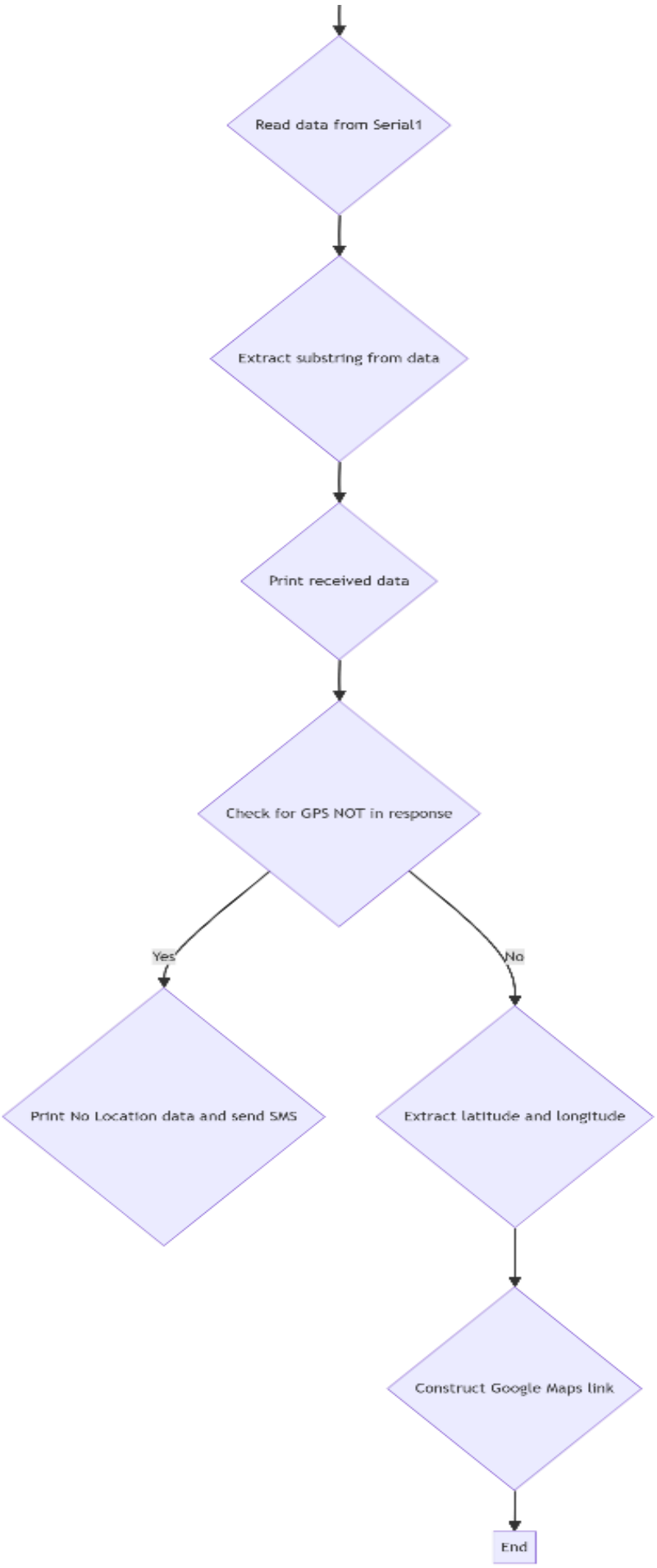
11. If "GPS NOT" is found, print "No Location data" and send SMS

12. If "GPS NOT" is not found, extract latitude and longitude

13. Construct Google Maps link

14. End


Start
Set digital pin to LOW
Introduce delay
Send AT command to Serial1
Print AT command to Serial
Wait for data on Serial1
Read data from Serial1


Read data from Serial1
Extract substring from data
Print received data
Check for GPS NOT in response
Yes
No
Print No Location data and send SMS
Extract latitude and longitude
Construct Google Maps link
End

7. Individual Contribution by members

21BCY10243 PRANEETH

In the development of the A9G board for a GPS tracking system with an SOS button, I played a critical role in its hardware design. I spearheaded the architecture of the A9G board, guaranteeing its seamless integration with the entire system's needs. This involved selecting and integrating suitable components, optimizing power usage for extended operation, and establishing communication protocols for reliable connectivity. Through meticulous attention to hardware specifications, I significantly improved the A9G board's reliability and efficiency. This laid the groundwork for a dependable GPS tracking system with a functional SOS button, ultimately contributing to the project's overall success.

21BCE10638 SARTHAK ATRE

On the Xiao C3 body remodelling and assembly project, Xiao's expertise shone through. He was responsible for the physical transformation and meticulous assembly of all the components. His skills in body remodelling ensured a perfect fit for each part, ultimately enhancing the Xiao C3's design and functionality. Xiao's careful assembly work guaranteed precision and efficiency, bringing the project together seamlessly. These combined efforts, from remodelling to precise assembly, played a key role in achieving the desired form and ensuring the Xiao C3 functioned flawlessly, significantly contributing to the project's success.

21BAS10020 LALITHA YENUGUDHATI

Xiao's proficiency was evident in the execution of the Xiao C3 body remodelling and assembly endeavour. I spearheaded the physical transformation process, meticulously piecing together each component. With my expertise in body remodelling, I ensured a flawless integration of all parts, elevating both the design and functionality of the Xiao C3. Xiao's precise assembly techniques not only guaranteed accuracy but also facilitated seamless cohesion throughout the project. The synergistic collaboration between remodelling and assembly, under Xiao's adept guidance, was pivotal in achieving the desired form and impeccable functionality of the Xiao C3, thus playing a crucial role in the project's triumphant completion.

21BCE11074 SOHAIL MOHAMMED

In the initialization and setup phase of the SOS button for the C++ GPS Tracker project, I intricately crafted and implemented a robust code architecture. I prioritized achieving seamless integration of the SOS button functionality through the establishment of precise communication protocols and fine-tuning event handling mechanisms. Furthermore, I implemented sophisticated error-checking mechanisms to fortify the reliability of the SOS button's setup. By meticulously addressing hardware dependencies and intricate software interactions, my coding contributions were geared towards fabricating a resilient and efficient SOS button system, thereby making a substantial impact on the overall success of the project.

21BCY10231 Prabhakar Reddy

I played a key role in integrating Google Maps into a GPS tracking system with an SOS button. This improved real-time location tracking for better accuracy. I also designed a streamlined emergency call feature to ensure swift communication during critical situations. By combining location data with the power of Google Maps, I created a user-friendly and comprehensive solution. This integration not

only allows for precise tracking but also empowers users to make emergency calls efficiently, significantly boosting the system's overall safety and responsiveness in urgent scenarios.

21BAI10379 KOLAVENNU HIMAJA

I played a crucial part in coding the SOS button functionality for the GPS tracking system project, specifically integrating the button press mechanism into the main loop. My focus was on ensuring efficient execution within the core functionality of the project. This contribution is vital, directly impacting the system's responsiveness in emergencies, enabling quick and reliable activation of the SOS feature. Working on the main loop enhances the overall reliability and effectiveness of the SOS button within the larger project framework.

21BCE10181 Manaswitha Reddy

In the process of the setup of the SOS button for the GPS tracking system, I prioritized user privacy. I implemented a C++ code-based solution that allows users to discreetly send SMS alerts without revealing their location. This feature empowers users to trigger emergency notifications while safeguarding their privacy. By focusing on secure communication, I ensured the SOS button offers both reliability and user privacy, becoming a valuable tool in critical situations.

21BAI10373 VATTEM REVANTH

In the GPS tracking system featuring an SOS button, I assumed a pivotal role in the implementation of a sophisticated feature designed to dispatch SMS messages embedding Google Maps hyperlinks delineating the user's precise geospatial coordinates. My coding endeavors in C++ were directed towards architecting a resilient and highly efficient mechanism for real-time location retrieval and dynamic Google Maps link generation. I meticulously orchestrated the seamless integration of this intricate functionality into the broader system architecture, thereby empowering users to effortlessly disseminate their exact locations during exigent circumstances. This innovative facet substantially elevates the project's technical acumen, furnishing a prompt and dependable conduit for users to articulate their geographical coordinates via SMS and thereby fortifying the overarching emergency response capabilities.

21BCE11680 EESHA PRANAV

In the SOS button and tracking system project, I played a key role in creating the flowchart. My primary focus was on designing an intuitive user interface for the SOS button application, ensuring its simplicity and effectiveness. I also took charge of implementing the location tracking system, integrating Google Maps API for accurate location information during emergencies. Additionally, I actively participated in identifying and resolving potential issues.

8. CONCLUSION

Conclusion: Bridging the Gap in Personal Safety with Software-Driven Design

This project investigated the development of a GPS tracker with an SOS button, focusing on the software architecture that would drive its functionality. By examining existing solutions, we identified a gap in seamlessly integrating real-time location tracking with emergency alert capabilities.

Our proposed software design addresses this gap by leveraging:

- **Real-time Location Tracking:** Continuous GPS data processing ensures accurate pinpointing of the user's location.
- **SOS-Triggered Emergency Alerts:** A dedicated button triggers a rapid response, transmitting location coordinates and a distress signal to pre-programmed contacts.

This software architecture has the potential to significantly enhance personal safety, particularly for vulnerable individuals like:

- **Outdoor Enthusiasts:** Venturing into remote locations with this tracker provides a safety net in case of emergencies.
- **Elderly Individuals:** The device offers peace of mind for caregivers and allows for quick assistance if needed.
- **Anyone in Unfamiliar Environments:** Whether traveling or exploring new areas, the tracker offers an extra layer of security.

Future Considerations:

While the current focus is on software design, additional development could involve:

- **Hardware Integration:** Implementing this software on suitable hardware would create a complete, functional device.
- **Communication Protocols:** Integration with existing communication protocols like cellular networks would enable seamless transmission of emergency alerts.
- **Emergency Response Systems:** Connecting with emergency response systems could expedite assistance upon receiving an SOS trigger.

In conclusion, this software design for a GPS tracker with SOS button showcases a promising approach to bridge the gap in personal safety solutions. Its potential to improve safety for various individuals paves the way for further development and real-world implementation. As the project progresses, aligning the software with suitable hardware and communication infrastructure can lead to a comprehensive safety device that empowers users and offers peace of mind to their loved ones.

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10.Biodata with Picture:

NAME: Mohammed Sohail Ahamed

REG ID: 21BCE11074

BRANCH: CSE [CORE] SCHOOL: SCSE

STATE: Andhra Pradesh NATIONALITY: Indian

EDUCATIONAL DETAILS: Bachelor of Technology (B. Tech) degree in Computer Science and Engineering (CSE) at VIT Bhopal University. CGPA-8.04.

Intermediate education - Gurusthan Junior College 2019 to 2021 Percentage – 86.3 in Andhra Pradesh State Board.

10th-grade education - Narayana High School, Andhra Pradesh during the academic year of 2018-2019, securing a 10/10 GPA [Andhra Pradesh state board].

My academic pursuits have provided me with a robust understanding of computer science and engineering, positioning me well for a prosperous professional journey in the field.

NAME: VATTEM REVANTH KUMAR

REG ID: 21BAI10373

BRANCH: CSE [AI & ML] SCHOOL: SCSE

STATE: Telangana; NATIONALITY: Indian

EDUCATIONAL DETAILS: I am currently pursuing my Bachelor of Technology (B. Tech) degree in Computer Science and Engineering (CSE) in AI & ML at VIT Bhopal University. My tenure began in 2021, and I have maintained a commendable CGPA of 8.30. Prior to my undergraduate studies, I completed my intermediate education at Prathibha Junior College from 2019 to 2021, achieving a remarkable percentage of 91.8 in Telangana State Board. Furthermore, I successfully completed my 10th-grade education at Lumbini High School

in Mahbubnagar during the academic year of 2018-2019, securing a 92 percent [SSC]. These educational experiences have equipped me with a strong foundation in computer science and engineering, preparing me for a successful career in the field.

NAME: SARTHAK SUNIL ATRE

REG ID: 21BCE10638

BRANCH: CSE [Core Branch] SCHOOL: SCSE

STATE: Maharashtra; NATIONALITY: Indian

EDUCATIONAL DETAILS: I am currently pursuing my Bachelor of Technology (B. Tech) degree in Computer Science and Engineering (CSE) at VIT Bhopal University, with my academic journey commencing in 2021. I have consistently maintained a commendable CGPA of 8.14. Prior to my undergraduate studies, I completed my intermediate education at Deogiri College Aurangabad, achieving 94.6%. In my 10th-grade education, I attended Cambridge School in the ICSE board.

My academic foundation in computer science and engineering has been strengthened through these diverse educational experiences. Currently enrolled at VIT Bhopal, I am gaining comprehensive knowledge and practical skills in the field, positioning myself for a successful career in the dynamic realm of computer science and engineering.

NAME: B. EESHA PRANAV

REG ID: 21BCE11680

BRANCH: CSE CORE SCHOOL: SCSE

STATE: Andhra Pradesh; NATIONALITY: Indian

EDUCATIONAL DETAILS: Bachelor of Technology (B. Tech) degree in Computer Science and Engineering (CSE) at VIT Bhopal University. CGPA - 7.98

Intermediate education - FIITJEE Junior College from 2019 to 2021

Percentage - 86 in Andhra Pradesh State Board.

10th-grade education - NSM school during the academic year of 2018-2019, securing a 85.5 percent [CBSE].

My academic endeavours have equipped me with a comprehensive grasp of computer science and engineering, preparing me effectively for a successful career path in the industry.

NAME: K. Sai. Praneeth ji

REG ID: 21BCY10243

BRANCH: CSE [Cybersecurity and Digital Forensics] SCHOOL: SCSE

STATE: Telangana; NATIONALITY: Indian

EDUCATIONAL DETAILS: Bachelor of Technology (B. Tech) degree in Computer Science and Engineering (CSE) in Cybersecurity and Digital Forensics at VIT Bhopal University. CGPA - 7.64

Intermediate education - Narayana Junior College from 2019 to 2021 Percentage - 90% in Telangana State Board.

10th-grade education - Narayana High School, Hyderabad during the academic year of 2018-2019, securing a 9.8 CGPA[SSC]

My academic pursuits have provided me with a robust understanding of computer science and engineering, positioning me well for a prosperous professional journey in the field.

NAME: D. PRABHAKAR REDDY

REG ID: 21BCY10231

BRANCH: CSE [Cybersecurity and Digital Forensics] SCHOOL: SCSE

STATE: Telangana NATIONALITY: Indian

EDUCATIONAL DETAILS: Bachelor of Technology (B. Tech) degree in Computer Science and Engineering (CSE) in Cybersecurity and Digital Forensics at VIT Bhopal University. CGPA - 7.95

Intermediate education - Sri Chaitanya Junior College from 2019 to 2021 Percentage - 92.4 in Telangana State Board.

10th-grade education - HILLSIDE SCHOOL, Hyderabad during the academic year of 2018-2019, securing a 79 percent [CBSE].

My academic endeavours have furnished me with a strong comprehension of computer science and engineering, so situating me for a fruitful career trajectory in the domain.

NAME: KASU MANASWITHA REDDY

REG ID: 21BCE10181

BRANCH: CSE [core] SCHOOL: SCSE

STATE: Telangana NATIONALITY: Indian

EDUCATIONAL DETAILS: Bachelor of Technology (B. Tech) degree in Computer Science and Engineering (CSE) in computer science and engineering at VIT Bhopal University.

Intermediate education - NARAYANA junior college from 2019 to 2021 Percentage - 98% in Telangana State Board.

10th-grade education - NARAYANA OLYMPIAD SCHOOL, Hyderabad during the academic year of 2018-2019, securing a 9.3 CGPA

I now have a strong foundation in computer science and engineering from my academic endeavours, which will help me on my path to a successful career in the area.

NAME: Sai Lalitha Yenugudhati

REG ID: 21BAS1020

BRANCH: MECHANICAL [Aerospace Engineering]

STATE: Telangana; NATIONALITY: Indian

EDUCATIONAL DETAILS: Bachelor of Technology (B. Tech) degree in Aerospace Engineering at VIT Bhopal University.

Intermediate education - FIITJEE Junior College from 2019 to 2021

My academic pursuits have provided me with a robust understanding of Aerospace Engineering, positioning me well for a prosperous professional journey in the field.

NAME: Kolavennu Himaja

REG ID: 21BAI10379

BRANCH: CSE AIML

SCHOOL: SCSE

STATE: Andhra Pradesh

NATIONALITY: Indian

EDUCATIONAL DETAILS: Bachelor of Technology (B. Tech) degree in Computer Science and Engineering (CSE) and specialization in artificial intelligence and machine learning at VIT Bhopal University.

Intermediate education – sri viswasanthi Junior College from 2019 to 2021

10th-grade education – sri viswasanthi school during the academic year of 2018-2019

My academic endeavours have equipped me with a comprehensive grasp of computer science and engineering, preparing me effectively for a successful career path in the industry.