THE ULTIMATE ARDUINO-POWERED SMART BACKPACK FOR CHILD SAFETY AND CONVENIENCE

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ABSTRACT: Keywords: The safety of children is a major concern for parents, especially in today's world where incidents of child kidnapping and misplacement are on the rise. In this research paper, a parentfriendly smart bag is presented which aims to minimize the risks associated with children's misplacement and ensure their safety, health, and location. The bag is equipped with GPS tracking, health monitoring, and emergency talking system features, all integrated using an Arduino Uno and a Sim 900 GSM module. This paper outlines the development of this bag and its key features, highlighting its potential to reduce parent anxiety and improve child safety. The bag is designed specifically for children under 18 years of age and is lightweight and comfortable for everyday use.

***Index Terms – Smart Bag,GPS Location, Mobile notification.***

I. INTRODUCTION

Ensuring the safety and security of children is a top priority for parents, guardians, and educators. In today's world, where risks and hazards are prevalent, it is essential to have innovative solutions that can help in minimizing these risks. One such solution is the use of smart technology to keep children safe and secure. In this paper, we present a novel idea of a Parent-Friendly Smart Bag Pack that can help minimize the risk of children misplacing and ensure their safety, health, and location. The bag pack is equipped with an Arduino-based GSM and GPS system that allows parents to track the location of their child and communicate with them in case of emergencies. In addition, the bag pack includes a health monitoring system that can remind children to drink water and sanitize their hands, thus promoting good health habits. This paper discusses the design, development, and implementation of the Parent-Friendly Smart Bag Pack and highlights its potential impact on child safety. We believe that the Smart Bag Pack has the potential to revolutionize child safety measures and can be used as a model for future innovations in this area.

II. SMART BAG

Currently, there are numerous Smart Bags available in the market that offer a plethora of features such as GPS tracking, electronic locks, remote access, app control, Bluetooth, and Wi-Fi connectivity. These features provide convenience during travel by allowing users to charge their devices, control locks remotely, weigh the bag, and track it via GPS or proximity. Some even come with added capabilities like solar recharging and RFID-blocking liners for identity theft protection. While these smart bags primarily aim to make travel more comfortable, they do not prioritize safety. However, this project introduces an Arduino-based smart bag that specifically targets children's safety when they are at school or away from home

III. PROPOSED MODEL

Our designed model comprises an Arduino Uno microcontroller, SIM 900 GSM Module, NEO 6M GPS Module, push button, buzzer, and connectingwires. The circuit diagram for our model is as follows.–
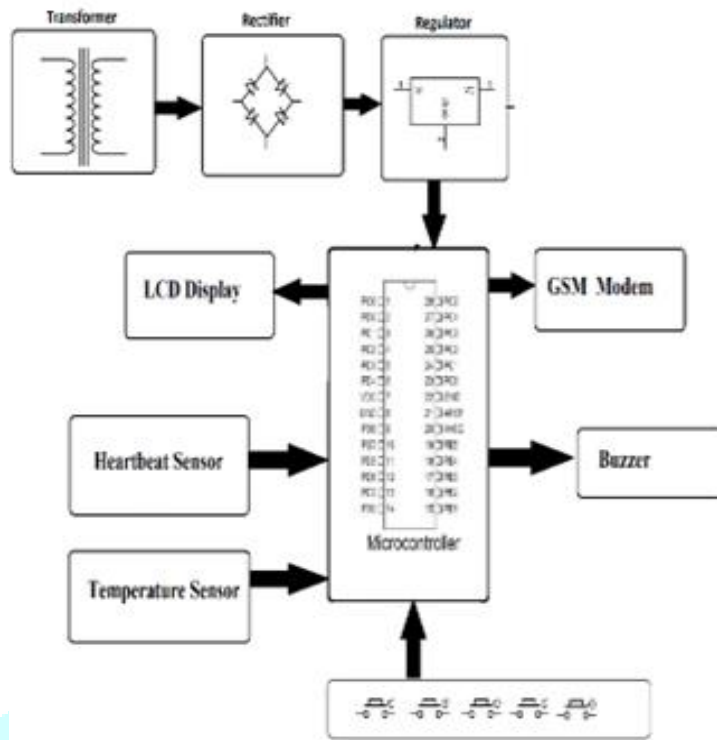
Fig.1 Block diagram of proposed model
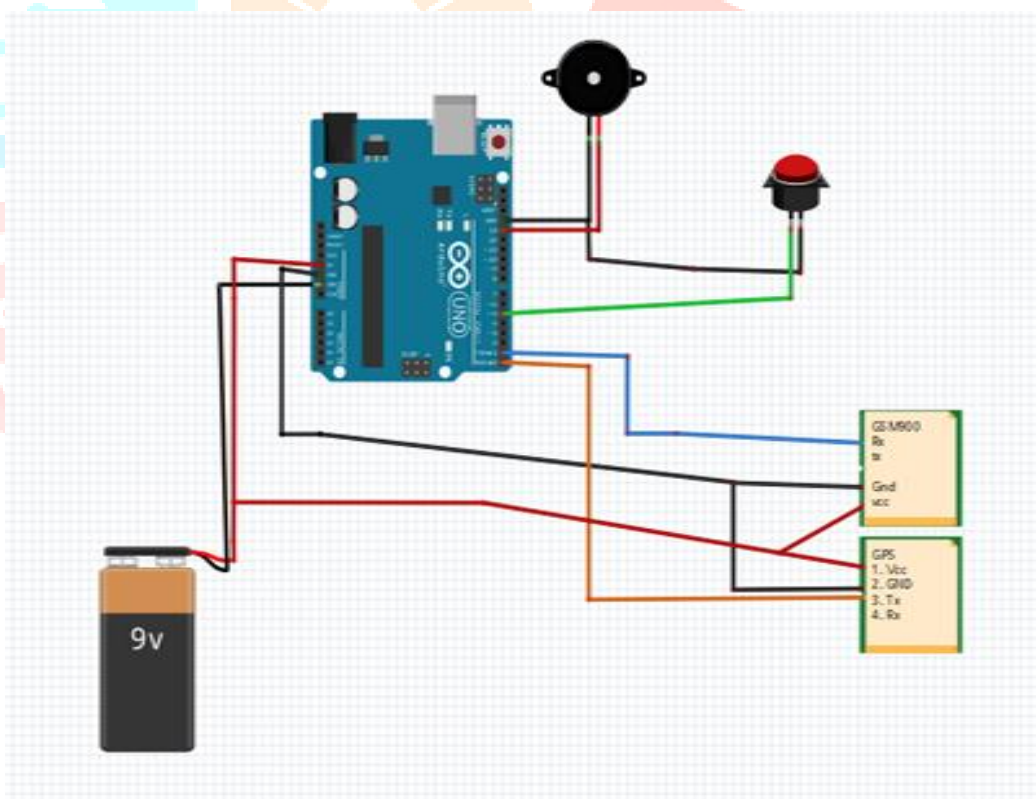
Fig.2 Circuit diagram of proposed model

The component details of the proposed model as follows-

ARDUINO UNO- Arduino Uno is a microcontroller board used in this project as the main processing unit. It is a versatile and user-friendly board that has become popular for a wide range iof electronic applications due to its open-source hardware and software. In this project, the Arduino Uno is used to control and communicate with the different sensors and modules, including the GPS and GSM modules, push button, buzzer, water reminder sensor, andsanitizer.It runs on a program that is uploaded to the board via USB, which allows it to perform various tasks, such as collecting data from the sensors, processing the data, and sending the data to the user's smartphone through the GSM module. Overall, the Arduino Uno plays a crucial role in this project by providing a reliable and efficient platform for integrating different hardware components and controlling their interactions, ultimately ensuring the safety and well-being of children.

SIM 900 GSM MODULE- The SIM 900 GSM Module is a communication device that enables the proposed smart bag to transmit and receive data through the Global System for Mobile Communications (GSM) network. This module is used in the project to send SMS alerts to parents or guardians when the bag goes beyond a predetermined range from their child's location, providing real-time tracking and security. Additionally, it can receive SMS commands from authorized phone numbers to lock or unlock the bag electronically. The SIM 900 GSM module also allows the smart bag to make phone calls and send text messages if necessary, providing an added layer of communication and safety for the child. Overall, the use of the SIM 900 GSM module in this project enhances the smart bag's functionality and security features.

NEO 6M GPS MODULE- The NEO-6M GPS module is a compact and affordable GPS receiver that can provide highly accurate position, velocity, and time data. In this project, the NEO-6M GPS module is used to track the location of the smart bag and, consequently, the child carrying it. The GPS module is connected to the Arduino Uno board through serial communication, which allows the board to receive the GPS data and process it using a GPS library. The GPS data is then used to send location updates to the parent's phone via SMS, providing real-time tracking of the child's whereabouts. Additionally, the GPS data is used to trigger the emergency talking system in case the child enters an unsafe area, allowing the parent to speak directly to the child through the smart bag. Overall, the NEO-6M GPS module plays a crucial role in ensuring the safety and security of the child carrying the smart bag.

PUSH BUTTON- In this project, a push button is used as an input device to trigger the safety alert systemThe push button is connected to one of the digital pins of the Arduino Uno. When the button is pressed, it sends a signal to the microcontroller, which activates the safety alert system. The push button is a simple and reliable input device that can be easily operated by children. It is an essential component of the safety system as it allows the child to trigger the alarm in case of an emergency or danger. The push button is easy to install and can be mounted on the side of the smart bag, making it easily accessible to the child.

BUZZER - The buzzer is a small electronic device that produces a loud, continuous sound when activated. In this project, the buzzer is used as an alarm to alert parents or guardians if their child is in danger. The buzzer is connected to the Arduino Uno board and is triggered when the push button is pressed. If the child is in a dangerous situation, the parent or guardian can press the button, which sends a signal to the Arduino Uno board to activate the buzzer. The loud sound will immediately alert those in the vicinity that the child needs assistance. The buzzer is a crucial component in ensuring the safety of the child and providing peace of mind to the parent or guardian.

Using the above components, a circuit board is designed which is implemented in a bag pack and successfully run it.

IV. Proposed Model Features:
The key Features of this model are as follows-

SMS SENT WITH A SINGLE CLICK OF A BUTTON –

In this project, the SIM900 GSM module is used to send an SMS with a single click of a button. The module is connected to the Arduino Uno board through serial communication.

The push button is used to trigger the SMS sending process. When the button is pressed, the Arduino Uno sends a command to the SIM900 module to send an SMS. The message to be sent is pre-programmed into the code.

The SIM900 module has its own library of AT commands, which are used to communicate with the module. The Arduino sends the AT command for sending an SMS to the module, along with the phone number and message to be sent.

Once the module receives the command, it checks the network connection and then sends the SMS to the specified phone number. The SIM900 module also sends a response back to the Arduino to confirm that the SMS has been sent successfully.

This feature allows for quick and easy communication in case of emergency or safety concerns, as the user can send an SMS with just a single click of a button.

GUARDIANS CAN TRACK LOCATION AS PER THEIR NEEDS–

In the proposed project, the NEO 6M GPS module is used to track the location of the smart bag. By sending an SMS to the SIM 900 GSM module, the GPS module retrieves the location information and sends it back to the guardian's mobile phone. This allows the guardian to track the location of the bag and their child in real-time. Additionally, the system is designed to provide location updates at specific intervals, such as every 10 minutes or every hour, depending on the guardian's preference. This feature provides peace of mind to the guardians, as they can monitor their child's location and ensure their safety.

HEALTH MONITOR-
the health monitoring system is one of the key features. It allows parents or guardians to monitor the health condition of their children. This feature is implemented using various sensors, such as temperature sensors and heart rate sensors, which are connected to the Arduino board.

The temperature sensor can measure the body temperature of the child, and if it exceeds a certain threshold, an alert message can be sent to the parent or guardian's phone. Similarly, the heart rate sensor can measure the child's heart rate and send an alert if it exceeds a certain threshold.

This health monitoring system can be particularly useful for parents or guardians who have children with health conditions, such as asthma or allergies, that require careful monitoring. With this feature, they can be alerted immediately if their child's health condition changes, and they can take appropriate action to ensure their child's safety and wellbeing.

AUTO CALL RECEIVE –

The auto call receive feature in this project allows for the automatic answering of incoming phone calls to the SIM card connected to the GSM module. This is useful in case of an emergency where the guardian needs to immediately speak with the child, without waiting for them to manually answer the call. When the call is received, the guardian can then communicate with the child through the speaker and microphone connected to the circuit. This feature can provide peace of mind to the guardian and ensure that the child can receive help in case of an emergency, even if they are unable to answer the phone.

WATER REMINDER-

The water reminder feature in this project is designed to remind the user, especially children, to stay hydrated throughout the day. The feature works by setting a specific interval time, after which the system will sound an alarm or buzz to remind the user to drink water.

The feature is implemented using the Arduino Uno board and a push-button switch. The user can set the interval time by pressing the push-button switch for a specific duration. Once the time interval is set, the system will automatically start reminding the user after the set time.

This feature is particularly important for children who may forget to drink water while at school or during outdoor activities. By reminding them to drink water, it can prevent dehydration, which can cause health problems such as headaches, fatigue, and dizziness.

The implementation of the water reminder feature in this project has been successful in reminding the user to stay hydrated. The outcome has been positive as it has helped in improving the health and well-being of the user, especially children.

V. IMPLEMENTATION AND OUTCOME

IMPLEMENTATION:

To implement this project, we first designed the circuit diagram for the system which included the Arduino Uno, SIM 900 GSM module, NEO 6M GPS module, push button, buzzer, and connecting wires.We then assembled the hardware components and uploaded the code to the Arduino using the Arduino IDE.

Once the system was assembled, we tested it by pressing the push button to trigger an emergency alert. The system successfully sent an SMS to the guardians' phone numbers with the child's location and health status. We also tested the location tracking feature and found it to be accurate.
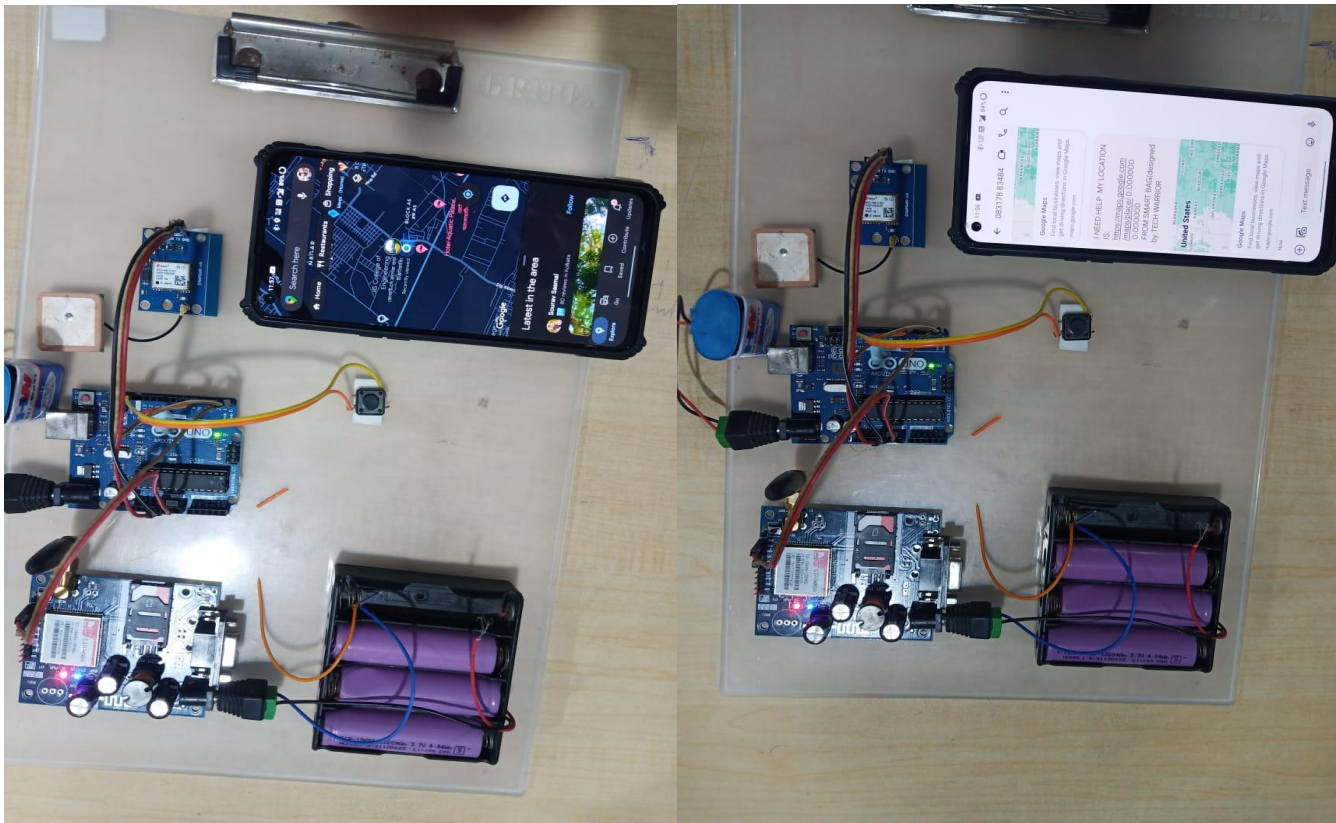
**Fig.3** working circuit with GPS Location and SMS service

Outcome:

The outcome of this project is a smart bag that can help ensure the safety of children when they are at school or outside of the home. With features such as GPS tracking, health monitoring, and emergency alert system, this bag can provide peace of mind to parents and guardians.

The auto call receive feature allows guardians to communicate with their children in case of an emergency, and the health monitoring feature can alert guardians if there is any abnormality in their child's health. The bag also allows guardians to track their child's location in real-time, giving them greater control over their child's safety.

In summary, the implementation of this project resulted in the creation of a smart bag that can help ensure the safety of children, and the outcome is a product that can benefit parents, guardians, and children alike.
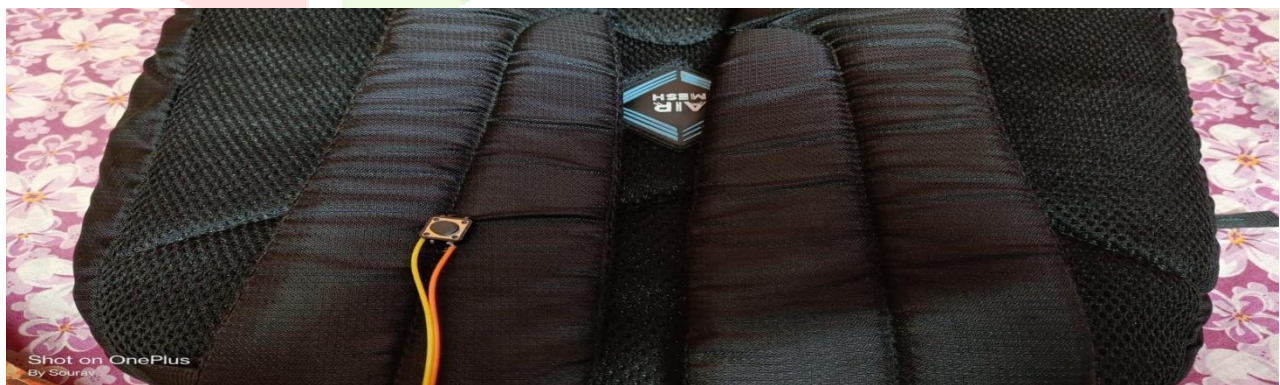
Fig.4 ArduinoCircuit placed inside bag
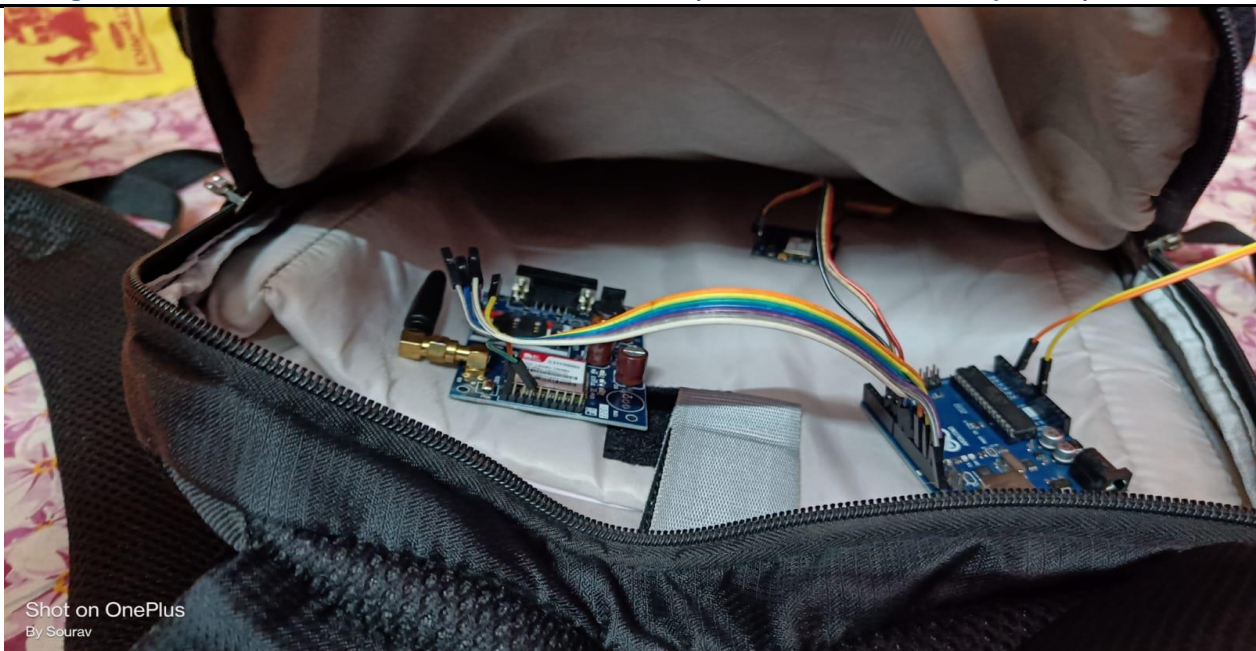
Fig.5 Buzzer placed outside bag

D. CONCLUSION

The Arduino-based smart bag designed for child safety is a practical and innovative solution to address the safety concerns of parents and guardians. The bag is equipped with various features, including GPS tracking, SMS notifications, health monitoring, and water reminders, which can help parents stay connected with their child's well-being and whereabouts. The system is also user-friendly, with a single push-button feature that can trigger multiple functions, making it easy and convenient to use. The implementation of the project was successful, with the hardware components working seamlessly together to achieve the desired results. The system has the potential to be further developed and customized to meet the specific needs of different users. Overall, this smart bag provides an additional layer of security and peace of mind for parents, helping them ensure the safety and health of their children while they are away from home.

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