



## **Arduino Uno Based Child Tracking System Using GPS and GSM**

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### **Abstract**

Wearable tracking gadget that school-age children can wear is the topic of this paper. It doesn't need any pricy technology to operate. This technology is usable by persons of all educational levels. It has got two buttons one is alert button and another is panic button The major objective of this gadget is to ensure that the youngster may contact their parents in an emergency. The alert button allows the child to notify their parents of an emergency and provide their current location. For communication, the current technology includes Bluetooth, WI-FI, and RFID. It is hard to communicate across a great distance with these technologies because they only have a narrow range of coverage. Also they are not that accurate. This device solves the issue by utilizing GSM technology. Parents do not need to submit any special code to the device to determine the child's location's latitude and longitude. If a child is in any emergency situation and wants his/her parents to know their current exact location. If a child feels uneasy, there are two methods to let the parents know. The cell phone of the parents or guardian receives the alarm message via SMS by pressing alert button and if the child wants to communicate to parents immediately, a call can also be made via this device using the panic button and the child can talk to the parent in real time.



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### **Keywords**

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Microcontroller;  
School Going Children.

### **Introduction**

This device is basically an embedded system prototype of the wearable device we plan to introduce. A device or system that has distinct functionalities integrated into it and real-time computation is called an embedded system. It consists of both hardware

and software. Embedded systems are crucial for the development of new technologies. Many industries, including the defense industry, the automotive industry, the medical equipment industry, and other commercial applications, particularly in automation, can employ the combination of hardware and

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software. The fact that kids are more vulnerable and kidnapping and missing children are a common occurrence is one of the motivations for this wearable device. These incidents increase when we talk about school going children. As a result, the child can also send a message to their parents if they are missed in a crowd or lose their way home. Two different push buttons are used for sending SMS and CALL at the parent's mobile phone.

The system's device is small and compact, which is another improvement. This gadget can be created in a wearable form, such as a bracelet or watch, so that kids can use it effectively.

There are two modules in this system. The initial one involves the parents. It is basically a mobile phone for receiving calls and messages. The rest of the device is contained in the second module, which is the kid module. It includes a microcontroller, emergency keys, GPS, GSM, and a power source. Consequently, the primary goal of this paper is to assist parents in finding or rescuing their children when they are in trouble.

### Literature Review

- To track and find children, numerous systems have been suggested.
- Certain systems require child to carry a mobile phone.<sup>2</sup>
- Some of them require designing of two different hardware modules.<sup>3</sup>
- Some use Bluetooth technology for communication.<sup>1</sup>
- Some use RFID to locate the child.<sup>4</sup>
- Most of the proposed child modules are larger in size and have numerous modules.<sup>4</sup>
- Smart Watches with internet connectivity or photo gallery facility in it are prohibited in classes and exam hall that's why our system will not require internet connectivity and does not have camera attached, to avoid this situation.

As mentioned in above point we found some promising techniques for tracking child's location but there were some issues in these systems.

In a research paper published in 2018, the author mentioned a system where they designed two different hardware modules one for the child and other for parent. Also in a research paper published in 2013 it is required for child to carry a smart phone for tracking location ,a school going child can surely not carry ta smart phone with them. These are some issues we intend to resolve in this paper.

### Material and methods

Proposed system can be largely classified into three subsystems. The first one is the Arduino UNO R3 microcontroller system. It is the central unit of our device. To construct the suggested system, this Arduino Uno is interfaced with the GPS and GSM modules.

### Components

#### Arduino UNO

Essentially a circuit board, Arduino uno is used to create electronics projects involving some coding.

The microcontroller based on the ATmega328P, Arduino UNO contains 16 mhz ceramic resonator, six analogue inputs , a USB port, an icsp header, a reset button , and a power jack. Additionally, it also contains 14 digital input and output pins, of which six are output pins for PWM. Everything required to support the microcontroller is included. To begin, all we need to do is utilise a USB cable to link it to a computer, and Use a battery or an AC-to-DC adaptor to power it.

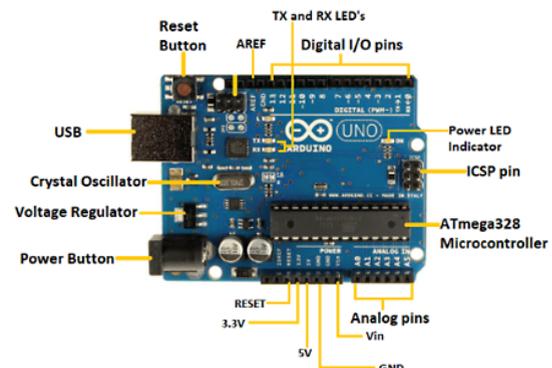


Fig. 1: Arduino UNO R3

**Neo 6M GPS module**

The usage of the Global Positioning System is the most accurate and fastest method of determining your location.



**Fig. 2: Neo 6M GPS Module**

A built-in EEPROM and an antenna are included in the Neo 6M GPS module.

Interface: TTL RS232

3V-5V Power Supply

Standard baudrate is 9600 bps.

Use standard NMEA sentences.

**SIM900A GSM Module**

The module offers GPRS/GSM technology for use in mobile sim-based communication. Mobile telephony and SMS transmission and reception employ the 900 MHz and 1800 MHz frequency bands, respectively.



**Fig. 3: SIM900A GSM Module**

**Methodology**

Here, we are developing a tool that can be worn as a wearable to track a student's position in real time. Also it should allow children to make contact with their parents in a situation of need. Therefore to achieve both these operations we are going to follow these few steps

- Interface Neo 6m Module with Arduino UNO.
- Interface Gsm SIM900A module with Arduino UNO.
- Once both these components are interfaced successfully with our microcontroller unit we can now programme our arduino uno for doing the task it is to perform.
- Once the code is compiled successfully on Arduino IDE we upload it on our arduino.
- We have also provided a microphone which is interfaced to SIM900A GSM module for transmission of voice of child during the call.

The device is to be provided with two push buttons ,one for sending sms to the registered mobile no.(parents number) other one is for calling parent in case the child wants to talk to their parents.

Using the Neo 6M Gps module, our primary objective is to continuously obtain the device's location (latitude and longitude) and send it to Arduino whenever it requests it.

Whenever the push button for sms in toggled the latitude and longitude are fed to the arduino .The arduino converts them into a google map's link and transmits a message to the registered no. saying "I NEED HELP" with this google link containing the location of the device.

GSM SIM900A module is used to transmit this message from the device to the parent's mobile as well as to make calls from the child's device.

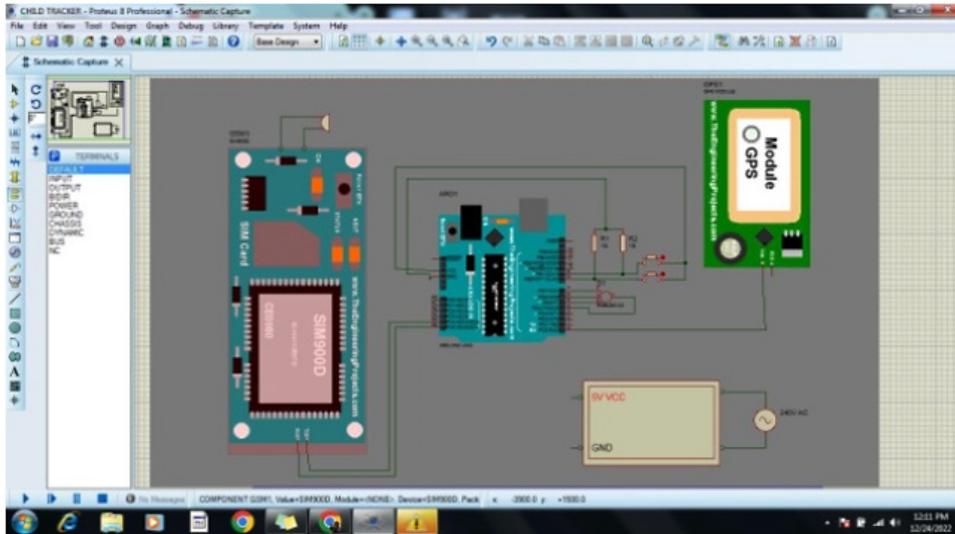
A LED is also interfaced with arduino as indicator to identify whether it is call which is being made or is it sms.When a call is made it turns red and when an SMS is sent it turns green.

**Improvisations**

- Existing commercial systems use technologies such as bluetooth and wifi for communication, these technologies have limited range of communication. therefore we used GSM

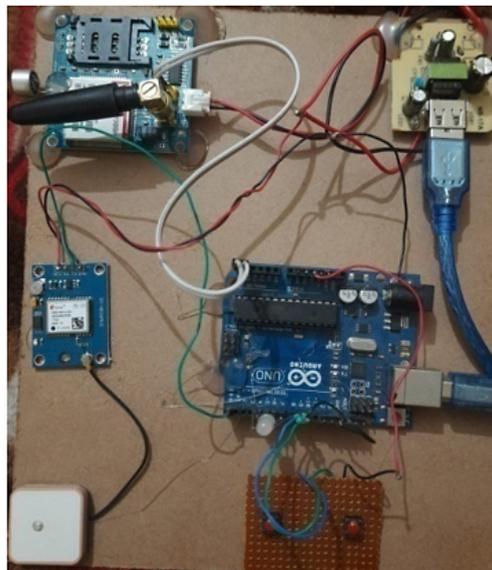
- technology for communication.
- Existing systems have child module bigger in size and required to be carried by the child therefore, we proposed wearable device which is small in size.
- No existing system have real time calling facility, but this system provides calling facility on one mobile no. (parent's mobile no.)
- Proposed system does not require any internet connectivity and also does not have any camera attached so as to make sure that the child is allowed to carry the device (e.g in form of wrist band) in class as well as in exam hall.

**Circuit Diagram**



**Fig. 4: Circuit diagram of proposed system**

**Working Model**



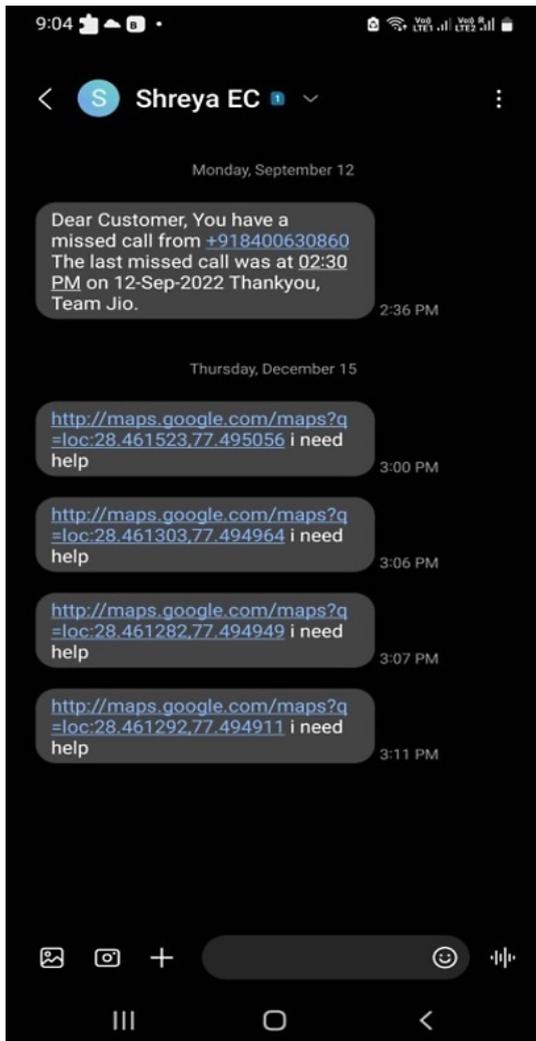
**Fig. 5: Hardware prototype of Child Module in proposed system**

**Results and Discussion**

The proposed model has two responses

**Case 1**

When the button for sending SMS is triggered, A SMS is sent to the pre registered mobile no. in the device i.e parents mobile number. This SMS contains a google map's link for the location of the device with a message "I need Help".

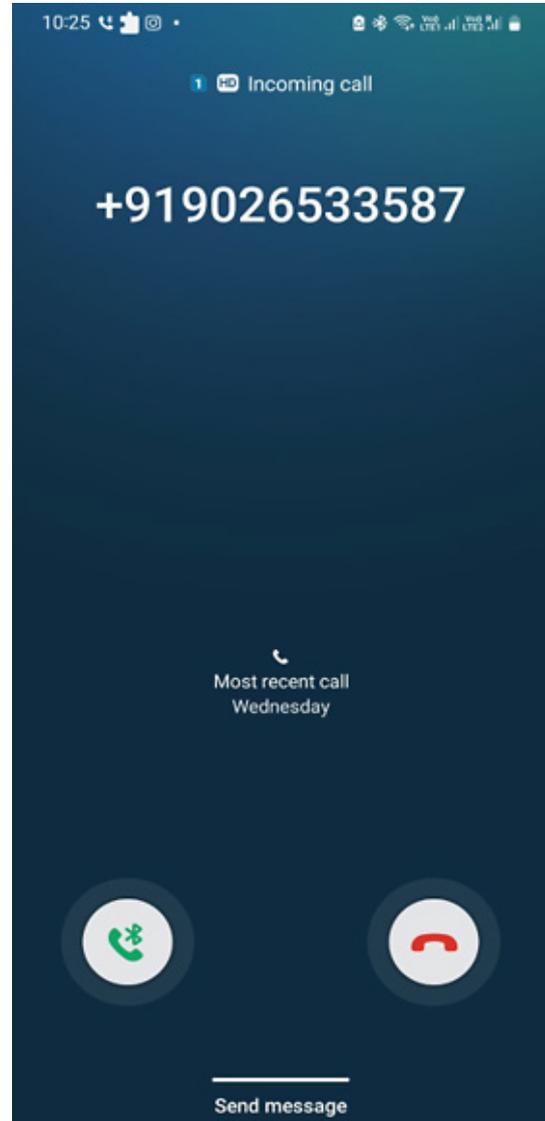


**Fig. 6: Message with location link**

**Case 2**

When the button for making a call is triggered a call is sent to the pre registered mobile no. in the device i.e the parent's mobile number. The parent can receive the call and hear what the child has to

say. The microphone interfaced to the GSM module facilitates the transmission of voice of the child.



**Fig. 7: Calling via child module**

**Applications**

- Whenever the child misses his/her bus back from school and is getting late. Then they can inform their parents by calling them.
- When the child is in any situation when he/she does not feel safe they can send the text as well as call their parents to let them know their location.
- If any mishappening takes place with the child like kidnapping the child can send his

her location to their parents and also can call parents to let them know about the situation.

These are a few of many possible applications this device can serve for a child.

### Future Scope

This research is about a Smart IoT device for children safety and tracking helping the parents to locate their children when they are in danger. The future scope of the project is to implement the IoT device which ensures the complete solution for child safety problems. To convert it into a wearable watch or wristband etc.

### Conclusion

We have reviewed all the existing technologies for child tracking systems and come up with this system with following improvements

- It has a vast range of communication due to SMS and calling using GSM technology.
- It is compact in size and so as to make it easily portable.

- It has a calling facility which is not provided in any child tracking device.

Using a microphone the child can talk to their parents whenever they are in a situation where they want to contact their parents.

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### Conflict of Interest

The authors declare that there is no conflict of interests regarding publication of this article.

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