
Microcontroller-Based Emergency Request Assistance Alert System Using GSM and GPS Modules

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Abstract: *The microcontroller-based emergency assistance alert system is a device that is constructed using an Arduino microcontroller, GPS Modules, GSM modules, and three buttons (buttons A, B, & C) to help a person that is in need of assistance to request for help by sending an SMS message containing the longitude and the latitude of the position of the sender and the type of assistant needed by the sender to a designated phone number recipient. If the assistant needed is a medical assistant, the person will press button A, button B is for rescue requests in the hand of kidnappers, and button C is to seek assistance from the fire service in case of a fire outbreak. GPS Module is responsible for measuring and taking the longitude and latitude of the position of the sender while GSM Module which has a SIM Card slot is to enable the sender to send an SMS message to a designated recipient.*

Keywords: *GSM Module, GPS module, Arduino Microcontroller*

1.0 INTRODUCTION

Requesting assistance is becoming more difficult in Nigeria especially now that the rate of kidnapping is increasing, and people are dying at home due to sickness (especially if there is no person closer to render assistance). And also people lose huge assets due to fire outbreaks, especially if the attention of fire service workers is not alerted on time. In order to overcome the risk of dying at home alone due to sickness, losing property due fire outbreak, and providing rescue to a person from kidnappers, a microcontroller-based emergency assistance alert system using GSM and GPS modules is proposed which works with the help of GSM and GPS modules, interfaced on the Arduino Microcontroller. The proposed device consists of three buttons {Button A (Rescue assistance from kidnappers is needed at), Button B (Medical attention is needed at), and Button C (Fire services workers' attention is needed at)}. An SMS message is sent to a designated Phone Number containing the longitude and latitude of the location of where the device, together with the Google maps in the SMS.

Application of tracking systems is becoming more important especially now that the rate of kidnapping is increasing, calling and describing the location of where a fire accident occurs to get the attention of fire services is becoming difficult and the rate of incidence of dying at home alone due to sickness is also increasing. So any device that will assist a

person to call the attention of helpers is a welcome idea. A small device is used to enable a person to seek emergency assistance by pressing a button on the device so that a message containing the information of his/her location (longitude and latitude), and types of assistance needed together with Google map will be sent to a designated phone number. The recipient of the message will then use Google Maps to track the location of the person to bring the needed assistance. The system will start once any button is pressed, the longitude and latitude of the location of the affected person are calculated and generated automatically by the GPS Modules and the microcontroller will then send out the longitude and latitude as an SMS Message to the designated phone number via GSM Modules. Nowadays, GPS plays some vital roles in providing a variety of applications, ranging from travel to mobile enterprise, and disaster response. GPS comprises a sequence of 24 satellites arranged in 6 characteristic 12-hour operational patterns, such that no less than five are in focus from each position in the world (GPS overview). Short Messaging Service (SMS) is a free functional application present on all mobile phones that allows the transmission of limited content of messages from one client to another (SMS Definition). The SMS feature is possible by using the GSM module which receives information from the GPS module.

2.0 REVIEW OF RELATED WORK

There are numerous works on tracking systems that provide the location of the children or any preferred object. In all these works, it is very difficult to monitor children and also track them. These works are limited to a certain range only. They are less secure. Most of these works explain the designing of the system by using an ARM7 microcontroller (Cassandra,2018) (Saranya and Selvakumar,2013) (Shahada and Hreiji,2019)(Arduino IDE).

3.0 METHODOLOGY

The methodology that will be adopted is the use of an Atmega328 microcontroller, GPS Modules, GSM Modules, three buttons, LCD resistors, capacitors, and connecting wires.

GPS Module (NEO-6MV2 is expected to be use because is very small in size(1.5"x1.0")):

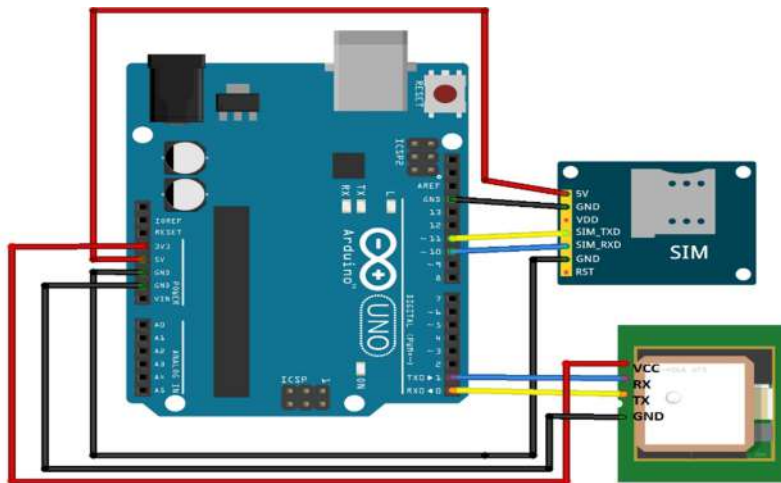


GPS stands for **Global Positioning System** and is used to detect the Latitude and Longitude of any location on the Earth, with exact UTC time (Universal Time Coordinated). This device receives the coordinates from the satellite for each and every second, with time and date. GPS offers great accuracy and also provides other data besides position coordinates.

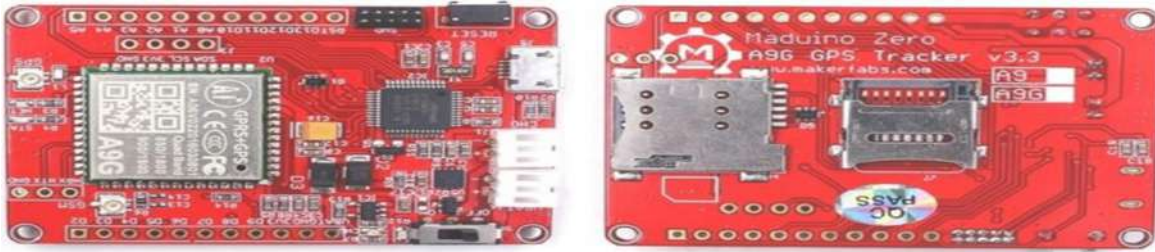
GSM Modules (GSM 8001 Module will be used because is also very small in size and will take micro SIM:



We connected the circuits containing the GSM and GPS Module to the Arduino as shown below.



Or we can use a single board where all three (microcontroller, GPS, and GSM Module) are on a single board. The board is called Maduino Zero A9G GPRS/GPS Board. This is a low-power A9G GSM+GPS+GPRS Module integrated with 32-bit Atmel's SAMD21 Microcontroller as shown below.

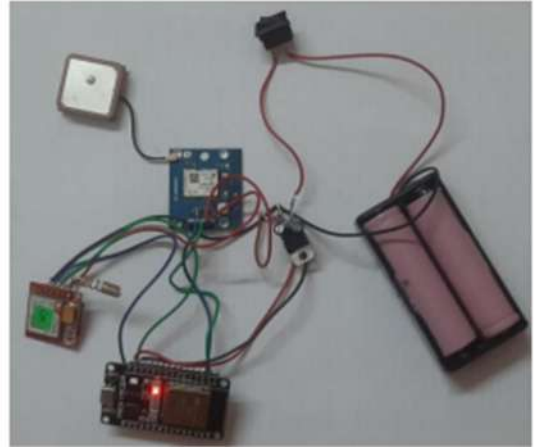
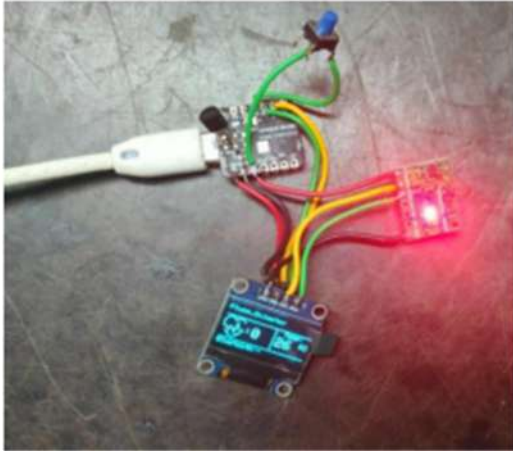


The module can be programmed via a micro USB Port and can be powered via 3.7V Lithium-Ion Battery. It has a switch to turn it ON & OFF. The digital Input-Output pins are there which can be used to connect any other modules or sensors. Arduino has an 8-bit controller but it has a 32-bit Atmel [ATSAMD21G18](#) controller, which makes the device super-fast. It has a voltage regulator IC to control the excess voltage. Similarly, there are two antennas, one is the GSM Antenna & the other is the GPS Antenna. The signal problem is not seen in this module because of its best design. You can insert a micro SIM here. Remember this is a 2G Modem only, so only 2G SIM can be used according to the frequency band. It also has a Micro-SD Port. You can also use an SD Card to save the data in text format.

The board doesn't need any external DC Jack or higher power supply. It can be powered using a 3.7V, 100mah Lithium-Ion Battery. There are two battery ports in the module, one port is for the Battery charging and the other for the Battery power supply. Once the battery is connected, you can slide the switch to turn on the device. Two LEDs are there which indicated the status of the power

4.0 RESULTS

To determine the effectiveness of the whole system, the location of a person requesting assistance either in an unsafe situation by using this Emergency Security Device (button B), needs the medical attention of Medical personnel (button A), or fire outbreak (button C). We obtained the results as expected since the system was built as expected according to plan. After the Push button switch is pressed, the entire system will be activated. Then immediately the SMS will be sent to the predefined mobile numbers with a location in the form of latitude and longitude.



CONCLUSION

All the components are tested and are working perfectly according to the specification.

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