

Using GPS and GSM Module to track location

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IC201-P (Design Practicum)

ABSTRACT

This system is the combination of the Global Positioning System (GPS) and the Global System Mobile communication (GSM) technologies via the microcontroller. It is used to detect the GPS location of a person, vehicle, or any objects which are attached to a tracking device. This system will be used by combining a smartphone with an Arduino UNO.

The GPS is a satellite-based navigation technology that provides accurate location and information. The GSM module is used to transmit and receive an update from the object location to a database.

Brief working of the system:

Data from the numerous satellites are received by GPS receivers in the NMEA protocol form. The system SMS contains latitude and longitude of the location of the object. The NMEA code consists of a combination of information. Arduino is linked to the GPS and the GSM module in the serial connection. The GPS receiver sends data to Arduino. Then, Arduino instructs the GSM module to send the location data to the GSM enable device in a short message form. Thus, by using the tracking system, it is easy to calculate and get the estimated location and time required to reach a given destination.

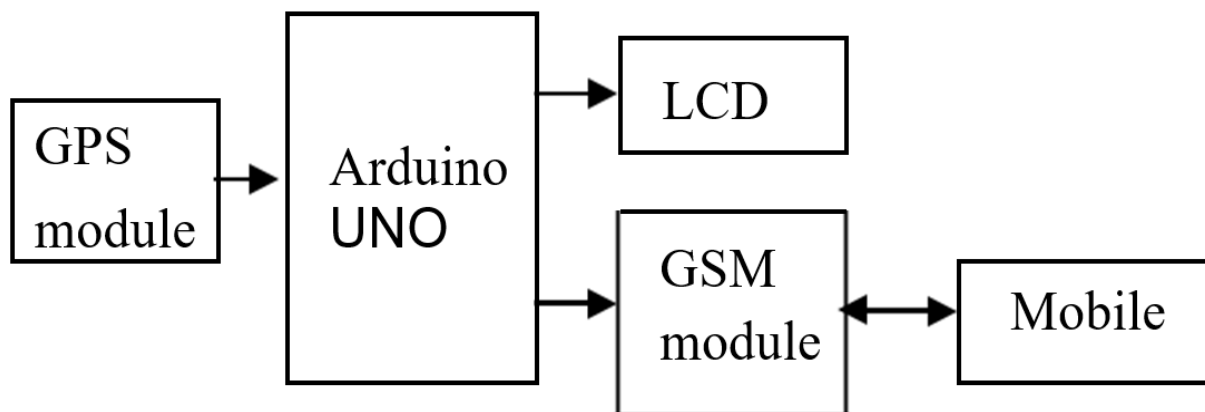


Figure 1. Block diagram of GPS and GSM based tracking system

1. INTRODUCTION

In this project, we will be using Arduino Uno training board, GPS receiver, and GSM SIM800L with ESP32 Node MCU Wireless Communication module are used as major hardware and basic C programming language is used for hardware description language to build a small digital circuit.

First, the sketch is uploaded into the Arduino programmable microcontroller board. After that GPS receiver tracks the satellite data and sends the Arduino Uno. And then, Arduino sends its data to the GSM module to the SIM card number recommended by the user. Under these circumstances, one can know the location where the person or vehicle has arrived as the short message from in the specified android mobile phone.

GPS Module:

GPS module consists of U-Blox NEO 6M module and a GPS antenna. The NEO-6 module series is a family of stand-alone GPS receivers featuring the high-performance U-Blox 6 positioning engine. The I2C compatible Display Data Channel (DDC) interface can be used either to access external devices with serial interface EEPROM or to interface with a host CPU. Its maximum bandwidth is 100kbit/s. NEO-6 modules are designed for use with passive and active antennas. The minimum gain and maximum gain are 15dB and 50 dB respectively and the maximum noise figure is 1.5dB. GPS receivers use a constellation of satellites and ground stations to compute position and time almost anywhere on earth. The positions of the satellites are constructed in a way that the sky above your location will always contain at most 12 satellites. The primary purpose of the 12 visible satellites is to transmit information back to earth over radio frequency (ranging from 1.1 to 1.5 GHz). With this information and some math, an abased receiver or GPS module can calculate its position and time.

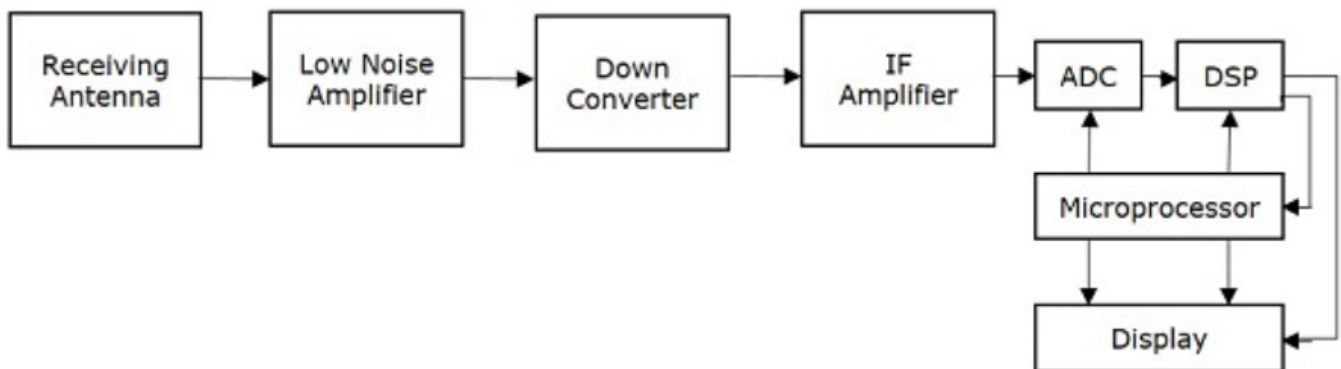


Figure 2. Block diagram of working of the GPS Module

EXPERIMENTAL SKETCH

2.1 Sketch of the GPS and GSM module

- By using software serial library and liquid crystal library, the sketch is written Arduino C language. Serial data transfer rate is specified as 96000baud. Without using GPS library and GSM library, GPS format and AT commands are used, respectively.
- Then, a connection of LCD is defined and the second counter is also prepared for time elapsed for GPS satellite searching time.
- According to the NMEA data string, the raw data from satellites contains the position, local time, and speed of the object. Among them, position data and local time and date are collected by GPS shield and send to Arduino to do the process of data expression on LCD.
- The prescriber's android phone number is already mentioned in the sketch including with secret code. When the coded message is sent to the GSM module, it is checked and confirmed whether the code and phone number are matched or not. If these are identical, the GPS location data are sent to the predetermined phone which is sent the message code.
- The conditions and configurations of GPS and GSM are displayed on the LCD from time to time. Data can be refreshed at the desired time interval.

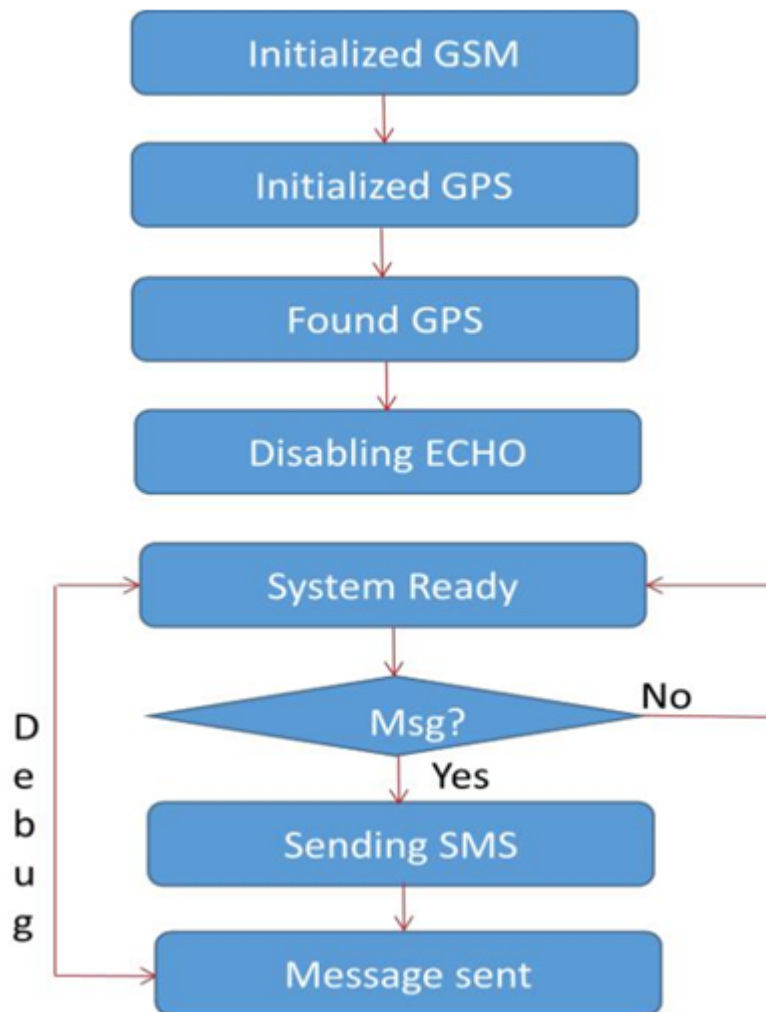
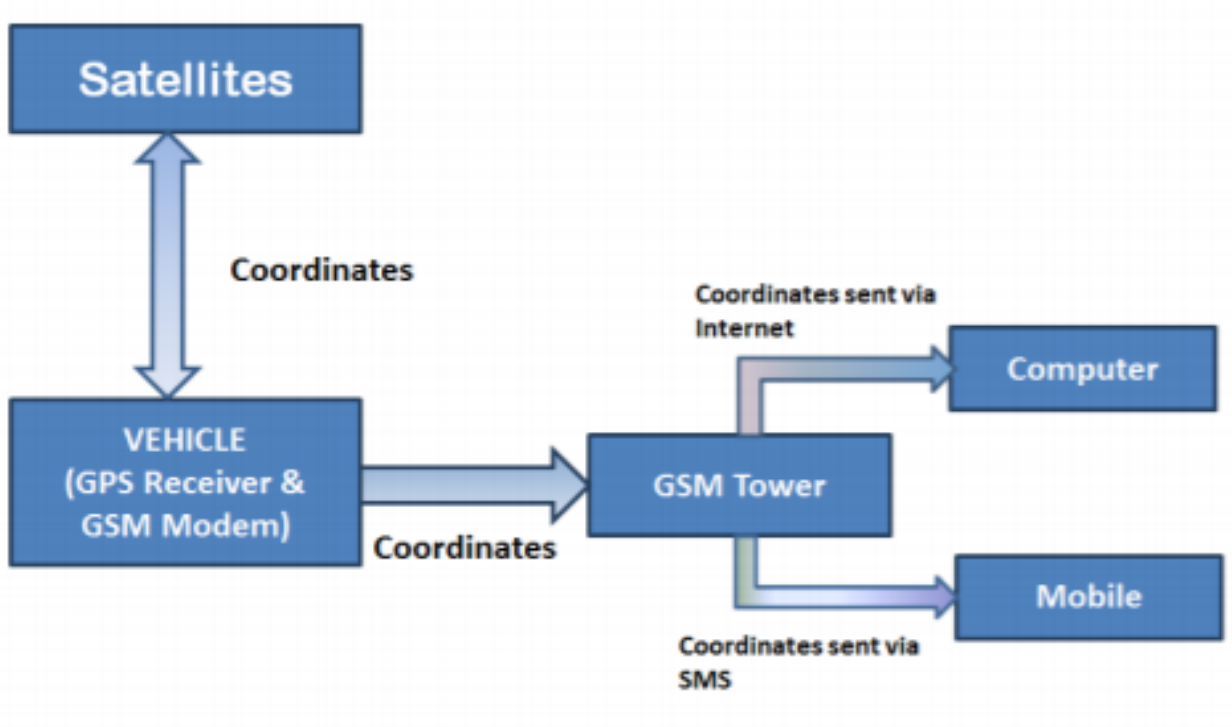


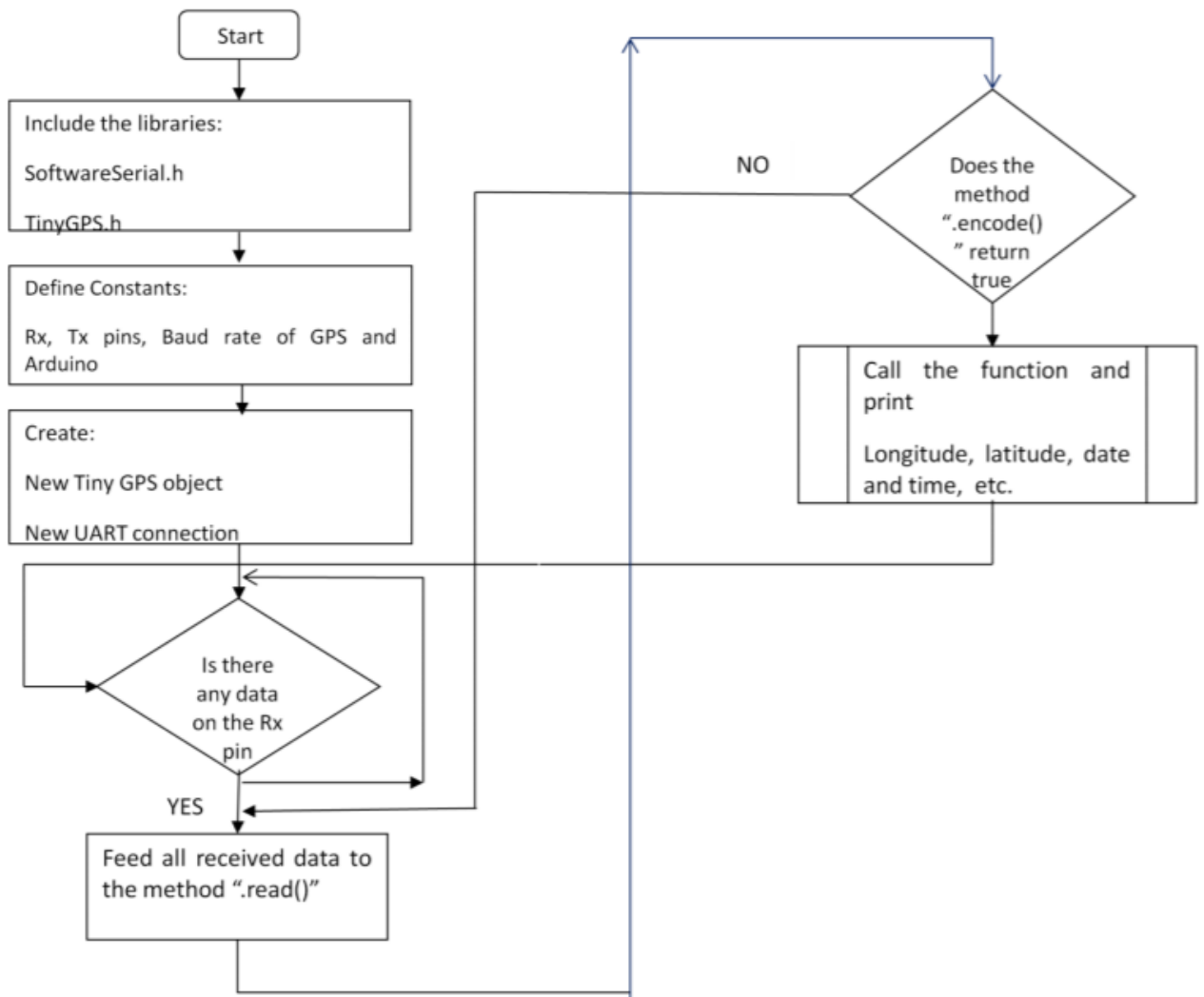
Figure 3. Program (sketch) of the GPS and GSM module work

ALGORITHMS:

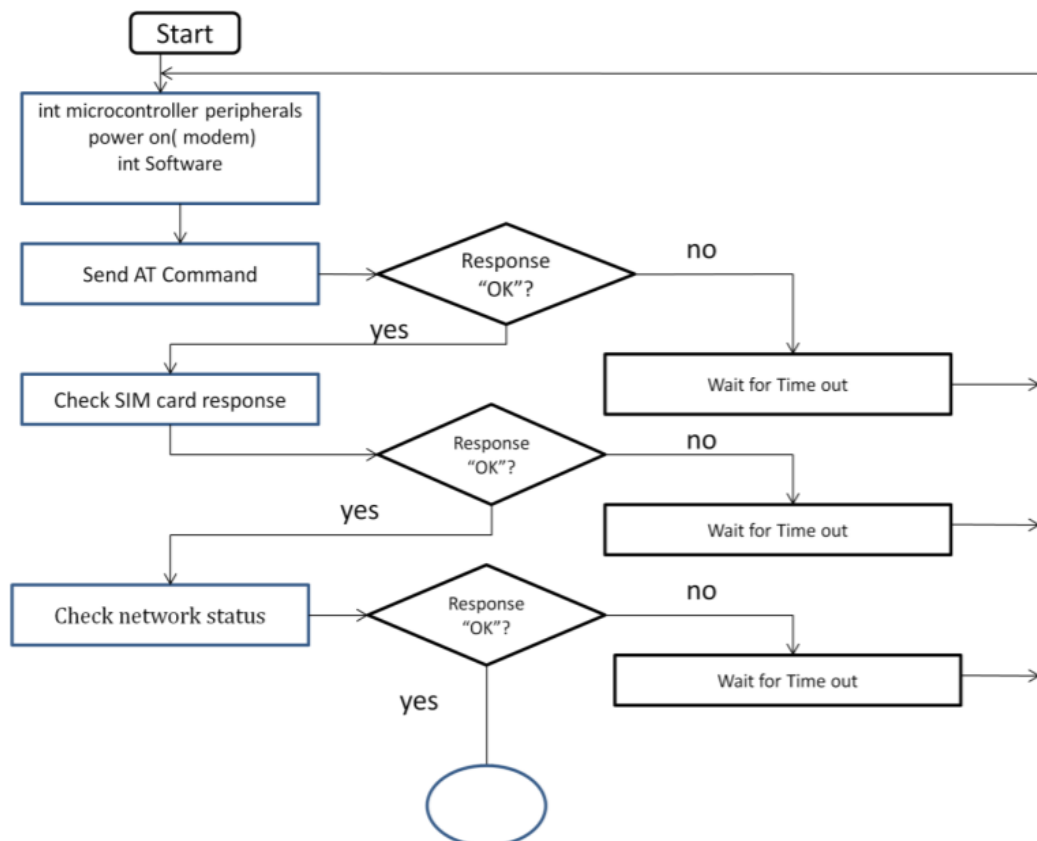
- Block diagram for the System:

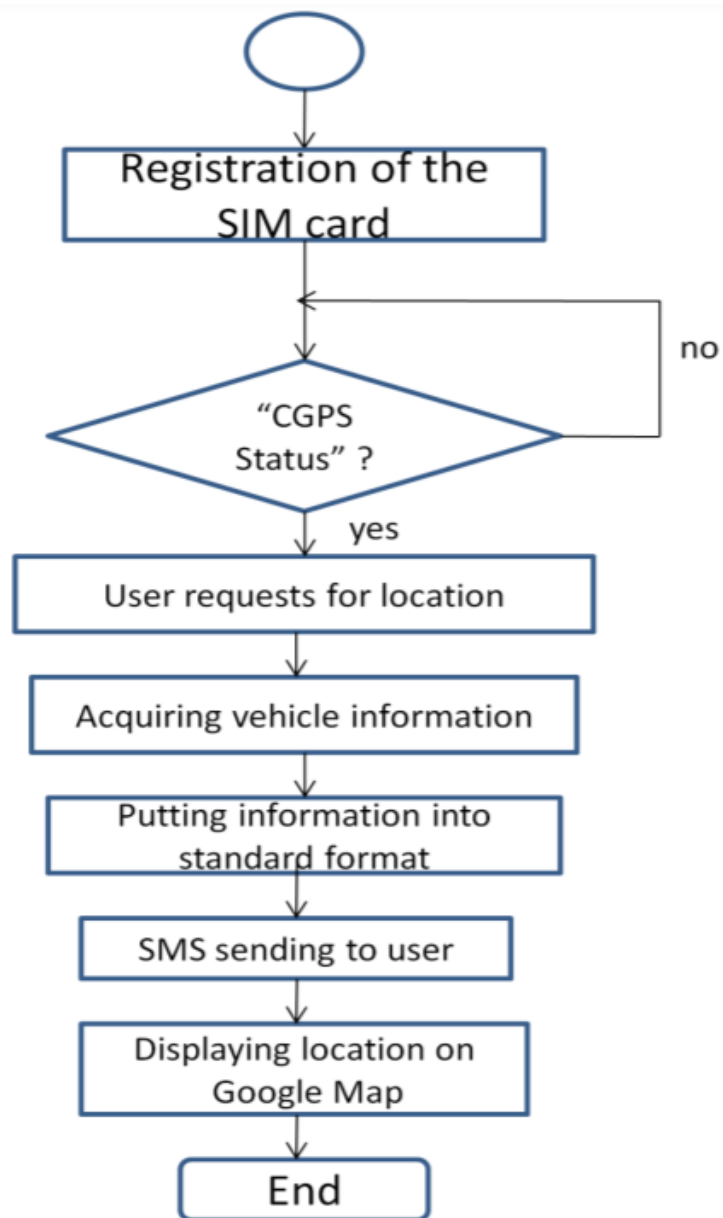


- Flowchart for GPS coding:



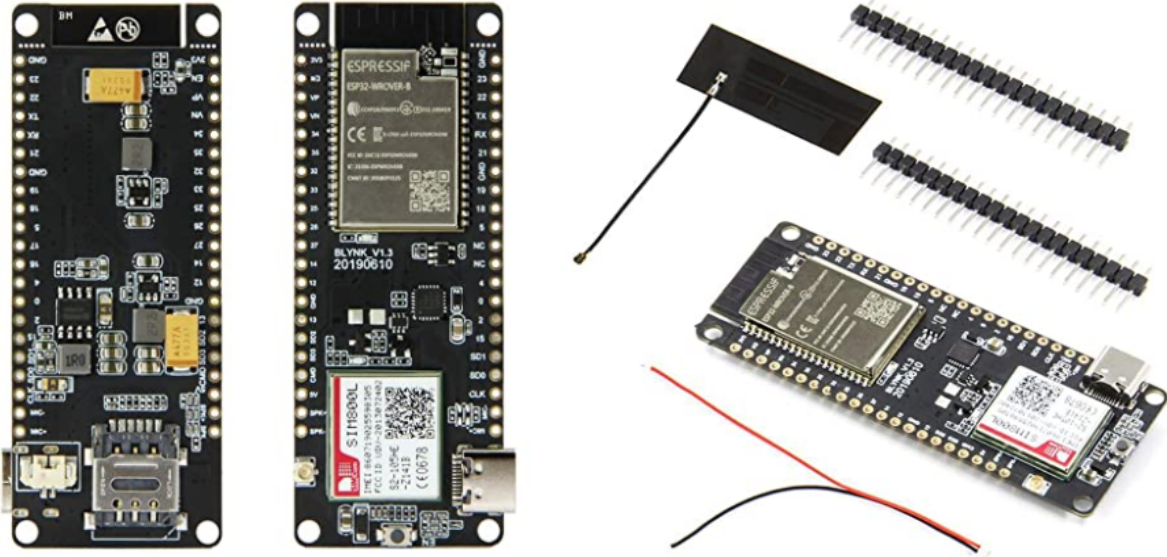
- Flowchart for GSM coding:





INVENTO SIM800L with ESP32 Node MCU Wireless Communication Module GSM GPRS Antenna Sim Card Module:

Cost: Around 4000 Rupees



Specifications:

- Chipset: ESPRESSIF-ESP32 (Wi-Fi & Bluetooth) 240MHz Xtensa single-/dual-core 32-bit LX6 microprocessor.
- FLASH: QSPI flash 4MB, PSRAM 8MB
- Working current: About **70mA**
- Sleep current: About **300mA**
- SIM card: Only supports Nano SIM card.
- Package Include 1 x SIM800L with ESP32
- Size: 10cm x 10cm x 1 cm