IoT Based GPS Location Tracker Using NodeMCU and GPS Module

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Abstract- *Nowadays one of the popular services of online taxi booking services like Uber, Taxi for Sure, Zoom Car and many more have opened the world of real time location tracking. GPS plays a vital role both in allowing the user and also the service provider to track the taxi. A vehicle tracking system combines the use of automatic vehicle location in individual vehicles with software that collects these fleet data for a comprehensive picture of vehicle locations. Modern vehicle tracking systems commonly use GPS or GLONASS technology for locating the vehicle, but other types of automatic vehicle location technology can also be used. Vehicle information can be viewed on electronic maps via the Internet or specialized software. Urban public transit authorities are an increasingly common user of vehicle tracking systems, particularly in large cities. Several types of vehicle tracking devices exist. Typically they are classified as "passive" and "active". "Passive" devices store GPS location, speed, heading and sometimes a trigger event such as key on/off, door open/closed. Once the vehicle returns to a predetermined point, the device is removed and the data downloaded to a computer for evaluation. Passive systems include auto download type that transfer data via wireless download. "Active" devices also collect the same information but usually transmit the data in near-real-time via cellular or satellite networks to a computer or data center for evaluation.*

Keywords- Global Positioning System (GPS), Node Micro Controller Unit (NodeMCU), Internet of Things (IoT), Vehicle Tracking System (VTS), Organic Light-Emitting Diode (OLED).

I. INTRODUCTION

In this paper, we are going to build an IoT-based GPS **Location tracker** using NEO-6M GPS Module. This Location Tracker Board consists of a NodeMCU, OLED Display Module, NEO-6M GPS Module, and 3.7 to 6V booster circuit. Here, we have also created a simple local web server to display the location details. This web server contains a link to directly check the location in Google Maps.

We have used PCB Way to provide the PCB boards for this paper. In the following sections of the article, we have covered in detail the complete procedure to design, order, and assemble the PCB boards for the IoT-based Location Tracker Board.

Components Required for GPS Location Tracker

1. NodeMCU ESP8266

The **NodeMCU ESP8266 development board** comes with the ESP-12E module containing ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects.

NodeMCU can be powered using Micro USB jack and VIN pin (External Supply Pin). It supports UART, SPI, and I2C interface.

NodeMCU ESP8266 Specifications & Features

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1
- UARTs: 1
- SPIs: 1
- I2Cs: 1
- Flash Memory: 4 MB
- SRAM: 64 KB
- Clock Speed: 80 MHz
- USB-TTL based on CP2102 is included onboard, Enabling Plug n Play
- PCB Antenna
- Small Sized module to fit smartly inside your IoT projects

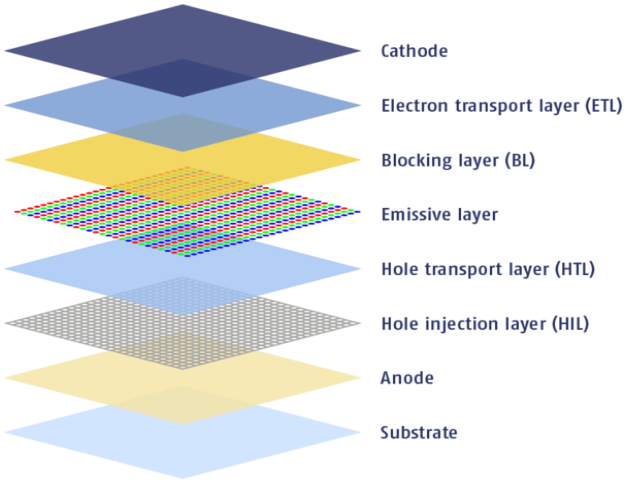
2. NEO-6M GPS Module

At the heart of the module is a NEO-6M GPS chip from u-blox. The chip measures less than the size of a postage stamp but packs a surprising amount of features into its little frame.

It can track up to 22 satellites on 50 channels and achieves the industry's highest level of sensitivity i.e. -161 dB tracking, while consuming only 45mA supply current.Unlike other GPS modules, it can do up to 5 location updates a second with 2.5m Horizontal position accuracy. The u-blox 6 positioning engine also boasts a Time-To-First-Fix (TTFF) of under 1 second.One of the best features the chip provides is Power Save Mode(PSM). It allows a reduction in system power consumption by selectively switching parts of the receiver ON and OFF. This dramatically reduces power consumption of the module to just 11mA making it suitable for power sensitive applications like GPS wristwatch.The necessary data pins of NEO-6M GPS chip are broken out to a 0.1″ pitch headers. This includes pins required for communication with a microcontroller over UART. The module supports baud rate from 4800bps to 230400bps with default baud of 9600.

3. OLED Display Module

The basic OLED structure is simple - an organic emitter placed between two electrodes. But in order to create efficient and long-lasting devices, commercial OLEDs use several intermediate layers, like electron transport and blocking layers. The whole organic stack is placed between the electrodes, and this whole structure is deposited on the substrate (glass or plastic) and the display backplane (driver electronics). Some OLED displays on the market make use of dozens of different layers, one on top of the other.



Currently, almost all OLED displays on the market are produced using an evaporation-based process, in which the OLED materials are deposited in a vacuum chamber. This has proven to be a great way to make OLEDs, but the process has its limitations - mainly material waste and high cost.

Companies are now developing next-generation deposition processes to enable more efficient production. One example is ink-jet printing, which makes use of soluble OLED inks that can be deposited using huge printers. This process is faster than the current evaporation process, and has almost no waste of materials. While there are still some challenges to overcome, it is expected that printed OLEDs will start entering the market soon - starting with TVs and monitor panels.

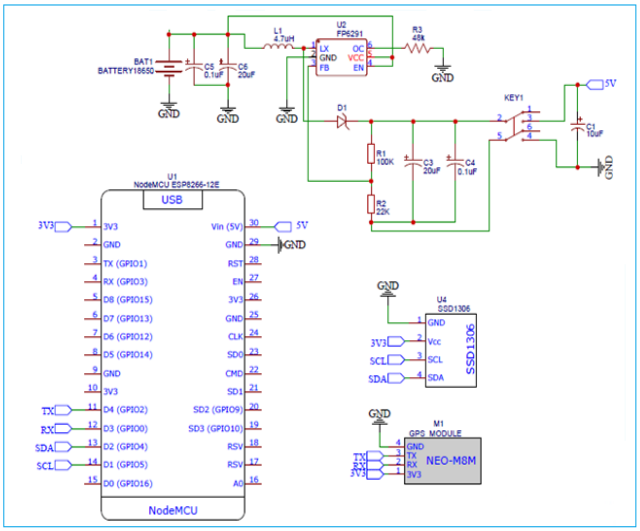
The future of OLEDs seems bright as their presence in the smartphone and TV markets is continuously growing, in addition to other markets (such as wearables, VR and more). OLED technology is still an emerging technology, and many avenues are still open for new materials to be found and new processes to be developed that could further enhance OLED displays.

IoT Based Location Tracker Circuit Diagram

The complete circuit diagram for **NodeMCU GPS Tracker** Board is shown below. The schematic was drawn using EasyEDA. This HAT consists of a NodeMCU with NEO-6M GPS Module, OLED Display Module, and Booster circuit. The booster circuit is designed around a dedicated FP6291 Boost Converter IC to boost the battery voltage from 3.7v to 6V. This location tracking board can be used to track Cars/Bikes/almost anything.FP6291 IC is a 1 MHz DC-DC Step-Up Booster IC, mainly used in the application, for example, getting stable 5V from 3V battery. You only need few extra components to design a booster circuit with this IC. Here, in this circuit, the Boost Converter circuit gets the input

supply through battery terminals (+ and -). This input voltage is then processed by FP6291 IC to give a stable 6V DC supply to the V_{IN} pin of NodeMCU.

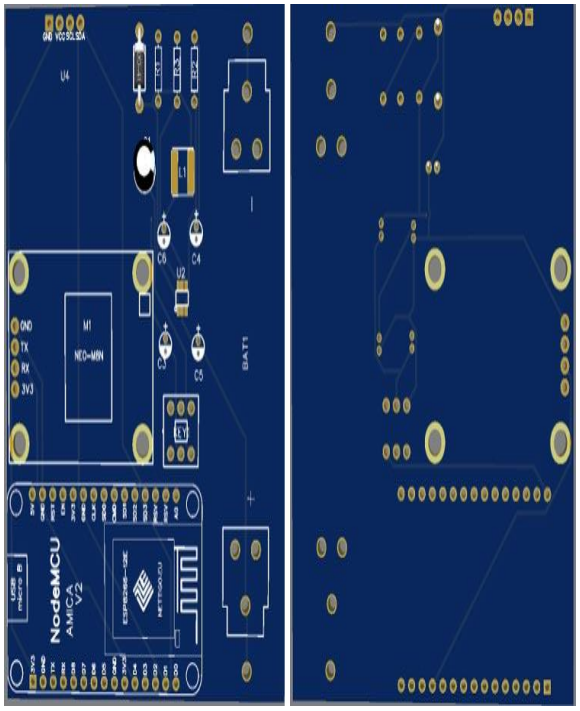
The output voltage from this IC can be configured using the potential divider circuit. The formula to calculate the output voltage is:



Fabricating PCB for NodeMCU GPS Tracker Board

Now that we understand how the schematics works, we can proceed with building the PCB for our project. You can design the PCB using any PCB software of your choice. We have used EasyEDA to fabricate PCB for this project. We have previously used EasyEDA many times and found it very convenient to use compared to other PCB fabricators. Click on the link to check all the PCB projects. They also offer a component sourcing service where they have a large stock of electronic components, and users can order their required components along with the PCB order.

While designing the circuits and PCBs, you can also make your circuit, and PCB designs public so that other users can copy or edit them and can take benefit from your work. We have also made this NodeMCU GPS Tracker PCB design file and GERBER file public, check the link given below:



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