WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Design and Implement GPS Receiver for Vehicle Tracking System

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ABSTRACT

The vehicle tracking system is a GPS based tracking system that is used for security applications as well. This is done with the help of the GPS satellite and the GPS module attached to the vehicle which needs to be tracked. The GPS antenna present in the GPS module receives the information from the GPS satellite in NMEA (National Marine Electronics Association) format and thus it reveals the position information. This information got from the GPS antenna has to be sent to the base station wherein it is decoded. In this paper, we would like to design and implement an GPS Receiver for vehicle tracking system.

Keywords: GPS, Vehicle Tracking System, NMEA, GSM, Antenna

I. Introduction

GPS (Global Positioning System) [1] is the technology most commonly used for vehicle tracking these days. There are also other variants of AVL (Automatic Vehicle Location) [2] that enable easy location of vehicles. The GPS modules with their satellite linked positioning technique make easy and accurate location of the vehicle possible. The information can be viewed on electronic maps that are connected to the Internet or otherwise supported by specialized software. Advanced GPS modules may also have cellular or satellite transmitters that communicate with remote users apart from the central station from where the tracking is done.

The other AVL systems like Loran and LoJack are terrestrial based and use radio frequency (RF) transmitters. RF transmitters send out powerful signals that can pass through walls, garages and other indoor barriers. Terrestrial or otherwise, most of these do not need antenna to be in direct line of sight with the satellite. This is a major advantage of the technology's progress.

To design an GPS receiver, we combined the GPS's ability to pin-point location along with the ability of the Global System for Mobile Communications (GSM) [3] to communicate with a control center in a wireless fashion. The system includes GPS-GSM modules and a base station called the control center as shown in Fig. 1.

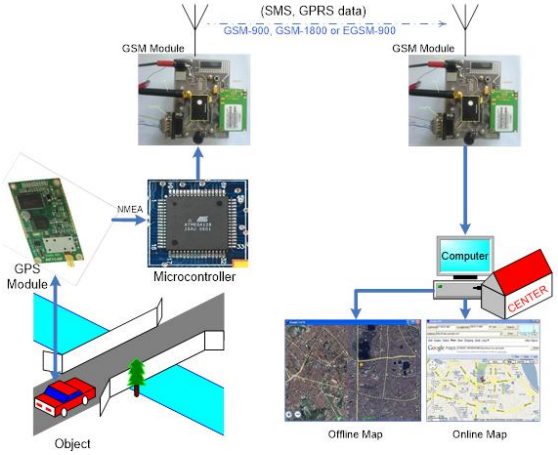

Fig. 1. Overview of Tracking System using GPS Receiver.

II. System Design

The GPS Receiver consists of two units, first is active antenna which receives RF signals and amplifies it. The antenna is active in the sense it takes power from the module and amplifies the signal for high sensitivity. The RF signal is filtered and processed to generate NMEA [4] format serial data output as shown in Fig. 2.These connections are marked on the PCB. Provide regulated +5V DC supply to +5V and Ground. The TXD output wire can be connected to microcontroller directly. The LED onboard will indicate that data is being transmitted out. It will blink every second indicating data out.

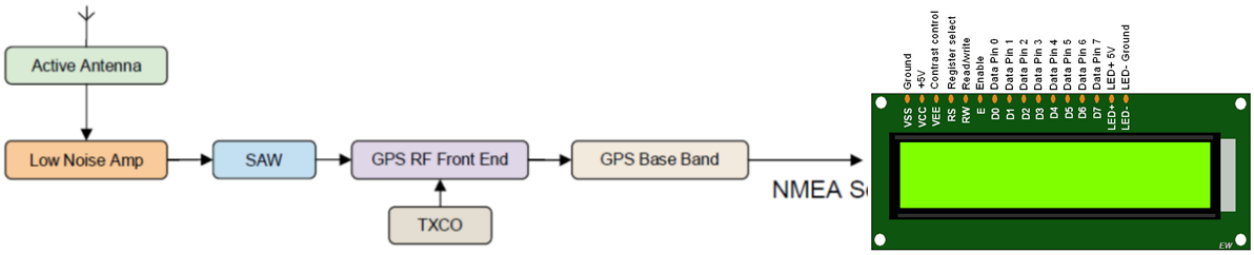

Fig. 2. System Design.

III. Implementation

- GPS Antenna transmit signal to GPM100 module [5]. GPM100 is a GPS module manufactured by Ginwave, it is widely used in mobile phones and personal devices (see Fig. 3)
- GPM 100 module will process the received signal and pass it to the Atmega128 microcontroller in the form of NMEA 0183 (see Fig. 4)
- Microcontroller will convert data and display it on LCD [6] (see Fig. 5)

Fig. 3. Module GPM100

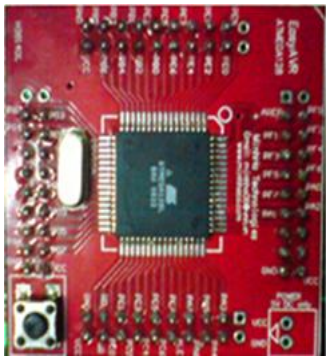

Fig. 4. ATMEGA 128

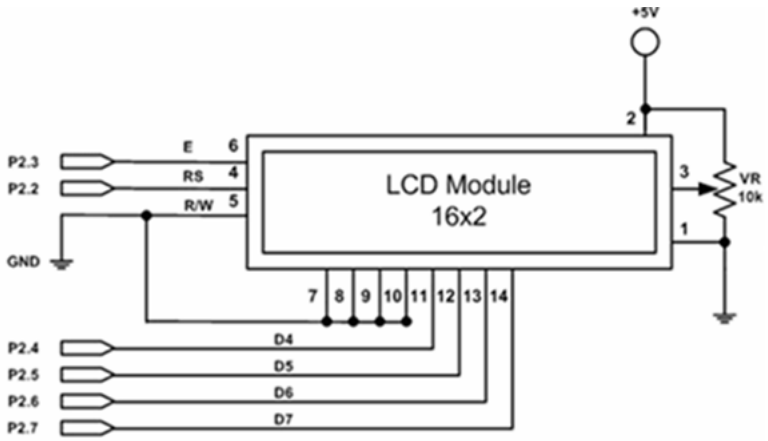

Fig. 5. LCD circuit.

A properly designed Vehicle Monitoring System saves time and work by eliminating the need for service personnel to visit each site for inspection, data collection/logging or make adjustments. Here we are using simplex transmission and not duplex transmission. So data can only be sent from remote end to the central end.We can also send the data regarding the speed, altitude, fuel level or any other quantity, to the industry end, from remote

places at any time (see Fig. 6).

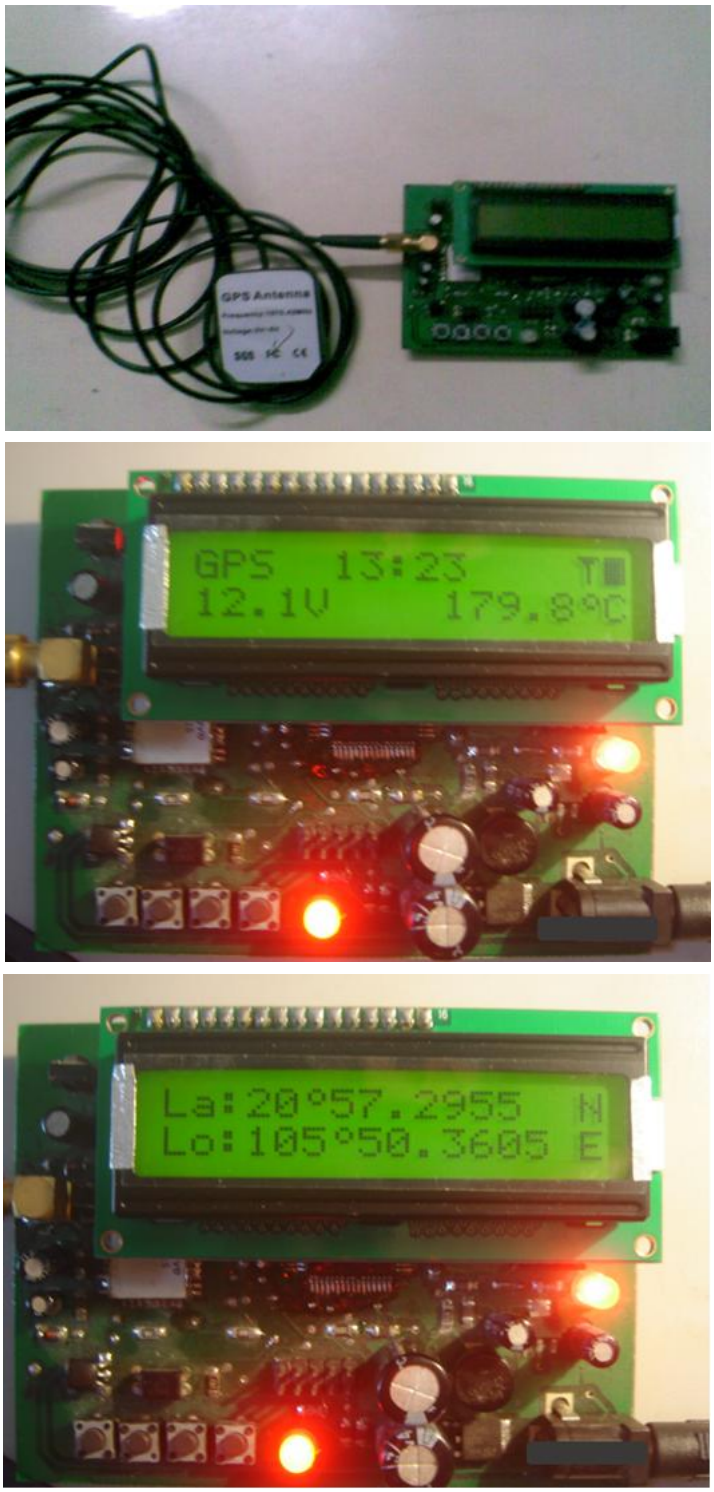

Fig. 6. Experimental results.

IV. Conclusion

Many issues surround the future of Global Positioning System technology and operability. The most certain aspect of the future of GPS is its increased usage and its expansion into new areas of application. Bradford Parkinson, from the University of Minnesota Center for Transportation Studies, predicts that by 2020 there will be more than 50 million GPS users that perform applications relating to the following fields: automobiles, ships, farm vehicles, Aircraft and military systems.

Acknowledgement

This work is supported by HUTECH University, Ho Chi Minh City, Vietnam; and FPT university, Hanoi, Vietnam.

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