



# DESIGN OF EMBEDDED BASED APPLICATION FOR GPS DATA COLLECTION AND PROSESSING USING ARM

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## Abstract

In this paper we investigate the development of an embedded based geographic information system. Its main characteristics concern the possibility to access various information sources and to provide the basic functionalities of a navigation system, e.g. positioning. This system uses a differential Global Positioning System (GPS) device to acquire the position of a device (e.g. vehicle). That data will be analyzed by microcontroller and send to PC. A PC with an LAN connection permits to access distant data sources and to transfer data between the components of the system. The basic software component in the architecture of our system is a local embedded server. It guarantees continuous access to local GPS data, yet additionally to interactive media and spatially referenced data which are put away on unique servers. We additionally exhibit few consequences of handy tests that have been completed with this frame work embedded in different applications.

**Keywords:** *Micro controller (LPC2148),GPS Module, ETHERNET Module.*

## I. Introduction

Localization is a fundamental service in mobility.

In outdoor applications such as, vehicle tracking, wildlife tracking participatory environmental sensing, and personal health and wellness applications.GPS receiving, although becoming increasingly ubiquitous

and lower in cost, is processing intensive and energy consuming.GPS is a space-based radio-positioning and time transfer system. GPS provides accurate position, velocity, and time information to an unlimited number of suitably equipped ground, sea,air and space users. GPS comprises three major system segments, Space, Control, and User. The Space Segment consists of a nominal constellation of 24 Navstar satellites. Each satellite broadcasts RF ranging codes and a navigation data message. The Control Segment consists of a network of monitoring and control facilities which are used to manage the satellite constellation and update the satellite navigation data messages. The User Segment consists of a variety of radio navigation receivers specifically designed to receive, decode, and process the GPS satellite 1-2 ranging codes and navigation data messages. It sends the data in the format of National Marine Electronics Association. But in this we are getting the bulk of data contains location, time, data, and satellite information. In this, there is no possibility of identifying required data,to analyze the data we are interfacing GPS receiver to Programmable controller for collecting required information. And the data will be processing by controller to Ethernet module for monitoring the sub systems.



## II. Related Study

Navigation is the important role in the tracking system. It is useful in variety of fields like Transport, Military security etc.

PankajVerma et.al gives the detail about the GSM and GPS based tracking system using Google map. In this the route travelled by vehicle and its location is tracked by GPS and GSM [1].

R. Ramani, et.al uses the authentication algorithm in tracking system for vehicle protection form theft. Microcontroller is used to send the control the engine depending upon user instruction [2].

G.Bharathi et.al proposed a method to stop the crime with the children. This method can be used for person or vehicle tracking by ARM controller which is used to controls the LCD, GPS module and GSM modem. The ARM controller will poll GPS module information (Latitude & Longitude) of vehicle location to and send to person over GSM network [3]. Mahesh Kadibagil et.al puts a friends or family member tracking system by using mobile client, web portal and map services. Information obtain is can be viewed on both mobile and web portal. [4].

Abid khan et.al designed a cost effective vehicle tracking system in which a message about the position of the vehicle is received on the mobile in the form of latitude and longitude is developed in [5]. A man less vehicle driving system by using arm and navigation system is suggested by R. Mohanapriya. Ultrasonic sensors are used for obstacle detection on the road. To find the particular geographical area it uses the Digital compass. It use magnetic sensor to measure the earth magnetic field. But considering all the suggested work and technologies still there is lot of scope of work pending to be done in this area.

## III. Design Of Proposed Hardware System

In system construction, it mainly consist of two part namely as software part and hardware part. Software part includes embedded software for interfacing of various hardware components like

LCD display,microcontroller, Ethernet moduleGPS etc.

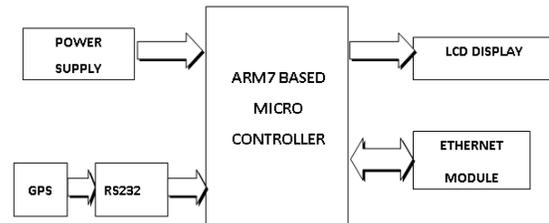


Fig.1.Hardware for GPS data Collection

In this, Microcontroller is interfaced withGPS receiver by using RS232 cable. It follows UART Protocol and standard baud rate of 9600.GPS receiver used to receive the data from space Segment (from Satellites), the GPS values of different Satellites are sent to microcontroller, where these are processed and forwarded to Ethernet. At the time of processing microcontroller accepts only required National Marine Electronics Associationstandard data format. From these values microcontroller takes latitude, longitude values including time, altitude, name of the satellite, authentication. In this, the time we are getting is based on GMT that will be converted into IST by using our microcontroller. After analyzing, converting, the data will be sending to Ethernet module to monitoring section(PC).



Fig.2. Ethernet module

In this we are using Wi04 module for establishing TCP/IP protocol. It containing the TMAC, PHY Module.The data received from the UART protocol istransmitted to the transmit engine which converts thereceived data into frame format by adding the preamble, start frame delimiter (SOF), and adding pad bits. In thereceive engine of the TEMAC the padded bits are removedfrom the pad format. The PHY or the SFP module is thetransceiver which is interfaced with the TEMAC through theserial Gigabit Media Independent Interface (SGMII) at oneend and



other end is interfaced to the receiving device which is PC. [6] discussed about a project, in this project an automatic meter reading system is designed using GSM Technology. The embedded micro controller is interfaced with the GSM Module. This setup is fitted in home. The energy meter is attached to the micro controller. This controller reads the data from the meter output and transfers that data to GSM Module through the serial port. The embedded micro controller has the knowledge of sending message to the system through the GSM module. Another system is placed in EB office, which is the authority office. When they send "unit request" to the microcontroller which is placed in home. Then the unit value is sent to the EB office PC through GSM module. According to the readings, the authority officer will send the information about the bill to the customer. If the customer doesn't pay bill on-time, the power supply to the corresponding home power unit is cut, by sending the command through to the microcontroller. Once the payment of bill is done the power supply is given to the customer. Power management concept is introduced, in which during the restriction mode only limited amount of power supply can be used by the customer.

#### **IV. Hardware Resources Features**

##### **LPC2148 CONTROLLER:**

In our paper we are using LPC2148 controller for data analysis it is a FPGA based controller board containing all required hardware for application. LPC2148 is ARM7TDMI-S Core Board Microcontroller that uses 16/32-Bit 64 Pin (LQFP) Microcontroller No.LPC2148 from Philips (NXP). All resources inside LPC2148 is quite perfect, so it is the most suitable to learn and study because if user can learn and understand the applications of all resources inside MCU well, it makes user can modify, apply and develop many excellent applications in the future. Because Hardware system of LPC2148 includes the necessary devices within only one MCU such as USB, ADC, DAC, Timer/Counter, PWM, Capture, I2C, SPI, UART, and etc.



Fig.3. FPGA based ARM7 board.

##### **RS232 Interface**

In telecommunications, RS-232 is the traditional name for a series of standards for serial binary single-ended data and control signals connecting between a DTE (Data Terminal Equipment) and a DCE (Data Circuit-terminating Equipment). It is commonly used in computer serial ports. The standard defines the electrical characteristics and timing of signals, the meaning of signals, and the physical size and pin out of connectors. The current version of the standard is TIA-232-F Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange. By using this interface we are communicating microcontroller with GPS, Ethernet modules.

##### **GPS:**

Global Positioning System tracking is a method of working out exactly where something is. A GPS tracking system, for example, may be placed in a vehicle, on a cell phone, or on special GPS devices, which can either be a fixed or portable unit. GPS works by providing information on exact location. It can also track the movement of a vehicle or person. So, for example, a GPS tracking system can be used by a company to monitor the route and progress of a delivery truck, and by parents to check on the location of their child, or even to monitor high-valued assets in transit.

A GPS tracking system can work in various ways. From a commercial perspective, GPS devices



are generally used to record the position of vehicles as they make their journeys. Some systems will store the data within the GPS tracking system itself (known as passive tracking) and some send the information to a centralized database or system via a modem within the GPS system unit on a regular basis (known as active tracking) or 2-Way GPS.



Fig.4.GPS Sensor.

### Ethernet Module

In this we are using Wi04 module for implementing Ethernet protocol. The WI04 module provides designers with a readymade component that provides a fully integrated solution for applications, using the IEEE802.11 standard in the 2.4-2.5GHz ISM frequency band, including 802.11b/g/n and also provides IEEE802.3, can be quickly and easily included in product designs. The modules integrate all of the RF components required, no need to perform expensive RF design and test. Products can be designed by simply connecting sensors and switches to the module IO pins or UART interface. The modules use ralink's chip Wireless MCU, allowing designers to make use of the serial interface to connect with their device. Hence, this module allows designers to bring wireless applications to market in the minimum time with significantly reduced development effort and cost.

This product is an embedded module based on the universal serial interface network standard, built-in TCP / IP protocol stack, enabling the user serial port, Ethernet, wireless network (Wi-Fi) interface between the conversions. Through the WI04 module, the traditional serial devices do not need to change any configuration; data can be transmitted through the Internet network. Provide a quick solution for the

user's serial devices to transfer data via Ethernet. Also the Wi04 module has FCC modular approvals and is compliant with EU regulations.



Fig.5. Ethernet module.

### V. Conclusion

In this paper, review and analysis of the GPS system offer associate output of the knowledge like time, position and speed from the GPS receiver. This may be helpful for tracking. From this pursuit system, the location is going to be displayed in PC with the assistance of GPS info and Ethernet module. Thus, we will simply monitor the creature anyplace on the planet with high accuracy.

### VI. Results

In this, below figure indicates the Hardware setup of our proposed application. In this we are Interfacing GPS module to DB9 pinconnector of the controller board and Ethernet module connected in another DB9 pin connector of Microcontroller.

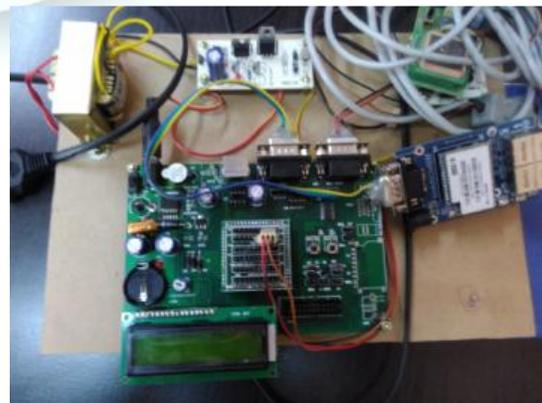




Fig.6. Hardware circuit for proposed application

Whenever you Switch on the application GPS starts continuously sending data to the controller it will show that data in LCD as show in below figure.



Fig.7.GPS Values in LCD.

## VII. References

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