Tracking System For Atmospheric Data Monitoring Weather Balloon Interfaced With GPS And GSM

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Abstract

Technology is getting advance day by day and it is providing the better life-style to human-beings. But when it comes to the safety and security of the people, the advancement of technology seems lacking. So as per the security and safety concern, the Global Positioning System (GPS) is a real innovation in the tracking era. At present there are lots of systems which are using GPS for tracking but the problem with them is that they are not able to transmit the data efficiently because most of the systems are wired. Hence this paper describes a system which is more efficient and accurate in determining the location of the weather balloon when it comes back to earth. This system is designed by using a Global Positioning System (GPS) module and a Global System for Mobile (GSM) module interfaced with microcontroller and this system is mounted on weather balloon.

Keyword: Global Positioning System, Global System for Mobile, tracking, security and safety, Weather balloon.

1. Introduction

A weather balloon is one of the tools utilized by the meteorologists to monitor the weather happenings and perform subsequent actions [2]. The data collected is sent to the control room when it is in the air but when the balloon returns to earth after its mission we are unable to track it. Some systems have already been designed to track weather balloons using a camera which is mounted on a pan/tilt mechanism [1]. This paper proposes a system which can be utilized to specify the coordinates at which atmospheric readings are monitored by weather balloon and also track its location at different instants of the mission. This enables us to monitor the position of the weather balloon for the entire duration of the mission, also after the completion of the mission (when it returns on earth surface).Block diagram of proposed system is shown below in fig (1.0).

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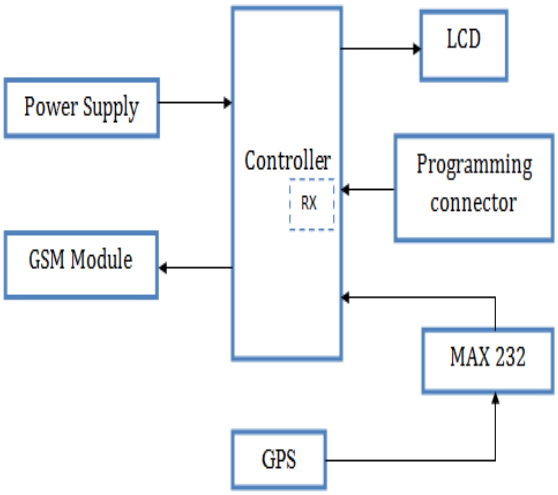


Fig(1.0) : Block diagram of proposed system

2. Working Principle Of Weather Balloons

Weather or sounding balloon is a balloon which carries apparatus with it to send information regarding the environmental changes i.e. atmospheric pressure, humidity, wind speed etc. The instrument utilized for monitoring is called a radiosonde[3]. The information collected is conveyed back to the control room where it is processed and utilized for wide range of application.

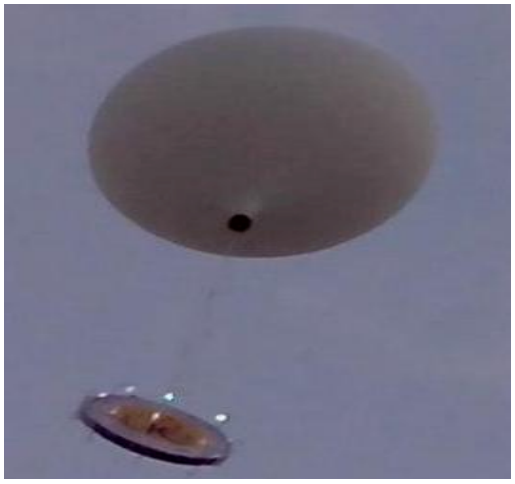


Fig 2.0: A real view of weather baloon

3. Hardware Development

3.1 GPS **:** Global Positioning System (GPS) satellites are used to broadcast signals from space that are received by GPS receivers. GPS satellites provide three-dimensional location i.e. latitude, longitude, and altitude and precise time. The output consists of serial data of 9600 baud rate that is standard NMEA 0183 v3.0 protocol , which allows us to offer industry standard data messages and a command set for easy interfacing with mapping software and connected embedded devices.

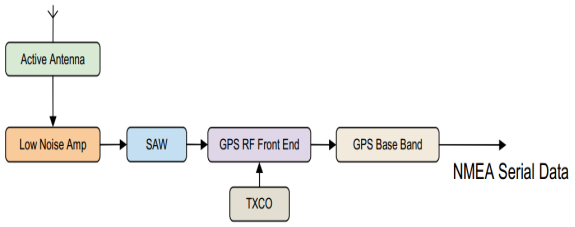


Fig 3.0: Block diagram of typical GPS modem

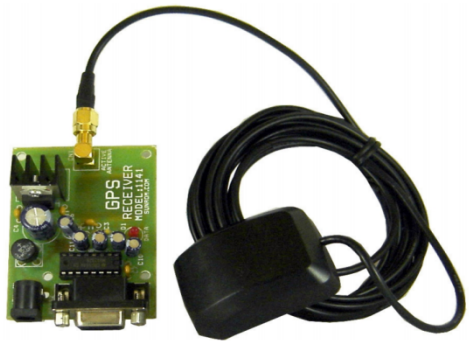


Fig 3.1: A view of GPS Modem

3.2 Atmega 8:

The ATmega8 is a low-power CMOS 8-bit microcontroller designed on basis of the AVR RISC architecture. ATmega 8 executes powerful instructions in a single clock cycle; enabling ATmega8 to achieve throughputs approaching 1 MIPS per MHz. Hence ATmega8 usage allows the system designed to optimize power consumption versus processing speed.

Current consumption: 500mA

Operating Voltage: 5 V

3.3 ***Display module-*** The LCD(liquid crystal display) unit receives character codes each of 8 bits from a microprocessor or microcomputer, latches the codes to its display data RAM of 80 byte. DD RAM is used for storing 80 characters, it converts each character code into a 5 ´ 7 dot-matrix character pattern, and displays these characters on the LCD screen.

3.4 ***3.4 MAX 232(level converter)-*** MAX232 is a dual driver/receiver IC that includes a capacitive voltage generator to supply EIA-232 voltage levels from a single 5-V supply [2]. Each receiver allows the conversion of EIA-232 inputs to 5-V TTL/CMOS levels. The receivers have a typical threshold of 1.3 V and a typical hysteresis of 0.5 V, and are able to accept ±30-V inputs. Each driver transforms TTL/CMOS input levels into EIA-232 levels. MAX232 IC requires few capacitors for its operation.

3.5 ***3.5 GSM Modem:*** GSM modems are used to communicate with mobile phones .AT prefix is used to start the communication which stands for attention and carriage return<cr> (0x0D) or line feed <lf> (0x0A) used as termination character of each command. Some basic command used in our system :

Fig 3.2: Some basic commands of GSM Module

4. Software Development

Firmware for the systems has been developed with the help of WinAVR compiler and AVR studio. The controller is programmed with help of AVRDUDE.The software is written in C language and compiled using the open source compiler avr-gcc. For project management AVR Studio was used. we have used our fully buffered, interrupt driven USART library for usart related job. The library comes in two files.

- USART.c
- USART.h
- Main_central.c
- Main_remote.c

The basic steps of software development are shown in Fig.4 Coding/debugging through AVR studio 4, compiling through Ponyprog software and burning through Ponyprog + ISP programmer. Microcontroller has been programmed to test the hardware as well to achieve the goal of above application

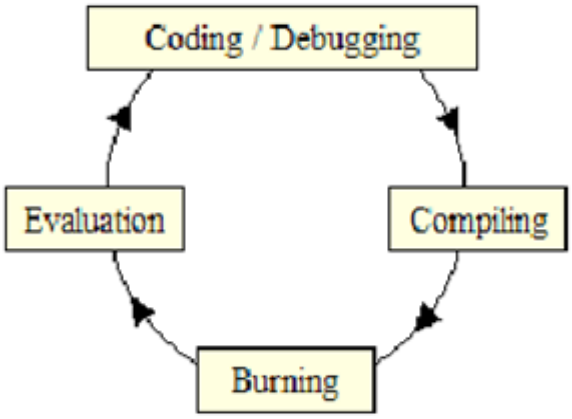


Fig 4.0: A flow diagram of software developement

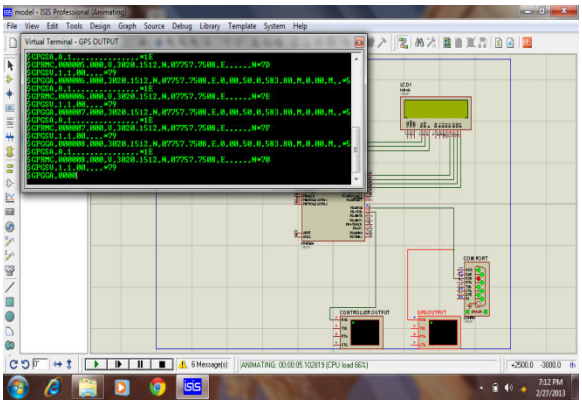
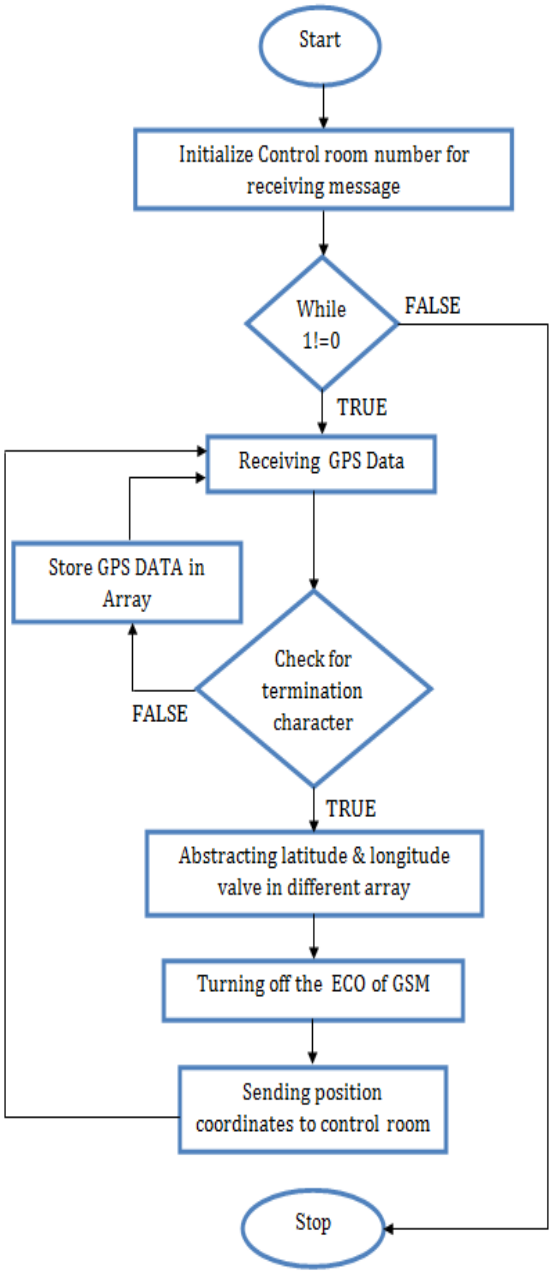


Fig 4.1: A snapshot of Simulation design of proposed system



Fig(4.1) flow diagram of system

5. Conclusion & Result

In this paper a tracking system for atmospheric data monitoring Weather baloon is proposed ,this system is also simulated on software and a demo model is designed with the help of this model we can able to track weather baloon .we can use this type of tracking system for other systems and vehicles .

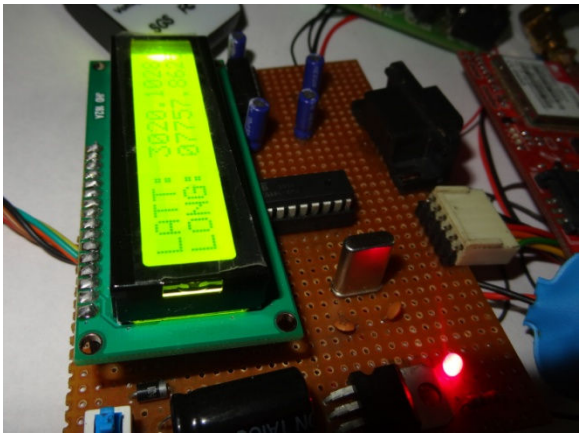


Fig 5.0: Hardware model of tracking system

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