



GPS Tracking and Controller for Car Black Box on Fpga

Ms. Bhalerao Pournima.P*, Prof. V. B. Baru

*E&tc, Sinhgad coe Pune
India*

Abstract— This paper proposes designing of Car black box controller with the Global Positioning System (GPS) in a very simple and efficient way for positioning and tracking. This system is designed to provide information about location based services along with the emergency services. The presented GPS based hand held terminal is designed using hardware components like Microcontroller 89C52 and GM 87 GPS Receiver. All information related to accident as driving data, collision data, positional data stored in memory. This data is routed to Fpga. The main feature of this System is its ease of use along with the compact size and visual display of results using PC and LCD display. All interfacing is done using serial communication.

Keywords— Global position system, Tracking, Fpga.

I. INTRODUCTION

Like Black Box of airplane, Car Black Box is used to record information related to accidents. Car black box records driving data, visual data, collision data and position data before and after the accidents so that it can be used to analyse the accident easily and to settle many disputes related to car accident such as crash litigation, insurance settlements. It can be used to not only reconstruct what happened before an accident by Insurance agents and police but improve vehicle design, roadway design and emergency medical service by automakers, government and hospital. In addition to the basic function, the car black box equipped with GPS system can send accident location information to central emergency and disaster server in real-time, therefore drivers who want help can receive service quickly by rack car, police and hospital ambulance [2].

1.1 GPS

The GPS is a constellation of 24 satellites that continuously transmit coded information, which is received by GPS receiver to precisely identify location on earth by measuring distance from the satellites [3]. Our main aim is to design the GPS in an effective way that allows navigating, positioning and tracking and provide location based emergency services information. The system proposed in this paper utilizes the GPGGA string format captured by the GPS receiver for providing exact location.

The system makes use of National Marine Electronics Association (NMEA) strings taken by GPS receiver. NMEA defines a RS-232 communication standard for devices that include GPS receivers. The GPS receivers can output geospatial location, time, headings and navigation-relevant information in the form of ASCII comma delimited message strings.

Out of these the following GPGGA string format is used in this system.

`$GPGGA,060003,3348.794,N,11754.064,W,1,07,1.0,66.2,M,-31.9,M,,*45`

GPGGA format of the NMEA string contains the required Geographical Positioning information and the time frame reference[11].

The GPS receiver used sends position information via a serial cable using the RS-232 standard, supported by the microcontroller. Max 232 IC served as standard TTL signal to the RS232 serial port for connecting with GPS receiver and PC. The microcontroller is received latitude and longitude (lat/long) information from raw data of GPS. And the lat/long data is sent to PC.

1.2 Sensors

Temperature sensor LM35 is used to detect temperature inside the vehicle. It has certain features that it Calibrated directly in ° Celsius (Centigrade) , Linear + 10.0 mV/°C scale factor ,0.5°C accuracy guaranteeable (at +25°C), Rated for full -55° to +150°C range.

Moisture sensor module SY-HS-220 is used to detect moisture.This module convert relative humidity into output voltage.

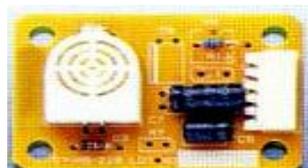


Fig 1.2 Moisture sensor module

II. EXPERIMENTATION

The development of embedded software required for implementing the required functionality is carried out in following manner.

Microcontroller: All ports are used for the interfacing devices like GPS receiver, Data bus, LCD and sensors. Port 3 lines RXD and TXD have been used to interface to GPS Receiver through RS232C compatible serial port that is implemented through MAX232 driver chip. Port 2 has been used to interface ADC port to controller. Port 1 has been used to interface to I²C bus used to write 1 byte to AT24C04 memory IC. It is also used to operate relay and to select mode. Port 0 has been used to drive set, data and control ports of LCD Display and control lines required for the Memory.

Memory Module: The memory module is used for the purpose of sorting location data along-with its positioning information such as Longitudes, Latitude.

LCD display and Keypad: The LCD module is used for the purpose of showing the results as latitude, longitude.

GPS receiver and Interface: The GPS receiver module generates information strings. The GM-87 GPS Receiver module generates information strings in the NMEA Protocol format. The strings are available at RS232C compatible serial interface as ASCII character sequences. The system interfaces to GPS receiver with the help of MAX232A Line driver/converters that connect to microcontroller UART through P3.0 and P3.1 pins. The GM- 87Mobile Locator provides real time GPS position GPGGA (Global positioning Global Positioning system Fixed data), to our portable System.

LCD Panel interface: The LCD panel is connected to the Microcontroller through Latch 3 operating as LCD control port and Latch 4 operating as LCD Data port.

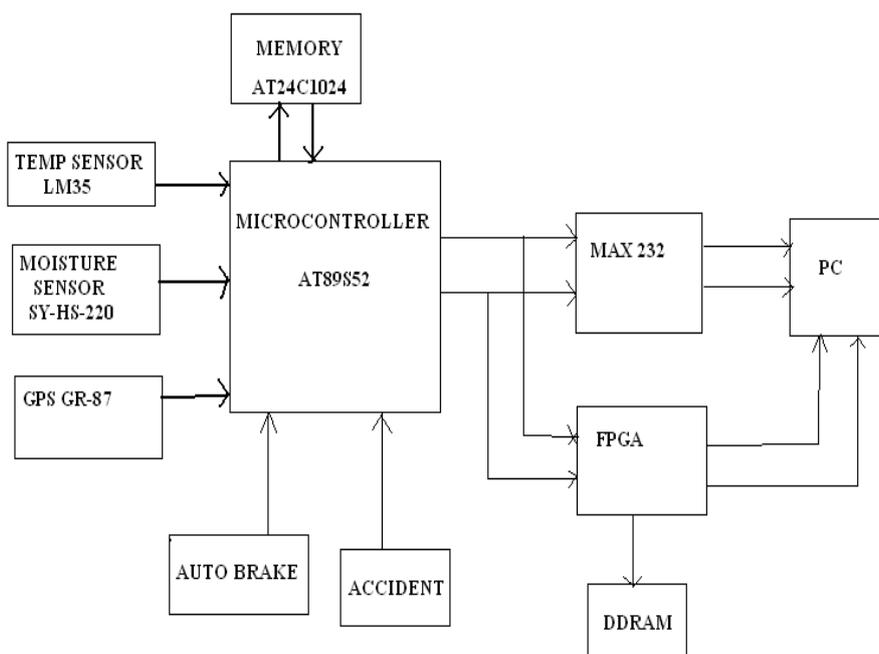


Fig 2.1 Proposed diagram of car black box

III RESULTS

Results are obtained for the following state:

- Interfacing ADC with microcontroller
- Interfacing GPS with LCD display
- Online mode result
- Offline mode result
- Hardware module

3.1 Interfacing ADC with microcontroller

An analogue-to-digital converter is a device that Converts a continuous physical quantity usually voltage to a digital number that represents the quantity's amplitude. Result of interfacing ADC with microcontroller is as shown in fig 3.1

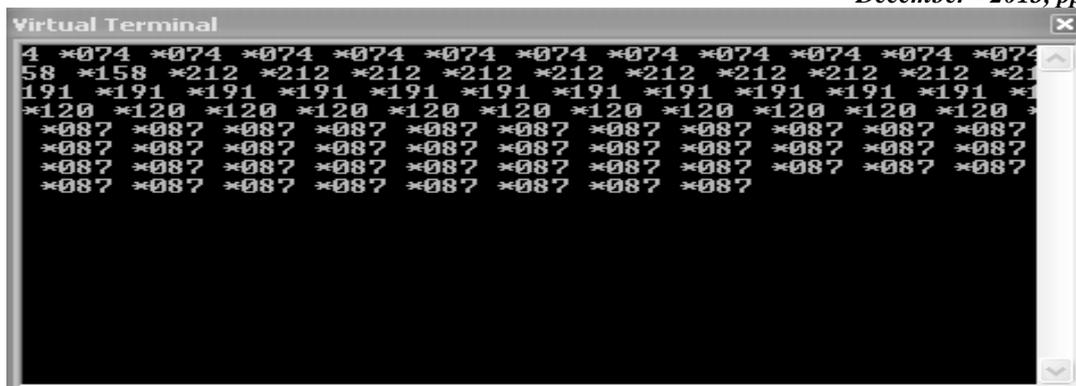


Fig3.1 Result of Interfacing ADC with microcontroller

3.2 Interfacing GPS with LCD Display

GPS receiver captures NMEA Strings carrying position information as latitude, longitude which is shown in fig 3.2.

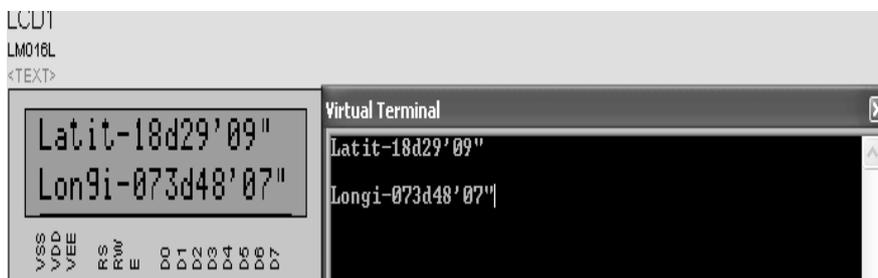


Fig3.2 Result of interfacing GPS with LCD Display

3.3 Online result Analysis

In online mode when we connect hardware and execute the software .Temperature sensor senses temperature. Moisture sensor senses humidity. After execution of required software, we can see the required result on online form. The result shown in fig 3.3

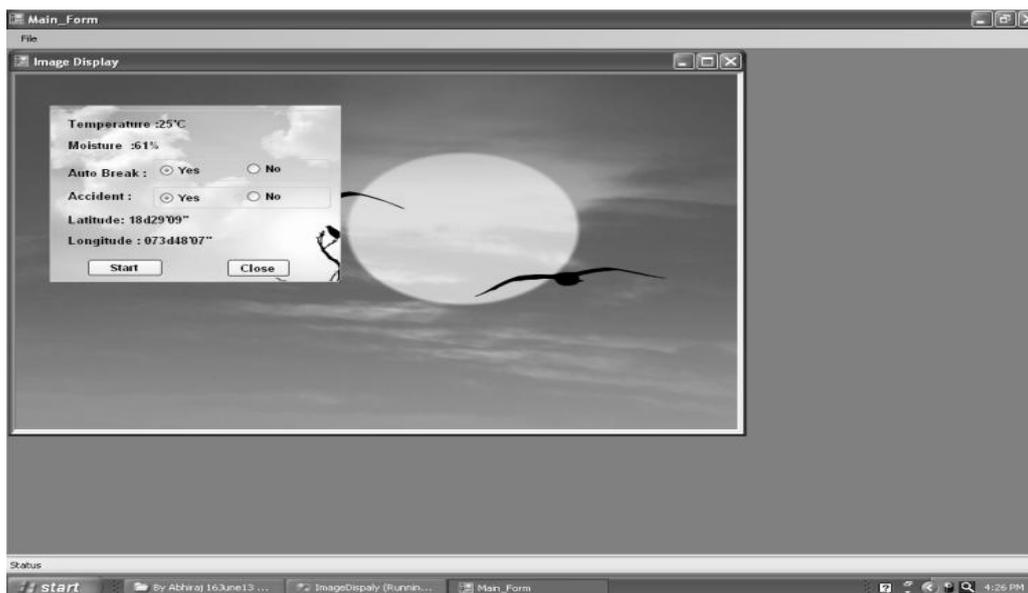


Fig 3.3 Online result Analysis

3.4 Offline result Analysis

We can check black box data in offline mode .When there is accident data stored on fpga IC retrieved, which is same as last data saved in memory. Result is as shown in fig 3.4

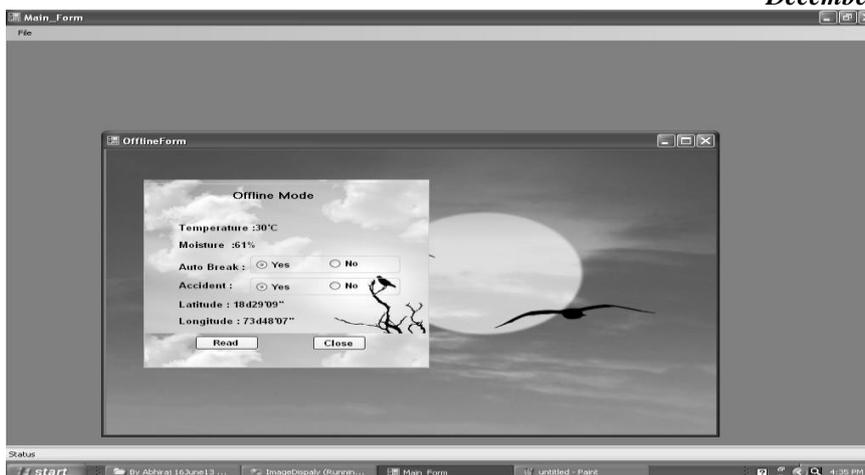


Fig 3.4 Offline result Analysis

3.5 Hardware module

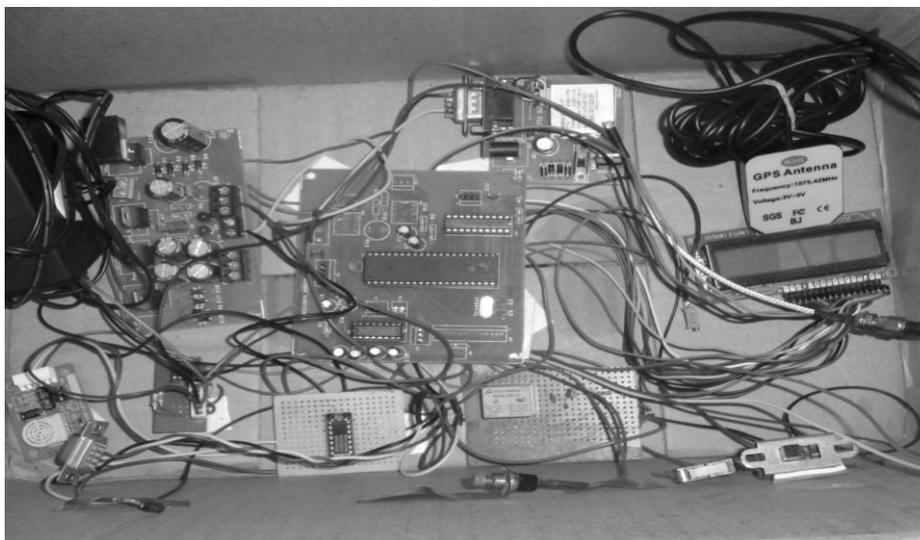


Fig 3.5 Hardware module

III. CONCLUSIONS

This design of car black box is very useful data while car accident which is required to resolve many disputes related to accidents. The data stored in memory and on fpga checked and verified.

ACKNOWLEDGMENT

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