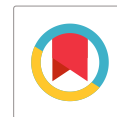# Geographical Location Tracking using Skytraq 96 GPS Module

Sheeba Farheen, D. R. Aishwarya, M. Raghavendra*
Department of CSE, SIT, Tumkur, KA, India
Received: 23.12.2016     Accepted: 01.01.2017     Published: 30-03-2017
*rag.sit.tumkur@gmail.com

## ABSTRACT

GPS is an electronic circuit, which captures satellite signals and calculates current location. The GPS signals are transmitted to Ubuntu System, which will be the Base Station. The experiment uses Skytraq-96 GPS chip and ZigBee technology to transmit signals wireless. XGPS software installed at the Ubuntu laptop will calculate and display following informations - Latitude, Longitude of current location and satellite position at the Sky, when the experiment is conducted. The results are displayed graphically for Tumkur, where experiments are conducted.

Keywords: GPS; XGPS; Skytraq 96; Zigbee.

## 1. INTRODUCTION

GPS is a outdoor positioning system, which is used in applications like navigation, location , tracking , locating exact position, suited routing etc . In navigation application continuous timing and positioning information is necessary. The satellites will send signals to the GPS receiver. It has outdoor antenna which receive the signal and it is processed by the skytraq IC and the raw data is fed to the zigbee receiver is connected to the Ubuntu lap, which will derive current geographical location and currently available satellites using graphical output. At the Ubuntu receiver using Xgps software, the signal is analysed and current satellite positions and location information is displayed graphically. The XGPS software installed at Ubuntu machine will receive and analyse the signal. The current satellite position and location information is displayed graphically.

## 2. RELATED WORK

Modern satellite navigation system uses Global Positioning System (GPS), for the location tracking (Richard B. Thompson, 1998). The satellites are transmitters which transmits radio signals. The original design has 18 satellites, with 3 satellites in each of six orbits. GPS receivers are hand-held and they run on small batteries, weights 200 gm and costs around 1800 Indian rupees. These devices will output latitude, longitude and altitude. The accuracy will be within 100 meters, and altitude with an error less than 150 meters. GPS has many applications especially in the area of tracking/navigation which works in any weather condition (Ahmad Ashraff Bin Ariffin et al. 2011).

XGPS is an open source (Alfred R. Lopez, 2010), which gives one such algorithm. This algorithm is an extension to stand alone GPS system which locates ones position. Using this algorithm the distance between two locations can be measured. This GPS module will generate the co-ordinates of the latitude, longitude and angle between the two positions. According to another white paper (Rashmi Bajaj et al. 2002), which describes the latest technology, which consists of a network of 24 satellites, spaced so that at least 5 are in the view from every point on the globe. Each satellite emits radio signals that a receiver present on the hand-held device estimates the satellites location and the distance between satellites and receiver. The receiver determines its position using information from 3 satellites precisely using a technique known as Trilateration. The receiver determines users latitude, longitude and altitude. GPS determines the time needed by a satellite signal to reach the receiver. It also compares a unique digital signature for a satellite with the receivers PNC in order to determine the signals travel time. GPS technology (Jiung-yao Huang and Chung-Hsien Tsai, 2008) is increasingly being applied in many different military applications beyond navigation. Soldiers use GPS in Land Warrior, guidance to the drop zone in night or inclement weather operations, airborne/airlift operation.

Jiung-yao Huang and Chung-Hsien Tsai (2008) paper describes GPS retransmission systems, its architecture, multiple antenna systems, use of GPS splitter, automatic signal level control. The datasheet are (Anis Drira, 2006) studied to conduct accurate experiments. GPS is mainly used for navigational system to attain high positioning accuracy (Carl Fenger, 2009) ranging from tens of meters down to millimeters.

Related work (Peter Mount, Blog) explains how GPS can be communicated with Raspberi Pi computer, which runs Ubuntu like OS namely raspbian. To make a computer as GPS receiver, we need to install following softwares gpsd, gpsd-clients ,python-gps. The information can be viewed on a X-Windows system. Open terminal and type xgps will open GUI Window and the live data is displayed.
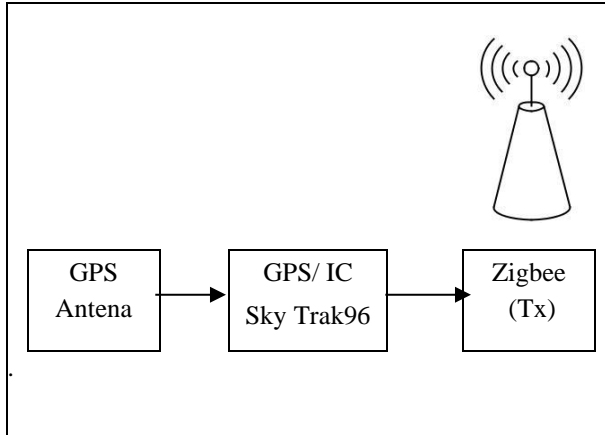


**Fig. 1: Block diagram of the experiment – Sender**

## 3. EXPERIMENTAL SETUP

The Zig bee receiver is connected USB port of Ubuntu system and gpsd server is started. xgps is invoked to display the ouput.
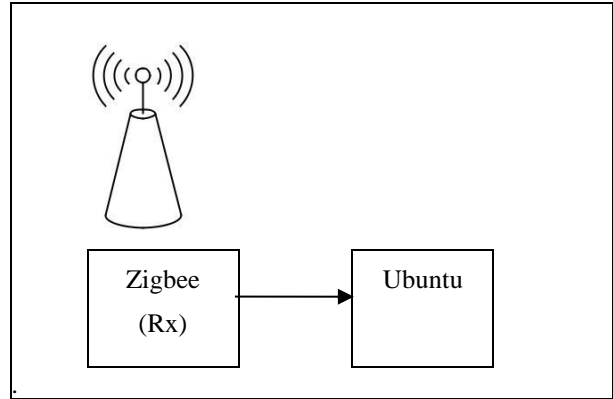


**Fig. 2: Block diagram of the experiment - Receiver**

Experimental Set Up: The connections are made as circuit diagram. The GPS antenna is placed outside the window and GPS board is attached to it . The ZigBee Transmitter is connected to the GPS module and it will send GPS signals to Ubuntu base station , where ZigBee receiver will receive these signals. These signals are fed to XGPS Server and location information is displayed by GUI.

```
sudo chmod 777 /dev/ttyUSB0
gpsd /dev/ttyUSB0
xgps
```
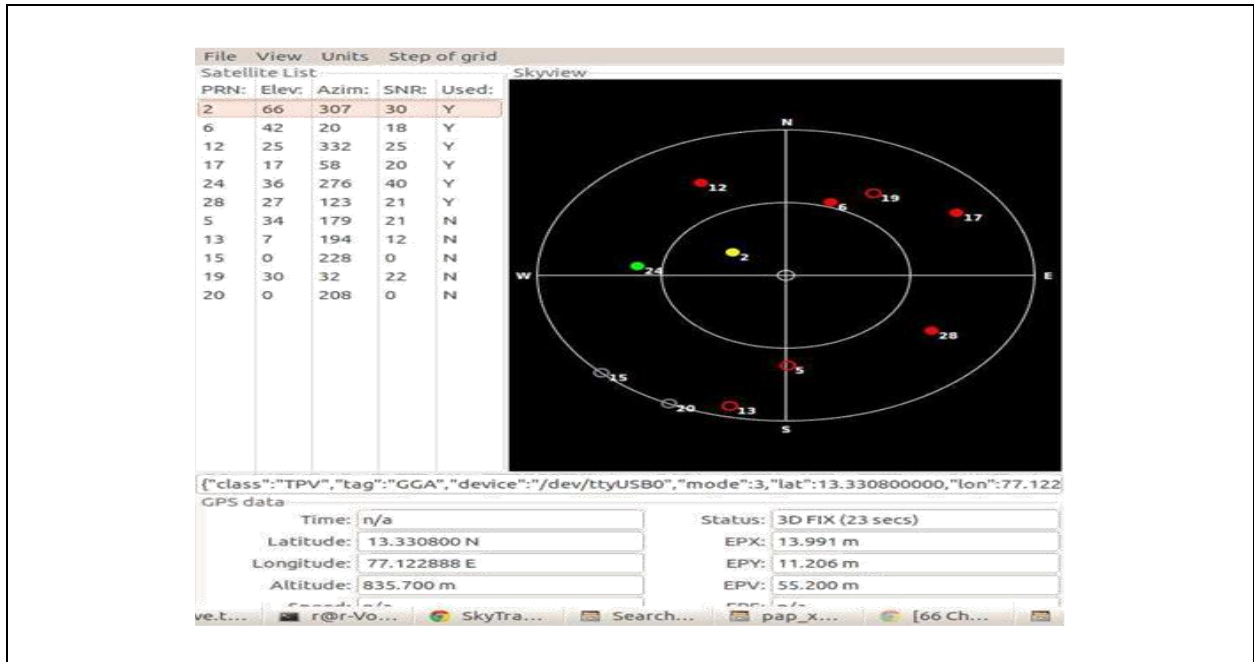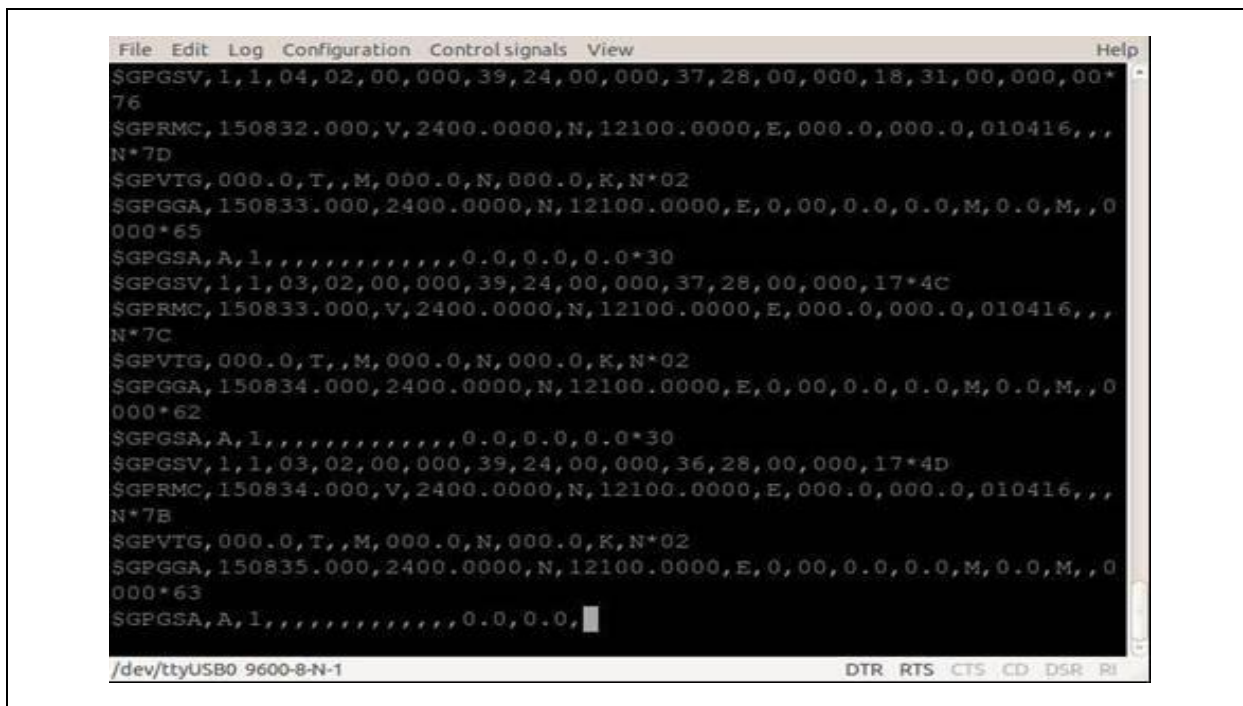


**Fig. 3: GPS Ttumkur location**

**Fig. 4: Serial terminal output**

## 4. RESULTS

According to http://www.worldatlas.com/as/in/ka/where-is-tumkur.html, Tumkur is a city found in Karnataka, India. It is located 13.34 latitude and 77.10 longitude and it is situated at elevation 814 meters above sea level".

The xgps result is : 13.33 N, 77.122 E, 835.700m

The experiment uses GPS antena, which operates on Frequency of 1575.42MHz, NSK33 GPS Board[1], Skttraq96 IC chip, 2.4 GHz RF Transceiver CC2500 and Ubuntu laptop.

The above figure shows serial terminal output at the Ubuntu system, which is invoked using XGPS Program. These information are processed and satellite position at sky and Tumkur location is displayed. ZigBee is con-nected to USB Port and it is accessed from the Serial Port as /dev/tty/USB0. XGPS (use internet resource) 1. GPS System 2. GPS Antenna. 3. IC Sky Track 96. 4. ZigBee TX.          5. Ubuntu System. 6. ZigBee RX.

## 5. CONCLUSION

The GPS receiver will receive signals from satellite and it is transmitted to Ubuntu via zigbee technology. The Xgps software will analyze the output and location and satellite positions are graphically displayed. Future work can be done to utilize this circuit in routing in long range communication using geographical based routing strategy.

## FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

## CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

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