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The Real Time Navigation Tracking Service Based on GPS System

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ABSTRACT: GPS is Global Position system, which is used for long distance time and frequency time application. GPS is space based navigation system that provides current location and time information to all weather condition. This system is used to provide the critical capability to military, civilien, and commercial users around the world. In this system is to develop latitude, longitude, velocity, altitude, the name of the current location and show the better show the better accuracy etc.
In this system to track the operation GPS depend on the various parameter likes RF communication link, satellite geometry GPS antenna placement, parameters to decode NMEA (National Marine Electronics Association). It provide the information regarding the numbers of satellite being tracking, satellite ID/PRN (Pseudo Random Noise) number and parameters like SNR (Signal to Noise Ratio) of the satellite signal, azimuth and elevation. We develop the GUI (Graphical User Interface) and display information on GUI. The parameter values are continuous variable and updated and are display on GUI. Hence the real time parameter values show on the table which was previously displayed on the GUI. To develop the internet based SMS (short message service) application which will message the real time latitude, longitude, altitude, speed and location name to the user's mobile. There is no need of power supply because we can carry handy device and this device will connect the PC/ Laptop all the time for tracking. The main aim of this system for navigation we will easy to used along with the compact size and visual display of results using PC and LCD display. An antenna is connected to the GPS receiver and received the signal from the satellite. The VB.NET (visual basic.NET) is to develop the system for programming language. VB.NET is Visual Basic .NET (VB.NET) is a multi-paradigm, high level programming language, implemented on the NET Framework which is easy to program and understand.

KEYWORDS: Global Positioning System, Graphical User Interface (GUI), Navigation, Positioning, Parameters, Visual Basic.NET (VB.NET), Personal Computer (PC).

I. INTRODUCTION OF NAVIGATION SYSTEM

Navigation has become an important aspect of day to day life. The Global Positioning System (GPS) is used on a large scale for navigation in aeronautics, defines and for civilian use.
(CR) There are plenty of other navigation systems available but GPS being far better, it is commonly used all over the world. Worldwide coverage and improved accuracy than other navigation systems are the most important advantages of the GPS. The constellation of GPS is 24 satellites that continuously transmit coded information, GPS receiver to receive the signal and precisely identify location on earth by measuring distance from the satellites. GPS is used on a large scale for navigation and tracking applications a user friendly GPS tracking system needs to be developed. There are many GPS tracking systems available in the market but are costly. Hence, a cheap and user friendly GPS tracking system can be developed which efficient and small in size. The aim is GPS system in an allow navigating, positioning and tracking and provide location based emergency services information.
Nowadays, airplanes, missiles, spacecraft, large sea vessels, ships, vehicles that move on dry land and even pedestrians make use of modern technology for navigation. It is also called GPS (Global Positioning System). The another system is GNSS (Global Navigation Satellite Systems) like Russian GLONASS (Global Navigation Satellite System), which is also global coverage and real time result display. The GPS based application available on mobile phone show tracking on maps but they require internet facility for navigation. The GPS time receiver and transferring and post - processing algorithms are the core of GPS communication system. Recently, navigation is importance for tracking position

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determining electronically by receiver, collecting information from satellites. Today different system used modern satellite navigation system such as vehicle moving, ships, sea vessels, Aircrafts, missiles. It is also called satellite navigation system as Global Positioning System (GPS). As compared other navigation system GPS provide better accuracy and global coverage.
This paper discussed on the real time GPS receiver system. It consist of GPS receiver with a USB connector, GPS software, GPS antenna which is develop in vb.net and GUI display using Laptop and personal computer.

II. SYSTEM MODEL AND ASSUMPTIONS

It considers a network with N The position and velocity of a moving object decide on land , at sea, in the air, or in space .Navigation is the process of monitoring and controlling the movement of object from one place to another object. It consists of four general categories:

1. land navigation,
2. marine navigation,
3. aeronautic navigation, and
4. Space navigation.

2.1. Navigation systems

These are various type of modern navigation system. The navigation systems are categorized below:

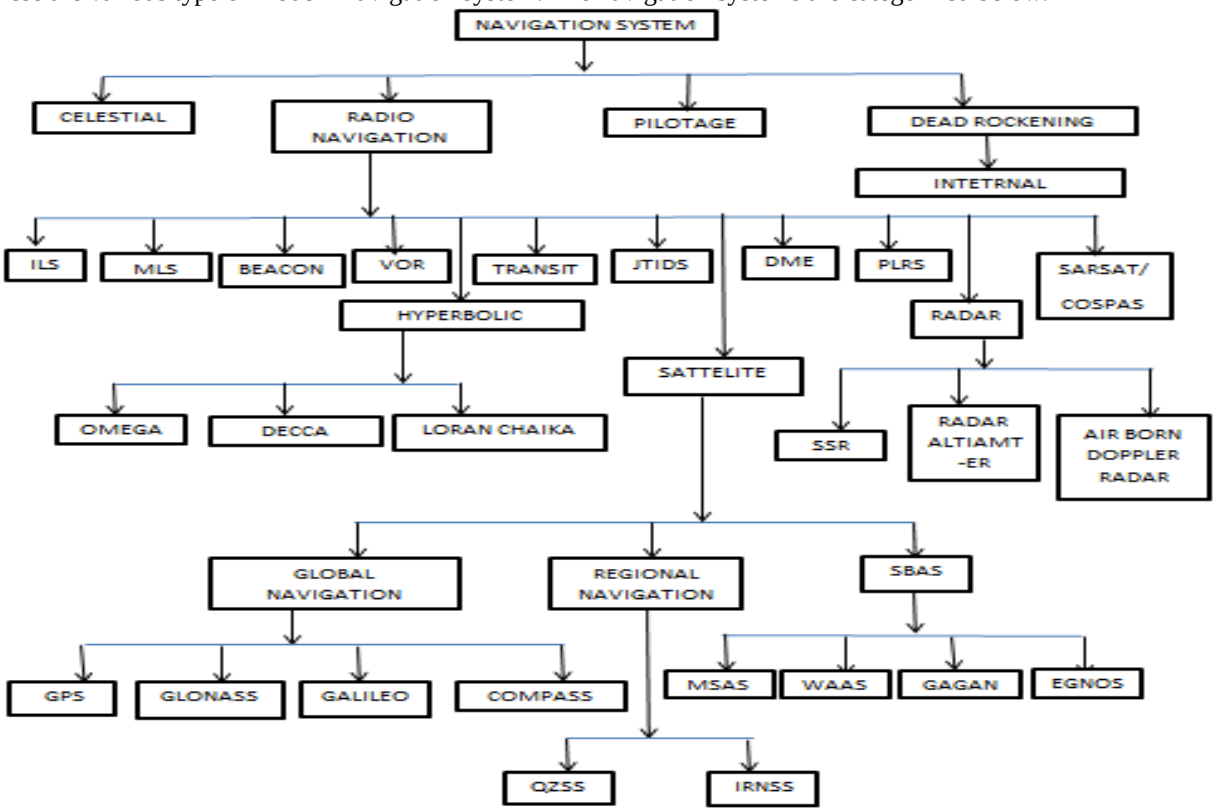

Figure 1: The classification of modern navigation system.

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III. GPS OVERVIEW

(FHS) that is composed of K distinct licensed channels. In each time slot, each node consecutively hops on FHS within a given order to transmit and receive a coordination packet. The aim of coordination packet that is generated by a node with message is to inform its path about the frequency channel decided for the message copying.

Furthermore, the coordination packet is assumed to be small enough to be transmitted within slot duration. Instead of a common control channel, FHS provides a diversity to be able to find a vacant channel that can be used to transmit and receive the coordination packet. If a hop of FHS, i.e., a channel, is used by the primary system, the other hops of FHS can be tried to be used to coordinate. This can allow the nodes to use K channels to coordinate with each other rather than a single control channel. Whenever any two nodes are within their communication radius, they are assumed to meet with each other and they are called as contacted. In order to announce its existence, each node periodically broadcasts a beacon message to its contacts using FHS. Whenever a hop of FHS, i.e., a channel, is vacant, each node is assumed to receive the beacon messages from their contacts that are transiently in its communication radius.

IV. EFFICIENT COMMUNICATION

The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. It consists of three segments of GPS.

1) Space segment 2) the control segment 3) the user segment. Which provides Navigation Satellite for Timing and Ranging (NAVSTAR) system for GPS?

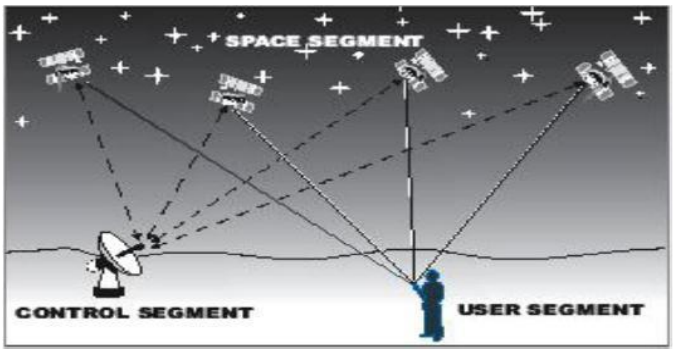

Figure 2: Three segment of GPS.

4.1. Space Segment

The GPS design originally called for 24 SVs, eight each in three approximately circular orbits, but this was modified to six orbital planes with four satellites each. The GPS satellite orbit around an approximate 20200 km in medium earth orbit viz. Block IIA (2nd generation,"Advanced"), Block IIR ("Replenishment"), Block IIR(M) ("Modernized"), Block IIF ("Follow-on"), and GPS III. Every satellite engenders and transmits a navigation message, In order to improve navigation system throughout earth satellite engenders and transmit navigation message. Which contain data get timely updated from control segment. A 1.023 MHz Pseudo Random Noise (PRN) coarse / acquisition (c/a) code sequence is added to this data. With the help of L-Band carrier frequency signal (L1) of 1575.42 MHz. The resulting code sequence is created by satellite module spectrum range signal. This SPS broadcast all signal throughout the user all over the earth. Each code is unique and distinctively identify each satellite constellation. It consists of least 24 satellites and it is heart of system. The satellite are present in high orbit 12000 nautical mile away from earth. The satellite is present in such a way that at least four they give one position. This satellite is timed using accurate clock.

4.2. Control Segment

The control segment is control the satellite by tracking device and then provides the correct information of orbital and clock. It consists of 5 control station around the world and 4 unmanned monitoring stations and 1 master control

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stations. The receiving station 4 unmanned constantly received signals from the satellite and then send the information to master control station. The satellite data should be correct and together with two other antenna site and send the correct information to the satellite.

43.3. User Segment

The user segment means including you and GPS receiver.GPS receiver depend on your hand and set in your system. They measure the time it takes for the signal from four separate satellites to get to the receiver for computing precise latitude, longitude and altitude.

V. RELATED WORK

Many scientists develop the GPS system for navigation and tracking applications. It improved the techniques for GPS satellite signals tracking, acquisition and processing have done. Maximum research are designed and make numerous applications in number of fields like mining , agriculture, banking etc. by interfacing GPS with other hardware or software technologies. A graphical programming language of complete GPS receiver design and its application. Explain an advanced GPS signal processing architecture and illustrates that how it can be applied to extend the GPS coverage into difficult environments such as indoors, urban canyon and under dense urban canopies. A software based GPS/Galileo receiver is design with including a structure of combined software GPS/Galileo receiver with multipath mitigation and Receiver Autonomous Integrity Monitoring (RAIM), they utilized the GPS and Galileo signals is presented. GPS-SBAS (Global Positioning System-Satellite Based Augmentation System) receiver. Digital Signal Processor (DSP) is developed and engineered for use in avionics applications. The use of technologies ASIC, FPGA and DSP is design and develop future GNSS (Global Navigation Satellite System) receivers is given. They introduced a software approach for acquisition, tracking and navigation system and GPS receiver using a RF front end and Analog to Digital converter.

5.1. GPS Satellite-End Tracking Process

It consist of 3 satellite are required to track an object accurately on frequency L1 (1575.42MHz) and other at frequency L2 (1227.6MHz the earth. Two signal broadcasts of Each satellite one at). Course/Acquisition code is unique satellite code and used to differentiate between the satellites. 1023 bits is C/A code, which modulates L1 signal every 1ms at 1.023 MHz. Assimilating the process, the satellite gathers a 1000Hz data and transmits it towards the receiver on the earth. The "navigation message" that is required by the receiver on earth to resolve the geographic position of the object. The 50bps of navigation message sent by each satellite are "This is satellite "X" reporting, & my location is "Y", sending the information at time "Z". Along with this data, each satellite transmits some orbital parameters.

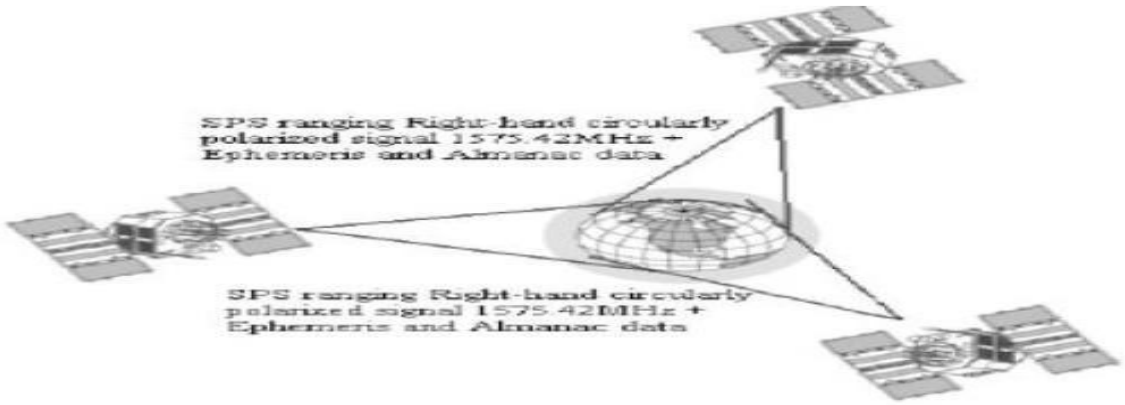

Figure 3: 100% Earth coverage for GPS satellite Tracking.

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VI. SYSTEM DESIGN

The GPS receiver system block diagram is shown in figure 4. The hardware module and software module is composed by system.

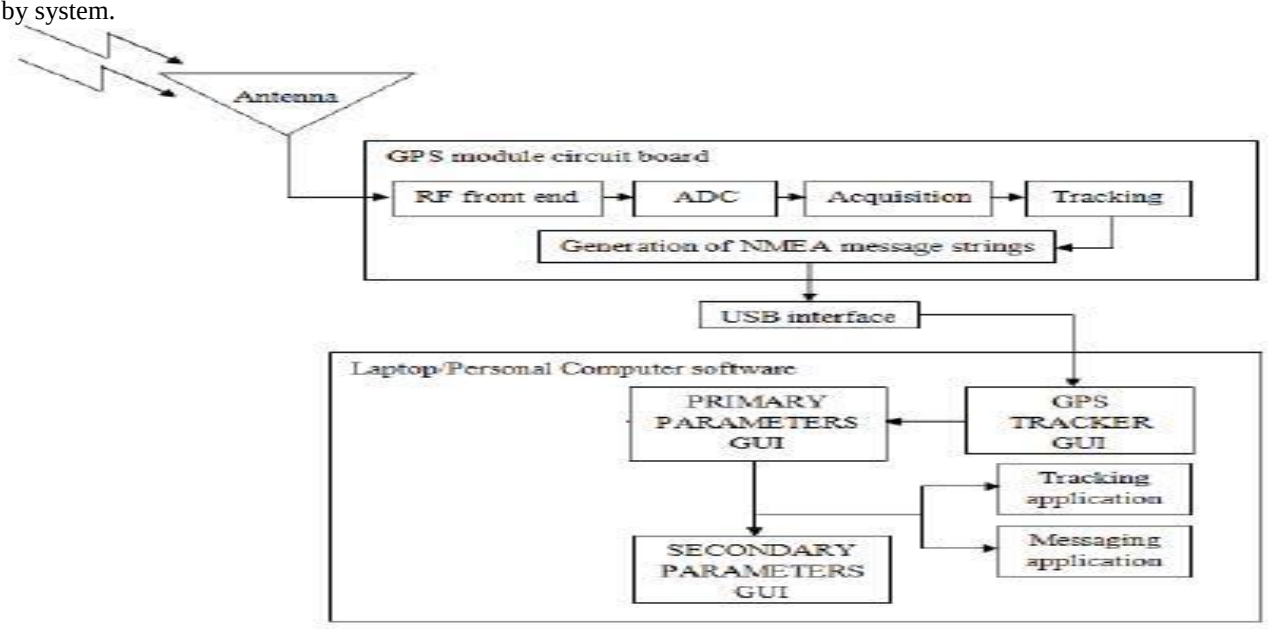

Figure 4: shows GPS receiver system block diagram.

The GPS satellites receive signals from antenna. These signals are given to the GPS module circuit board. the NMEA message strings produce the signal from the module circuit board processes the signals. the system software is installed using the USB connector then show the NMEA message strings on the computer or laptop. Firstly the system software, GPS TRACKER, GUI shows the window for username and password. If username and password is correct entered display GUI of "PRIMARY PARAMETERS" . After clicking „START DATA IN" button the NMEA strings are processed by the system software and the "PRIMARY PARAMETERS" GUI displays the parameters like latitude, longitude, altitude, speed, number of satellites in view, the location name, the satellite ID, the NMEA message string, date, UTC constant, HDOP, COG, the GPS string length and the GPS string name. From the "PRIMARY PARAMETERS" GUI on clicking of "SEND SMS" button an SMS can be send to a particular mobile number. This message shows the location name, latitude, longitude, altitude and speed of the user location. In "PRIMARY PARAMETERS clicking SECONDARY PARAMETERS" button. Display on GUI SECONDARY PARAMETERS. The GUI show the information of the satellite regarding like Azimuth, Elevation, SNR and satellite ID. From the "PRIMARY PARAMETERS" GUI on clicking "LOCATION" button, the current location of the user is displayed in the textbox. The developed web based application which displays the

"PARAMETER HISTORY" table. These table display parameters like latitude, longitude, altitude, speed, date and time and location name. .NET programming language is develop on system software. It is application oriented programming language. For developing the web based application, a server is developed in SQL server management studio express 2005. This server stores the parameters which are to be displayed in the "PARAMETER HISTORY" table.

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VII. SYSTEM EXECUTION METHODOLOGY

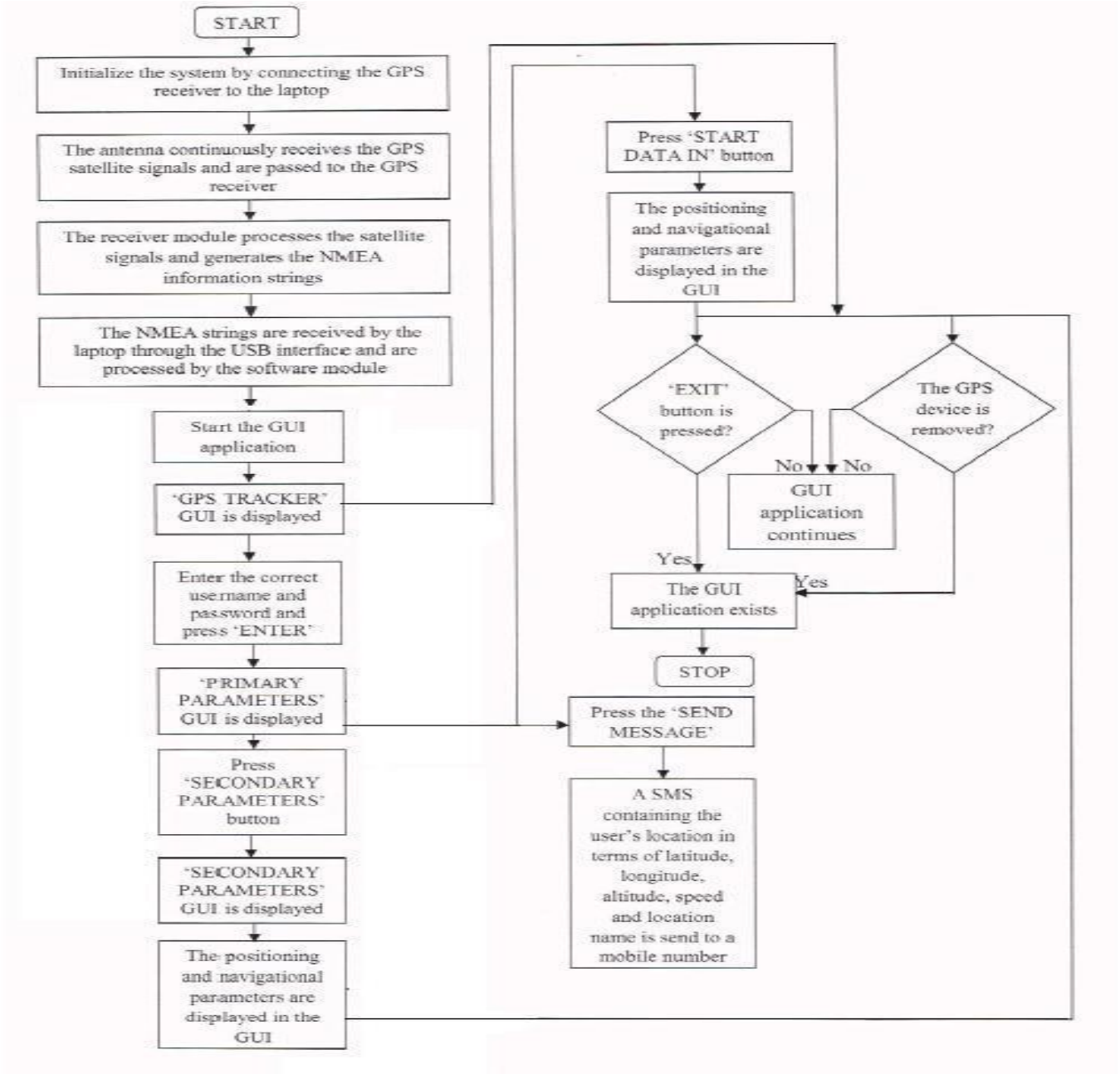

Figure 5: Shows the system execution flow sequence.

VIII. RESULTS

To illustrate the performance of the developed real time GPS receiver .The system taken were the real time results of the system. The tested results are tabulated in table 1, 2 and 3.

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r.No.	Latitude N	Longitude N	Altitude (m)	Speed (Km/hr)
1	2001.9790	07378.6547	625.7	10.4
2	2001.9811	07378.7384	627.3	11.6
3	2002.0678	07376.8157	629.5	14.6
4	2001.8178	07378.8479	630.8	18.9
5	2001.6141	07378.4058	625.4	13.5
6	2001.1289	07377.8436	628.2	12.4
7	2001.0859	07377.5025	624.5	18.6
8	2000.8903	07377.2214	624.7	12.6
9	2000.7149	07377.1327	623.9	13.5
10	2000.5012	07377.0626	626.2	11.2
11	1999.8156	07376.9188	625.8	15.4
12	1999.7995	07376.9188	625.3	13.5
13	1999.4648	07376.9231	624.4	14.3
14	1999.4325	07376.3099	625.2	12.5
15	1999.3760	07375.4039	626.1	12.3

Table 1: shows the values of parameters displayed in "PRIMARY PARAMETERS" GUI at different locations.

The real time values of Latitude, Longitude, Altitude (above mean sea level) and speed are shown in table 1.

Sr.no.	Actual Point/Location name	Course Over Ground (degrees)	HDOP	No. of satellites used
1	A	172.4	1.1	9
2	B	175.6	1.5	4
3	C	143.7	1.4	6
4	D	160.4	1.4	7
5	E	255.8	1.5	4
6	F	234.2	1.2	8
7	G	233.6	1.5	5
8	H	210.7	1.5	4
9	I	196.5	1.4	6
10	J	223.4	1.4	7
11	K	172.6	1.1	9
12	L	171.4	1.4	6
13	M	195.7	1.5	4
14	N	192.9	1.5	5
15	O	263.4	1.4	7

Table 2: values of parameters displayed in "PRIMARY PARAMETERS" GUI for the same locations.

Table 2 shows the values of parameters displayed in "PRIMARY PARAMETERS" GUI for the same locations whose parameters are shown in table 1.

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Sr.no.	Satellite ID/PRN number	Azimuth (degrees)	Elevation (degrees)	SNR
1	32	21	81	40
2	20	319	44	36
3	16	159	43	35
4	31	25	38	33
5	14	79	09	31
6	22	138	07	32
7	06	318	17	37
8	27	165	03	29
9	29	31	63	24

Table 3: Values of parameters.

Table 3 shows the values of parameters displayed in "SECONDARY PARAMETERS" GUI for location point "A" The number of satellite signal received the GPS receiver system hence the view are the receiver tracks the satellites. The information of these satellites show satellite ID/PRN number, azimuth, elevation and SNR for location point "A" are tabulated in table 2. The values of parameters given in table 2 are obtained from „SECONDARY PARAMETERS" GUI.

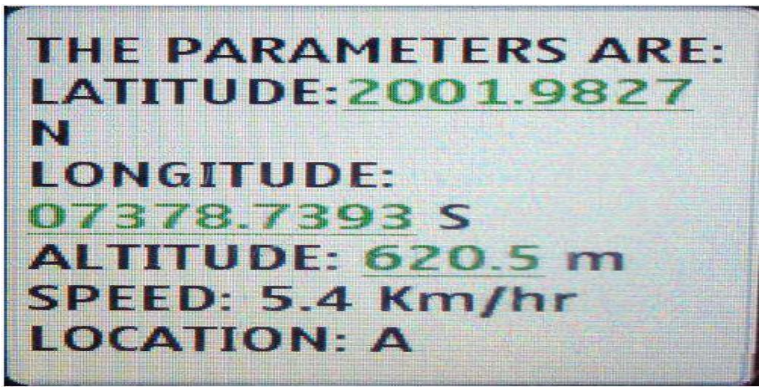

Figure 6: The message received by the user on using the SMS Service.

After pressing the button send message the GPS parameter message describe the navigation data and position of the user which contain longitude, latitude, speed, location, altitude and send this information to mobile number. The message received by the user is shown in Figure 5 where location of user is shown as alphabet „A".

IX. APPLICATIONS

- Environment and forestry.
- Mining, oil & gas.
- Agriculture.
- Military applications.
- Public safety.
- Animal tracking.
- Banking.

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X. CONCLUSION

The investigated is a real time GPS receiver. The system is developed successfully. The location parameters are extracted from string message of NMEA. These parameters are represented in the standard form of units like degrees, meters, dBHz, etc. The receiver system requires time of about few seconds in order to acquire the satellite signals, process the signals to generate the NMEA message strings and to process the strings to obtain the location parameters. The hardware and software installed on the pc or laptop and to run the system software are minimum. Due to small size power supply requirement is less and system hardware is portable. The internet facility is required for SMS sending. The web based parameter which display parameter history table needs internet browser to display parameter history table.

XI. FUTURE SCOPE

- It can be miniaturized system hardware in small device with the system software installed in the device along with the display.
- The map of database can be created so that find out the location can be seen on the map and also regarding information of location can display.

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