Design and Implementation of Real Time Basic GPS Receiver System using Simulink 8.1

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Abstract— The Basic GPS (Global Positioning System) Receiver is designed in this proposed research using 29 satellites. It is a space-based satellite navigation system which gives the location and signal travelling time information in every weather circumstances, everywhere on the Earth. It is required minimum four or more GPS satellites to measuring the correct information of the signal time and location. Signal travelling time information is measured by the help of the speed of light. During this earlier period, the execution of a whole GPS receiver is divided into two parts. The first part is implementation and second one is navigation solution of GPS receiver. The implementation of GPS receiver is done by using of FPGA and this part is also including the achievement with a tracking phases. This algorithm is executed inside HDL programming. The second portion was designed on DSP through written an algorithm using Matlab programming. So we are dealing with all these three section of GPS receiver. The three section of GPS receiver are done by using FPGA, DSP, andSimulation. The receiver structural designs are very understandable and simple to comprehend and modify after that debug. In the common, this proposed research would be showing a unique designing for implementing as well as simulating of the basic GPS receiver with the help of graphical programming.

Key Words: GPS Receiver, MATLAB, Software Defined Receiver, Simulink, Acquisition.

I. INTRODUCTION

A GPS receivers are provision of Standard Positioning Services (SPS) transmitted hanging in the balance carrier i.e. 1.57542 GHz through the Coarse Acquisition (C/A) code that have four eliminates to take the area and time from received signal. These stages are: the front-end, the accomplishment stage, the following stage and the route arrangement stage. The design of 8-channels single frequency GPS receiver with having C/A code having a carrier frequency and intermediate frequency simulate in the Matlab. It speaks about GPS receiver calculation and a record for a genuine GPS gathered on or after a particularly composed ASIC-based front-end. In like manner, the calculation of the complete GPS is measured and convoluted, in light of the fact that it contains unique stages that arrangements with the preparing of RF, IF and basebands signals.

We compose a complete calculation for a GPS receiver; In which every part was written in the own algorithm of secure portion that delivers the output to another portion to complete the next portion of the algorithm. A Single-Frequency Approach are changed according to the Simulink models, resulting to changing the calculation of different parts to match with the GUI environment and construct the reproduction time much faster. This bit of composing includes a stage the course just before an unmistakable, simple, and straightforward reproduction of GPS receiver actualized with the SDR innovation. The usage of a finish 8-channel GPS collector is refined by means of a graphical situation. As a rule, the graphical climate makes the connection between the reproduction, and execution clearer and simpler to investigate, in light of the fact that we can put test focuses anyplace and get prompt results. The use of graphical programming dispenses with the need of cooperation and empowers one and only individual to complete the reproduction of complete system in brief time. The achievement of utilizing graphical programming, for example, SIMULINK is simulating a confounded system, for example, the GPS collector was open the course for other confused systems to reproduced
using same way. This will be encouraging the instruction, the alteration and the troubleshooting of a considerable measure of the complex electronic systems.

II. BASIC GPS RECEIVER WITH ALL STAGES
The GPS receiver having Simulink models such as acquisition, tracking a range of satellite signal, pseudo range calculation and navigation position solution were design and developed in real time. GPS signal was gathered from the front end. Its practical block diagram is demonstrated in reference. The comparative sign is used as a part of testing & building up the Matlab calculations.

i. ACQUISITION OR INITIAL PHASE
Here we have simulate and implemented a simple basic GPS receiver through Simulink in (figure 1). In this GPS receiver are using PNR (pseudo random noise) code, satellite C/A code and channel. PRN code is the unique code and C/A is also unique for every satellite. In addition to the PRN ranging codes, In which a GPS receiver have known all detailed information about each satellite's position and the network.
At the receiver end we also used same receiver C/A code generator and PRN code. The input and output PRN code are same for one satellite like an example if we connect our input PRN code 21 then at the receiver end we are getting the PRN code in 21.

![Simulink model to represent the basic GPS receiver](image)

In this Simulink block (figure 1), we are using one block the name is channel, it is interconnectivity of the GPS transmitter and the receiver. In which two options are there one is channel that passes the input signal from the channel and second is bypass in which we can pass the GPS input signal directly to the receiver input end. The channel of transmitter and receiver of basic GPS receiver Simulink block are shown below, this block having transmitter or receiver gain, free space path loss and receiver thermal noise. By using a channel we can take input from the transmitter directly with passing all these block that is called bypass input.
In acquisition phase we choose one of obvious satellites and choose together carrier frequency with code stage generally. In the tracking we track any progressions to these qualities to guarantee right information decoding and the pseudo range as well as position was ascertained. There are two extra models; one gives demodulation Carrier with alternate gives disspreading code. This two model demodulation as well as disspreading model was simulated first encourage lookup tables that existed inside acquisition model.

ii. CROSS CORRELATION

The correlation between the transmitter and receiver signal block structure are showing (figure 3) here that block diagram are implemented in the Simulink using DSP library. It is showing the signal relation between the amplitude and the time. In this block we have used two circular correlations and is having two inputs real or imaginary make a combination of both these two getting one output. The output waveform between the satellite signal amplitude and the time is shown in (figure 4).
iii. TRACKING & NAVIGATION

The tracking or navigation is an important phase for the basic GPS receiver. The fundamental motivation behind following is refine the acquisition results and track any progressions that jump out at these outcomes with time. A demodulation or dispersing is done to approaching signal to acquire the 50 bits/s of navigation information. The information estimate that being handled in every following cycle was carry complete C/A code in addition to or less the postponement or slack that is being estimated in tracking phase. In tracking phase the tracking start begins if the number of the recognized PRN codes at acquisition stage ≥ 4. In general way, tracking was designed with carrier tracking loop that works in consistency as well as code tracking loop. The carrier or code tracking loop system was used more often. In GPS receiver there is Phase Lock Loop (PLL) and Delay Lock Loop (DLL). Typically these two loops were joined inside one loop to expand the control for produced transporter frequency and code stage and to lessen the quantity of multipliers. This procedure is reducing tracking time of the basic GPS receiver.

In the navigation phase the 50 Hz navigation bits are decoded by received GPS signal information to acquire the pseudo range. The GPS receiver position and clock offset is simulated according to the given block diagram.

The initial phase in navigation arrangement stage is Bit Synchronization. In this section we discover time anywhere bit moves happen and afterward each 20ms were supplanted using single value which speaks to a navigation information bit. The second phase of this section is deciding the start of every sub-frame to comprise of 8-bit long introduction and that was performed by associating tracking output with mainly created preface.

The navigation bits information is prepared currently to be decoded and ephemeris parameters could be decoded. Pseudo random range estimations are expert by two stages: the first stage is to discover starting range of GPS. The second stage is to stay informed regarding the at first ascertained pseudo ranges. The starting pseudo reaches are used as a part of figuring receiver position (X Y Z) with receiver clock counterbalance (dt). The method of Least-Squares system is generally using as a part of ascertaining receiver position more than or equal 4 obvious satellites.
The complete GPS receiver Simulink models having such type of block like acquisition acquire the information of input signal, tracking are used to track the user position, and last one is navigation solution were collective in one block that represents a simulation phase of a GPS receiver. Designing the GPS receiver on DSP that makes the structural design is very understandable and straightforward to debug, adjust any single part of it and measure instantaneous results.

![Graphical representation of GPS receiver](image)

**III. CONCLUSIONS**

In the present research we have presented simulation or implementation of a basic GPS receiver along with graphical programming. Besides we can be presented the arrangement of adjusting both the intermediate frequency IF and sampling frequency Fs in Simulink basic GPS receiver, it give the proportional results can just analyzed. Using graphical situation as a part of both the reproduction and execution stages makes planner brain devoted more often than not in creating and improving the calculation and taking less time for coding.

**IV. REFERENCES**