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# Global Positioning System Principal, Applications and Simulation of Gold Sequence

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***Abstract: - This paper is aimed to preset the survey of the various technological advancements in the field of global positioning systems and there applications. The paper aimed to address the various recent developments in the field of global positioning system (GPS) and there west uses. Various constraints for navigation system are considered for discussion. Application including earth rotation, earth quack studies, Navigation, for civil surveying, and deformation of Dams, vehicles monitoring and tracking etc. are explored in the paper. Paper also discuss concept like differential GPS (FGPS), Global navigation satellite systems (GNSS) and Aviation's, this paper has preseted the study of the Golf sequence generation and correlation analysis for the GPS navigation.***

***Key Words:* Global Positioning System, Gold Sequence, Satellite communication, GPS segments, GPS Applications, Aviation, Navigation, Surveying.**

## I. INTRODUCTION

The gold sequences are most frequently being used for the signaling in the GPS based navigation and the correlation radars applications. There are various forms of the gold sequences have been developed in the past. The paper primarily aimed to preset the study of various GPS applications and followed by the Gold sequence simulation. Paper has also preseted review of arioso sequences used for GPS systems in past.

***BACKGROUND***

The main function of GPS systems is as a localization framework for location detection. This paper discusses a number of recent developments that have increased the rate of success of object localization. The Global Positioning System (GPS) was developed by the Department of Defence (DoD) of the United States during the early 1970s, employing satellites as the navigational framework. At first, GPS was developed as a military technology to suit the demands of the American military.

**But after being made available to civilians, it has evolved into a multifunctional system that is usable for both military as well as civilian users. The GPS constellation, which is comprised of 24 active low-Earth elliptical satellites, delivers worldwide navigation services. As depicted in Figure 1, these capabilities also referred to as the first operational capability (IOC).** With this arrangement of geometry, 4 to 10 GPS satellites were accessible from any part of the world. The orbits of GPS satellites are almost circular (elliptical with a maximum variation of about 0.01) and incline at a 55° angle from the equator. The semi-major axis of a GPS orbital is roughly 26,560 km, which corresponds to the satellite's elevation of 20,200 km beyond the flat surface of the earth. Around 12 sidereal hour eleven hours and 58 minutes) make up the GPS orbital interval. The GPS system has been deemed as having reached full operational capability (FOC) upon July 17, 1995, guaranteeing the presence of no fewer than 24 functioning, uncontrolled GPS satellites [1]. At an average frequency of 1575.42 MHz, each of the satellites sends to Earth both its precise inbuilt clock and its geographical position.

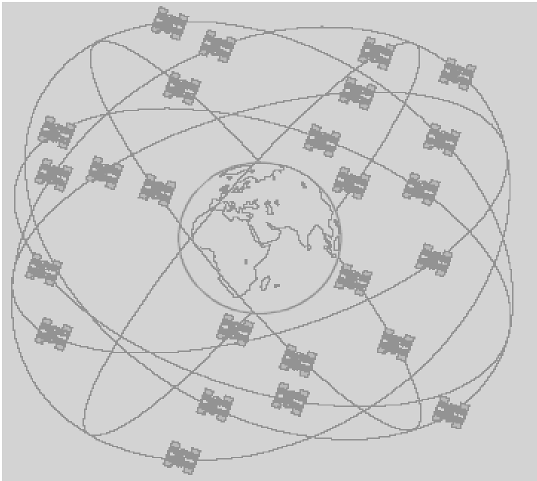

**Fig. 1 GPS satellites placement in orbiting planes**

## II. GPS SEGMENTS

GPS consists of three segments: the space segment, the control segment, and the user segment (Figure 1.2) [1].

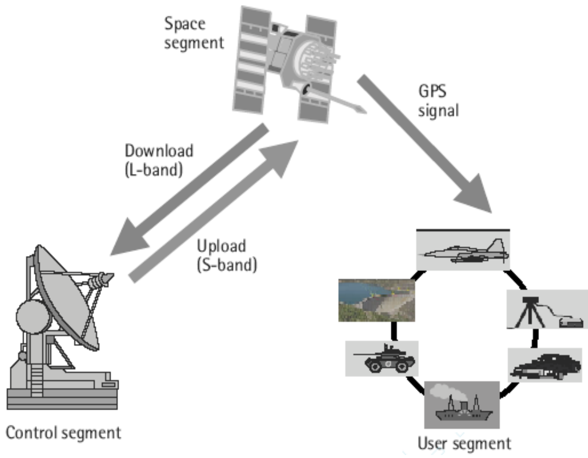


**Fig.2. various major segments used in GPS localization and monitoring system**

The 24-satellite configuration described above in the preceding paragraph makes up the space segment. A signal is transmitted by each GPS satellite that consists of a navigation information, two sine wave signals (also referred to are carrier frequencies), including two digital codes. Binary bi-phase modulations are used to add codes as well as the navigation signal to the carriers. The major purpose for the carriers as well as codes is to calculate the separation between the user's receiver when the GPS satellites. The spatial coordinates of satellites being a function of the time are one piece of data in the navigation signal. Gold code in this paper is generated and simulated as digital pulses for such applications. The correlation is measured under the noisy environment.

## III. GPS APPLICATIONS

A GPS can be used in a variety of situations, including aviation and maritime operations. According to some, GPS is to positioning what the clock was to timing. Among the typical uses for a GPS system is shown in the figure 3

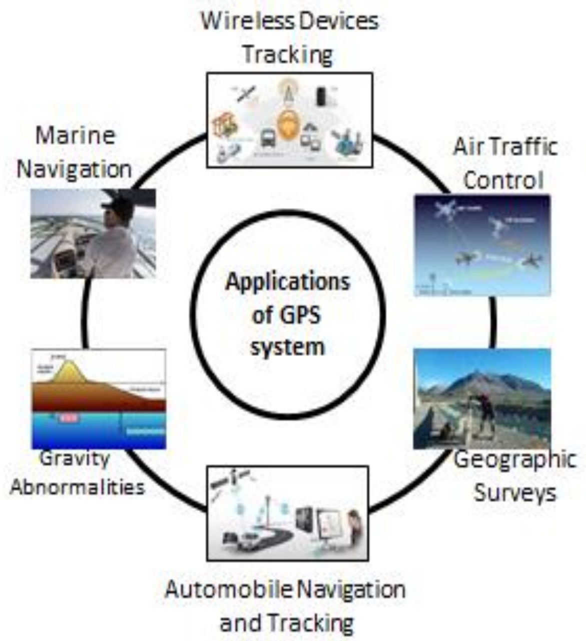


**Fig.3. Most Frequent Applications of GPS Systems Navigations**

The most frequent applications of the GPS include in marine negation and air traffic monitoring and aviation systems. Recently the GPS based tracking is incorporated I the all mobile devices for location tracking. The automobile system has also the recent example of tracking the vehicles.

Some other GPS applications are;

- Creation of zero with great precision for GPS stations.
- Employing GPS stations to strengthen, density, and reposition the current primary control networks.
- Geodetic control and connections linking remote islands to the mainland.
- Creation of the precise geoid employing GPS data.
- Studies of earth rotation as well as polar motion using GPS signals.
- Employing GPS to calculate gravity anomalies.
- Location of oceanographic stations, buoys, etc.
- GPS for Earthquake monitoring

## IV. GPS TRANSCEIVERS BLOCK DIAGRAM

Figure 4 below illustrates a block schematic of the signal's transmission in a satellite based vehicle tracking.

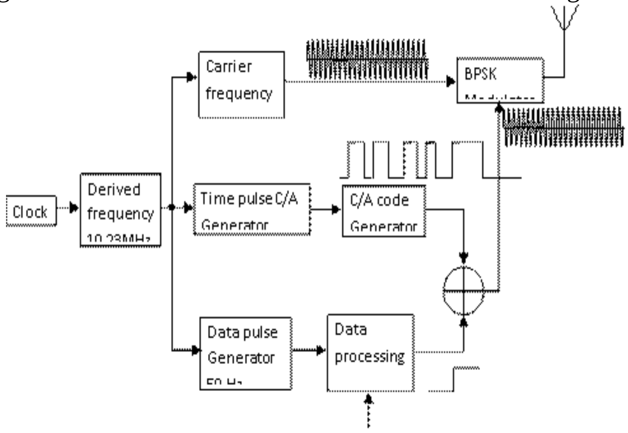


**Fig.4. GPS signals generation system diagram**

A satellite derives its fundamental frequency, 10.23 MHz, from the resonance frequency among one of its four atomic clocks. From this fundamental frequency, other frequencies such as the frequency of carrier, data frequency, PRN or golf sequence generation timing are derived. Data is dispersed throughout a 1MHz bandwidth in this way. Employing bi-phase shift keying (BPSK), information is modulated using the gold code modulates its L1 carrier in turn. The L1 carrier phase changes by 180 degrees for every change of the modulated data. Figure 2.2 displays the waveforms for the various signals.

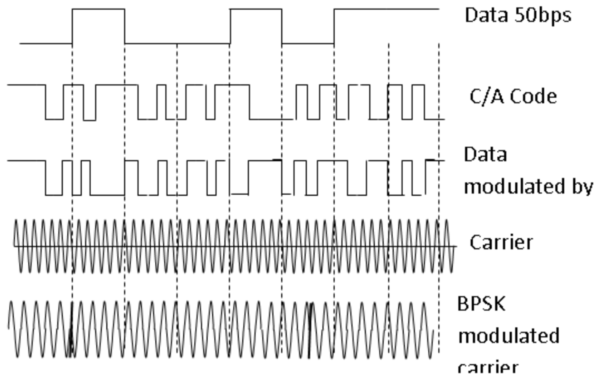


**Fig.5. Conventional GPS control signals waveforms**

A respective streamlined GPS receiver is depicted in the Figure 6 below.

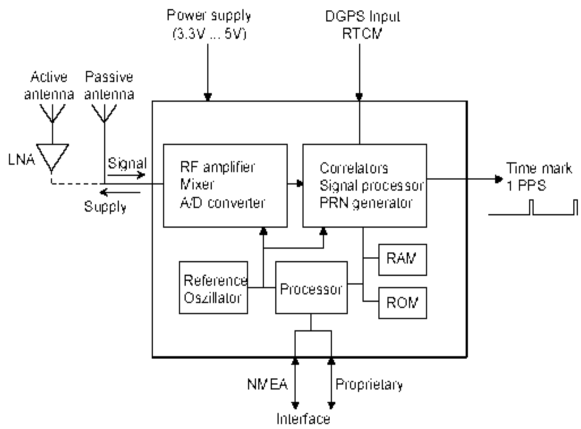


**Fig.6. System diagram of respective GPS receiver**

MINHUCK PARK study suggested a way for wide-area drone protection employing GNSS (global positioning satellite system) interference signals. In order for the signal tracking loop to track the defensive signals and direct the drones to a safe area, the defensive GNSS signals produced by a single signal generator sweep the genuine GNSS signals. By modifying the signal generator's temporal offset, the suggested algorithm executes a sweep in the measurement domain, allowing it to cover a larger area. In this fundamental study, we looked at the signal generation technique for the transition of signal tracking locks from authentic to defensive signals in circumstances where a signal generator does not exist to confirm the viability of wide area protection.

P. Lu and co. Designed L1 civil (L1C) signal of the global positioning system (GPS) uses a novel code concept. L1C codes are generated in a very different way than conventional range codes. To open the door for future research, a technique for the right generation must be discovered. Only one Legendre sequence, made up of Legendre symbols, serves as the foundation for L1C codes.

S. N. Reddy and others presented design and implementation of PRN code on Spartan-II FPGA hardware is also demonstrated in this work. The output of the created SPS PRN code is accepted by hardware, and simulation results and analyses of the PRN codes' properties show positive results. The execution analysis and simulation of the auto-correlation function (ACF) and cross-correlation function (CCF) features for PRN sequence are also demonstrated in this article. SPS PRN codes were successfully simulated using the Xilinx ISE test system and MATLAB tools. The results of the test simulation fall within the theoretical bounds. S Cho et al. have study, a dynamic localization strategy for a mobile robot with changing speed is proposed. Since the time-of-flight of the ultrasonic signal is used to determine the distance to the beacon, localizing a mobile robot equipped with active beacon sensors takes a fair amount of time. When the mobile robot moves slowly, the measuring time does not result in a significant amount of error. The localization error, however, increases with the speed of the mobile robot and is then unusable for precise navigation.

Bernhard Hofmann et al. suggested using a distributed Kalman filter (DKF) based on stochastic reachability (SR) to compute secure global positioning system (GPS) time across a network of receivers. We estimate the stochastic reachable set of GPS using SR, which is parameterized by the probabilistic zonotope (p-Zonotope). We created a two-tiered strategy that calls for known measurement error bounds in only non-spoofed circumstances. By deviating from a measurement innovation's anticipated p-Zonotope, we first accomplished measurement-level spoofing mitigation. Yang, G., He, X., and others propose GPS receiver links with many antennas in the GPS multi-antenna device that the authors created, and the experimental findings are described in this work. The effectiveness of GPS as a tool for tracking slope stability and dam deformation has already been established. In comparison to other surveying methods, it gives more precision. When used for slope and dam monitoring, GPS does have some drawbacks. The main disadvantage has been the high expense because monitoring sites need to implement GPS on a big scale.

Radars are common tools for defense, survey, and vehicle steering systems, according to Kumar et al. However, the delicate nature and high cost of these tools prevent them from being used in everyday situations. Several additional options will be added thereto, such as vehicle signature reading, which will be used to determine the type of car, such as a delivery or emergency vehicle. We tend to projected associate degree approach to creating the device easier, cheaper, & to form the device abundantly compatible for vehicles so it will be used for machine-controlled vehicle driving system as well as collision shunning system. Khaled Rouabah and others we suggest a more straightforward and quick Gold codes generator that may quickly and effectively initialize to any required code. Its basic idea is to create just one sequence (code number 1) from which all other signal codes can be created. This is achieved by simply shifting this sequence by various delays that are carefully chosen utilizing the properties of the bicorrelation function.

## V. RESULT AND SIMULATION OF GOLD SEQUENCE

In this section some of sequential simulations of the GPS signals generation using PRBS and gold codes are preseted.

**Table 1. Simulation parameters**

| Variable range | description |
|---|---|
| K=16 | quantity of signals |
| aoa = [50 80 -45 -10 0 0 0 0] | Array of the k signals' angles of arrival |
| f = 1575.42*10^6 | GPS signal's frequency |
| T = 0:0.01:10 | Sampling time |
| d = 0.002 | distance among the antennas |
| A = [] | Empty steering matrix |
| c = 3*10^8 | EM wave velocity |

This paper has presented the basic evaluation of the C/A code and the gold sequence generation of the GPS trans recovers used in the navigation.

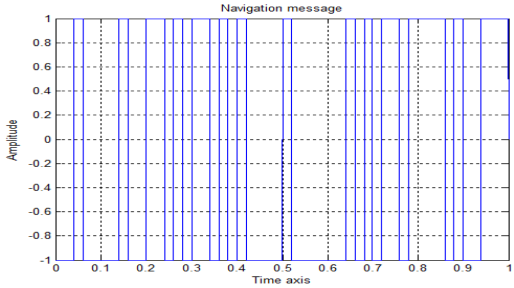


**Fig.7.Simulation of the Navigation signal**

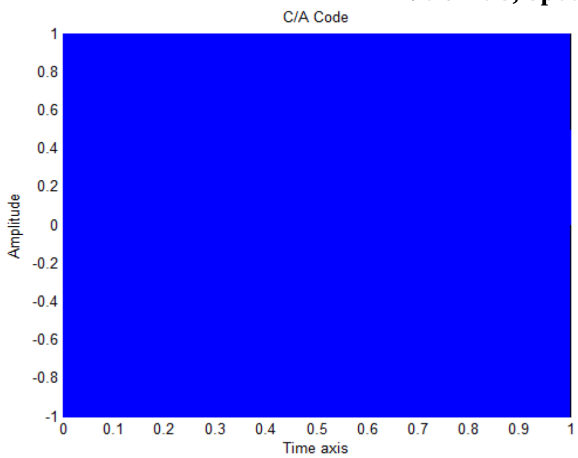


**Fig.8.The C/A signal generation for message**

As part of our main project, the research discussed in this paper is centered on the development of an anti-jamming and anti-spoofing technique using GPS signals. We opt for the MATLAB simulation and implementation programmer.

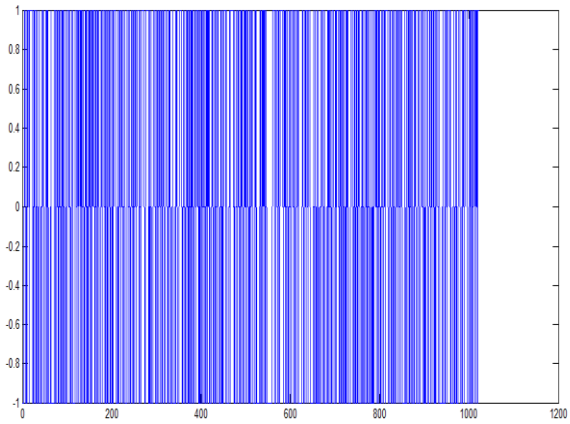

**Fig.9. An Example of the Gold code generation for the GPS satellites**

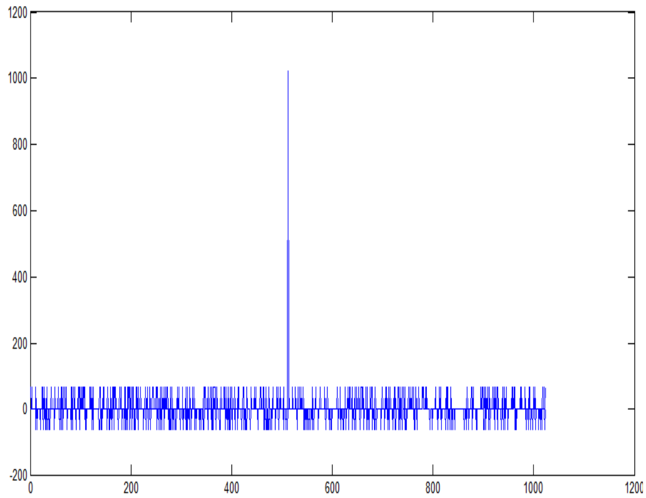

**Fig.10. Calculated correlation between gold code for 4 and 8 satellites**

## VI. CONCLUSION

The Global Positioning System (GPS) has proven to be a great asset in a variety of civilian applications. The purpose of this study is to provide a summary of the main technological developments in the area of global positioning systems and their applications. The purpose of the paper was to discuss the different recent advancements in the global positioning system (GPS) and their western applications. Different navigational restrictions are taken into consideration and discussed. The study examines several applications, such as earth rotation, earth quake investigations, navigation, civil surveys, dam deformation, vehicle monitoring and tracking, etc. The research covered in this paper is focused on the creation of a GPS signal anti-jamming and anti-spoofing technique. We decide to use the simulation as well as implementation programmer for MATLAB.

This work has established the study of the Gold sequence formation and correlation analysis for the GPS navigation. It also discusses concepts like differential GPS (FGPS), global navigation satellite systems (GNSS), and aviation.

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