Role of GPS and Satellites Navigation System In Development Area

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Abstract-*Global Positioning System or GPS is a satellite navigation system mounted on space to provide location as well as time information at any section of the earth that has no obstruction in the GPS satellite line of sight (Cunningham 1). GPS technology has advanced and continues to advance very fast with new models being developed each year to correct challenges experienced in order versions. Furthermore, GPS technology continues play an active role in the modern engineering as evident in the wide range of applications that it has been proved to be of immense help and contributions. In this review of literature, the active role played by GPS in modern engineering shall be discussed in detail, particularly as regards to the various fields in which this technology has been applied. The literature review will address: Integration of GPS and Geographical Information System (GIS; application of GPS in traffic studies and other applications such as probe vehicles, management of traffic Congestion and traffic volumes; attitude determination using GPS, particularly noise analysis in attitude determination using GPS; GPS for intelligent vehicle-highway systems; geometric modeling of highways using GPS; and GPS for parallel load flow analysis. The GPS positioning and navigation using GPS (Global Positioning System) where explored, GPS is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS receiver in the areas of precise positioning, mapping locations, navigating across the mapped locations very easily. The purpose of this paper is to showcase the experiences that incurred in designing a positioning and navigation system (GPS), which can be used as a moving compass, steering to any mapped destination, providing the information about near by places, tourist attractions, petrol bunks etc.*

Keywords-GPS, Map, Vehicle Tracking

I. INTRODUCTION

In this section of the paper, a brief overview of GPS Technology is provided. The Global Positioning System (GPS) [1] is a constellation of satellites that orbit the earth twice a day, transmitting precise time and position (latitude, longitude and altitude) information. With a GPS Receiver, users can determine their location anywhere on the Earth. The complete system consists of 24 satellites orbiting about 12,000 miles above the Earth, and five ground stations to monitor and manage the satellite constellation. These satellites provide 24-hour-a-day coverage for both two-and three-dimensional positioning anywhere on Earth.

A GPS satellite navigation system was begun in the 1970s by the US Department of Defense, which continues to manage the system, to provide continuous, worldwide positioning and navigation data to US military forces around the globe. GPS basically offers two levels of service namely SPS (Standard Positioning Service) for civilian access and PPS (Precise Positioning Service) for exclusive military use with higher level of encryption.

As already stated above, the basis of GPS Technology revolves around precise time and position information, which is being accomplished through atomic clocks and location data. Basically the satellites broadcast the time and their position. A GPS receiver receives these signals, listening to three or more satellites at once (it's also called tracking), to determine the users position on earth.

A GPS working principle is that, it measures the time intervalbetween the transmission and the reception of a satellite signal, and then it calculates the distance between the user and each satellite. Through the distance measurements of at least three satellites in an algorithm computation,

II.HARDWARE DESCRIPTION IN GPS SYSTEM

2.1 Digital Compass Description

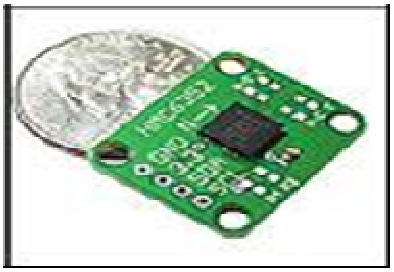

Figure 1.Digital Compass

The Digital Compass magneto-inductive technology is able to electronically sense the difference in the earth's magnetic field from your vehicle's magnetic field. Some digital compass used in automobile has an embedded microcontroller that subtracts out user's auto mobile magnetic field (distortion) from the stronger earth magnetic field, providing highly accurate compass readings. (ASD, 2006)

The electronics compass such as Honeywell family is generally a device for determining aircraft direction using the magnetic field of the Earth. This technology is called magneto-inductive and is the largest advancement in compass technology since the fluxgate was invented 60 years ago. The operation of the compass is based on the principle of electromagnetic induction with the Earth's magnetic field acting as the induction field for an electric generator. Because the direction of the Earth's magnetic field is aligned nearly north-south, the electrical output of the generator will vary depending on its orientation with respect to the Earth's magnetic field. This variation in the generated voltage is measured, allowing the Earth inductor compass to determine direction.

Advantages

1. The Digital Compass magneto-inductive technology is able to electronically sense the difference in the earth's magnetic field from your vehicle's magnetic field.
2. GPS channel receiver and super sensitive antenna for fast satellite signal locking and accurate tracking. device for determining aircraft direction using the magnetic field of the Earth
3. Features a brilliant backlit display or nighttime use, and its small, portable, lightweight housing is not only rugged – it floats.

2.2 DTH Receiver

DTV receiver is a set-top box that permits the reception of digital television. Its components are very similar to a desktop PC. The DTV receiver is a vital link in the chain of television system. The goal of a broadcasting system is to concentrate the hardware requirements at the source to simplify the receivers and makes it as inexpensive as possible.

It is usually connected to the TV set or incorporated in the TV set. The main features of a DTV receiver may be classified as follows:

Advantages

1. decodes the incoming digital signal;
2. verifies access rights and security levels;
3. displays cinema quality pictures on the TV set; outputs digital surround sound;
4. Processes and renders Internet and interactive TV services.

2.3 GPS Receiver

GPS receivers & Tuner are using the extra signals above the minimum that is required to further refine the position for increased accuracy. This is known as an over determined solution. The concept explained above show that the GPS receiver can establish its precise position on any place on the earth. When the GPS receiver mounted on the vehicle, it will establish the current position of the vehicle and sending the information to the PIC18F4550 microcontroller.

III. CASE STUDY IMPLEMENTATION OF A GPS

SYSTEM

In this section of the paper, the phases informed about GPS system are discussed and elaborated with the needed information.

The phases inform that the developing a case study implementation is:

1. Initialization of the GPS Receiver
2. Serial Interfacing of GPS with PC and Mapping of various important locations
3. File Management & filtering of GPS data
4. Designing a Location Master to accommodate the mapped data
5. Moving Compass and precise positioning

The case study implementation of the GPS system is done. The developed system acts as a basic positioning and navigation interface for traveling across the city providing the users the requisite information. The mapped data's that will be presented in the coming sections are all pertaining to the positional coordinates of the various locations present in city.

1. Re-Initializing of the GPS Receiver using EZ-Start
2. Mapping and storing the locations of the new destination.

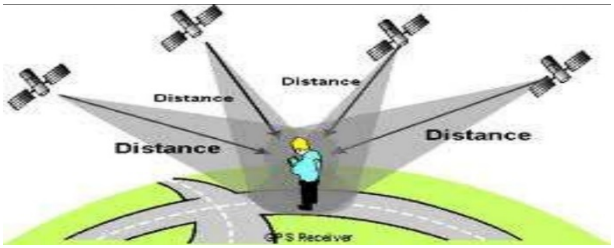

Figure 2. GPS Receiver

3.1 Initialization of the GPS Receiver

In this section the steps involved in initializing the GPS receiver are discussed, these steps are solely for the Magellan GPS receiver 310; however steps in initializing the other receivers will be more or less the same as described below. Initialization step in GPS is required while taking it more than 10,000 kms for fastest tracking and also it is always preferable to initialize the receiver for that region.

Before using GPS 310 for the first time, the receiver needs to know its approximate location. Using Magellan's EZStart procedure, the GPS 310 will prompt us for the information it requires when we turn it on for the first time. There is no need to initialize receiver each time we use it. For the first time when using GPS 310, the following steps needs to be done for initialization.

The GPS will begin to acquire information from the satellites and use this information to compute your current position (called a position fix). Before doing so, initialization of the GPS receiver has to be done, the screen of the GPS displays the number of satellites are being tracked. After the GPS receiver has received positioning data from at least three satellites (it takes approximately 2-3 minutes), it will begin computing a position fix based upon the information it is receiving. As soon as a position fix is computed, the receiver switches to the navigation screen displaying the moving compass. The word "TRACKING" is displayed in the lower right corner indicating that the receiver is computing position fixes. The obtained position fixes can be saved in memory for use later when you want to return to that position, saved position fixes are referred to as landmarks or LMK (can be saved through pressing MARK in GPS Receiver). Using the above procedure for mapping and computing position fixes in GPS Receiver, the following precise positioning of some of the locations in and around Salem is taken and they are stored in the backend for further computing.

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3.5 Moving Compass and precise positioning

This section of the paper portrays the task done in moving compass module of the GPS system as it holds the key for precise positioning and navigation across the city with relative ease. It basically is used for precise positioning by comparing the mapped positional coordinates present in the location master with that of the newly acquired positional fix of the current location of the user while traveling across the city.

This module is dependent on other modules mentioned above like Initialization, Mapping, Location Master, File management and Filtering of GPS data for precise positioning across the city.

IV. APPLICATIONS OF THE GPS SYSTEM

The application of the GPS System is illustrated as below as follows.

1. Identifying user position precisely
2. Navigating from point to point
3. Moving compass
4. Steering to destination
5. To act as a city guide software

V. CONCLUSION

In GPS navigation, Aircraft, civil or military, it is certainly a prime requisite to be able to detect system failures quickly and alert the flight crew accordingly. There has been much interest in using the Global Positioning System (or GPS) for air navigation although the overall integrity of this new system has not yet been thoroughly proven; this study is part of a larger effort aimed at answering this question by looking specifically at the problem of the detection of subtle system clock failures. Several detection models, all patterned after the Magill adaptive filter, were developed and studied. One of these was chosen over the others to demonstrate failure detection in various flight environments and under different failure conditions; The Magill scheme calls for a parallel testing of several composite hypotheses, each identifying a measurement (pseudo range from a satellite in the case of GPS) to detect the failure. There can, of course, be as many hypotheses as there are measurement sources available. A null hypothesis covers the no-failure situation. Conditional probability calculations uniquely associated with each hypothesis provide the proper indication as to which of the hypotheses is the "correct" one after accumulating enough information from the observed measurements; In the Monte Carlo simulations carried out to test this detection scheme, favorable results were obtained. The enroute scenario for an aircraft involves very modest dynamics which, when taken advantage of, showed clearly the feasibility of prompt detection and identification in this situation. In the dynamically noisier no precision approach environment, the

results obtained were somewhat marginal, though encouraging nonetheless.

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