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Review of an Accurate System Utilizing GPS Technology

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Abstract

The Global Positioning System (GPS) has the ability to provide precise position and control data no matter where on the planet it is used or what kind of weather is present. In the 1980s, the United States Department of Defense made the Global Positioning System (GPS), which had initially been developed for use by the military, available for use by civilians as well. The scientific applications of GPS in the domains of the military, community, and commercial sectors are perpetually growing at an accelerating rate. The use of global positioning system (GPS) technology is beneficial in a wide variety of fields, such as agriculture, construction, mining, measurement, product transportation, and the management of organizational supply networks. The precise synchronization of GPS time is necessary for the operation of large-scale networks, positioning systems, financial systems, and financial marketplaces, as well as infrastructures for the generation and distribution of electricity. Without them, it is difficult to conceive of what life would be like with cellular reception. This is because it is impossible to imagine. In this article, we will take a look at the many different applications that make use of GPS technology, and we will also discuss the most essential aspects of the technology itself.

Introduction

Not only are the atomic clocks that are contained on GPS satellites synchronized with one another, but they are also synchronized with instruments that are situated on Earth. On a consistent basis, alterations are brought about in response to any departures from the hour that was specified. satellite surveillance The clocks on GPS transmitters are not synchronized with the current time, which makes them significantly less dependable than they ought to be. By keeping track of a large number of satellites at once and resolving a set of equations in real time, the Global Positioning System (GPS) provides an accurate report of the receiver's current location as well as its departure. In order for the detector to be able to determine changeable values, it is necessary for the detector to maintain track of the satellite's coordinates as well as any variations in the timetable. Satellites that use the Global Positioning System (GPS) make one revolution around the Earth every single day. GPS receivers are able to identify each satellite by deciphering the satellite's own unique signal as well as details about the satellite's trajectory. These spacecraft are responsible for transmitting this information. These characteristics, in conjunction with trilateration, are utilized by GPS transmitters in order to recognize individuals. The length of time that it takes for a GPS receiver to receive a signal is one of the factors that is used in the process of calculating the distance between a spacecraft and a GPS receiver. If the beneficiary has the ability to collect distance measurements from additional satellites, then it will most likely be able to determine the location of the user. The

Global Positioning System (GPS) is capable of measuring orientation in addition to location and speed. In the not too distant future, GPS analysis will include improved optimization of electronic devices, prolonged battery life, and the incorporation of data from other navigational devices (Aughey, 2011; Witte & Wilson, 2004).

The Global Positioning System, also known as GPS, is made up of three different components that work together to give you instructions. The following are the three categories into which data on GPS position can be classified: (1) Space, also known as satellites, are devices that orbit the Earth and relay information to people on the ground. time of day in addition to location on the globe; (2) Ground control: the Control Section is made up of earth-based surveillance stations. User apparatus includes things like ground transmitters and master control stations, among other things. Other instances of user apparatus include GPS receivers and transmitters, such as timepieces. These are typically worn on the user's wrist. Devices such as smartphones and other electronics can track your position.

GPS Applications

One of the earliest disciplines of knowledge has surfaced as a primary emphasis within the field of geosciences as a direct result of the quick development of GPS technologies over the course of the past 35 years. As a direct result of the ability of GPS geodesy to determine three-dimensional locations with a degree of precision comparable to millimeters, numerous discoveries have been made in the fields of geophysics, seismology, atmospheric science, hydrology, and natural disaster science. These advancements have been made possible by the advent of modern technology. Monitoring GPS instrument installations or trajectories on Earth's land and water surfaces, in the atmosphere, or in space is essential for theory and applications, such as understanding geological and magmatic processes and minimizing the impact of natural disasters on civilized society as well as the environment. Applications that could be taken from this (Bock & Melgar, 2016); (1) Overcrowding on the roadways; (2) People from all over the globe, including those in the commercial, governmental, and military sectors; (3) Tectonics: With the help of the Global Positioning System (GPS), scientists are now able to calculate the movement of earthquake fissures in terms of ground motion and position; Terrorists and the Global Positioning System (GPS): The Global Positioning System (GPS) is an important instrument for identifying terrorists. Attacker; (5) The application of GPS in mining: The use of real-time kinematic (RTK) GPS has been shown to result in substantial improvements in a number of mining activities. RTK GPS makes it possible to carry out a wide assortment of duties, such as surveying, excavating, and monitoring vehicles, among other things. topographical precision right down to the centimeter level; (6) Navigation: Navigators rely on computationally precise speed and direction information; Sizes; (7) It is strongly suggested that a global positioning system (GPS) be used in the event of a natural catastrophe in order to determine the precise location and time. Natural disasters such as earthquakes, flash floods, and wildfires; (8) Automatic vehicles make use of a technology called the Global Positioning System (GPS) in order to identify and maneuver around other vehicles, such as automobiles and lorries. (7) Agriculture: GPS-based precision agricultural applications, field monitoring, and planning are being used on fields. These applications are designed to function without the presence of a person.

Related Works

In the year 2014, Mohammad Salah devised and put into practice a system for keeping track of time and punctuality. Every single company employs the use of GPS in order to precisely identify its position. With the help of GPS, it is possible to rapidly pinpoint the location of a person (GPS watch, GPS-enabled device, mobile phone, etc.). We consider an employee to be working when the location of the business and the position that employee holds are very similar to one another or when they are the same. In the research, a revolutionary new approach to

calculating time and attendance based on geographic position is suggested as a possible solution (Uddin et al., 2014).

Su and Lee (2016) introduced the concept of embedding a loop antenna into the steel framework of a chronograph. This would allow the watch to receive radio signals. If the shorts on the upper aluminum frame are precisely aligned, the projected loop antenna may be able to supply smartwatches with a 1575 GHz GPS signal.

Jisha et al. (2018) have developed a software that can track vehicles and keep an eye on the students who ride them. The software monitors the vehicles that are utilized by the educational institution. It is feasible for an Android application and a computer to communicate with one another. This device maintains an account of both the people who attended and the vehicles that were present. Users include school administrators, faculty members, and instructors, as well as guardians and students. The software can communicate with GPRS and SMS mobile phones in addition to satellites. This application for Android gives parents the ability to keep an eye on their children and control the transportation they use (Jisha et al., 2018).

During a run that was 56 kilometers long, Johansson and her companions took the GPS sports watches through their tests to see how well they performed (2020). These GPS sports instruments have a variety of precision in the distance calculation that ranges anywhere from 0.6% to 1.9%. This range allows the user to get the most accurate reading possible. This demonstrates that GPS sports devices are a valid and useful method for trainers to evaluate the achievements of their athletes as well as the amount of training stress that their athletes are experiencing. When carrying out an analysis of the data, it is essential to take into account the possibility of any minor mistakes having been committed (Johansson et al., 2020).

The year 2021 will mark the beginning of the evaluation process for the marathon GPS models that Javier Lluch and his colleagues developed. It does this by collecting information from people who participate in marathons. They found 73,865 GPS records spread across 85 distinct devices. The accuracy of GPS technology developed specifically for roadways is distinct from that of GPS devices developed specifically for hiking routes and mobile phones. During their participation in a marathon, competitors may be able to acquire a more accurate speed in addition to other measurements if they make use of the information provided here (Lluch et al., 2020).

The objective that Michal Vorlek and his colleagues 2021 set for themselves was to evaluate the performance of an inexpensive GPS receiver (the Holus RCV-3000) and a well-known wristwatch (the Garmin Forerunner 35) in comparison to a piece of apparatus that is approved for use in the field of physical activity research (the Qstarz BT-Q1000XT). One of these instruments was delivered to each of the six different geodetic positions so that it could be installed there (e.g., open spaces, parks, and housing). The coordinates of each gadget were examined, and the results were compared to the coordinates of well-known geodetic locations. The accuracy of the three instruments remained unaltered regardless of where they were placed within the six different locations. According to research conducted in 2021 by Vorlek et al., the Garmin was found to be more accurate in the central business district of the city, while the Holux was found to be more accurate in the park and housing estate regions.

Researchers led by Jane Chung and her colleagues in the year 2022 investigated the use of global positioning systems (GPS) in the assessment of life-space mobility (LSM) and general health in participants who were at least 65 years old. Using 30 Fitbit flows and GPS, a total of eight topographical and temporal LSMs were produced over the period of three days. The distance traveled and the area covered both pointed to active excursions outside the home, despite the fact that 90% of the movement velocities measured inside the house were negative, indicating inactivity. Both the overall distance traversed and the movement speed at the 95th percentile differed according to the cognitive categories that were being used. These studies

suggest that global positioning system (GPS) devices may be able to monitor users' health for the purposes of preventative medicine (Chung et al., 2022).

Portable and personal navigation devices were a topic of conversation among Anisha Cullen and her fellow colleagues as they considered the year 2022. The development of the disease is accompanied by a deterioration in cognitive abilities as well as difficulties in mobility. More people are approaching the age where they can resign, which means they have more time to travel. Caregivers can more easily identify dementia patients who have become disoriented and meander off with the assistance of GPS (PwD). They carry out a surveillance of the mobility behaviors of PwDs that is non-invasive (Cullen et al., 2022).

In the year 2022, Chong Shen and his colleagues plan to design and implement a completely original customizable Kalman filter. It is recommended that you make use of a MEMS-INS/GPS/polarization compass Kalman filter, also known as an MR-STSCKF for short. Because of the filtration, the calculations used to determine the association of the system are changed. The technique that has been recommended has the potential to overcome disparities in the sensor sample frequency while simultaneously maintaining accurate orientation. Experiments have shown that making use of MR-STSCKF contributes to an integrated navigation system's (one that includes MEMS-INS, GPS, and a polarization compass) improved overall performance (Shen et al., 2022).

Jhilam Jana and his colleagues declare that by the year 2023, they will have developed a system for monitoring COVID-19 patients that is based on the internet of things and that is both effective and inexpensive. If the strategy that has been recommended is put into action, there is a better chance that this contagion, which could lead to serious consequences, will not spread throughout the community. Technology that is both inexpensive and recyclable can make it easier for healthcare institutions and municipal governments to independently monitor and keep notes on their constituents. This ability to monitor and keep tracks on their constituents is made possible by technology (Jana et al., 2022).

Conclusion

The hypothesis of this study was that GPS is an accurate and reliable method for the determination of speed over ground. The results show that GPS is generally accurate for speed determination under all conditions. In this paper, we went through the main features of GPS technology and review on the systems that utilities from this technology. we are selected some system from the 2014 to 2023 and the results shows that the GPS offers accurate location and control data anywhere in the world and in any weather condition.

References

Aughey, R. J. (2011). Applications of GPS technologies to field sports. *International journal of sports physiology and performance*, *6*(3), 295-310.

Witte, T. H., & Wilson, A. M. (2004). Accuracy of non-differential GPS for the determination of speed over ground. *Journal of biomechanics*, *37*(12), 1891-1898.

Bock, Y., & Melgar, D. (2016). Physical applications of GPS geodesy: A review. *Reports on Progress in Physics*, *79*(10), 106801.

Witte TH, Wilson AM. Accuracy of WAAS-enabled GPS for the determination of position and speed over ground. J Biomech. 2005;38(8):1717–1722.

Uddin, M. S., Allayear, S. M., Das, N. C., & Talukder, F. A. (2014). A location based time and attendance system. *International journal of computer theory and engineering*, *6*(1), 36.

Su, S. W., & Lee, C. T. (2016). Metal-frame GPS antenna for smartwatch applications. *Progress in Electromagnetics Research Letters*, *62*, 41-47.

Jisha, R. C., Mathews, M. P., Kini, S. P., Kumar, V., Harisankar, U. V., & Shilpa, M. (2018, December). An android application for school bus tracking and student monitoring system. In *2018 IEEE International Conference on Computational Intelligence and Computing Research (ICCIC)* (pp. 1-4). IEEE.

Johansson, R. E., Adolph, S. T., Swart, J., & Lambert, M. I. (2020). Accuracy of GPS sport watches in measuring distance in an ultramarathon running race. *International Journal of Sports Science & Coaching*, *15*(2), 212-219.

Lluch, J., Rebollo, M., Calduch-Losa, Á., & Mollá, R. (2020). Precision of wearable GPS in marathon races. *IEEE Consumer Electronics Magazine*, *10*(1), 32-38.

Vorlíček, M., Stewart, T., Schipperijn, J., Burian, J., Rubín, L., Dygrýn, J., ... & Duncan, S. (2021). Smart Watch Versus Classic Receivers: Static Validity of Three GPS Devices in Different Types of Built Environments. *Sensors*, *21*(21), 7232.

Chung, J., Boyle, J., & Wheeler, D. C. (2022). Relationship Between Life-Space Mobility and Health Characteristics in Older Adults Using Global Positioning System Watches. *Journal of Applied Gerontology*, *41*(4), 1186-1195.

Cullen, A., Mazhar, M. K. A., Smith, M. D., Lithander, F. E., Ó Breasail, M., & Henderson, E. J. (2022). Wearable and Portable GPS Solutions for Monitoring Mobility in Dementia: A Systematic Review. *Sensors*, *22*(9), 3336.

Shen, C., Xiong, Y., Zhao, D., Wang, C., Cao, H., Song, X., ... & Liu, J. (2022). Multi-rate strong tracking square-root cubature Kalman filter for MEMS-INS/GPS/polarization compass integrated navigation system. *Mechanical Systems and Signal Processing*, *163*, 108146.

Jana, J., Basu, S., Tripathi, S., Chakrabarti, A., & Bhaumik, J. (2022). Design and Implementation of IoT-Based System for Tracking and Monitoring of Suspected COVID-19 Patient. In *Advances in VLSI and Embedded Systems: Select Proceedings of AVES 2021* (pp. 163-173). Singapore: Springer Nature Singapore.