Frequently Asked Questions

Understanding GPS Tracking

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Globally Positioning Sport

Understanding GPS Tracking

The GPS Satellite System

The 24 satellites that make up the United States of America GPS space segment are orbiting the earth about 20,000km above us. They are constantly moving, making two complete orbits in less than 24 hours. These satellites are travelling at speeds of roughly 11,000km/hr.

GPS satellites are powered by solar energy. They have backup batteries on board to keep them running in the event of a solar eclipse, when there's no solar power. Small rocket
boosters on each satellite keep them flying in the correct path.

GPS works in all weather conditions, anywhere in the world, 24 hours a day. There are no subscription fees or setup charges to use GPS.

How it Works

A GPS receiver must be locked on to the signal of at least three satellites to calculate a 2D position (latitude and longitude) and track movement. With four or more satellites in view, the receiver can determine the user's 3D position (latitude, longitude and altitude). Once the user's position has been determined, the GPS unit can calculate other information, such as;

1. Speed
2. Direction
3. Path
4. Distance
5. Distance to destination

GPSports GPS receivers are extremely accurate, thanks to their multi-channel design. 12 channel receivers (can track up to 12 satellites at any time) are quick to lock onto satellites when first turned on and they maintain strong locks, even in dense foliage or urban settings with tall buildings. Certain atmospheric factors and other sources of error can affect the accuracy of GPS receivers. These factors are what lead to the small error seen in GPS positioning.

Positional Accuracy

Sources of GPS signal errors

Factors that can degrade the GPS signal and thus affect accuracy include the following:

1. Ionosphere and troposphere delays - The satellite signal slows as it passes through the atmosphere.

2. Signal multipath - This occurs when the GPS signal is reflected off objects such as tall buildings or large rock surfaces before it reaches the receiver. This can take place in a built up city centre.

3. Receiver clock errors - A receiver's built-in clock is not as accurate as the atomic clocks on-board the GPS satellites.

4. Orbital errors - Also known as ephemeris errors, these are inaccuracies of the satellite's reported location.

5. Number of satellites visible - The more satellites a GPS receiver can "see," the better the accuracy. Buildings, terrain, electronic interference, or sometimes even dense foliage can block signal reception, causing position errors or possibly no position reading at all.

6. Satellite geometry/shading - This refers to the relative position of the satellites at any given time. Ideal satellite geometry exists when the satellites are located at wide angles relative to each other.

Absolute and Relative Positioning

In sport, absolute positioning is not as important as relative positioning. Relative positioning is the actual distance achieved regardless of the exact latitude and longitude of the person.
For example, an athlete may run a training loop twice, and there may be an absolute positioning error of 3-4m from one lap to another (the two loops are offset by this distance), but when the actual distance for each loop is measured, there is typically less than 1% distance error to the true distance covered.

GPSports Systems has modified the standard GPS module which has resulted in a highly accurate system that is used by elite sports teams around the world.

GPSports Position on Sampling Rate
Updated November 2012

GPSports Proprietary 15Hz Positioning Rate.

GPSports' SPI HPU and SPI Pro X II has a 15Hz positioning sampling rate. Here we outline why we chose this rate, how we achieve this level of accuracy and the benefits to be had to the client.

GPS technology is not an exact science – it is known that there are significant differences in the accuracy achieved with different GPS modules and antenna configurations. The GPS sampling rate given by any GPS module is a generic rate that is deemed most suitable for standard GPS use, such as non-rapid change of direction activities (Walking, driving, flying, sailing).

Most GPS modules can be modified to sample between 1Hz and 20Hz – each with a potential error associated with this rate of logging.

What is not usually evident is that increased sampling doesn't automatically imply improved accuracy. If there is an error associated with each sample point, the more sampling points often means the increased potential for error.

In the professional team sports environment – the standard GPS technology is not suitable for the demands of this activity. The basic signal is enhanced through intelligent algorithms (rules) that use a combination of GPS signal, athlete speed, heading (direction) and activity immediately prior to the sampling point.

GPSports has been in the team sports GPS tracking business longer than any other company and during this time we have been able to refine our product such that we have enhanced the basic signal outputs from the GPS modules we used and through extensive testing have come to the conclusion that the best results for the team sports market come from combination of both GPS signal and our own advanced positioning processing.

It is irrelevant what the GPS sampling rate states on the "Box" – it is the accuracy and reliability of the data that is captured and made available to the client that is the key to the success of any technology.

GPSports is clearly seen as the leader in this field – with over 60 peer reviewed research project submitted using our technology and over 50 universities worldwide using our technology on a daily basis for research and teaching purposes we stand by our position as being the best, most accurate GPS technology available for sport worldwide.