

The Many Benefits and Applications of GPS systems

In order to fully appreciate the various possibilities that the GPS technology offers consumers, one first needs to be aware of exactly what the applications and benefits are of this important technology.

This article discusses what GPS is, how it works, and what current uses have been found for it that can be acquired on the general market. Of course, there are new applications being developed all the time, as the technological environment becomes more advanced.

What is GPS?

Originally conceived as a navigation aid for the military, the Global Positioning System, or GPS, has since grown from relatively humble beginnings as different supporting technologies have been developed, some of which are within reach of consumer budgets.

All that GPS does is provide a set of coordinates which represent the location of the GPS unit with respect to its latitude, longitude and elevation on planet Earth. It also provides time, which is as accurate as that given by an atomic clock.

The actual application of the GPS technology is what leads to such things as navigation systems, GPS tracking devices, GPS surveying and GPS mapping. GPS in itself does not provide any functionality beyond being able to receive satellite signals and calculate position information. But it does that very well!

How it Works

The actual principle of GPS is very easy to appreciate, since it is exactly the same as traditional "triangulation" (although this is not quite correct, as GPS does not use angles). If one imagines an orienteer needing to locate themselves on a map, they first need to be able to find at least three points that they recognize in the real world, which allows them to pinpoint their location on the map.

They can then measure, using a compass, the azimuth that would be needed to take them from the point on the map to their current position. A line is then drawn from each of the three points, and where the three lines meet is where they are on the map.

Translating this into the GPS world, we can replace the known points with satellites, and the azimuth with time taken for a signal to travel from each of the known points to the GPS receiver. This enables the system to work out roughly where it is located - it is where the circles representing the distance from the satellite, calculated on the basis of the travel time of the signal, intersect.

Of course, this requires that the GPS locator has the same coordinated time as the satellites, which have atomic clocks on board. To do this, it cross checks the intersection of the three circles with a fourth circle, which it acquires from another satellite.

If the four circles no longer intersect at the same point, then the GPS system knows that there is an error in its clock, and can adjust it by finding one common value (one second, half a second and so on) that can be applied to the three initial signals which would cause the circles to intersect in the same place.

Behind the scenes, there are also many complex calculations taking place which enable the system to compensate for atmospheric distortion of the signals, and so forth, but the principle remains the same.

Tracking Devices

One of the easiest applications to consider is the simple GPS tracking device; which combines the possibility to locate itself with associated communications technologies such as radio transmission and telephony.

Tracking is useful because it enables a central tracking centre to monitor the position of several vehicles or people, in real time, without them needing to relay that information explicitly. This can include children, criminals, police and emergency vehicles, military applications, and many others.

The tracking devices themselves come in different flavours. They will always contain a GPS receiver, and GPS software, along with some way of transmitting the resulting coordinates. GPS watches, for example, tend to use radio waves to transmit their location to a tracking center, while GPS phones use existing mobilephone technology.

The tracking centre can then use that information for co-ordination or alert services. One application in the field is to allow anxious parents to locate their children by calling the tracking station - mainly for their peace of mind.

GPS vehicle tracking is also used to locate stolen cars, or provide services to the driver such as locating the nearest petrol station. Police can also benefit from using GPS tracking devices to ensure that parolees do not violate curfew, and to locate them if they do.

Navigation Systems

Once we know our location, we can, of course, find out where we are on a map, and GPS mapping and navigation is perhaps the most well-known of all the applications of GPS. Using the GPS coordinates, appropriate software can perform all manner of tasks, from locating the unit, to finding a route from A to B, or dynamically selecting the best route in real time.

These systems need to work with map data, which does not form part of the GPS system, but is one of the associated technologies that we spoke of in the introduction to this article. The availability of high powered computers in small, portable packages has led to a variety of solutions which combines maps with location information to enable the user to navigate.

One of the first such applications was the car navigation system, which allows drivers to receive navigation instructions without taking their eyes off the road, via voice commands.

Then there are handheld GPS units, such as those from Garmin and Magellan and a dozen other manufacturers, which are commonly used by those involved in outdoor pursuits, and only provide limited information such as the location, and possibly store GPS waypoints. A waypoint being a location that is kept in memory so that the unit can retrace the same path at a later time.

More advanced versions include aviation GPS systems, which offer specific features for those flying aircraft, and marine GPS systems which offer information pertaining to marine channels, and tide times, etc.

These last two require maps and mapping software which differ vastly from traditional GPS solutions, and as such can often be augmented with other packages designed to allow the user to import paper maps or charts.

There are even GPS solutions for use on the golf course. Golf GPS systems help the player to calculate the distance from the tee to the pin, or to know exactly where they are with relation to features such as hidden bunkers, water hazards or greens. Again, specific maps are needed for such applications.

About the Author: Guy Lecky Thompson is a successful freelance writer offering guidance and suggestions for consumers regarding [GPS tracking](#), [GPS](#), [GPS maps](#) and [tracking devices](#) (<http://www.1st-at-gps-tracking.com/>). His many articles give information and tips to help people save money and make smarter decisions.