

The subject we'd like to talk about is "Use of GPS in number of sciences and every day life". Before we start, let me first say some words about essence of GPS, so you will know what we are talking about.

Introduction

GPS stands for Global Positioning System. Global, because it works all over the world. Positioning, because the main idea of this is to gain coordinates.

How GPS works? In very simple words, there are about 24 GPS satellites orbiting around the Earth. To know the position, GPS must send and receive some signals theoretically from three of them, but practically, this number is over 7 to keep accuracy as precise as possible. Knowing the time signal was coming and precise time, GPS device can calculate the distance between each satellite, and its position. The accuracy is usually about 5 meters. The process how GPS work is actually more complicated that I say, but the point is not to have a technical science on here, just an idea.



A GPS satellite

What is worth to know is, that first experimental satellite was launched in 1978. GPS system was developed by United States Department of Defense, and satellite constellation is managed by United States Air Force 50yh Space Wing. The annual cost of maintaining the system is 400\$ million, however GPS becomes free for civilian users as a public good.

The fact that GPS is free of charge and very precise lead to use in many, many aspects of life, from which we will mention only a few.

GPS in automobiles

Well I saw GPS in action when driving a car. Despite having a map, there were no need to use them, as hints of GPS device are - I must say - unbelievable. GPS "knows" where you are, when you have to turn right, it computes the direction, distance etc.

What is more, when missing the crossing the driver – according to GPS – was about to turn, in several meters he or she is being warned about missing the crossing, and the way it can be fixed (e.g. turning right on the next crosing). Impressive.

GPS in other means of transport

So as you can see, the very first of use of GPS is in automobiles. They can be equipped with GPS receivers at the factory or as after-market equipment. Units often display moving maps and information about location, speed, direction, and nearby streets and landmarks.

Other means of transport

If this can be apply to a car, why not to aircraft? Aircraft navigation systems usually display a "moving map" and are often connected to the autopilot for en-route navigation. Cockpit-mounted GPS receivers and glass cockpits are appearing in general aviation aircraft of all sizes, using some other technologies to make accuracy better. Many of these systems may be certified for instrument flight rules navigation, and some can also be used for final approach and landing operations. Pilots use recorders to log GPS data to verify arrival at turn points in gliding competitions. Flight computers can find alternate waypoint, airport, mountain pass and many things.



GPS is used also on boats and ships. Maritime GPS units include functions useful on water, such as “man overboard” (MOB) functions that allow instantly marking the location where a person has fallen overboard, which simplifies rescue efforts. GPS may be connected to the ships self-steering gear.

Bicycles often use GPS in racing and touring. GPS navigation allows cyclists to plot their course in advance and follow this course, which may include quieter, narrower streets, without having to stop frequently to refer to separate maps. Some GPS receivers are specifically adapted for cycling with special mounts and housings.

Hikers, climbers, and even ordinary pedestrians in urban or rural environments can use GPS to determine their position, with or without reference to separate maps. In isolated areas, the ability of GPS to provide a precise position can greatly enhance the chances of rescue when climbers or hikers are disabled or lost (if they have a means of communication with rescue workers). GPS equipment for the visually impaired is available. For more detailed information see the article [GPS for the visually impaired](#)

Military

GPS allows precise targeting of various military weapons like for example smart bombs. To help prevent GPS guidance from being used in enemy or improvised weaponry, the US Government controls the export of civilian receivers. A US-based manufacturer cannot generally export a receiver unless the receiver contains limits restricting it from functioning when it is simultaneously (1) at an altitude above 18 kilometers (60,000ft) and (2) traveling at over 515 m/s (1,000 knots).

The GPS satellites also carry nuclear detonation detectors, which form a major portion of the United States Nuclear Detonation Detection System.

Heavy equipment

Heavy Equipment can use GPS in construction, mining and precision agriculture. The blades and buckets of construction equipment are controlled automatically in GPS-based machine guidance systems. Agricultural equipment may use GPS to steer automatically, or as a visual aid displayed on a screen for the driver. This is very useful for controlled traffic and row crop operations and when spraying. Harvesters with yield monitors can also use GPS to create a yield map of the paddock being harvested.

Precise time reference

Many systems that must be accurately synchronized use GPS as a source of accurate time. GPS can be used as a reference clock for time code generators or NTP clocks. Sensors (for seismology or other monitoring application), can use GPS as a precise time source, so events may be timed accurately. TDMA communications networks often rely on this precise timing to synchronize RF generating equipment, network equipment, and multiplexers.

Racing and touring

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Next possible use is GPS tracking - systems use GPS to determine the location of a vehicle, person, or pet and to record the position at regular intervals in order to create a log of movements. The data can be stored inside the unit, or sent to a remote computer by radio or cellular modem. Some systems allow the location to be viewed in real-time on the Internet with a web-browser. In isolated areas, the ability of GPS to provide a precise position can greatly

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Mobile satellite communication

Satellite communications systems use a directional antenna (usually a "dish") pointed at a satellite. The antenna on a moving ship or train, for example, must be pointed based on its current location. Modern antenna controllers usually incorporate a GPS receiver to provide this information.

Emergency and location-based services

GPS functionality can be used by emergency services to locate cell phones. The ability to locate a mobile phone is required in the United States by E911 emergency services legislation. However, as of September 2006 such a system is not in place in all parts of the country. GPS is less dependent on the telecommunications network topology than radiolocation for compatible phones. Assisted GPS reduces the power requirements of the mobile phone and increases the accuracy of the location. A phone's geographic location may also be used to provide location-based services including advertising, or other location-specific information.

Location-based games

The availability of hand-held GPS receivers has led to games such as Geocaching, which involves using a hand-held GPS unit to travel to a specific longitude and latitude to search for objects hidden by other geocachers. This popular activity often includes walking or hiking to natural locations. Geodashing is an outdoor sport using waypoints.

Sureveying

Survey-Grade GPS receivers can be used to position survey markers, buildings, and road construction. Premium version of GPS (which is not free actually) can measure with accuracy up to 1 cm, which make possible to use GPS in surveying and mapping. High precision measurement can be used to determine the height of the ground, multiple automatic station around the volcanoes and areas of tectonic movements can be used to interpret the cause of deformation, ground movement etc.

Another interesting use is skydiving - In areas where skydiving through cloud is permitted the GPS can be the visual indicator when spotting in overcast conditions, this is referred to as a

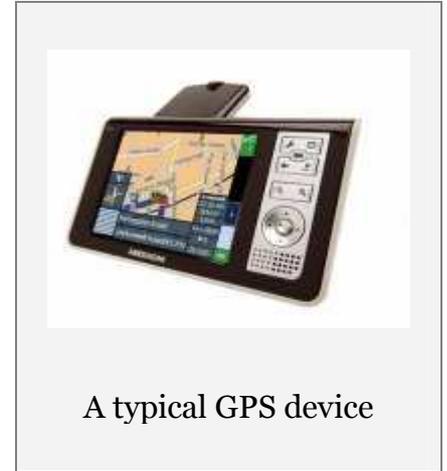
"GPS Spot". It takes into account the direction and strength of wind and position of plane and destination.

Conclusion

These were not only uses of GPS systems. There are plenty another uses – such as weather prediction, photograph annotation and many, many more.

GPS combined with GIS is a powerful, fast growing technology. You can find today watches with GPS, mobile phones with GPS, laptops with GPS, dog-collars with GPS, cellphones for kids with GPS. I can't wait for my fridge to use GPS :).

One is certain. The technology of tomorrow is available today.
Thank you.



Sources

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- <http://electronics.howstuffworks.com/gps1.htm>