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OLYMPIC GNSS

WHAT IS THE ROLE OF GNSS IN THE OLYMPICS? LIKE JUST ABOUT EVERY OTHER AREA OF SOCIETY, THE ANSWER IS 'INCREASING'.

The four years between the 2004 Athens Olympics and the 2008 Beijing Olympics has seen a significant increase in the use of GNSS to support the events. Looking forward to 2012 we can perhaps foresee more of a revolution in the use of GNSS. This column provides a glimpse into some of the possibilities.

How would you feel if you had been training for years, perhaps a decade or more, only to get struck down with food poisoning at the Olympics this summer? The nightmare of this possibility has not escaped the Beijing organisers, who have arranged sophisticated GPS tracking and monitoring systems to ensure food safety. Strict controls on production and storage of food will apply, with GPS providing the location of individual food consignments. The tracking devices will also monitor continuously for any unexpected movements, which could imply tampering or other problems.

The other main areas where GNSS will be used at Beijing 2008 are also safety and logistics related: GPS in buses, GPS in cars, GPS to help with foreseen traffic problems, GPS to locate and direct taxis.

GPS devices are also used by athletes to assist with their training. Garmin's Forerunner is a good example, where the athlete's position, derived from a high sensitivity GPS, is used in conjunction with heart rate and other sensors to provide information on performance.

But GPS is not the only satellite navigation and positioning system that's being used this year in Beijing. China already has a satellite navigation system called BeiDou-1. This system comprises 5 geostationary satellites that are in higher orbits than the GPS satellites. Also, critically, the geostationary satellites are in a single arc above the equator of the Earth and don't move in relation to the earth. GPS accuracy is best when the geometry, or spatial spread, of the satellites visible to the receiver is wide. With all satellites in one arc, the geometry is poor, which adversely affects accuracy. Also, special receivers are needed to track BeiDou-1 signals. It seems that BeiDou-1 will be used for traffic monitoring and traffic information services during the Olympics this year. This is certainly possible, as measuring relative speed, such as how fast a vehicle is moving in traffic, should be feasible. Because of its limitations, BeiDou-1 cannot readily be used for road navigation using in-vehicle navigation systems.

However, China's ambitions in GNSS do not stop with BeiDou-1. China has announced BeiDou-2, or Compass, navigation system (BeiDou means Compass in Chinese). Compass will be much more like the familiar GPS system, with up to 30 satellites in medium-earth-orbits that will orbit the Earth approximately every 12 hours. The first Compass M-1 satellite was successfully launched on 14 April 2007, with further launches planned for 2008.

The good news for consumers is that Compass and GPS should be interoperable. In practice, this should mean that inexpensive receivers will look for satellites from both systems, improving performance and signal availability in difficult conditions. Compass should at least be part built by the 2012 London Olympics.

The same is also true of Europe's much-anticipated Galileo GNSS. Galileo now, at last, has the green light from the European Commission. There will be more information on the Galileo system in this column in the September / October issue of GeoConnexion.

So, what about GNSS in 2012? What applications and services should we expect in the context of the London Olympics? Further, what could we imagine might be possible by then?

First, a reality check. While it's very exciting to talk about new GNSS systems from Europe and China, building and launching satellite systems is measured in years, even decades. Having said that, it's projected that both Galileo and Compass will have at least partial constellations operating by 2012. This will mean that receivers will likely be available that will pick up not only the GPS signals but also the compatible signals from Compass and Galileo. This will be particularly relevant at the L1 frequency that is used by effectively all consumer GPS receivers today.

A really major change is that most cellular phones are projected to have on-board GPS by 2012. In many cases this will be Assisted-GPS, where the data on precise satellite locations, signal health and so on are pre-loaded into the phone. A-GPS works better in difficult environments than non-assisted GPS and also provides faster initial position fixes.

By 2012, it's likely that a very wide range of applications will be a reality. Looking for your friends on the Olympic complex? Your phone will locate you, find out where they are, tell you which route to take to get there. Want to find the nearest facility? Ask your phone.

In getting to the Olympics, it's likely that you will be paying to use at least some of the European road network by 2012. This could be certain routes at all times, or for using busy routes at peak times. GNSS is a strong candidate technology to enable this, with the advantage that major ground infrastructure investment is not required.

If your journey to the Olympics is by plane or train, GNSS could be playing more of a role in these areas as well by 2012. Work is ongoing to switch rail signalling to GNSS, and to use GNSS more for aircraft landing and en-route navigation. As these are both safety-critical application areas, standards and certification are essential, and are currently actively ongoing in both areas.

More specifically in relation to the Olympics, I would speculate that GNSS could be used more to enhance the athlete's or team's training and techniques. In individual performance measurement an example is precise measurement of pace during long distance training. GNSS will also be used more for team sports. An example here would be to monitor the position and movement of players in a team game, which can then be analysed to look for successful patterns or techniques.

Finally, what about GNSS-guided fireworks at the opening ceremony? Well, there is no technological reason why not … but then again …