Andy Beckerson is Director of Business Development at KOREC (www.korecgroup.com) and can be contacted by email at andrew.beckerson@korecgroup.com

Correction services are all the same, aren't they?

Andy Beckerson takes a look at recent developments that can enhance or even replace RTK network solutions

RTK positioning has been around for over 20 years and is now an accepted method of GNSS use. In the early days the method was a GPS base station, normally set up over a known point, and a backpack GPS rover with the antenna and controller mounted on a pole. A radio was used to send a correction from the base to the rover positioning the pole in reference to the known point.

The assumption made was that any GPS errors in position at the base were the same at the rover, providing the distance between the two was relatively small, i.e. up to 10Km. Thus a correction could be applied to the base, at a known position, and this correction sent to the rover via the radio link.

With the radio limited to 0.5w output, the operating range was acceptable for most engineering/surveying applications. The next step was to maximise the range by replacing the radio with a mobile phone, with the rover effectively dialling the base. This improved the range, but at the expense of accuracy - and it was still only a single base solution.

Network solutions

With the advent of network solutions, where the correction is calculated from a number of base or reference stations, the single base limitations are removed. However, RTK positioning via a network can have problems depending on the quality of the local network, the quality of the mobile phone coverage, and the area in which you are working.

Such problems can manifest themselves in initialisation difficulties or loss of position. Remedies might include turning off the GLONASS signals, or changing back from a network to single

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CenterPoint® RTX, Trimble RTX's premier correction service, provides accuracy better than 4 cm (1.5")

base solution. Both can, at best, be described as 'workarounds' that drastically affect productivity and positional accuracy. If is still happening to you then what follows may be of interest.

Enter PPP

Recent advances have introduced a technique known as PPP, or Precise Point Positioning. This method uses a different technique from 'sending a correction', but in the past had limitations of long initialisation times and accuracies approaching 10cm. However, today the technology and systems available can deliver cm level accuracy with short initialisation times. The real advantages are that you don't require a local infrastructure of reference stations and, more importantly, you don't require a radio or mobile phone!

PPP solutions can be applied to RTK positioning. The Trimble XFill is one type of solution that allows a RTK rover to continue surveying even after the mobile phone signal drops out. The service is delivered by satellite and the rover continues in RTK accuracy for five minutes. This can be the difference between continuing with the GNSS equipment or getting out the Total Station!

The best of all worlds

But PPP - as a standalone service, rather than an enhancement to RTK Network solutions - is now becoming viable for some geospatial applications. The emergent RTX (Real Time eXtended) system provides horizontal accuracies of around 1-2 cm, 1-sigma. Recent tests have shown the horizontal RMS was 1.4 cm, with a 95% horizontal error of 2.4 cm. These are typical values for the satellite-based RTX horizontal performance. The vertical performance for the same receiver and time period was vertical RMS 2.8 cm, with 95% vertical error of 4.4 cm. These results were obtained from a receiver operating in Ames, Iowa, US.*

In conclusion, RTX is a new positioning technology that brings together the advantages of techniques that do not require a local reference station network or a mobile phone connection, while providing the productivity of RTK positioning.

The RTX solution employs ambiguity resolution on a global scale for both network and rover processing, including GPS and GLONASS satellites in the solution - no more being told to turn off GLONASS to get an initialisation!

*Information taken from " RTX Positioning: The Next Generation of cm-accurate Real-Time GNSS Positioning"