Real-time RTK-quality Velocity Accurary Without Base-station

Customers of OxTS, the British inertial navigation and GPS/GNSS manufacturer, can now benefit from velocity measurements approaching 1cm/s accuracy and a slip angle accuracy of 0.1Â° RMS at high speed â€“ without the need for a base-station. This achievement is thanks to the new gxInteger algorithm and the way OxTS products utilise both GNSS and inertial measurements.

This development means customers that want real-time RTK-quality velocity and orientation measurements, but don't require 2cm position accuracy, no longer need to spend time and money setting up a base-station and have more freedom in selecting test sites.

Automotive customers benefit most directly from gxInteger as it means lower-cost devices like the RT3100 and RT2500 are even better at vehicle dynamic testing than previously. The benefits aren't limited only to automotive applications as the gxInteger mode is applicable in all RT devices. As a result any application where high accuracy velocity and orientation measurements are required in real-time, will see a cost/benefit improvement.

Phase Measurements

The gxInteger algorithm works because it estimates velocity based on phase measurements of the L1 carrier-signal over a given time period – which is very accurate. Normally, GNSS systems (including our previous gx/ix algorithm) use the instantaneous Doppler measurements estimated by tracking the L1 C/A signal – but this can be relatively noisy and limits the overall accuracy. The challenge is that carrier-phase measurements are not always available from all visible satellites; and because the Doppler shift from carrier phase measurements is estimated over time, the estimate has a latency that can affect real-time systems.

This is not an insurmountable problem for OxTS devices because their velocity measurements are not derived directly from GNSS measurements; the system simply uses the gxInteger output to improve the measurements it has. So by developing some extremely complex algorithms, the system can successfully use carrier-phase measurements from fewer satellites, and even though they would be considered too old to be used by real-time GPS-only devices. That is how OxTS devices can achieve RTK-quality output with just 3.5 ms latency, without the need for a base-station.