Inertial+

Inertial and GPS Measurement Systems

Features

- 6-axis INS
- Dual-antenna GPS option with Inertial+2
- Use your GPS Input
- No jumps in position
- Roll, Pitch
- True Heading
- GPS Time Aligned
- Accurate Measurements
- Shutter Time Capture
- Distance Output
- Wheel speed input
- 100Hz Updates
- Real-Time
- Low Latency
- Quick Installation
- Compact Size

Applications

- Aerial Survey
- Agriculture
- Asset Management
- GIS data acquisition
- Land Survey
- Road Monitoring
- Road Profiling
- Road Survey

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Inertial+

Cost Effective improvement to GPS measurements

The Inertial+ Navigation System is an extremely price competitive solution for improving measurements from a GPS receiver.

Designed as a drop-in component the Inertial+ takes the serial NMEA data from your current GPS receiver, blends it with inertial sensors and outputs the improved data in the same NMEA format. Other input and output formats are supported.

Smooth Position

GPS often jumps because of multipath and changes to the satellite constellation. The Inertial+ measurements are computed from the gyros and accelerometers, which do not jump. GPS is used to update these measurements and prevent them from drifting.

Continuous Position

Even when GPS is not able to make a measurement, the Inertial+ will output from its inertial solution. Using a wheel speed odometer input the drift rate in position can be as low as 5 metres in 2 minutes.

Orientation

As well as improving position and velocity measurements, the Inertial+ measures Heading, Pitch and Roll. These are important for correcting cameras or laser sensors.

Dual-Antenna GPS

The Inertial+2 system is designed to use dual-antenna GPS for even greater heading accuracy. Using two GPS receivers, a very accurate and stable heading measurement is possible under low dynamic conditions, such as aircraft flights. Heading accuracy is constant during long flight lines, where inertial systems typically reduce in accuracy.

Parameter	Using SBAS	Using OmniStar HP	Using RTK
Position Accuracy[1]	0.5m CEP	0.1m CEP DGPS	0.02m 1σ
Velocity Accuracy	0.1 km/h RMS	0.08 km/h RMS	0.05km/h RMS
Acceleration			
– Bias	10 mm/s² 1σ	10 mm/s² 1σ	10 mm/s² 1σ
– Linearity	0.01%	0.01%	0.01%
– Scale Factor	0.1% 1σ	0.1% 1σ	0.1% 1σ
– Range	100 m/s²	100 m/s²	100 m/s²
Roll/Pitch	0.05° 1σ	0.04° 1σ	0.03° 1σ
Heading[2]	0.1° 1σ	0.1° 1σ	0.1° 1σ
Angular Rate			
– In-run Bias	2 deg/hr	2 deg/hr	2 deg/hr
– ARW	0.2 deg/√hr	0.2 deg/√hr	0.2 deg/√hr
– Range	100°/s	100°/s	100°/s
Update Rate	100 Hz	100 Hz	100 Hz
Calculation Latency	3.9 ms	3.9ms	3.9 ms

Note 1: Position Accuracy is dependent on the accuracy of the attached GPS receiver. Typical figures shown.

Note 2: Heading accuracy of the Inertial+2 is stable under low dynamics. Heading accuracy of the Inertial+ can achieve 0.1 degrees on a land vehicle under normal driving conditions.

Physical Specifications

Parameter	Inertial+ / Inertial+2
Power	9-18 V d.c. 15W
Dimensions (mm)	234 x 120 x 80
Weight	2.2 kg
Operating Temperature	–10 to 50°C
Vibration	0.1 g²/Hz 5-500 Hz
Shock Survival	100G, 11ms
Internal Storage	2 GB
Interfaces	RS232, Ethernet

Save Time

It takes a lot of time to correct poor GPS measurements by hand. Often geo-referenced data is lost because of poor GPS.

Hours of time and many geo-referenced images can be saved with an Inertial+.

Technology

The Inertial+ system includes three angular rate sensors (gyros), three servo-grade accelerometers and all the required processing in one very compact box. An internal low-cost GPS provides accurate time alignment and makes it simpler to use.

Simple configuration software allows the user to change the mounting angle; displace the measurement point to a virtual location; change the GPS receiver type and many more.

Once configured the Inertial+ works autonomously and does not require user attention. It can be used by non-skilled operators.

The internal logging enables the Inertial+ range of products to work stand-alone. Post-mission, data can be output in ASCII text format and loaded in to the software of your choice.

The outputs from the Inertial+ have less delay, or lower latency, than GPS. It is not necessary to wait for the GPS measurement before the data is output. The GPS corrections will still be accepted if they are more than 0.5s late.

The precision ADC in the Inertial+ systems gives more than 20 bits of resolution. The resolution of the acceleration measurements is 0.12mm/s² (12μg). The ADC oversamples the analogue sensors and uses coning/sculling motion compensation algorithms to avoid aliasing of the signals.

The internal processing includes the strapdown algorithms (using a WGS-84 earth model), Kalman filtering and in-flight alignment algorithms. The internal Pentium-class processor runs QNX real-time operating system to ensure that the outputs are always delivered on time.

For further information please contact OxTS or your nearest local agent.

Plots of GPS-only (yellow) and Inertial+ (red) in an Urban Environment

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