ADVANCED NAVIGATION

POSITIONING EVERYWHERE

SPATIAL

ROBOTICS

LAND SURVEYING

UNMANNED AERIAL VEHICLES

MOTORSPORT

TRACKING AND SECURITY

MARINE

Spatial is a ruggedized miniature GPS aided inertial navigation system and AHRS that provides accurate position, velocity, acceleration and orientation under the most demanding conditions.

It combines temperature calibrated accelerometers, gyroscopes, magnetometers and a pressure sensor with an advanced GNSS receiver.

These are coupled in a sophisticated fusion algorithm to deliver accurate and reliable navigation and orientation.
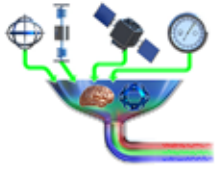
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CALIBRATED DYNAMIC RANGING SENSORS
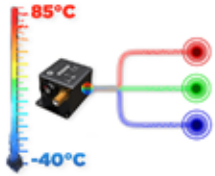
Spatial contains some of the highest performance MEMs inertial sensors currently on the market. These are put through Advanced Navigation's intensive calibration process to increase their performance further still and provide consistently accurate data over an extended temperature range of -40°C to 85°C. Advanced Navigation's custom calibration process is the only full sensor calibration that can provide dynamic ranging, allowing the user to select a sensor range for high accuracy or high accelerations on the fly. As part of this calibration, every Spatial unit spends 8 hours in our specially built rotating temperature chamber.

RELIABILITY

Spatial has been designed from the ground up for mission critical control applications where reliability is very important. It is built on top of a safety oriented real time operating system and all software is designed and tested to safety standards with fault tolerance in mind. The hardware is protected from reverse polarity, overvoltage, surges, static and short circuits on all external interfaces. The GNSS contains RAIM, which excludes both malfunctioning, and tampered satellite signals.

ADVANCED FILTER

Spatial contains Advanced Navigation's revolutionary sensor fusion filter. The filter is more intelligent than a typical extended kalman filter and is able to extract significantly more information from the data by making use of human inspired artificial intelligence. It was designed for control applications and has a high level of health monitoring and instability prevention to ensure stable and reliable data.
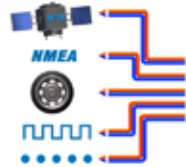
MULTI CONSTELLATION GNSS

Spatial's next generation GNSS receiver supports all of the current and future satellite navigation systems including GPS, GLONASS, GALILEO and BeiDou. These additional satellite constellations allow Spatial to provide accurate position and velocity data in environments where GPS only units can't, such as urban canyons and indoors. When Spatial can't get a satellite fix, it continues to navigate using inertial navigation.

HOT START

Spatial contains a next generation battery backup system that allows it to hot start inertial navigation from its last position in 500 milliseconds and obtain a GNSS fix in approximately 3 seconds. The battery backup system lasts for the lifetime of the product and will provide backup for 48 hours without power. Spatial is the first GNSS/INS in the world to provide hot start navigation.

MINIATURE RUGGED ENCLOSURE

Spatial's precision marine grade aluminium enclosure is waterproof and dirtproof to the IP67 standard and shockproof to 2000g, allowing it to be used in the most extreme conditions. A sophisticated venting system allows the unit to measure air pressure whilst keeping water out. Its minimal size, weight and power requirements allow for easy integration into almost any system.

HIGH UPDATE RATE

Spatial's internal filter runs at 1000Hz and data can also be output at this rate over high speed RS232. This allows for control of dynamically unstable platforms. Spatial is also highly tolerant of dynamic movement and vibration with a very advanced custom navigation filter.

PERIPHERALS

Spatial features two general purpose input output pins that support an extensive number of peripherals. Including odometer based input for ground vehicles, RTK GPS systems, DVLs and USBLs for underwater navigation, NMEA input/output and more. For an integration fee, custom peripheral devices can be added.

NAVIGATION

Horizontal Position Accuracy	2.0 m
Vertical Position Accuracy	3.0 m
Horizontal Position Accuracy (with DGNSS)	0.6 m
Vertical Position Accuracy (with DGNSS)	1.0 m
Velocity Accuracy	0.05 m/s
Roll & Pitch Accuracy (Static)	0.1 °
Heading Accuracy (Static)	0.5 °
Roll & Pitch Accuracy (Dynamic)	0.2 °
Heading Accuracy (Dynamic with GNSS)	0.2 °
Heading Accuracy (Dynamic, Magnetic Only)	0.8 °
Heave Accuracy	5 % or 0.05 m (whichever is greater)
Orientation Range	Unlimited
Hot Start Time	500 ms
Internal Filter Rate	1000 Hz
Output Data Rate	Up to 1000 Hz
Latency	0.4 ms

GNSS

Model	u-blox M8
Supported Navigation Systems	GPS L1 GLONASS L1 GALILEO E1 BeiDou L1
Supported SBAS Systems	WAAS EGNOS MSAS GAGAN QZSS
Update Rate	10 Hz
Cold Start Sensitivity	-148 dBm
Tracking Sensitivity	-167 dBm
Hot Start First Fix	1 s
Cold Start First Fix	26 s
Horizontal Position Accuracy	2.5 m
Horizontal Position Accuracy (with SBAS)	1 m
Velocity Accuracy	0.05 m/s
Timing Accuracy	30 ns
Acceleration Limit	4 g

COMMUNICATION

Interface	RS232
Speed	4800 to 1M baud
Protocol	AN Packet Protocol or NMEA
Peripheral Interface	2x GPIO and Auxiliary RS232
GPIO Level	5 - 20 V
GPIO Functions	1PPS Odometer Stationary Pitot Tube NMEA input/output Novatel GNSS input Trimble GNSS input AN Packet Protocol input/output Packet Trigger Input Teledyne DVL input Tritech USBL input Custom (contact us)

HARDWARE

Operating Voltage	5 to 36 V
Input Protection	±40 V
Power Consumption	100 mA @ 5 V(typical)
Hot Start Battery Capacity	> 48 hrs
Hot Start Battery Charge Time	30 mins
Hot Start Battery Endurance	> 10 years
Operating Temperature	-40 °C to 85 °C
Environmental Protection	IP67, MIL-STD-810G
MTBF	> 50,000 hrs
Shock Limit	2000 g
Dimensions (excluding tabs)	30x30x24 mm
Dimensions (including tabs)	30x40.6x24 mm
Weight	37 grams

SENSORS

SENSOR	ACCELEROMETERS	GYROSCOPES	MAGNETOMETERS	PRESSURE
Range (Dynamic)	2 g 4 g 16 g	250 °/s 500 °/s 2000 °/s	2 G 4 G 8 G	10 to 120 KPa
Noise Density	150 ug/√Hz	0.005 °/s/√Hz	210 uG/√Hz	0.56 Pa/√Hz
Non-linearity	< 0.05 %	< 0.05 %	< 0.05 %	-
Bias Instability	20 ug	3 °/hr	-	100 Pa/yr
Scale Factor Stability	< 0.05 %	< 0.05 %	< 0.05 %	-
Cross-axis Alignment Error	< 0.05 °	< 0.05 °	< 0.05 °	-
Bandwidth	400 Hz	400 Hz	110 Hz	50 Hz