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3DM-GX1®

Gyro Enhanced Orientation Sensor



Introduction

3DM-GX1® combines three angular rate gyros with three orthogonal DC accelerometers, three orthogonal magnetometers, multiplexer, 16 bit A/D converter, and embedded microcontroller to output its orientation in dynamic and static environments.

Operating over the full 360 degrees of angular motion on all three axes, 3DM-GX1®provides orientation in matrix, quaternion, and Euler formats. The digital serial output can also provide temperature compensated, calibrated data from all nine orthogonal sensors at update rates of 350 Hz.

Networks of 3DM-GX1® nodes can be deployed by using the built-in RS-485 network protocol. Embedded microcontrollers relieve the host system from the burden of orientation calculations, allowing deployment of dozens of 3DM-GX1® nodes with no significant decrease in system throughput.

Output modes and software filter parameters are user programmable. Programmed parameters and calibration data are stored in nonvolatile memory.

Features & Benefits

- on-board processing/filtering of accelerometer, gyro and magnetometer output
- fully compensated over wide temperature range
- calibrated for sensor misalignment and gyro G-sensitivity
- supports hard-iron field calibration
- outputs Euler angles, quaternion, orientation matrix, attitude and heading (azimuth/yaw) or raw sensor data
- standard RS-232, RS-485 outputs, optional analog output
- small, lightweight and low power
- AHRS, IMU and vertical gyro modes

Applications

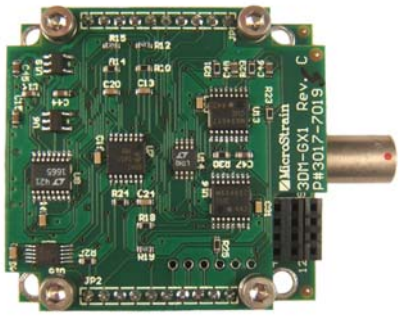
- unmanned aerial / underwater vehicles, robotics – navigation, artificial horizon
- computer science, biomedical – animation, linkage free tracking/control
- mobile cameras, sonar scanners – image reconstruction
- mobile radio antennas – aiming optimization, dynamic correction, antenna shaping
- manufacturing – container handling, hydraulic lift systems, machine tools

BEST OF SENSORS EXPO SPRING 2002 GOLD

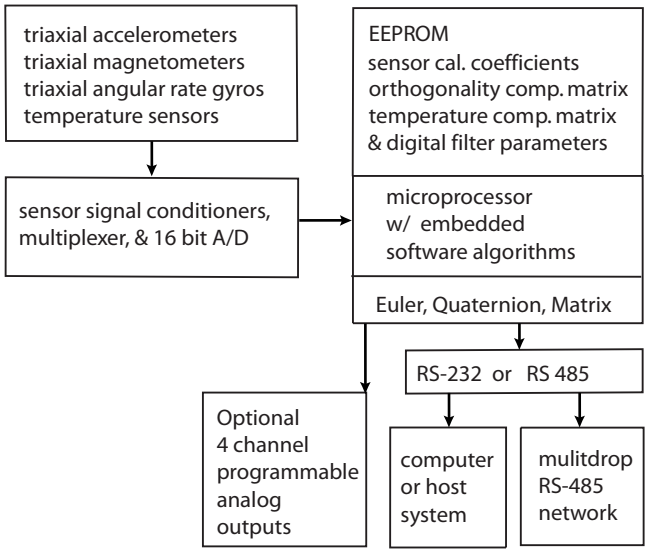
3DM-GX1® utilizes the triaxial gyros to track dynamic orientation and the triaxial DC accelerometers along with the triaxial magnetometers to track static orientation. The embedded microprocessor contains a unique programmable filter algorithm, which blends these static & dynamic responses in real time.

This provides a fast response in the face of vibration and rapid movement while eliminating drift. The stabilized output is provided in an easy-to-use digital format. Analog output voltages proportional to the Euler angles can be ordered as an option.

Full temperature compensation is provided for all nine orthogonal sensors to insure performance over a wide operating temperature range.



3DM-GX1's® small size is ideal for OEM applications.



Specifications

Orientation range (pitch, roll, yaw)	360° all axes (orientation matrix, quaternion) ± 90°, ± 180°,± 180° (Euler angles)
Sensor range	gyros: ± 300°/sec FS accelerometers: ± 5 g FS magnetometers: ± 1.2 Gauss FS
A/D resolution	16 bits
Accelerometer nonlinearity Accelerometer bias stability*	0.2% 0.010 g
Gyro nonlinearity Gyro bias stability*	0.2% 0.7°/sec
Magnetometer nonlinearity Magnetometer bias stability*	0.4% 0.010 Gauss
Orientation resolution	<0.1° minimum
Repeatability	0.20°
Accuracy	± 0.5° typical for static test conditions ± 2.0° typical for dynamic (cyclic) test conditions & for arbitrary orientation angles
Output modes	matrix, quaternion, Euler angles, & nine scaled sensors with temperature
Digital outputs	serial RS-232 & RS-485 optional with software programming
Analog output option	4 channel, 0–5 volts full scale programmable analog outputs
Digital output rates	100 Hz for Euler, Matrix, Quaternion 350 Hz for nine orthogonal sensors only
Serial data rate	19.2/38.4/115.2 kbaud, software programmable
Supply voltage	5.2 VDC minimum, 12 VDC maximum
Supply current	65 mA
Connectors	one keyed LEMO, two for RS-485 option
Operating temp.	-40 to +70°C with enclosure -40 to +85°C without enclosure
Enclosure (w/tabs)	64 mm x 90 mm x 25 mm
Weight (grams)	75 grams with enclosure, 30 grams without enclosure
Shock limit	1000 g (unpowered), 500g (powered)

*Accuracy and stability specifications obtained over operating temperatures of -40 to 70°C with known sine and step inputs, including angular rates of ± 300° per second.

For additional information, please refer to "3DM-GX1 - Detailed Specifications", available online at www.microstrain.com.

MicroStrain®

MicroStrain Inc.
310 Hurricane Lane, Unit 4
Williston, VT 05495 USA
www.microstrain.com

ph: 800-449-3878
fax : 802-863-4093
sales@microstrain.com

Patent Pending

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