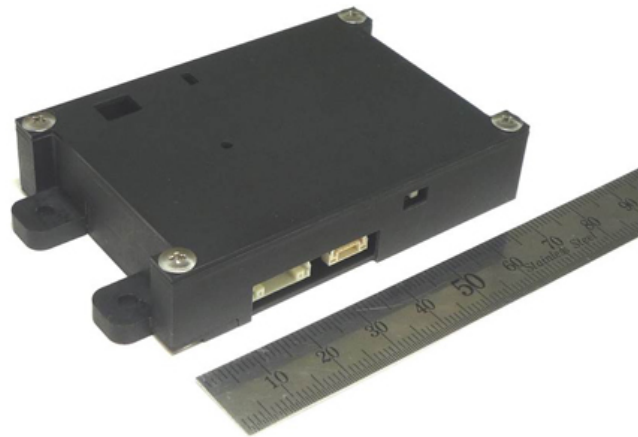


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Panasonic Develops a "Motion Sensing Unit" for Robots



"Motion Sensing Unit" for Robots
(July 2016, Panasonic)

Panasonic's "Motion Sensing Unit " for robots allows for orientation detection and location estimation that meet the requirements of robot manufacturers.

Osaka, Japan - Panasonic Corporation announced today that it has developed a "[Motion Sensing Unit \[1\]](#)" that performs orientation detection and position estimation for industrial and service robots. In addition to an [acceleration sensor \[2\]](#) and a [gyro sensor \[3\]](#) that employ silicon [Micro Electro Mechanical Systems \(MEMS\) \[4\]](#) detector elements, this new unit incorporates Panasonic's own algorithms that take advantage of these sensors, enabling highly accurate detection of orientation and positioning information.

With the expanding need for labor-saving measures, manufacturing automation, and technology to support aging populations, the market for robotics, including industrial and service robots, is growing rapidly. There is a pressing need to efficiently develop highly accurate orientation detection for robots along with functions such as position estimation, in a short period of time. The newly developed motion sensing unit enables high-precision sensing as it incorporates algorithms and parameter settings.

Panasonic's Motion Sensing Unit has the following features:

1. High-speed output of high-precision orientation information based on the development of proprietary algorithms and technology for processing detector elements
2. Ability to have preset parameters according to the customer's application
3. Correspondence to six-axis detection algorithms for three rectilinear and three rotational movement in XYZ directions

The newly developed product is comprised of the following elemental technologies:

1. Algorithm technology to optimize sensor combination
2. Technology for high-precision processing of silicon MEMS sensing elements

To realize high-precision motion sensing units, many robot manufacturers purchase devices such as acceleration and gyro sensors, and then develop their own software to control those devices. This places a lot of burden on the design of software needed to obtain highly accurate orientation information, which in turn increases development time and costs. The newly developed unit will help to reduce robot development workload.

Suitable applications:

Vibration suppression, anomaly detection, orientation control detection, and position estimation for autonomous industrial (non-automotive) mechanical systems including industrial robots, service robots, heavy equipment, agricultural machinery, and amusement arcade equipment.

Sample shipments are scheduled to start by the end of 2016.

[Features]

1. High-speed output of high-precision orientation information based on the development of proprietary algorithms and technology for processing detector elements

In order to realize faster and higher precision robot operation, it is important to quickly and accurately ascertain the orientation and position of the robot body. The newly developed product detects rotational and linear motion in the XYZ directions, and performs high-speed output of highly accurate orientation information. As a result, it enables rapid and accurate control of the robot drive and orientation.

2. Ability to have preset parameters according to the customer's application

For robot drive control, it is necessary to ascertain a variety of information such as orientation detection and position estimation. Currently, robot manufacturers perform a variety of software parameter settings with an emphasis on accuracy or speed, etc., depending on the application. The problem however, is that this requires time for software development. Since the newly developed product can be delivered with preset parameters according to the application, it makes robot settings easier for the manufacturer. Then it will help to reduce robot development workload.

3. Correspondence to six-axis detection for rectilinear and rotational movement in XYZ directions

Given design diversification and the expansion of environments in which robots are used, built-in sensors need to be easily installed regardless of the mounting direction. The newly developed product has six-axis detection for rectilinear and rotational movement in XYZ directions. This means it can detect complex movements whether mounted in the vertical, horizontal, or diagonal directions. Therefore, it expands robotic applications by working in a variety of usage and installation environments.

[Panasonic's technologies]

1. Algorithm technology to optimize sensor combination

Generally, gyro sensors offer superior high-speed response. However, measurement errors tend to increase when measurements are continued for a long period of time. Similarly, acceleration sensors can make highly accurate measurements, but they are susceptible to vibration. By developing fusion algorithms for an orientation detection sensor based on Panasonic's proprietary algorithms, the disadvantages of the aforementioned sensors have been eliminated. Accordingly, with the newly developed product, Panasonic has realized both detection accuracy and response speed, which had been a challenge previously. At the same time, highly accurate orientation information output for low to high-speed movement has been realized.

2. Technology for high-precision processing of silicon MEMS sensing elements

To achieve a high accuracy sensor, the detector elements must be processed with high precision. Panasonic developed processing technology with low-distortion and a high aspect ratio. It also realized a small MEMS detector element that can obtain high-precision orientation information.

[Specifications of the Motion Sensing Unit]

Item	Reference properties
Orientation detection accuracy	0.2 deg (XY axes), 1.0 deg (Z axis)
Angular velocity measurement range	± 300 dps (XYZ axes)
Acceleration measurement range	± 2.9 G (XYZ axes)
Output Cycle	1 ms
Communication interfaces	UART and SPI
Dimensions	74 mm (length) × 49 mm (width) × 16 mm (height)

[Term Descriptions]

[1] Motion sensing unit

This is a unit that detects the motion of an object using built-in gyro and acceleration sensors. Panasonic uses this term for a unit that outputs high-precision orientation information that describes all movement on XYZ axes (rotational and linear motion) detected using a 3-axis acceleration sensor and a 3-axis gyro sensor. This is done using signal processing by a microprocessor with built-in sensor fusion algorithms.

[2] Acceleration sensor

This sensor is for detecting change in the speed of an object moving in a straight line (change in speed per unit time). It is used for vibration detection on hard disks, step counting in pedometers, position and orientation detection in aircraft and automobiles, and orientation detection in smartphones and game controllers.

[3] Gyro sensor

This is a sensor for detecting the speed (rotational angle per unit time) at which an object is rotating. It is also referred to as an angular velocity sensor or gyroscope. It is used for shake detection in digital still or video cameras, position and orientation detection in aircraft and automobiles, and motion detection in smartphones and game controllers.

[4] MEMS

Micro Electro Mechanical Systems (MEMS) are a general term for microscopic devices that are produced through precise processing of materials to function as sensors, actuators, switches, and resonators, etc. The field has undergone rapid advancement in recent years with the progress of semiconductor technology and the ability to process silicon with high precision and at low cost. In addition to gyro and acceleration sensors, MEMS technology is used for pressure sensors, inkjet printer heads, digital mirrors in data projectors, and magnetic recording heads for hard disk drives.

About Panasonic

Panasonic Corporation is a worldwide leader in the development of diverse electronics technologies and solutions for customers in the consumer electronics, housing, automotive, enterprise solutions and device industries. Since its founding in 1918, the company has expanded globally and now operates 474 subsidiaries and 94 associated companies worldwide, recording consolidated net sales of 7.553 trillion yen for the year ended March 31, 2016. Committed to pursuing new value through innovation across divisional lines, the company uses its technologies to create a better life and a better world for its customers. To learn more about Panasonic:

<http://www.panasonic.com/global>.

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