TEST RIG FOR MEMS-GYROS

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Introduction

In a motion sensing application it is desirable to choose the most optimal sensor for the specific application. The question is what motion sensor is the "best" sensor? There is no simple answer, it depends on the application and what demands the construction shall meet. Therefore the question is to find out what parameters that are important in a specific application. It can be the size, price, lifetime or some performance parameters, like high sensitivity, wide sensing range, temperature tolerance, heating, high shock robustness, power consumption or any other parameter. To help the engineer to select the most optimal MEMS-gyroscope (gyro) a test rig has been developed and used.

Materials

The development of this test rig is based on the needs to evaluate different MEMS-gyros and verify their performance. The purpose; develop an easy to use test device that can test a wide range of gyros, a general MEMS-gyro test rig. Studies shows that MEMS-gyro manufactures use many different test methods and devices to verify function and performance. These tests are made in special designed test laboratories with big, expensive, very precisely equipment that gives good test traceability. The tests are extensive and it takes a long time to do a complete full-scale test. For industry, studies of other gyro test rigs shows that the test rig often are developed and designed for a certain industrial application.

Methods

With the aim to design a general test rig that is simple to use, a technical design investigation was made. The main function is to rotate the gyro and measure the precision in the gyros signal response and how precise it is in different situations. This includes detection of different movement patterns and performances in different environment conditions (e.g. temperature, vibrations). For this reasons the test rig shall be small, so it can be placed in a climate chamber, making it possible to measure the influence of temperature and humidity variations. It should be possible to test more than one gyroscope at a time, and also be able to test different types of gyros (e.g. different axis). Therefore the design must allow test of different numbers and types of gyros at the same time. The traceability is important; therefore all tests shall be logged and stored. It is important that no extra equipment is needed to make the test rig running. Therefore shall a regular computer control all tests, via the USB-bus.

Results

A test rig that can test up to six test objects at the same time has been developed. It can be the same kind or different types of gyros that is tested. It is possible to operate the test rig manually, but for making automatic tests, different standard test programs was developed. A computer controls the test programs and stores the logged data. The data is used for analyze and evaluation of the gyros.

Conclusions

With this test rig is it possible to verify and evaluate different MEMS-gyro. The test rig can be used to do both simple functionality tests and more advanced application tests. All data is stored so repetitive tests can be made in a later time and the old data can be used to compare the behavior of the component. It is also easy to compare different types of gyros with the test rig. It is also possibly to compare how ageing, temperatures and ruff environment have affected the component.