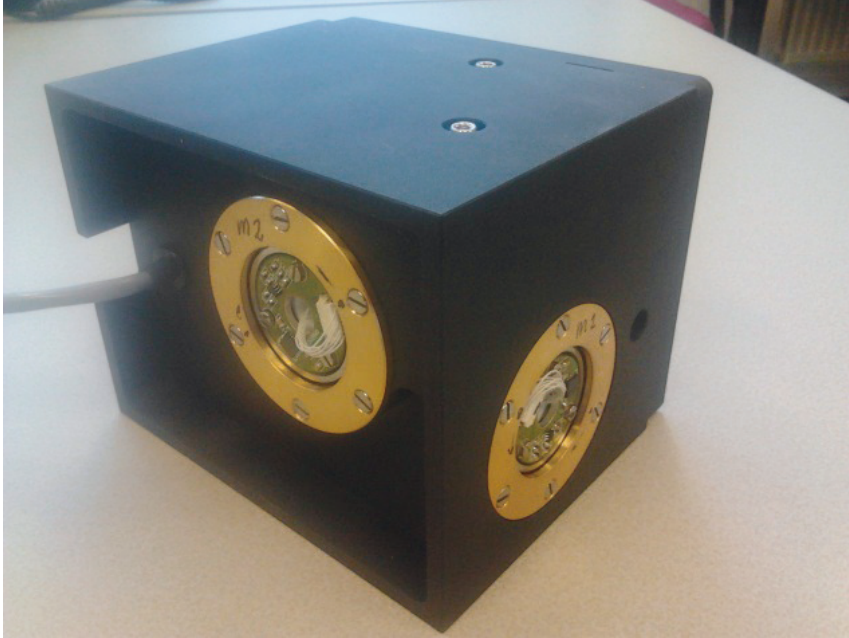


# DRIFTLESS



**TNO** innovation  
for life

## INTRODUCTION

Inertial sensors are used in a lot of application. Examples are: navigation, localization, north finding, platform stabilization etc. Accelerometers are sensors that provides information about acceleration. Gyroscopes are sensors that provides information about angular velocity. This sensor information can be used to calculate velocity, location and orientation (attitude).

### WHAT IS THE BIG ISSUE?

Due to sensor offsets (usually called the bias) the accuracy of position, velocity and orientation estimation decreases in time. This process, which is called “drifting”, is inevitable. As a result the sensors and the navigation system need to be calibrated often. In general this is done by combining the inertial sensors with other sensors (e.g. using GPS location information).

### INDUSTRIES SOLUTION

The technology industry invests a lot of money in producing sensors with a very low bias. This results in very expensive and often very large and heavy sensors for applications where high precision inertial navigation is required and GPS is absent (e.g. deep sea navigation). Examples of such expensive and large sensors are the Fibre Optic and laser gyros. Low-cost MEMS gyros currently cannot be used in these applications due to their high sensor biases.

### TNO SOLUTION

TNO has developed a different, much cheaper solution to reduce the drift. By being able to estimate the sensor biases, the navigation system drift can be largely eliminated. This patented technology enables the use of low-cost MEMS sensors in applications that generally requires high-end expensive sensors.

### UNIQUE TECHNOLOGY

- Completely removing DC, static and dynamic bias with smart sensor signal processing (only white noise remains).
- No temperature compensation required for bias estimation
- Sensor independent, making any sensor much more accurate (e.g. accelerometers, gyroscopes, magnetometers, etc.).
- Biases of all sensors (accelerometers, gyros, magnetometers etc.) estimated at the same time using the same set-up.

### CURRENT STATUS

- Technology demonstrated.
- Almost all DC/static bias removed. A very small residual bias remains.
- Very low-cost MEMS gyros used to achieve near laser gyro quality (8 deg/hr demonstrated)
- Residual bias of 0.1 mg demonstrated using very low-cost MEMS accelerometers.

### YOUR BENEFITS

- Much better localization / navigation using same sensors.
- Comparable localization / navigation using much cheaper (MEMS) sensors.
- Much longer stable localization / navigation.
- To be combined with GPS for high precision applications.



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### TNO

TNO is an independent innovation organisation that connects people and knowledge in order to create the innovations that sustainably boost the competitiveness of industry and wellbeing of society.

TNO focuses its efforts on seven themes including Defence, Safety and Security: TNO works on a safe and secure society by creating innovations for people working in defence organisations, the police, emergency services and industry.

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