

## Thesis and Internship Opportunities

for students in

Computer/Electrical Engineering, Microsystems Engineering, Computer Science or similar fields

### Development of a Control- and Measurement Application for Combined Linear and Rotation Motion Simulator

The Institut für Mikro- und Informationstechnik of the Hahn-Schickard-Gesellschaft develops miniaturized sensors and actuators. In the field of inertial sensors and systems. The research activities in Villingen-Schwenningen started in 1997. Since then several silicon-based micromachined sensors have been built that can either measure acceleration (accelerometers) or rotation velocity (gyroscopes). Silicon based micromachining makes it possible to produce low-cost and small size sensors for a variety of applications, e.g. navigation and stabilization systems for automotive industry or hardware for low-cost virtual-reality systems.

For characterization of inertial sensors and the inertial measurement units (IMU) combining several types of sensors it is mandatory to simulate highly accurate and repeatable orientation in space as well as precise trajectory. Although an available advanced 3D motion simulator can be used to simulate arbitrary complex rotations, it is rather non-trivial to assess the performance with respect to arbitrary linear accelerations such as those the sensors and systems are exposed during human motion, automotive applications or operating of advanced equipment.

With the recent acquisition of Isel AG equipment (Fig.1) it is now possible to apply simultaneously arbitrary trajectory (2D) and rotation (2D) in order to evaluate the performance of inertial components as well as overall systems such as those including software estimation schemes such as orientation Kalman Filters. As the measurement task strongly depends on the particular application profile, a fixed measurement process can't be standardized. For this reason flexible software performing measurements and control of the equipment is necessary.

#### Currently available work includes:

- Development of the equipment interface to PC with the help of the drivers and software provided by the equipment manufacturer.
- Development of application GUI, data file interface and corresponding software implementation.

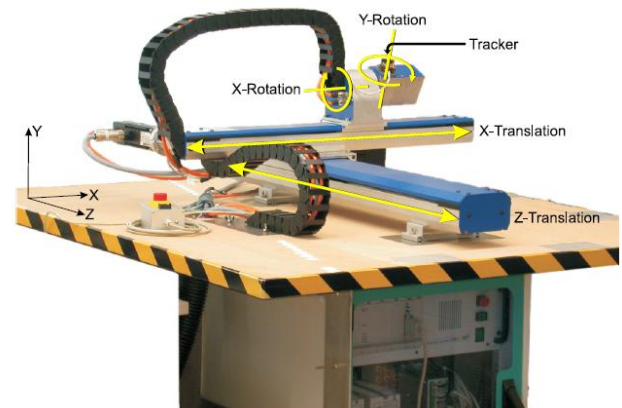


Fig. 1 Example of a linear and rotation motion simulator unit.

- Development of the measurement and control program based on National Instruments LabView which is capable to initialize the complex motion and acquire the corresponding measurements at the same time if necessary.
- Evaluate the possibility to create the interfacing software using Matlab and/or C/C++.

#### Requirements:

- Interest in the state-of-the-art measurement technologies of sensor and system.
- General background in measurement equipment, electrical engineering and control systems.
- Good knowledge in software engineering.
- Skills in LabView, Matlab and C/C++ desirable.

The students can make advantage of HSG-IMIT experience in inertial sensor system measurement and algorithm development. Additionally, the content of the thesis or internship can be adapted to the specific interests of the applicant. We would be very pleased to welcome You as a new student co-worker of HSG-IMIT. Further information and details can be obtained from the contact listed below.

#### Facts about HSG-IMIT:

- Located since 1990 in the new facilities in Villingen-Schwenningen
- Currently more than 90 employees in research and development
- Typically 10-20 student co-workers per semester
- Approximately 700 m<sup>2</sup> of laboratory space with state-of-the-art equipment
- Approximately 600 m<sup>2</sup> of cleanroom classes 10-1000, solely dedicated for the production of microstructures

#### Benefits for our students:

- Involvement in an up-to-date and application-oriented field of research
- State-of-the-art software and equipment
- A highly motivated and interdisciplinary work environment
- A competitive compensation to which a rent subsidy can be granted
- Support in finding an appropriate room during the stay at HSG-IMIT

Your contact:



Dipl.-Ing.  
Jan Dehnert

Inertial Sensors and Systems

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