

Abstract

Small sized, unmanned vehicle (UV) models are an important part of recent research and development trends. They enable testing new technologies, even those which are used in real vehicles of the future. In addition these UVs are applied in a wide range of applications. In order to guide the vehicle with onboard control algorithms it is essential to know its exact position and orientation. This information is supplied by a navigation system which often contains an inertial measurement unit (IMU). The IMU developed in SZAKI contains MEMS sensors, which have several advantages. They are small-sized, consume low-power, affordable, and able to measure three-dimensional acceleration and angular velocity. However their output is corrupted by noise and depends on the temperature, thus it is essential to calibrate them. This thesis presents the development steps of an active calibration device which is able to perform this task quickly and accurately.

This device is a gimbal, which has two degrees of freedom, so it is able to move the IMU into arbitrary orientation. The so called smart actuators developed in SZTAKI are used to rotate the axes. These actuators are equipped with an excessively accurate position and angular rate control. Furthermore the position of the actuators are measured by a magnetic encoder, so the acceleration and angular velocity reference of the IMU can be calculated. Finally an algorithm can be written with the help of these data to determine the calibrational parameters of the sensors.