

## Experimental Determination of Mass Moments of Inertia Using a Hexapod

Knowledge of the mass inertia tensor is a fundamental prerequisite for the dynamic analysis of moving technical systems. In maritime engineering, aerospace, and robotics, the accurate determination of the mass moments of inertia of instrument carriers, sensor platforms, or robotic units is crucial for control, stability, and the predictability of motion behavior. In particular, for complex or additively manufactured geometries, an analytical determination is difficult or only possible to a limited extent.

At the Chair of Marine Technology, a hexapod with six degrees of freedom is available in combination with a multi-component force/torque sensor. This experimental setup allows the execution of defined motion sequences while simultaneously measuring the resulting reaction forces and moments. On this basis, the objective of this project is to develop an experimental and software-assisted method for determining the mass inertia tensor. The complete measurement and evaluation process is to be validated using a test object with known properties.

The following aspects are to be addressed in detail:

1. Literature review of the relevant topics
2. Development of a motion sequence for the targeted excitation of defined degrees of freedom
3. Programming of software (e.g. in Python or MATLAB) for determining the inertia tensor from measurement data
4. Execution of a measurement campaign on a reference object with an analytically known inertia tensor to validate the method
5. Documentation of the investigations as well as presentation and discussion of the results

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