Development and Construction of an Automatic Robot Motor Module Test and Tuning Rig

Background

Modular industrial robots are great potentials to optimize industrial automation. Modular concepts as presented in [1] make it possible to flexibly adapt the physical structure of a robot to the requirements of particular tasks. Before using any actuated robot module for the first time, it must be configured to fulfill the intended properties and all necessary functions must be tested and validated.

Description

In this thesis a robot actuator test rig is to be designed, for tuning and testing newly build robot modules. The test and tuning rig must measure and set the correct zero-position of the robot module, must specify the individual friction behavior and must measure whether the module matches certain criteria, which are yet to be specified. Figure 1 shows an exemplary concept of the test rig.

![Concept of a test and tuning rig for actuated robot modules. The module's mounting to the rig, the rig's actuators and sensors, the communication interface and the data logging software must be developed.](image)

The design process contains selecting necessary sensors and actuators, designing the mechanics of the test rig using CAD, ensuring communication between a test PC and the sensors and actuators, programming the test rig using C++ and MATLAB. In the end of this thesis the user can mount an actuated robot module easily to the test rig and select a standard tuning procedure, which automatically tests the functions of the module, sets its zero-position and gathers individual data. All gathered data is then saved in a common format (e.g. csv). The data can also be shown live in textual and visual form.

Tasks

- Familiarizing with existing concepts of test rigs.
- Definition of requirements of the test and tuning rig (what data to be gathered).
- Selecting of suitable measurement methods.
- Designing the mechanical design of the test rig using CAD, finite element analysis, and established calculation methods, and selecting the components to buy.
- Design of electronic interfaces for communicating between test rig and a test computer.
- Programming of the controllers and data gathering of several test scenarios using MATLAB.
- Programming of a library of test functions for communication.
- Proving functionality of the test rig in exemplary test runs and tuning.
- Documentation of results.
References