



## Robot programming and intelligent error analysis in scientific endstation at MAX IV Laboratory.

*Control of an industry robot (CATS) used for scientific sample change. Intelligent analyzing of errors between CATS and the surrounding equipments, as well as automatic resolving of problems.*

### **Background**

The MAX IV Laboratory is the largest electron synchrotron accelerator in Scandinavia. It is heavily expanding with the new site in Lund (Brunnshög), where the new synchrotron will be ready at around 2016, possessing the best specifications in the world. The synchrotron produces extremely brilliant X-ray beams which is used in various areas of material science, physics, chemistry and biology, at about 12 different end-stations, beamlines, where X-rays are used to investigate physical and chemical aspects of various samples. One of the scientific end-station used in Structural Biology uses an industry robot (CATS) in order to rapidly change samples cooled down to 100 K in a safe way.

The robot is programmed and steered through commands on a TCP/IP port. It calculates in run-time the movements in order to do a specific task and remembers the exact position of the motors. It is coordinated with other equipment at the beamline, that needs to work in cooperation. At times hardware, software or communication are failing. This lead to manual resetting the state of the equipment in way that requires a good understanding, and thus only a few person will do at our site.

### **Project**

We suggest a project that includes

- Writing an interface to the robot hardware communication and the rest of the beamline control system. This will be done through a Tango Device, which is a common standard for hardware control, and with an increasing number of users.
- From our experience of errors, write routines for “rescuing” or resetting the robot to a safe state, depending on what problem appeared.
- Write an intelligent agent that checks status for neighbouring equipment and resolves issues between them in case of a crash.

### **About MAX IV Laboratory**

The staff is multinational with expertise knowledge in various different areas. Working language is english, and occasionally swedish. This project is a chance to get to know one of the most technically advanced, most varying and challenging working environments.

#### ***Please e-mail for more information!***

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