Automated Sharper

The Xovis AG develops and manufactures optical people counting sensors. As part of the manufacturing process, the camera lenses are adjusted into focus. A mechanical device to automate this process already exists. In the context of this thesis, the electronics and software have been developed.

Baseline

The Automated Sharper has two baseline projects, a manual sharper and a mechanical engineering diploma thesis. The manual sharper is currently used to focus the lenses. It provides the test setup and software functionality to measure the sharpness of a lens, but requires an operator to adjust the lenses by turning them. In a mechanical engineering diploma thesis from 2014, the mechanics and a proof of concept have been realised to automated this process. The goal was to make the Automated Sharper ready to use and gather experience for a mechanical redesign.

Concept

The mechanics consist of three stepper motors, two to turn the lenses with lens grippers and one to move the mounting to make placing and removing sensors easier. The test setup contains optical targets at the desired focus distance. A C# desktop application is used as the main interaction point with the operator. It has to get the images from the sensor, calculate its sharpness and adjust the lenses accordingly. This process is repeated until the lens reaches the desired sharpness. The progress status is displayed to the operator on a GUI.
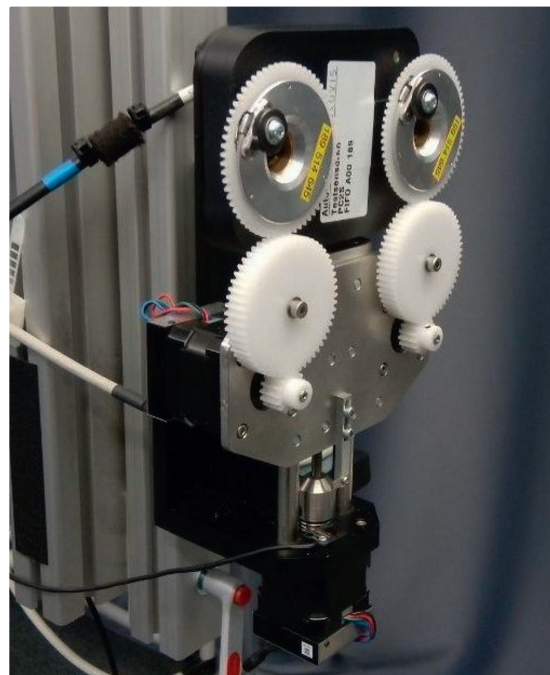
Implementation

The first step was to make the stepper motors controllable over Ethernet and easy replaceable. This was realized by using simple stepper motors with a step/ direction inputs and a Raspberry Pi as a gateway. On the Raspberry Pi, a high level HTTP API has been implemented using the Dropwizard (Java) framework. On the desktop application, the components of the manual sharper application were adapted and an algorithm to calculate the next lens movement from the current sharpness was implemented and tested.

Conclusion and Outlook

The Automated Sharper is now ready to be put into operation. A few final adjustments are required to better handle disturbances. A redesign of the mechanics should also be considered to work with more hardware types.

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Xovis PC2 Sensor with Stereo Camera

Automated Sharper