

Recommissioning the Y-Delta

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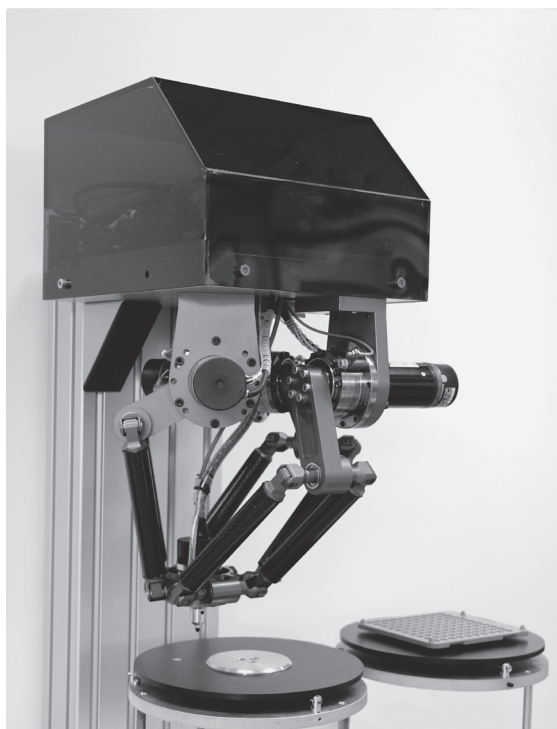
Delta robots allow both high-speed and high-precision handling. Many applications in the micromechanical industry use this kinematic configuration. In 2007 CSEM SA developed a medium-sized delta robot, the Y-Delta-Rouge. The robot was used for demonstration and research purposes. For some time, the robot has no longer been functional. The purpose of this thesis is to recommission the robot and demonstrate its proper operation.

Introduction

A delta robot is a parallel structure consisting of three arms connected to a base platform. Its main advantage is that the wrist-plane – and hence the end-effector – remains always parallel to the base-plane. CSEM's Y-Delta-Rouge possesses also a rotation axis at the end-effector, which allows to control part orientation. This robot is now 10 years old and no longer functional: the control computer is aged and prone to failures, the motor controllers are old and one encoder is defective.

Goal

The Y-Delta-Rouge shall be refurbished and recommissioned. The encoder needs to be replaced. The motors must be examined and replaced if necessary.



Refurbished Y-Delta-Rouge

The rotation axis shall be replaced. The motor controllers shall be upgraded if feasible. A new industrial computer shall be selected, procured and commissioned.

Finally, a demonstration of the system shall be developed to showcase the robot's capabilities.

Implementation Refurbishing

The defective encoder and the rotation axis were replaced. The motors and their controllers were examined and tested. All motors were found functional. The motor controllers were upgraded to the most recent EPOS4 of Maxon Motors AG. A new base platform was designed to fix the new components. A suitable replacement industrial computer was selected and procured.

Recommissioning

The new components were mounted on the base platform. The complete wiring was revisited and updated as necessary for the new motor controllers, which were tuned. All electrical functions were confirmed. The new industrial PC was commissioned.

Software

The existing robot control software was developed on an older version of the real-time QNX operating system. For this thesis, the source code was ported into the open source operating system Linux Low Latency. The control software was commissioned and tested.

Demo

Different demonstration scenarios were evaluated. To showcase high-velocity motions, a pick & place demonstration was chosen and carried out: Small gear-wheels are sorted including proper alignment. For this purpose, a suitable gripper was designed.

Conclusion

The Y-Delta was successfully recommissioned. A demonstration was implemented that showcases its capabilities. CSEM can now use the system for demonstrations and research. In addition, CSEM can now use the selected industrial computer and ported control software for other applications.



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