

Assessment of the bachelor thesis by Nikita Litvishko

## **Reconstruction of Spheres in 3D for Robot Calibration**

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The goal of the thesis was to develop a technique for reconstructing the pose of touching spheres in space from their images in a single perspective image. This is a problem related to robot and manipulator calibration when the knowledge of sphere poses allows to close a kinematic chain and thus calibrate parameters of a manipulator.

The thesis reviewed the geometry of perspective camera, second order curves and surfaces in images and in the space, and the sphere projection to an image. The review is correct and adequately presented.

The main contribution of the thesis is in developing a method for computing the pose of a sphere in space from its image. The method is presented in Chapter 3 and experimentally verified in Chapter 4. Experimental verification is reasonably structured and shows the quality that can be achieved with different types of spheres in practice.

On the positive side, I have to value that Nikita Litvishko was able to grasp the topic and propose a technique for sphere pose computation from a single image. He also evaluated his method in the situation with single as well as with two spheres.

On the negative side, we see that the language of the thesis still needs to be improved. Also, the constraint of two touching spheres has not really been exploited in the estimation.

Nikita Litvishko had somewhat cold start and it took us some time to reach efficient collaboration. Nevertheless, as time went, he become more and more efficient. Nevertheless, he still has to work hard to match best students at his level of studies.

To conclude, Nikita Litvishko presented a useful engineering work and sufficiently fulfilled the goals set in the assignment. His work is not excellent but quite solid. Therefore, I recommend grading the thesis by the *very good grade B*.

Prague, 10 June 2014

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