

## Study proposal

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# Supervision trough tracking and analysis of a rotating object with computer vision techniques

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## 1. the objects



In a former robotics & art project media artist Julius Popp<sup>1</sup> has built two "wheels", micro.adam and micro.eva<sup>2</sup>. They have a built in microprocessor that can control one or several arms. By moving the arms, the center of mass of the wheel is shifted in a way that it begins to roll. By a coordinated control of the arms, the rolling can be transformed into a quite fast rotation. The "wheels" have built in gyroscope<sup>3</sup> sensors to get feedback on actual movement.

There is a video showing the movement:

<http://ilabws13.informatik.uni-leipzig.de/~mai98fdi/da/raeder.mpg> (17 MB, mpeg4)

<http://ilabws13.informatik.uni-leipzig.de/~mai98fdi/da/raeder.wmv> (25 MB, less compression)

## 2. the objectives

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<sup>1</sup> [julius@hgb-leipzig.de](mailto:julius@hgb-leipzig.de)

<sup>2</sup> [sphericalrobots.com](http://sphericalrobots.com)

<sup>3</sup> [http://www.mathe-schule.de/Physik/links\\_kreisel.htm](http://www.mathe-schule.de/Physik/links_kreisel.htm)

In order to facilitate analysis of the algorithm controlling the "wheels", it is desirable to record the movement with simple parameters and save them to a database:

- angle the "wheel" is turned from null position
- angle of each arm relative to the wheel

From this data the turning speed can easily be derived and also an alarm can be generated when the wheel has stopped rotating or an arm has stopped moving (eg. because something has locked).

The desired parameters could be derived by different means, eg. by contacts mounted directly to the wheel, giving a signal each time a certain angle was passed. The position of the arms could be self reported by the wheel controller.

But in order to apply computer vision techniques, those means will not be used as primary sensors. They might be used to evaluate the resulting computer vision algorithm.

### **3. the approaches**

Two approaches to the computer vision task, that is essentially only 2d, are planned.

#### **3.1 standard mathematical approach**

TBD

#### **3.2 approach using neuronal network techniques**

TBD