

Institut für Echtzeit Lernsysteme

Master thesis:

Pattern Recognition: Development of a movement model for *Daphnia Magna* for detecting behavioral changes

At the Institute of Real-Time Learning Systems one main focus is the development of systems for object- and situation recognition. This includes computer vision systems for tracking and classifying objects. Such a system is currently being developed as part of the European project FENOMENO¹ for the detection of behavioral changes of zooplankton (*Daphnia Magna*) exposed to Nanoparticles. The effects on Nanoparticles on the environment are largely unknown. Thus, great efforts are made worldwide to find analytical tools for risk assessment. The goal of our research is the development of a computer vision system that can detect and classify behavioral changes in the movement patterns of *Daphnia magna* under the influence of Nanoparticles.

The existing system is able to track single *Daphnia* with a certain error rate. The resulting movement data is analyzed statistically and by classical classifiers. In this work, an additional classification approach should be developed for the detection of changes in the movement patterns of *Daphnia Magna*. There are physical models that describe the movement of particles like the Random Walk Model or Brownian Movement. These models can be described by mathematical formulas.

This thesis consists of four tasks:

1. Creation of a survey concerning state of the art methods and choosing one or more that are considered useful for our application
2. Development of a physical movement model for *Daphnia Magna* based on the existing tracking data and creation of a definition for changes in behavior regarding the model
3. Implementation of the movement model into the existing computer vision system
4. Test and evaluation of the model, comparison with the already existing classifiers

Requirements:

- Your field of study is Informatik or similar and you want to achieve the Master degree
- programming skills in C++
- good to very good English (most literature is in English)
- affinity to physics and mathematics
- willingness to work accurately and scientifically

Optional:

- Experience with OpenCV

The thesis can be written in English or in German. The results should be presented at the final meeting of the FENOMENO project in March 2018 (it is not necessary to present the results in person). Basically it is also possible to publish the result of the thesis as a paper or a poster.

If you are interested, mail to
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¹ www.fenomeno-nano.de/