Technische Universität Braunschweig

ibvt Institut für Bioverfahrenstechnik

InES Institut für Energie- und Systemverfahrenstechnik

May 18, 2017

Announcement student master thesis (Masterthese/Studienarbeit)

Process analysis via computer vision

Data analysis for optical tracking in (micro) bioreactors using cameras

Process analysis is of great importance in understanding the dynamic behaviour of a reactive system. In particular in biochemistry, processes and their interactions are in general complex. Hence, process control in biochemical systems requires effective monitoring based on precise online measurements, where many of the today used physiological measurement techniques are limited to offline analysis [1]. Computer vision technologies promise to overcome the offline drawback and to lead to advanced automated laboratories in the future [2].

Recent developments in the automobile industry towards autonomous driving have pushed computer vision technologies and its applications. Numerous available tools and functions for camera-enabled techniques, to mention here the open source library OpenCV (http://www.opencv.org), are available and shall be used to analyse biochemical processes in (micro) bioreactors. Process quantities to determine are for example mixing time (see figure 1), velocities by object tracking, and many more.

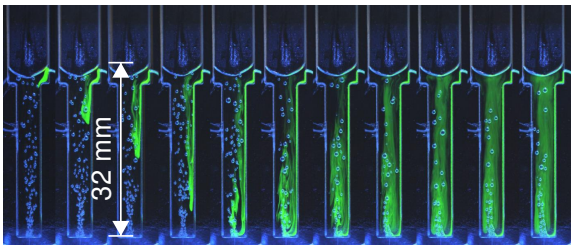

Figure 1: Mixing process

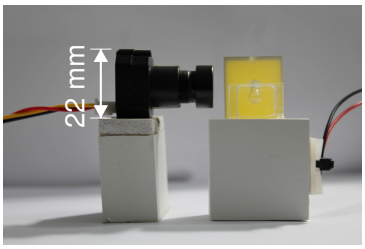

Figure 2: Exemplary set-up

In this student thesis (Master- or Studienarbeit), a data processing chain for image and video processing, applied to events in (micro) bioreactors, should be developed. The student first acquaints himself with existing experimental set-ups (see figure 2), possibilities of computer vision, its realisation, and underlying theories. Subsequently, the data processing chain and its prior defined functions are implemented and, in a last step, validated with results from available data or conducted experiments.

[1] William S. Levine, ed. *The Control Handbook, Second Edition: Control System Fundamentals*. 2010.

[2] S. V. Ley et al. “Camera-enabled techniques for organic synthesis”. In: *Beilstein Journal of Organic Chemistry* 9 (2013), pp. 1051–1072.

Requirements:

- Interest in biochemical processes and coding
- Good knowledge in programming
- Liking for combination of computer simulations and experiments
- Independent and autonomous working
- Fondness for building something from scratch
- Possible as master thesis or Studienarbeit in English or German language

Feel free to contact the following responsible persons:

Lasse Frey, IBVT
l.frey@tu-braunschweig.de
+49 (0)531 391-8325

Moritz Schulze, InES
mo.schulze@tu-braunschweig.de
+49 (0)531 391-7858