AquaBioTox
ON-LINE MONITORING OF DRINKING WATER BASED ON A BIOLOGICAL BROAD-SPECTRUM SENSOR WITH AUTOMATIC IMAGE EVALUATION

Motivation and Objectives
Water networks are exposed to deliberate or accidental contamination

- Problems of existing analytical techniques
  - time-consuming
  - limited spectrum of toxins

- AquaBioTox-Sensor
  Key idea
  - Biological (micro) organisms are exposed to drinking water
  - Changes in motion behavior / fluorescence indicate toxin

Properties of AquaBioTox-Sensor
- Minimization of fault-alarm by using various highly sensitive biological (micro) organisms
- Characteristic properties of biological organisms are automatically analysed by image processing

Innovation
- Process stabilization
  - Long-term stabilization of biological sensor systems
  - Optimal supply with nutrients, oxygen, temperature

- Image processing
  - Motion behavior and fluorescence of the (micro) organisms are measured by cameras
  - Reliable detection requires extensive image processing methods

- Information fusion and diagnosis
  - Distinction between natural and toxic based changes of biological (micro) organisms
  - Reliable detection by model-based approaches (e.g. physical model, neuronal network)

Biological Sensor Systems
Biological organisms are the main components of AquaBioTox

- Bacteria strains (E. coli and Caulobacter crescentus)

- Mammalian cells (hamster cells CHO and human cells HEK 293T)

- Daphnia magna

Changes in color, fluorescence or motion behavior in contact with toxins → Detection of toxic influence

Usage of various biological systems allows the detection of a wide toxin spectrum

Experimental Results
Two prototypes of the AquaBioTox sensor system realized

- Representative water network at Berliner Wasserbetriebe used as a platform for AquaBioTox-Sensor
- Investigation of performance under realistic conditions