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 fluorescence / luminescence indicate toxin

Properties of AquaBioTox sensor
- Minimization of fault-alarm by using various highly sensitive biological cell systems
- Characteristic properties of 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
  - Fluorescence / luminescence of the microorganisms is measured by a camera with image intensifier tube
  - Reliable detection requires robust 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)

Experimental Results
Prototype of the AquaBioTox sensor system realized

Biological Sensor Systems
Biological organisms are the main components of AquaBioTox

- Bacteria strains
  (E. coli, Caulobacter crescentus)
- Mammalian cells
  (hamster cells CHO and human cells HEK 293T9)

Changes in fluorescence / luminescence in contact with toxins → Detection of toxic influence

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