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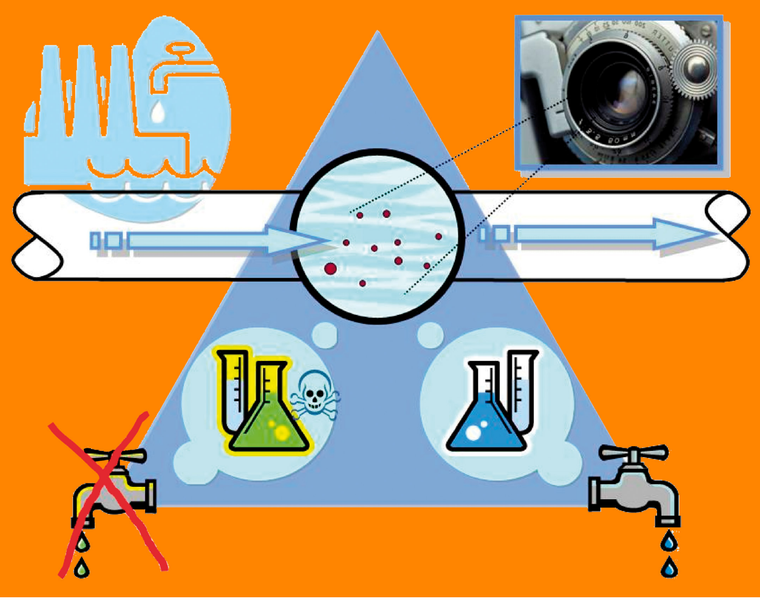
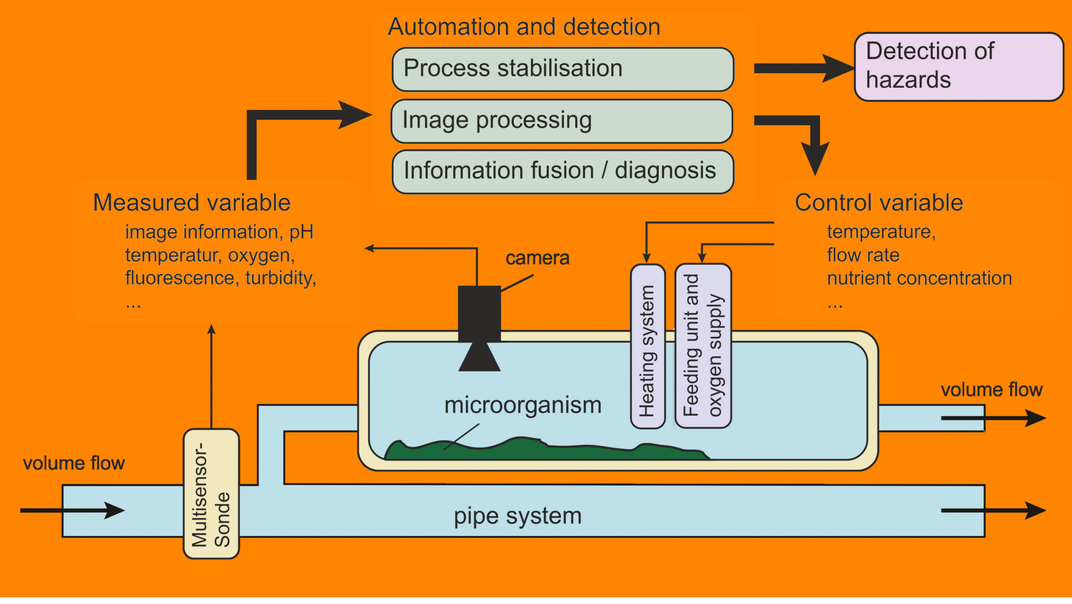




AquaBioTox

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
- Requirements
  - online-capability
  - fast and reliable
  - robust against false alarm
- **AquaBioTox sensor**

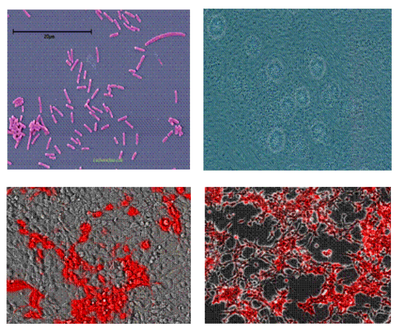
  Key idea
  - Biological (micro-) organisms are exposed to drinking water
  - Changes in fluorescence / luminescence indicate toxin

  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

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**

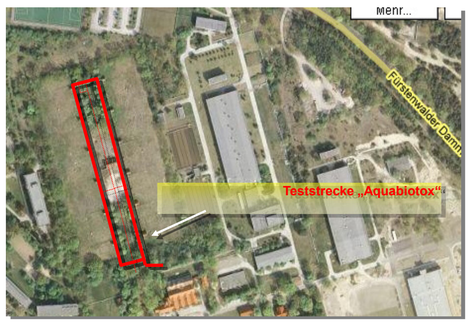
Innovation

- 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)

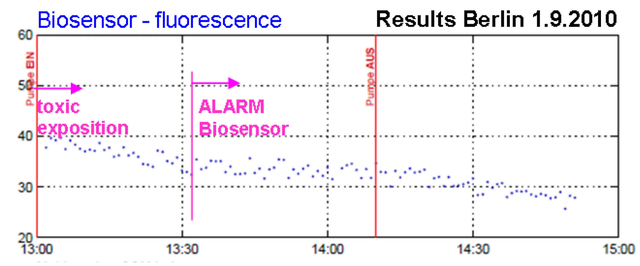
Experimental Results

Prototype of the AquaBioTox sensor system realized

AquaBioTox prototype.



Real-world test platform at Berliner Wasserbetriebe.



fast and reliable detection of contaminants

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

Dr. Thomas Bernard
Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB
Phone +49 721 6091-360
thomas.bernard@iosb.fraunhofer.de

Dr. Iris Trick
Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB
Phone +49 711 970-4217
iris.trick@igb.fraunhofer.de