

Call for a Master's thesis project



Title: Modeling of Bacteria Propagation in Water Distribution Lines

Today, water distribution networks efficiently bring water to cities, buildings and public places. However, occasionally bacteria and other microorganisms may pollute water along the distribution lines. This is especially dangerous in drinking water. New wireless biosensor networks, which are networks composed of small sensing units capable to measure the state of the water and wirelessly transmit it to a central monitoring unit, can track the bacteria burst out and its spreading along the lines.

Understanding how bacteria flourish and propagate along these lines is essential to predict spreading of bio-pollution and counteract it. If models for pollutant dispersion were available, the placement of sensors used to detect bacteria and other microorganisms can be optimally planned. Therefore, mathematical modeling of the bacteria diffusion may have a great potentiality to improve the monitoring and control of water, with substantial benefits not only for the water production and distribution, but also for the human health and environment.

In this master thesis project, we propose to investigate how to model bacteria propagation along water distribution lines. The availability of existing models for bacteria dispersion and drift will be investigated. In addition, state-of-the-art numerical simulations of particle transport in complex geometries (pipes' bent and junctions) will be performed to extend the existing database. The numerical simulations will use parallel algorithms to solve the unsteady three-dimensional Navier-Stokes equations on supercomputers. Based on these results, we study the optimal monitoring of bio-pollution in water distribution networks.

This is an exciting interdisciplinary project between the Automatic Control Lab, Electrical Engineering, and the Linne FLOW Centre, KTH Mechanics. Students challenged by working in an interdisciplinary field, learning new techniques and broadening their knowledge are encouraged to apply. Any Master's student interested in mechanical engineering, electronics and wireless networks is welcome. Biology, mechanical engineering, electrical engineering, engineering physics, and computer sciences students with strong mathematical background are encouraged to contact the persons below.

Starting time: from September 2012

Contact persons

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