DIGITAL TWINS FOR OPTIMISATION AND CONTROL OF DRINKING/PROCESS WATER PRODUCTION

Introduction

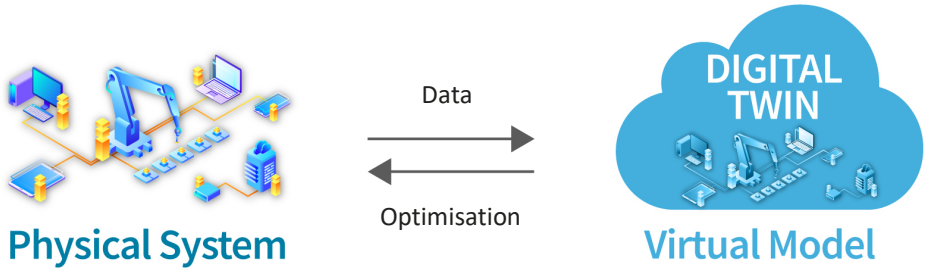
Water scarcity is a critical problem encountered throughout the world, and most specifically in Belgium and Flanders. Water utilities are confronted with the need for better water sources management, as droughts and decline in available groundwater caused by climate change and overpopulation increase water stress in the region.

For the optimal operation of water production, *digital twins* or the real-time use of such models would represent a powerful tool to monitor process trains and improve efficiency. Implementations for several processes are available, such as reverse osmosis, membrane distillation and bioreactors. However, models are still missing for many other processes.

Methodology

Water process models are typically mechanistic, but the combination with statistical or machine learning models could bring a new paradigm where data-driven models can be used to teach and optimise physics-based models. Advanced control strategies such as *Model Predictive Control* (MPC) can then make use of this hybrid approach to optimise process control while satisfying certain constraints (e.g. performance, energy consumption, etc.).

The work will focus on the implementation of a process train consisting of several unit processes in series for the production of drinking/process water in different operational and control scenarios. An immediate application of the developed algorithm could be the validation of existing processes where the different parameters for required water quality can be measured. Discussions with partners from drinking and industry sectors are currently ongoing to find the most suitable case studies.



Objectives of the thesis

The goal is to develop a model with sufficient predictive power to be used as a digital twin. Background knowledge of modelling and simulation, process control and basic programming skills are required.

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BACKGROUND
C&B, C&G, L&W, M, L&V

LANGUAGE
English

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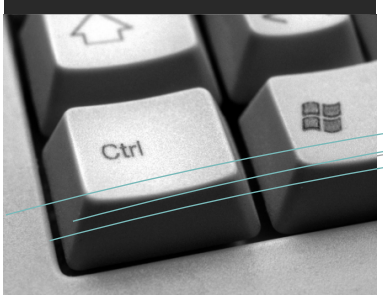

CAPTURE BIOMATH