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Abstract book

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Criteria to select an appropriate tool for ecological modelling

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The use of model building and dynamic simulation can give a better insight in different processes which describe ecosystems or the behavior of the system, so that optimal management of the system can be ensured, resulting in cost reduction and less pollution. This approach uses mathematical models that give a reliable image of the existing system (plant, river, …).
The model base includes several models regarding

- Wastewater treatment
- Water reuse
- River
- Integrated Urban Water Systems

HEMMIS, in partnership with Ghent University, worked out a software platform for dynamic simulation, in which it is easy to integrate your own know-how. The platform named WEST® uses the easy to learn Model Specification Language, which enables the user to adapt and extend the available models or to enter new models into the system.

The Configuration Builder allows for graphical component-based modeling. The Configuration Builder is especially designed for the interactive composition of complex configurations from basic building blocks and supports unlimited size and complexity of system configurations, easy implementation of controllers and an extended model and component library.

In the Experimentation Environment the simulation of the characteristics of the system can be controlled interactively (Dynamic interactive simulation). At any time during the simulation parameters can be changed, using sliders or manually.
A lot of supportive tools are present to help you create a reliable simulation experiment.

1. Trajectory optimization experiment
   Certain model parameters are varied to minimize the *distance* between a simulated trajectory and a given (measured) trajectory. This is mostly done for parameter estimation, but it can also be used for controller tuning and process design optimization.
2. End value optimization experiment
   The most general use of the optimizer where some parameters are varied (possibly constrained) as to minimize a goal function.
3. Sensitivity analysis experiment

The sensitivity of the model with respect to model parameter variations can be investigated.

4. Scenario analysis experiment
   An automatic run of a set of simulations with different values for several parameters can be performed. The values of the parameters are changed within a specified interval according to a linear equally, logarithmic equally or randomly spaced distribution.

All this aspects will be shown in relation to some river water quality cases that have been worked out by different universities.