MSc Thesis Proposal

Transporting waste intelligently using hybrid model predictive control

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Waste transportation systems

Massive amounts of waste water are produced everyday by households and industries all over the world. Sewer systems are the large-scale water systems that have to handle your waste. These systems span complete urban areas and drain wastewater out from these urban areas up to wastewater treatment plants. In addition, sewer systems prevent stormwater arising from excessive rainfall to flood into streets by draining water up to neighboring rivers.

Clearly, the efficient operation of sewer systems is of crucial importance to minimize the amount of pollutants that is released into the environment. Cities in areas that experience heavy rainfall as well as coastal towns that regularly experience storms are hereby of major concern. Moreover global climate changes cause more intense periods of precipitation than before, increasing the risk of floods and overflows.

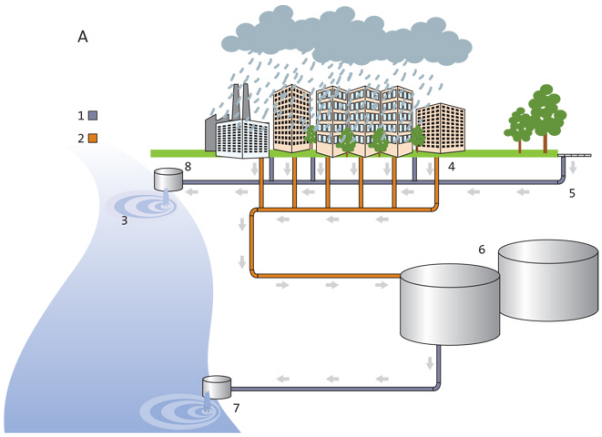

Fig. 1: Seperated sewer system.

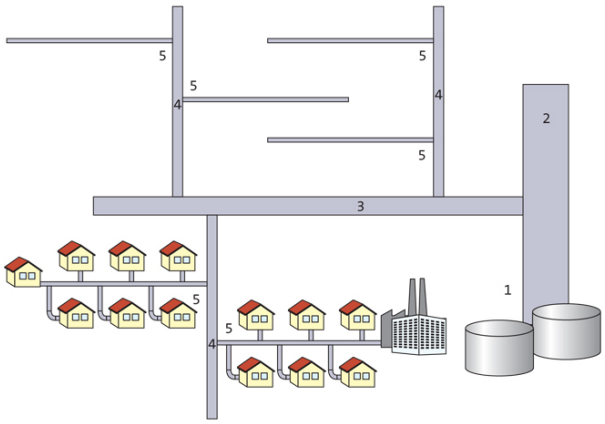

Fig. 2: Sewer system overview.

The control challenge

Sewers are operated using pumping stations to control the flows in the system. This operation is generally carried out manually and in a centralized way. When storage facilities are present, they allow to store sewage during a storm. When the storm is over, sewage is pumped out of the storage facilities and sent to a wastewater treatment plant. An efficient operation of the pumping stations and an efficient use of the storage facilities may be able to minimize the sewer overflows, the use of the water treatment plant, and consequently the release of pollutants into the environment. How can the sewer system be controlled most efficiently?

The assignment

In this project you will develop a model predictive control strategy for controlling sewer systems. You will hereby explicitly take into account economic objectives (pumping costs), operational constraints (min/max allowed flow velocities, water levels), and precipitation forecasts. In addition, you will consider the hybrid nature of sewer systems: continuous water flow dynamics are influenced by discrete pump and gate actions. You will have to possibility to assess the performance of your control scheme on realistic case studies provided by the industry.

More information

If you are interested in selecting this project as your MSc project, please stop by at the office of Rudy Negenborn (8C-3-20) or Bart De Schutter (8C-2-11). See also http://www.dcsc.tudelft.nl/~rnegenborn/ for more information.