

How would you distribute intelligence to wastewater pumps?

Problem scenario in water catchment systems

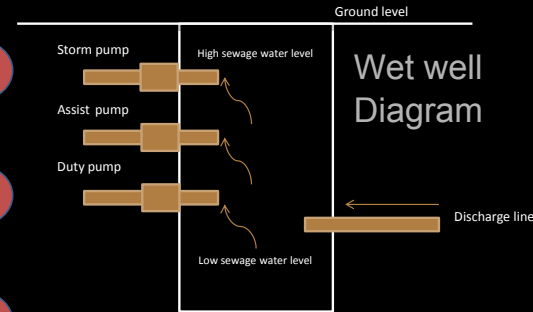
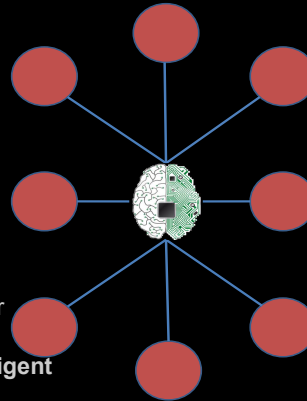
In developed countries, the transport of waste water is a **challenge** that water utility companies have. Part of their operations include **switching pumps manually** that are present in wet wells where a collection of waste waters from several sources accumulate and flow outwards to either the sea or rivers prior to treatment. **Water regulatory authorities** impose **heavy fines** on water companies that allow surface areas to become **flooded** or **water pollutants detected are high**. The way forwards is by means of **intelligent automation to control waste water pumps**.

Distributed fuzzy logic

At present, research is being conducted on optimising waste water pump control by using **Fuzzy Logic techniques**, but there is **no means of distributing the automation**. There has been research conducted in the past that can intelligently monitor sensor data within homogenous and heterogenous WSN environments, but yet, none focuses on **control**.

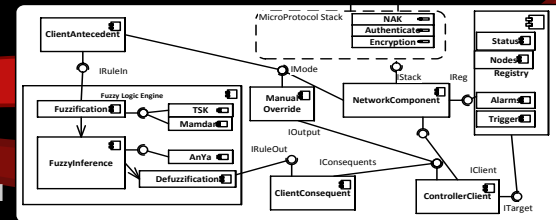
Components for distributing smart systems

At Lancaster University, we are looking into novel ways of distributing smart systems into WSN nodes whilst maintaining a **flexible and configurable** design by **avoiding a monolithic black box** approach and to allow application programmers to focus on a higher level of abstraction. Our vision is of using **Component Based Software Engineering (CBSE)** to create a **distributed fuzzy engine framework** within a **hybrid distributed network** that is able to **intelligently control** waste water pumps that will **prevent localised flooding** and **save pump activations** which has the benefits of **saving energy** and **maintenance costs**, hence passing the savings to the **water utility customers**.



Wet wells (denoted by the red nodes) receive fuzzy inputs from a controller (Brain in the middle) within a substation relaying messages to its headquarters above and its WSN nodes located below. Each node is represented by the wet well diagram which have WSN's located in the sewer pipes to measure water flows and within the wet well to measure the amount of water already present.

The diagram below is a component diagram at the substation level that will manage communications between the lower nodes and the higher level.



Controller Level Middleware