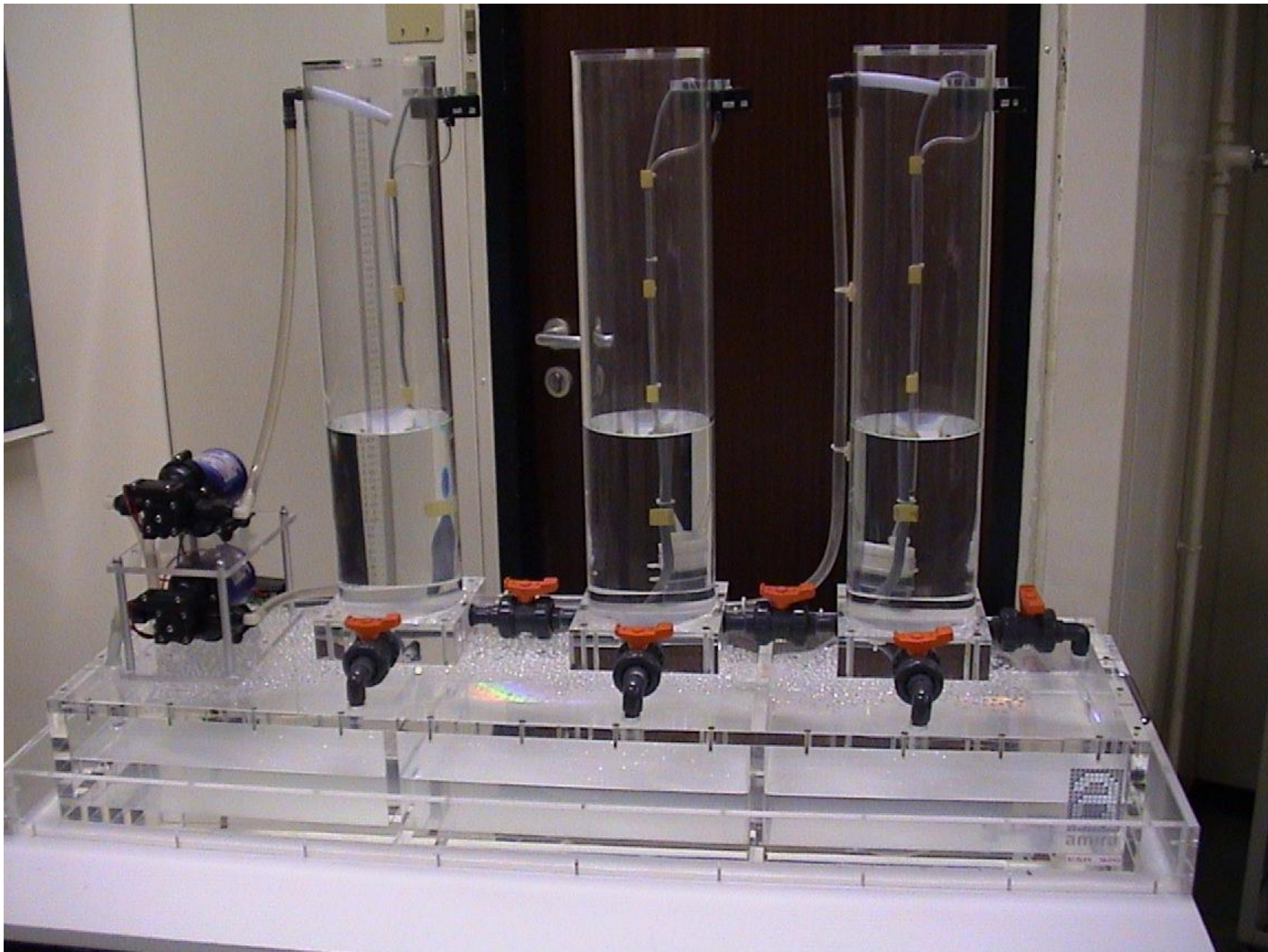


Description of the three-tank system



Input to the three-tank system

Pump inputs to Tank 1 and Tank 2

Available measurements

Measurements from the piezo-resistive pressure transducer

Interfaces

A/D and D/A external interfaces to the computer

The three tank system can be considered as:

- A nonlinear multi input-multi output system
- A hybrid system consisting of continuous and hybrid behaviour
- A discrete-time system
- A discrete-event system

Model of the three-tank system

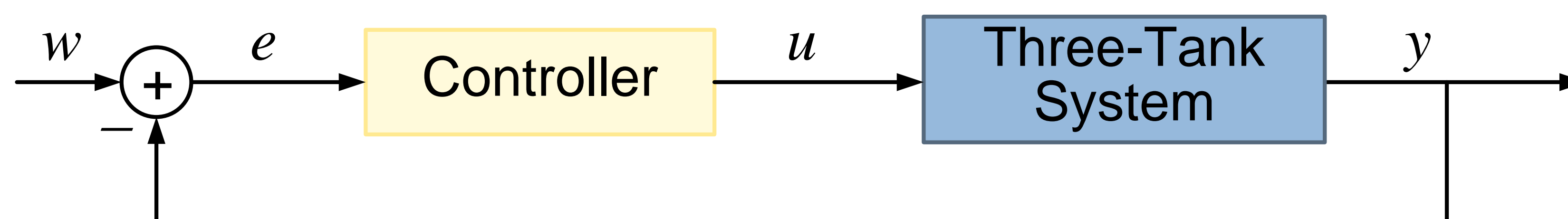
$$A \frac{dh_1}{dt} = q_1(t) - \alpha_1 \operatorname{sgn}(h_1(t) - h_3(t)) \sqrt{\operatorname{abs}(h_1(t) - h_3(t))}$$

$$A \frac{dh_3}{dt} = \alpha_1 \operatorname{sgn}(h_1(t) - h_3(t)) \sqrt{\operatorname{abs}(h_1(t) - h_3(t))} - \alpha_2 \operatorname{sgn}(h_3(t) - h_2(t)) \sqrt{\operatorname{abs}(h_3(t) - h_2(t))}$$

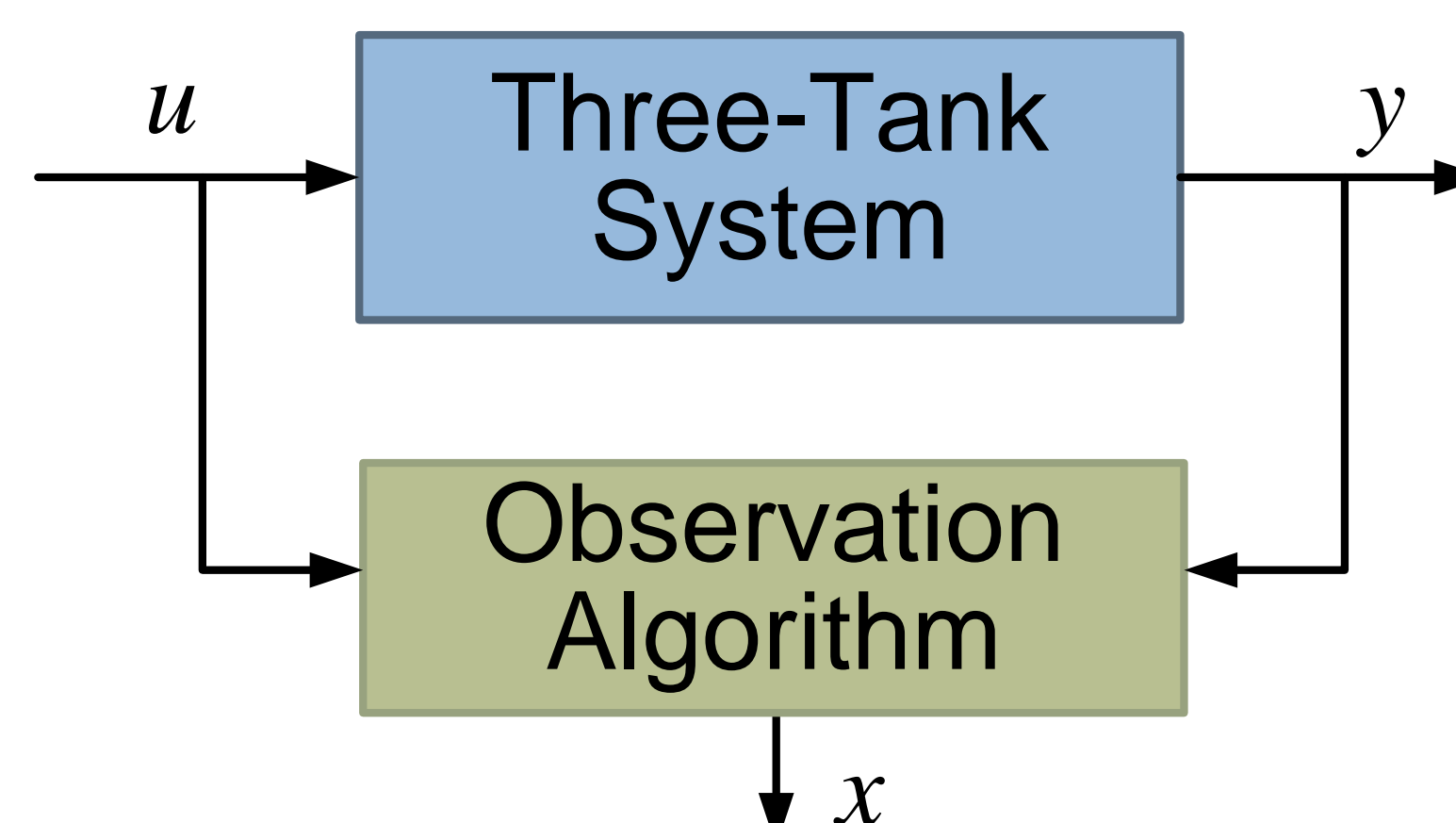
$$A \frac{dh_2}{dt} = q_2(t) + \alpha_2 \operatorname{sgn}(h_3(t) - h_2(t)) \sqrt{\operatorname{abs}(h_3(t) - h_2(t))} - \alpha_3 \sqrt{h_2(t)}$$

Experiments with the three-tank system

Controller Design - Control level of the Tank 3 from the given pump inputs



State observation - Determine the level of the the three-tank system from the pump input and the outflow



Diagnosis and reconfiguration - Diagnosis is to determine the faults in the system from inputs/outputs
 - Reconfiguration is to adjust the controller so that the system behaves normally despite a fault

