

Project title: Testbed and algorithms development for distributed control of compartmental systems

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Project description: This REU is part of an NSF-funded project on the distributed control of compartmental systems. These systems have been gaining increasing popularity lately, as models of large-scale infrastructures such as irrigation networks and the National Airspace System. The basic idea is to represent the infrastructure as a network of coupled sections or “reservoirs”, which exchange flows (of water or vehicles) with each other. Each section can be analyzed and controlled separately, thus simplifying the design and implementation of regulation strategies.

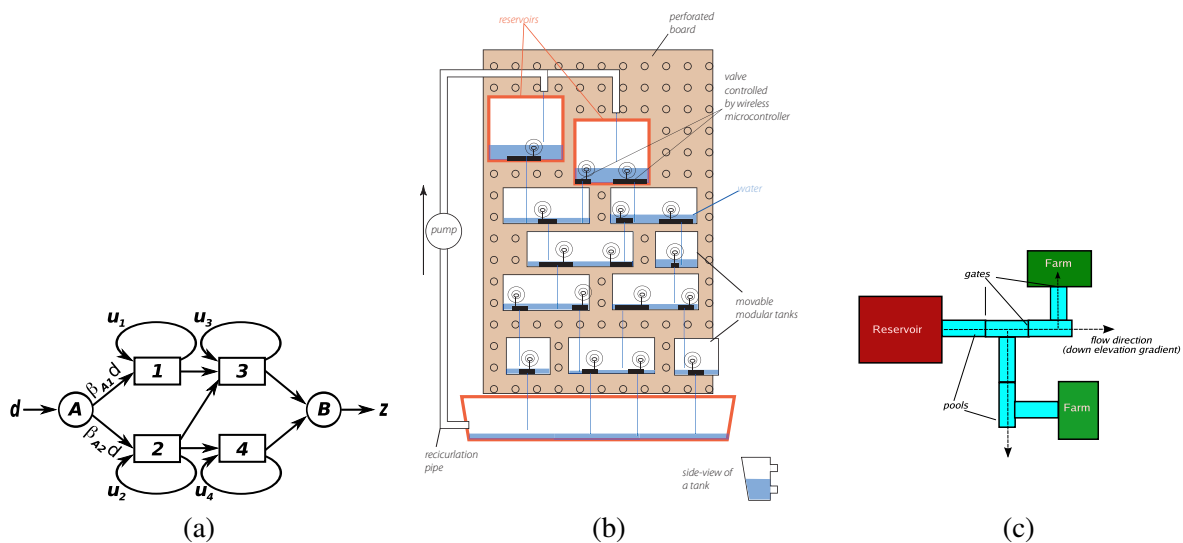


Figure 1: Three compartmental systems. (a) A portion of the National Airspace System; (b) the testbed to be developed; (c) a simple irrigation network

The present project focuses on the realization of an experimental testbed, as pictured in Figure 1.(b), which will serve as an abstraction of the infrastructures of interest, and on which some of the control algorithms designed by the group will be validated in a realistic setup. The testbed consists of several actual water-filled containers equipped with individual valves, pressure sensors, and networked microprocessors.

The student will be part of a group in charge of constructing the testbed and implementing some of the control algorithms developed by the graduate students.

Student preferred background and expected research activities: The ideal candidate will have a solid background in mathematical methods, including ordinary differential equations (familiarity with control theory would be a big plus), and have experience working in a lab and Knowledge of matlab/simulink or a real-time implementation language would also be useful, but is not required.

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