SIMULATION OF CONTROL OVER NETWORK WITH SIMEVENTS TOOLBOX

M. Blaho, T. Chvostek, M. Foltin

Syprin s.r.o., Žehrianska 10, 851 07 Bratislava

Regular structure of control loop contains controller, sensors, actuators and controlled process. During controller design we often don't consider the whole set of control loop parameters and throw away some specific parameters which will not affect our process. It simplifies our modeling and calculations, but it can be also dangerous when used in an real environment. Communication between controller and controlled process in both ways is mostly considered as an ideal, non-delayed network, but in a real systems is process and controller connected to a industrial bus or a network containing delayed communication.

Data exchange between sensors, actuators or controllers connected to communication network can lead to unpredictable delays. Consider the situation when two nodes wants to transmit data at the same time. The medium access control mechanism (of used communication network) will choose which node can immediately transmit data and which will abandon for a some time. As as result of this effect transmitted data (of some nodes) are delayed. Transmit delay can be constant, or time varying. Delayed data transmission can affect not only quality and performance of controlled process (designed without communication delays), but also can cause system instability.
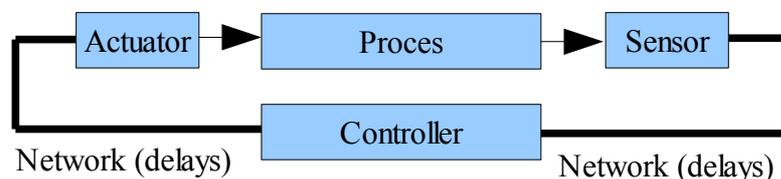
Usage of networked control systems (NCS) has also other side effects. When NCS nodes are damaged, have an failure, or network is overloaded, the communication of the whole NCS will break down and it often results in a system instability. We know two main design methods how to optimize and to improve NCS:

- change and improve communication protocol
- redesign controller with consideration of communication delays

This paper will focus on the second method. Behavior of network is simulated with Simevents toolbox. Simevents is a Matlab tool used for modeling and simulation of discrete event systems. It simulates "traveling" of basic element – "simevents entity" through network of stacks, servers, switches, or network gates based on events. Advantage of Simevents is, that we can model hybrid systems containing continuous processes and discrete networks. The main aim of this paper is to find out proper settings for a controller which communicates over network. Communication is realized on the network with variable time delay.