TTK4147
Miniproject

Helge-André Langåker
Morten Rostad

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Part 1 Simple controller

The parameters used:
- Period of controller = 5ms
- Kp = 10
- Ki = 800

The PI parameters was given in the assignments text. The period was found by trial and error by looking on the plot of the period response time. The controller period had to at least be greater than 2ms, according to the plot. Periods greater than 5ms gave too much oscillations, and lower values meant missing the deadline.

The system response goes towards a steady state at approximately 0.25s, which we deemed "good enough."

The controller system consists of two threads. One which sends a GET message to the server and listens for updated y-values constantly. The other thread is a PI controller which uses the measurement to calculate a new setpoint and sends this to the server at a fixed interval of 5ms. The updated y-value is protected by a mutex, as it is shared between the two threads.

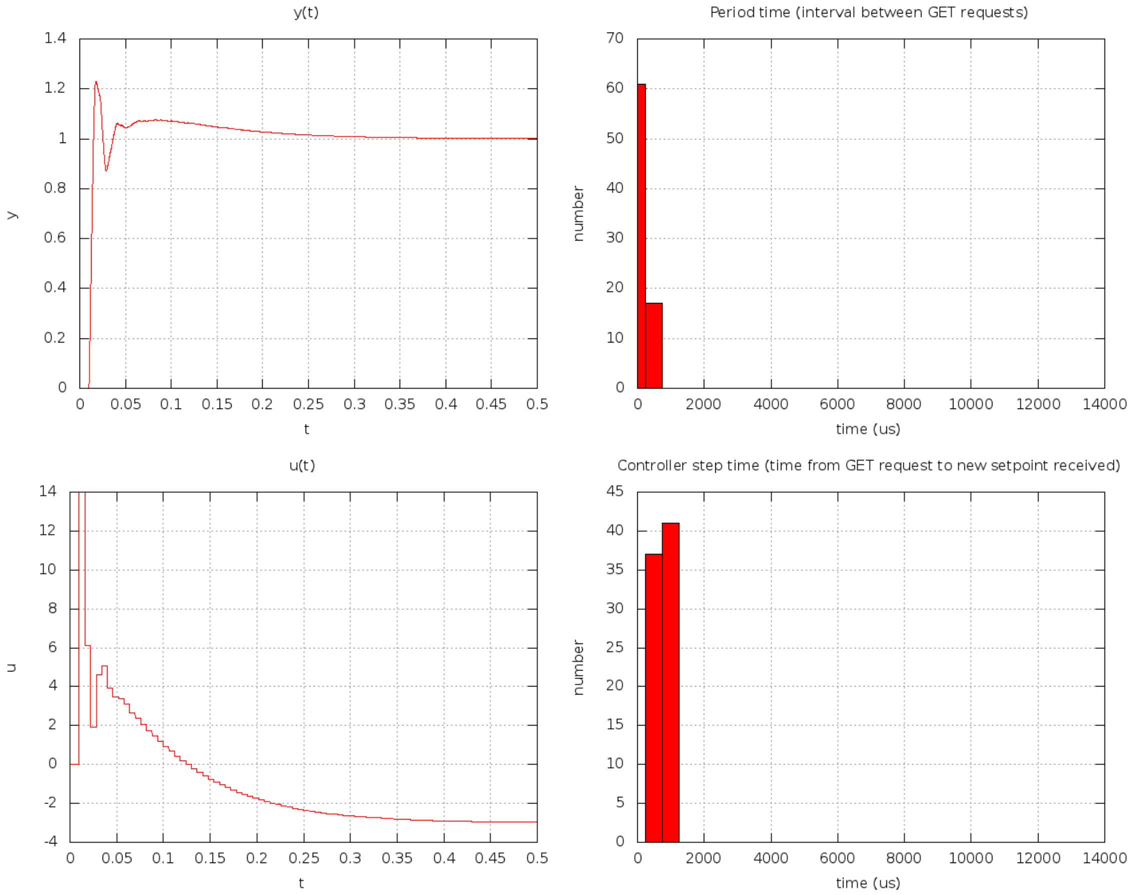

Figure 1: Plot4 from part 1

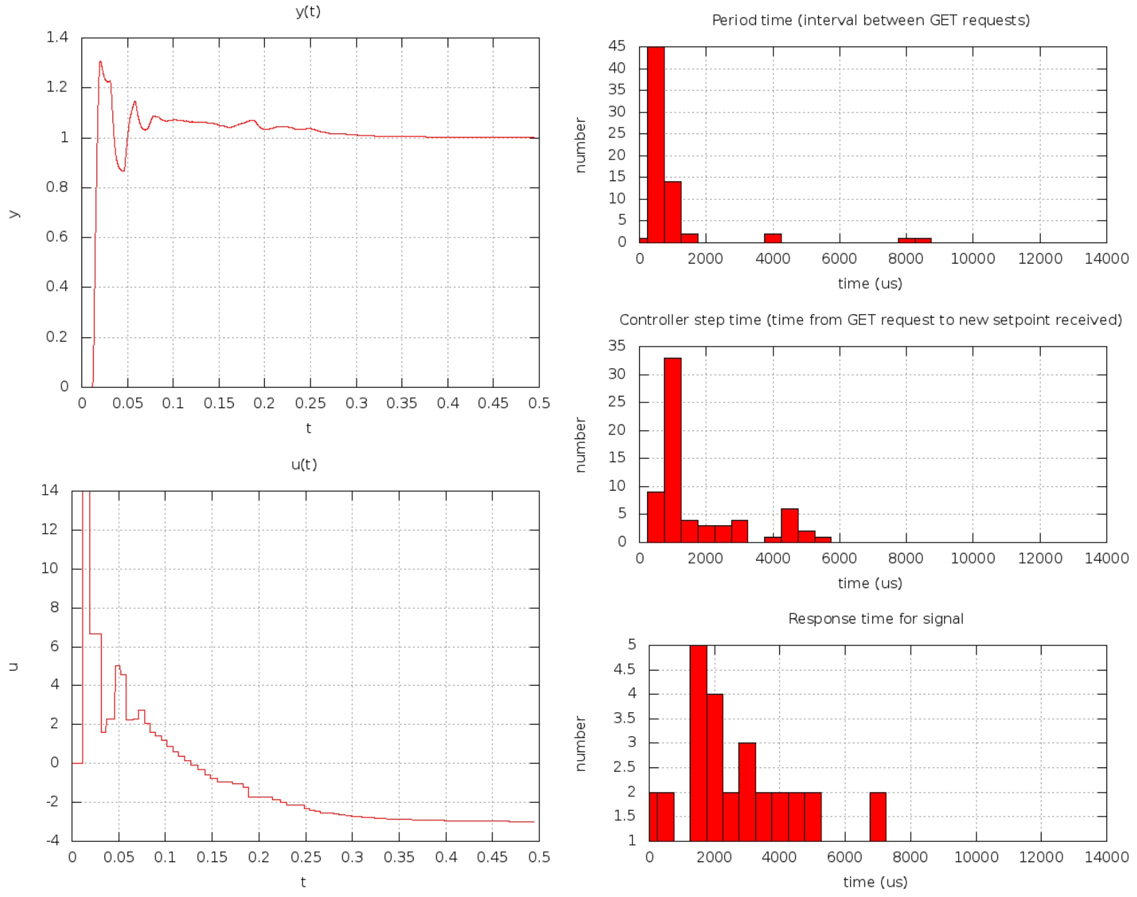

Figure 2: Plot5 from part 2

Part 2 With Signal handling

The same parameters were used as in part 1. We extended the system with two additional threads. One who constantly sends a GET signal to get updated y-values and another who replies to SIGNAL-messages. The "listen-thread" decides if the received message is a y-value or a SIGNAL, and updates the respective global variable signal_flag or system_measurement. Both are protected with mutexes.

As we now have three threads that sends on the same UDP socket, the socket is also protected with a mutex.

As a result of implementing the signal response, the controller became more unpredictable, and slightly slower, with more oscillations. We did not compensate for this by adjusting the PI values or the period.

The signal response is also quite unpredictable, as we get different results each time we simulate. This has to do with the priority of the UDP traffic. The response thread will sometime have to wait for the other threads to send their messages. This could be addressed by introducing thread priorities, where the signaling would get a higher priority. This could possibly have a negative impact on the PI-controller.