To do: Receive a grade

Due: Tuesday, 16 September 2025, 11:59 PM

In the previous exercise, the process was controlled directly without feedback. Now we have the feedback circuit (or measurement or process value) shown in Figure 1, which controls the process.

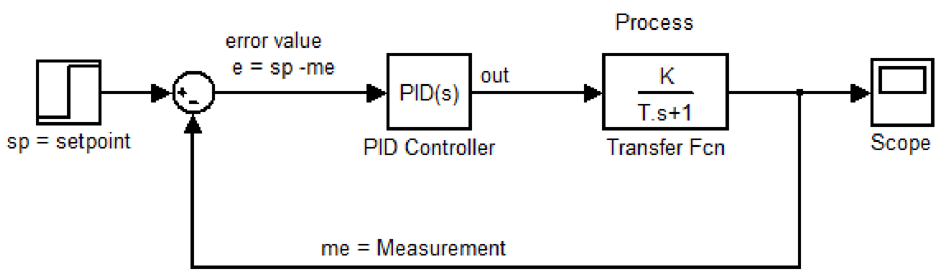

Figure 1 Closed system

Instead of using a Simulink controller, it is your task to make it yourself.

Use Simulink to make your own **parallel PID** controller from separate components. Figure 2 shows the controller algorithms as a time-continuous graph, where u(t) represents the controller output. Figure 3 shows a Simulink version of the same formula, where the time-continuous formula has been converted to Laplace form. The formula in Figure 3 corresponds to the Simulink connection where con is the controller output. In the finished controller, any combination of P, and I and D can be freely chosen.

The controller factors Kp, Ti and Td can be 1 at this stage, so you don't need to worry about them. We'll come back to tuning later on.

$$y(t) = Kp\, e(t) + \frac{1}{Ti}\int e(t)dt + Td\,\frac{de(t)}{dt}$$

Figure 2 Parallel controller algorithm, time-continuous

$$Y(s) = Kp\; e + \frac{1}{Ti}\frac{1}{s}e + \mathrm{Td}\; \mathrm{s}\; e$$

Figure 3 Parallel controller algorithm for Simulink

The controller structures can be found in the course material. You will need at least the following components in Simulink: *Step, Sum, Gain, Integrator, Derivative, Manual Switch, Transfer Function, Mux, Scope*. (Note that you can also search for these using the search function in the Simulink library).

You can try different setting values (in the Final value Step function).

Make at least the following four test runs and attach photos of them to your report:

- P controller and 1st order process
- P controller and integrating process

- PI controller 1st order process
- PID controller 1st order process

Comment on the operation of the controls in both processes. A first-order process can be, for example, a process with gain **K = 3**, time constant **T = 5** and delay **L = 0**. The integrating process can be a process with a gain of one, i.e. only of the form 1/s.

Submission

Make a short report and submit it to Moodle in pdf format. Include screenshots of the tests and a short commentary.

Edit submission | Remove submission

Submission status

Submission status	Submitted for grading
Grading status	Not graded
Time remaining	Assignment was submitted 25 days 16 hours late
Last modified	Sunday, 12 October 2025, 4:24 PM
File submissions	simulink.pdf 12 October 2025, 4:24 PM
Submission comments	Comments (1)

Pushpa Koirala - Sun, 12 Oct 2025, 4:24 PM

```
% A3

%Process Definition

K=3;
T=5;
L=0;

s = tf('s');
P = K/(T*s + 1)* exp(-L*s)
step(P)
```

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