# PID Controller Design 2.5

The new version of PIDRegions applet is available at www.PIDlab.com. In this paper, the new features of "PID Controller Design 2.5" are described.

1) The frequency tracking

In the Nyquist plot and in the RP window is possible to get the corresponding frequency for each point of the Nyquist curve or region. For this purpose, some graphical elements were added to the applet (they are highlighted in the picture below).
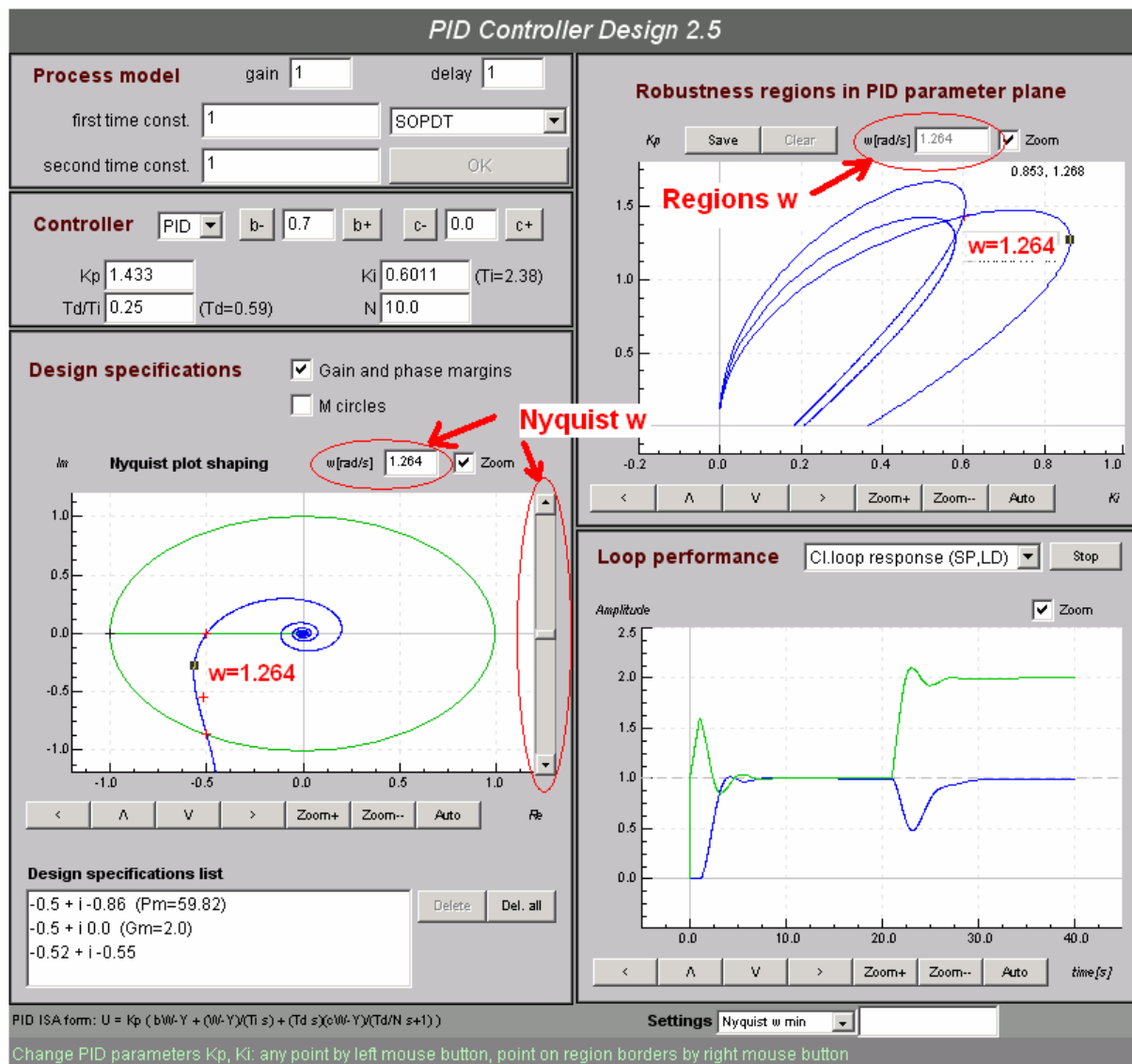
The point highlighted by the black square corresponds to the frequency written into the text field above the graph. The frequency can be changed:

a) **Nyquist plot**: write the new frequency into the text field above the graph of change the frequency fluently using the scrollbar at the right side of the graph.

b) **Regions:** If you move the mouse while right button is pressed the nearest point will be highlighted and the corresponding frequency will appear in the text field. The same frequency will also be shown in the Nyquist plot. The text field is not active, because more than one point corresponds to one

frequency so the position for painting the black square is not unique. By the same reason, the scrollbar was not added to the regions graph.

2) (Complementary) Sensitivity function shaping

Sufficient dumping of sensitivity function (SF) at the large frequency band is a common practical requirement (disturbance dumping). On the contrary, complementary sensitivity function (CSF) should be equal to one at the large frequency band (reference signal tracking). Sometimes, we want SF to be well dumped at higher frequencies (disturbance dumping, unmodelled dynamic at higher frequencies). These requirements as so as Nyquist plot shaping requirements could we ensure using the applet version 2.5 (or higher).

In Sensitivity function or Complem. sens. function graph can we by mouse click define shaping point which should SF(CSF) reach. by this point, we define the protected area which is highlighted in the graph by red color.
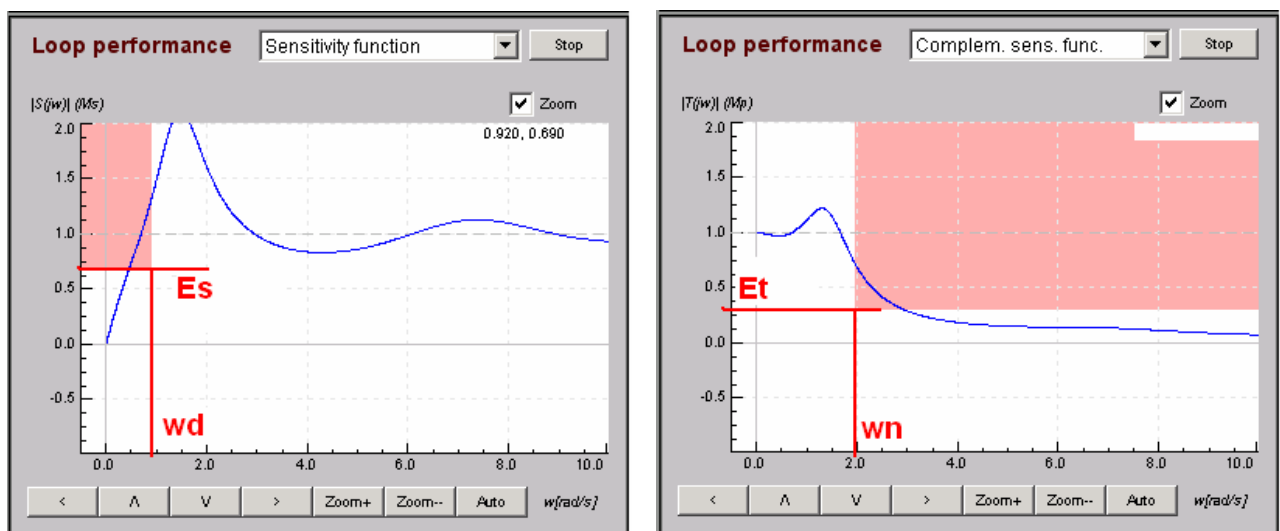
The corresponding region in RR window is painted for each shaping point. If we choose PID parameters at the region border, the SF(CSF) function will pass through this point. The region is added into design specifications list and we can work with it as so with any other region.

The M-circles with values *Ms=Es* and *Mp=Et* are painted in the Nyquist plot. If we f. e. choose PID parameters at CSF region border, we can persuade, that the Nyquist curve crosses the M-circle at the point with frequency *wn*.

We can define just one region for SF and one for CSF. We can change them directly in the SF (CSF) graph by mouse click or by hand in the Design specifications List. These two regions are parameterized by *d* parameter which we can specify in the Settings panel (Regions d min, Regions d max).
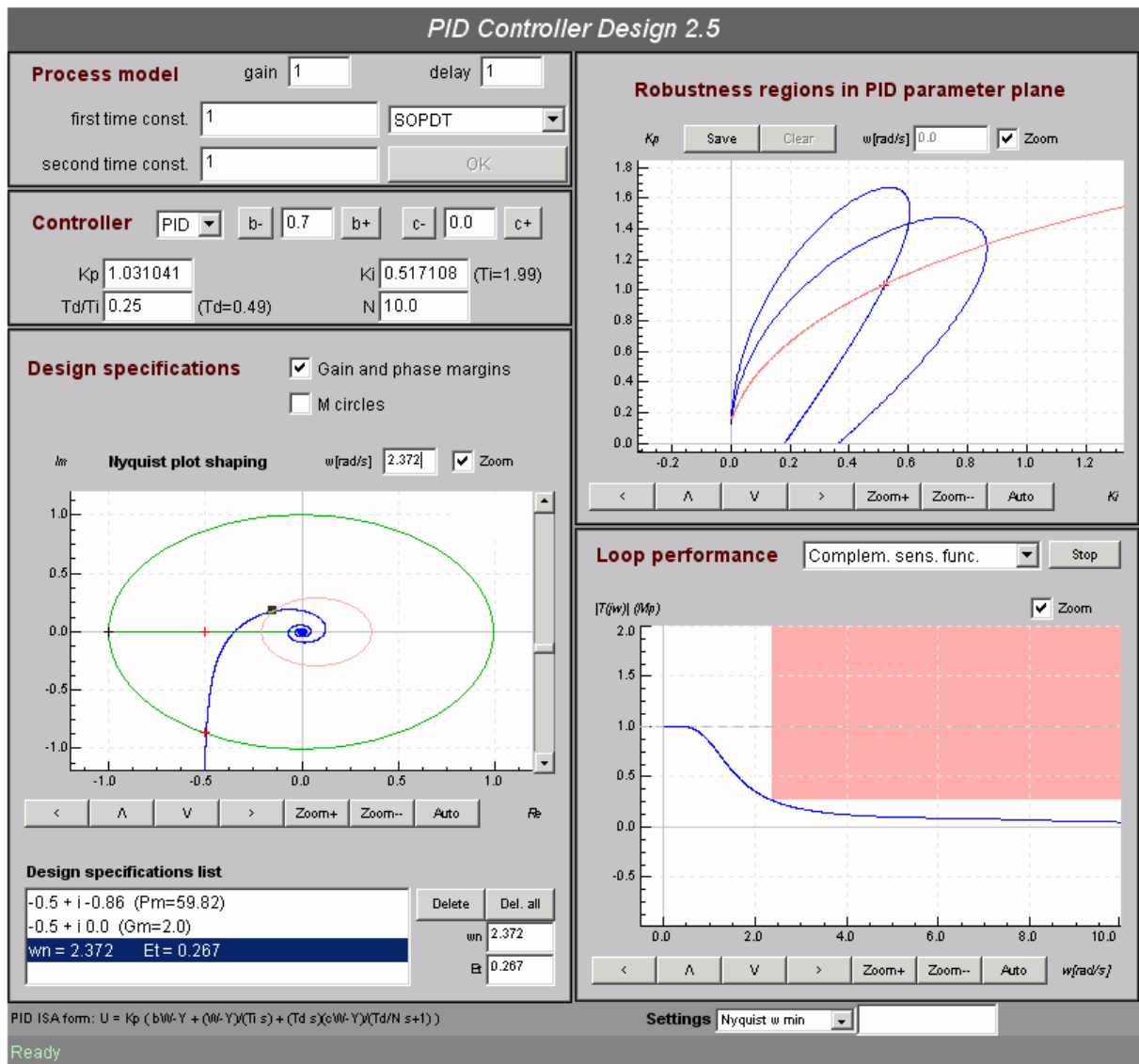
[1] PID controller design on Internet: www.PIDlab.com