Technical University of Denmark

31342 Introduction to Programmable Logic Controllers

Exercise 9

Visualizations

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Instructor:

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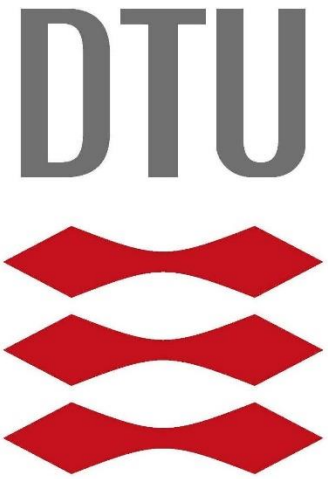


Spring, May 2, 2019

Task 1: Visualization of the Control Box:

A visualization model of the control box is constructed by adding red, yellow, and green circles for the lights on the control box, and 2 toggle buttons and 1 tap button for the switches on the control box.

The visualization model is shown in the Figure 1.

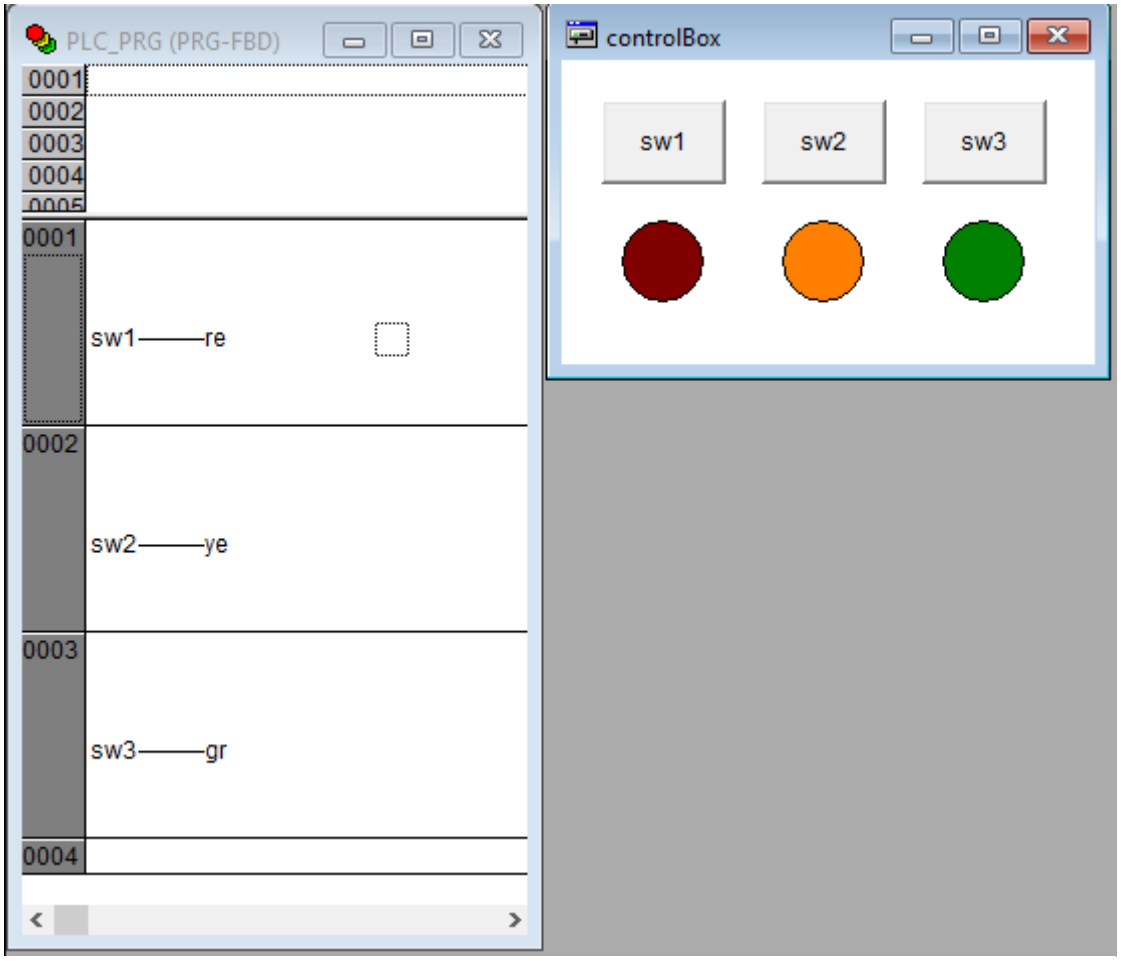


Figure 1: The visualization model of the control box

When the input variables for the button are assigned with the physical inputs on the control box, then the model shows only the actions in the control box. Namely, the lights can not be controlled by the buttons in the visualization model; the physical inputs, the switches on the control box take priority.

The Figure 2 shows some cases in the model.

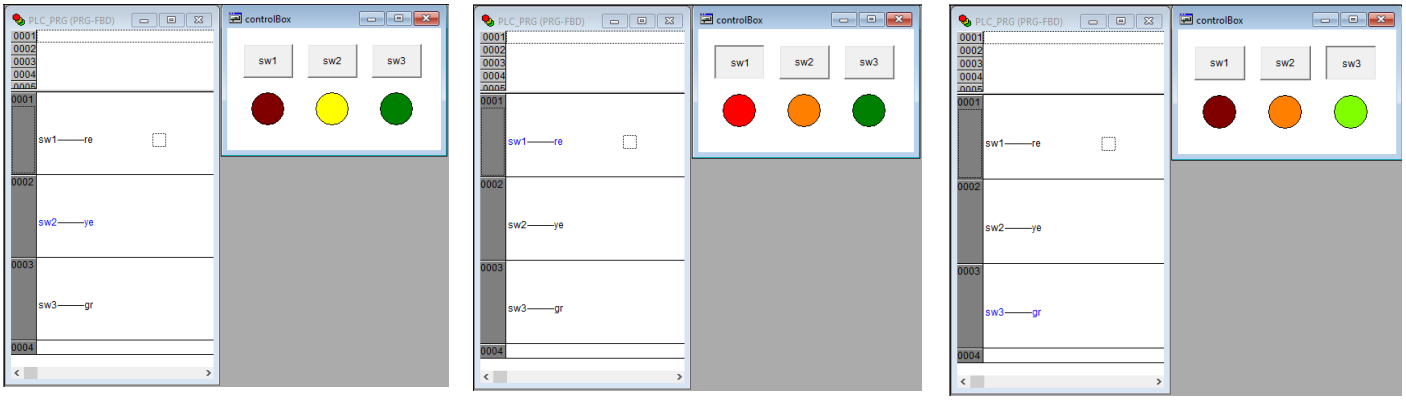


Figure 2: Some cases in the visualization model

In order to able to control the lights with both the virtual inputs and the physical inputs on the control box, the implementation of an OR gate can be used. The new model is shown in the Figure 3.

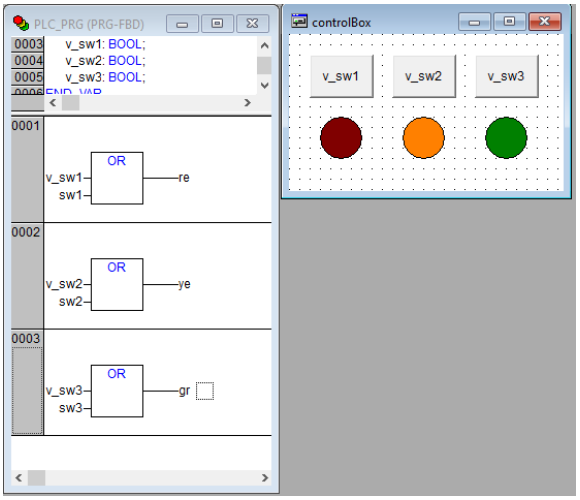


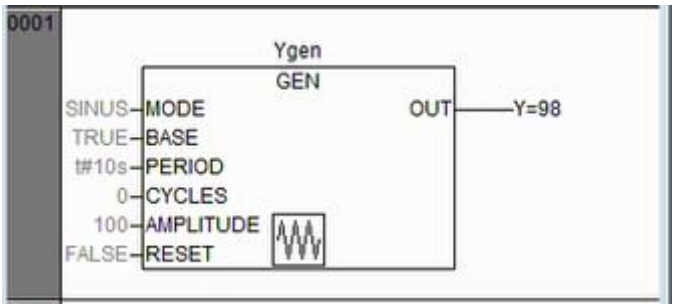
Figure 3: The new visualization model

However, a drawback is present in this implementation: If one of the inputs for a light is high, then the other input becomes irrelevant, meaning that it loses the control of the light.

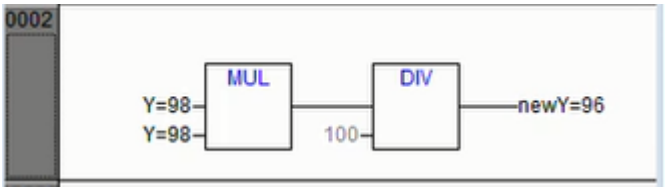
Task 2: Visualization of a Sinus Function:

The Y = 100 sin (2π t / (10 s)) is obtained by using a GEN function block with the inputs as following:

- MODE: SINUS
- BASE: TRUE
- PERİOD: t#10s
- CYCLES: 0
- AMPLITUDE: 100
- RESET: FALSE



The visualization of the Y with a meter element with a range ±100 is given in the mp4 file named *ex9_part2_meter* that is in zip file named as *ex9_visualizations*.



The $Y^2/100$ is calculated by using a MUL function block with both inputs Y and then by using a DIV function block with 100.

The plot of Y and $Y^2/100$ using a trend element is given in the mp4 file named *ex9_part2_trend* that is in zip file named as *ex9_visualizations*.

The data of the plot in the trend element can be logged in a file. The file is uploaded with the name *ex9_part2_logFile*. Some parts of the file are shown in the following.

```
1556401176;77976521;27-04-2019;09:39:36;PLC_PRG.Y;8.000000;PLC_PRG.newY;0.000000;
1556401176;77976721;27-04-2019;09:39:36;PLC_PRG.Y;20.000000;PLC_PRG.newY;4.000000;
1556401176;77976938;27-04-2019;09:39:36;PLC_PRG.Y;34.000000;PLC_PRG.newY;11.000000;
1556401177;77977138;27-04-2019;09:39:37;PLC_PRG.Y;45.000000;PLC_PRG.newY;20.000000;
1556401177;77977343;27-04-2019;09:39:37;PLC_PRG.Y;56.000000;PLC_PRG.newY;31.000000;
1556401177;77977543;27-04-2019;09:39:37;PLC_PRG.Y;66.000000;PLC_PRG.newY;43.000000;
```

One line of the log file consists of the time stamp of the runtime system, (?), the date, the time, and the variable name and its value, respectively.

Task 3: Visualization of the Implementation of the Exercise 8:

A visualization model of the room model from the 8th exercise can be implemented by adding the green indicator for the light and the yellow indicator for the heater, and by adding the current room temperature value as a meter element. Also, the control of the light is done by a button on the visualization model.

The visualization model is shown in the Figure 4.

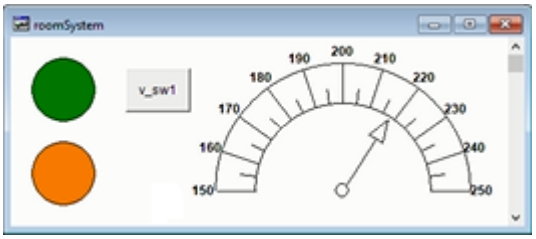


Figure 4.a: The visualization model for room model - the light and the heater are off

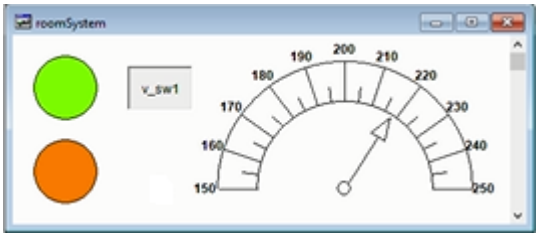


Figure 4.b: The visualization model for room model - the light is on, and the heater is off

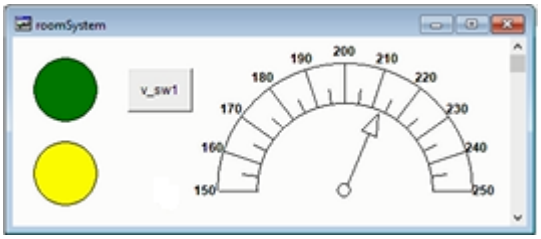


Figure 4.c: The visualization model for room model - the light is off, and the heater is on

Note: The temperature values are shown as multiplied by 10, since they are stored as so in the 8th exercise.

The visualization of the room model is given in the mp4 file named *ex9_part3(ex8_part6)* that is in zip file named as *ex9_visualizations*.