

# Designing a traffic light controller

## Lab 2, ESDM

### Objective

Introducing students to the Simulink environment and the Stateflow component.

### Theoretical aspects

TBD

### Exercises

1. Create a model for a car traffic light controller, according to the specifications below.

#### Model specifications

The model shall control the light of a car traffic light.

Inputs:

- button: boolean. Button available for pedestrians to press, when they want to cross the street

Outputs:

- sigR: boolean. Control RED light. TRUE to turn on red light, FALSE to turn it off.
- sigY: boolean. Control YELLOW light. TRUE to turn on yellow light, FALSE to turn it off.
- sigG: boolean. Control GREEN light. TRUE to turn on green light, FALSE to turn it off.

Requirements:

- Red light lasts for 30 seconds.
- Red light is followed by green light.
- Green light lasts at least 60 seconds.
- If no pedestrian presses the button, green light lasts indefinitely.
- If a pedestrian presses the button, green is followed by yellow:
  - If the button is pressed during the first 60 seconds of green, yellow happens after the 60 seconds expire
  - If the button is pressed after the first 60 seconds, yellow happens immediately
- Yellow light lasts for 5 seconds, and is followed by red
- Upon initialization, the system defaults to red

2. Extend the model in the following way:

- Add two new outputs for the pedestrian traffic light as well. The pedestrians are shown only red and green: they have when cars have green or yellow, and green when cars have green.
- Make the yellow light blinking (1 second on, 1 second off).
- Make the last 8 seconds of pedestrian green blinking.

## General requirements

- Model Settings: Set the Solver type to “Fixed-step”, “discrete (no continuous states)”, and fixed step size to 0.1 (see Fig.1)

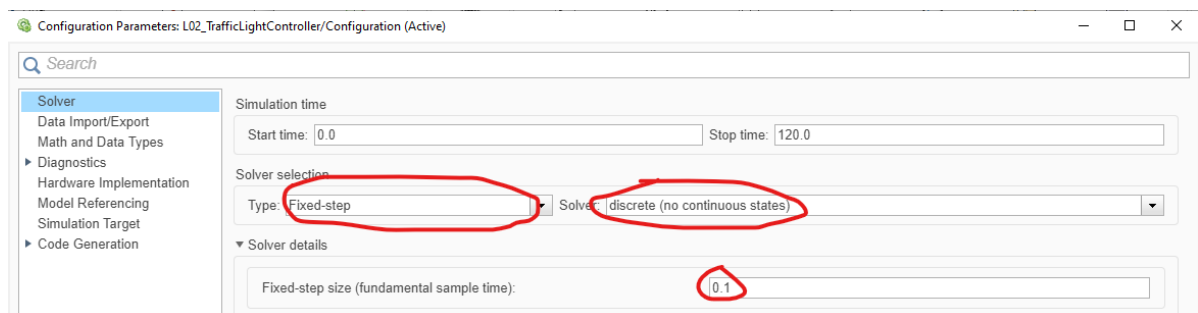


Figure 1: Model Settings

- Run the model for 120 seconds, use “Simulation Pacing” to have simulation time 3-4x faster than normal time (see Fig.2)
- Put all inputs and outputs into a Scope block, for visualization (see Fig.3)

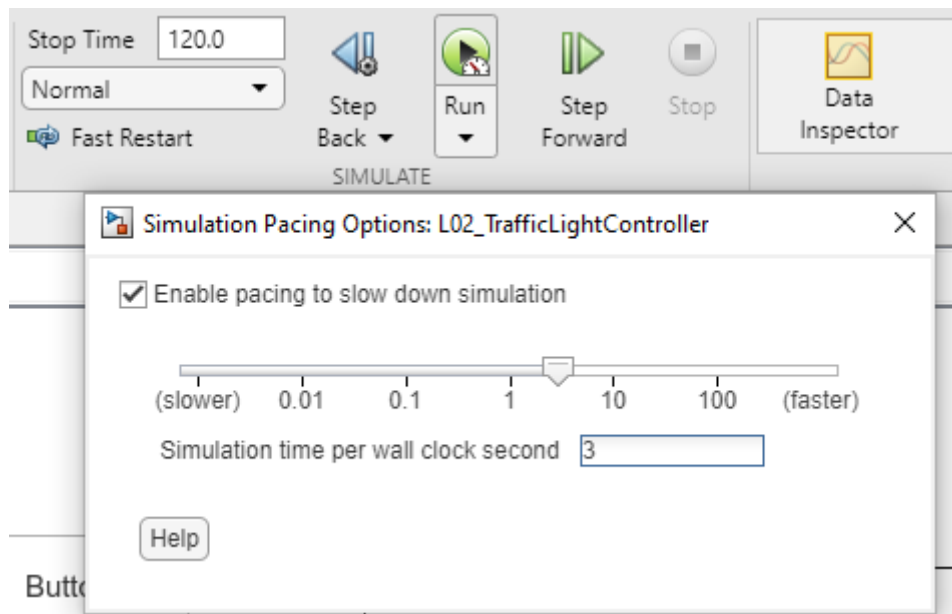


Figure 2: Simulation time

- Attach a “Push Button” from the Dashboard group as the input button (see Fig.3)
- Attach three “Lamp” blocks from the Dashboard group as the output (see Fig.3)

## Final questions

1. TBD

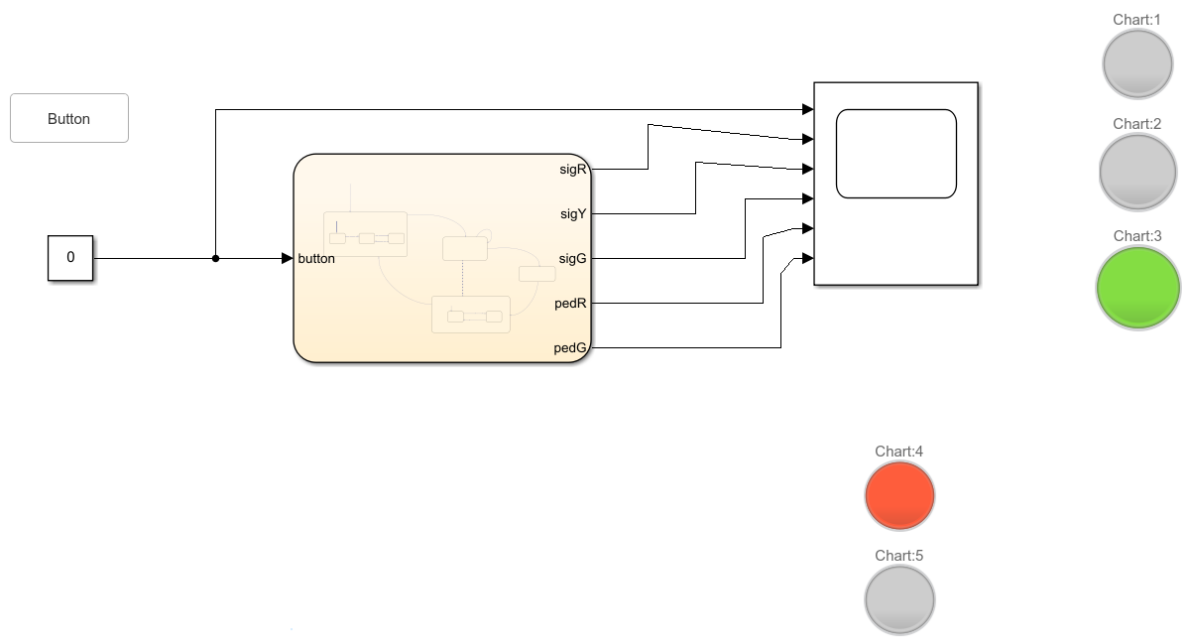


Figure 3: Desired overview