

Self-Service Car Wash controller

ESDM Project



Figure 1: Self Service Car Wash - Control Box

General description

1. Create and test Simulink model with a state machine implementing the control logic of a Self-Service Car Wash.
2. Write a report on the project, containing:
 - a. An overall description of the design (how it works, states, transitions etc,).

- b. Some tests of the functionality (2-3 tests, depending on complexity, covering normal usage and some error scenario)

For each test, indicate:

- The test scenario: what are the inputs, what are the desired outputs
- The test results: include screenshots from the tests, to prove the tests work

Requirements

1. The car wash machine has 4 programs:
 1. Foam: pour detergent foam at low pressure
 2. Water: pour water at high pressure
 3. Wax: pour wax at low pressure
 4. Osmosis: pour special mineral-free water, low pressure

2. The Simulink model has the following inputs and outputs:

Inputs:

- ProgramSelection (number, 0 to 4)
 - 0 = no program selected
 - 1/2/3/4 = one of the four programs above
- EmergencyStop button (boolean): when TRUE, stop the pump and cancel everything
- Coins: number of input coins inserted at the beginning

Outputs:

- Source: pick the source reservoir of the liquid:
 - 0 = Foam
 - 1 = Normal Water
 - 2 = Wax
 - 3 = Osmosis Water
- Pump: set the pump state:
 - 0 = pump is off (idle)
 - 1 = pump works with low pressure
 - 2 = pump works with high pressure
- Machine Status (integer):
 - 0 = IDLE
 - 1 = PROGRAM_1
 - 2 = PROGRAM_2

- 3 = PROGRAM_3
 - 4 = PROGRAM_4
 - 5 = PUMP_ERROR
3. The machine accepts one or more input coins at the beginning, until the first program is specified. Afterwards, no coin is accepted (this is a simplification of a normal system).
 4. Each coin pays for 6 minutes of functioning. The pump shall be stopped when the time expires.
 5. The timer starts counting when the user selects the first program, after coins have been inserted.
 6. Each program is activated by setting the source reservoir to the desired value, and the pump to the desired pressure. The program is stopped by setting the pump to 0.
 7. During any program, the Status output shall be set to PROGRAM_1, PROGRAM_2, PROGRAM_3 or PROGRAM_4.
 8. If the ProgramSelection input changes to a different program during an ongoing program, then change to the new program. ProgramSelection input cannot become 0 during operation.
 9. The EmergencyStop button stops the pump immediately and cancels any ongoing program.
 10. The EmergencyStop shall be debounced in both directions, with a duration of 0.2 seconds.
 11. Use parameters from Matlab whenever for all values you consider necessary (e.g. duration of times etc.). Our customer may want to adjust the parameters at any time.
 12. Test your state machine (use one/multiple separate test models if necessary)