Power window control system using Tiva C running FreeRTOS

Project scope

1. Implementation of front passenger door window with both passenger and driver control panels.
2. FreeRTOS implementation is a must.
3. Implementation of 2 limit switches to limit the window motor from top and bottom limits of the window.
4. Obstacle detection implementation is required, no need for current stall sensor, just use a push button to indicate jamming.

Shown in the figure areas of the car to be implemented highlighted in red.

System basic features

1. Manual open/close function

When the power window switch is pushed or pulled continuously, the window opens or closes until the switch is released.

### 2. One touch auto open/close function

When the power window switch is pushed or pulled shortly, the window fully opens or closes.

3. Window lock function

When the window lock switch is turned on, the opening and closing of all windows except the driver's window is disabled.

4. Jam protection function

This function automatically stops the power window and moves it downward about 0.5 second if foreign matter gets caught in the window during one touch auto close operation.
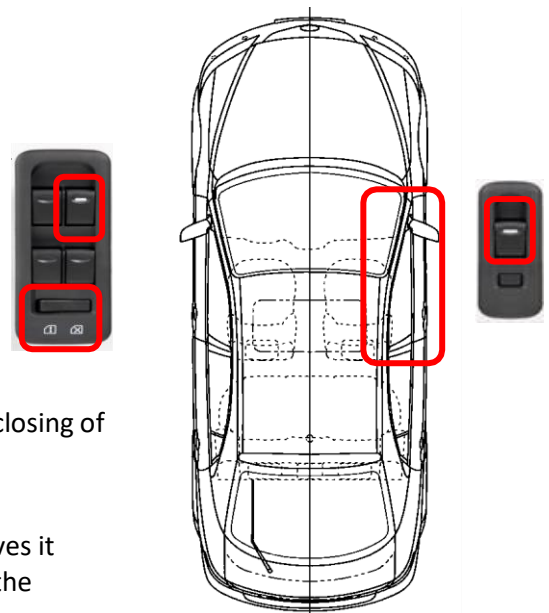
Project implementation

Your system must basically contain the following hardware:

1- Tiva C.
2- Top and bottom limit switches (as shown aside).
3- DC Motor (as shown aside) to indicate the operation of the window.
4- Push buttons (as shown aside) to operate the up and down of the window in both passenger and driver sides.
5- ON/OFF switch (as shown aside) to operate locking of the passenger panel from the driver panel.

Limit switch

DC Motor

Push button

Finite state machine

The best implementation for the system is to implement the control logic using Finite State Machine, with transitions depending on the inputs.

With the aid of a MATLAB Example named "Simulink Power Window Controller Specification" you can check the state machine model used in the system and implement it into your code.

ON/OFF switch
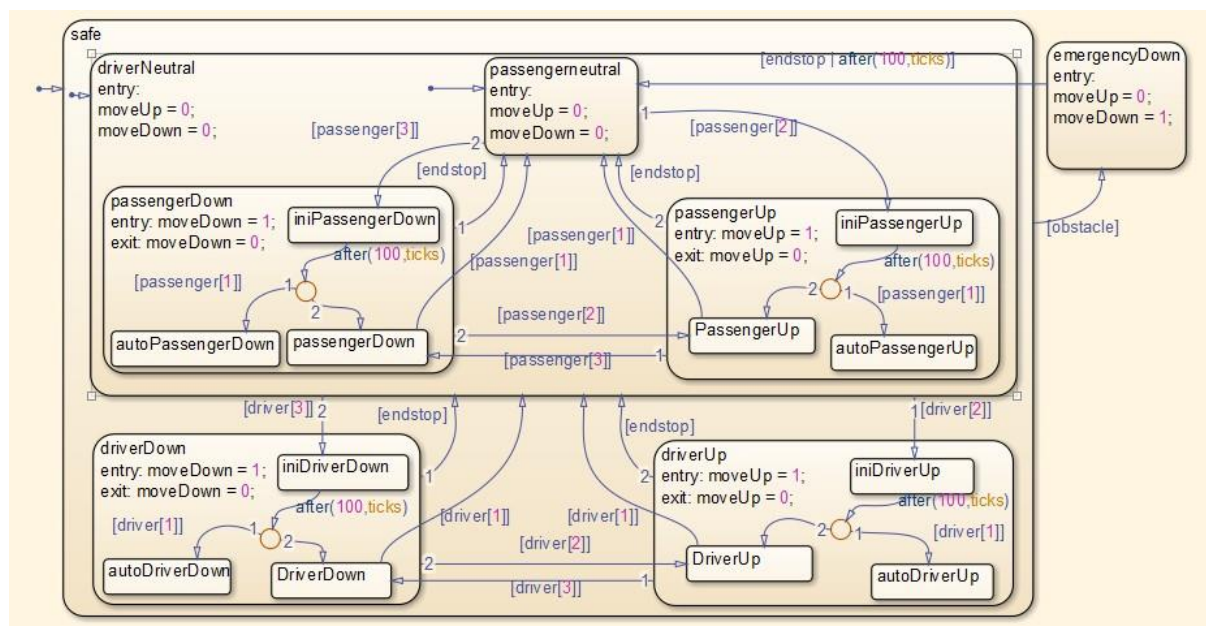
Simulink State Machine

Deliverables

1. Your Project folder (**you are required to use queues, semaphores, and Mutex in your project**).
2. File that has a URL to a short video inside (clarify all the test and corner cases of your system).
3. Documentation report.

Group Project (6 team members maximum)

Deadline

Sat, 11 h May 2024