ENMT211 Elevator Project Milestone 1

Term 2 2023

The main task for the first milestone is to demonstrate your software safely and correctly operating the elevator doors. To do this, you will need to be able to move the elevator carriage up and down to get the carriage lined up with a floor.

1 Moving the Carriage

At the moment, this movement doesn't need to be automated, manually using pushbuttons will be sufficient.

- Implement some method of moving the carriage up and down using pushbuttons. One pushbutton should move the carriage up, another pushbutton should move it down. When neither pushbutton is being pressed, the carriage should not move
- You will need to select an appropriate DAC (digital to analog converter) value to set the speed the carriage moves up and down at. About 50 % of full scale is a good choice

2 Operating the Doors

Now that the carriage can be moved manually, the operation of your carriage doors can be tested. There are a number of basic functions that your software will need to implement. The TA's will want to see each of these demonstrated.

- When the carriage is not located at a floor, the doors should not open, even if someone presses the 'open doors' button.
- If the carriage is moving past a floor without stopping there, the doors should not attempt to open, even if the 'open doors' button is held down
- When the carriage first arrives at a floor, the carriage doors should open. When the doors have been open for a while (3-5 seconds is fine), the doors should close again, unless the 'open doors' button is being held down.
- When the carriage is sitting idle on a floor, the 'open doors' button should cause the doors to open, and the 'close doors' button should cause the doors to close.
- When opening and closing the doors, the door motor should only be activated for as long as it takes to move the door to the required position. THe door motor should not be kept powered once the doors have reached the stops.
- When the doors are open, the carriage should be unable to try to move up and down, even if one was to press the buttons you have set up for moving the carriage.

3 Implementation details

Note that it **is** possible to 'trick' the supervising microcontroller if you try to open the doors whilst the elevator carriage is moving at speed past a floor, which can result in damage to the elevator rig (the doors jam the carriage in the shaft).

You should implement appropriate solutions to avoid this situation, which will be very inconvenient (the elevators take time to repair).

In particular:

- You are required to have an explicit *'CURRENT_STATE=SAFE_TO_OPEN'* check in your code.
- Once check (at least initially) could be that the motor DAC is set to the hold value, that is the carriage is not trying to move.
- Another check could be based on the encoder reading, which should be nearly constant (over a period) if the carriage is actually stationary.