

ENMT211 Elevator Project Milestone 2

Term 2 2023

This milestone focuses on calibration and motion control.

1 Position measurement

The first step to be able to creating a control system for positioning the elevator carriage is to be able to measure the current location of the carriage. You do this using the optical encoder attached to the winch motor, the same way you used the optical encoder during the PLC labs earlier in the year. You will need to configure the PLC settings appropriately (if you use the provided Template.cxp file then this is already done for you), and then use an instruction to read the memory location containing the present value of the high speed counter which reads the encoder.

Configure the PLC correctly, then use appropriate instructions to read off the encoder value. By moving the carriage up and down, show that the encoder value changes to represent the location of the carriage.

2 Calibration

The encoder value is a number related to the position of the carriage. But how do you know which value will correspond to being positioned at each floor? Because the optical encoder is a 'relative' rather than 'absolute' encoder, each time your software runs, the absolute values returned by the encoder will be different. You need to use some method of calibration, so that the location of each floor is obtained.

First, decide on the calibration method you will use. You will need to consider whether or not you will zero the encoder count and how you will record the position of each floor. You will also need to decide what your 'reference point/s' will be, and perhaps which limit switch 'edges' you will use.

Then, you can implement your calibration system. You will need to use instructions such as MOV or MOVL to move data around within the PLC's memory. At this point, you need to consider the numerical aspects of your data; how much space do your variables take up, and are they signed or unsigned?

3 Motion Control

Calibration gives the target positions for each floor, motion control is then required to drive the carriage to those positions. You should implement a closed loop motion controller that changes the DAC value based on the desired speed/position of the elevator carriage and the position signal from the encoder.

Consider how you can add controlled acceleration and deceleration to your design, so your elevator arrives and departs from floors smoothly. Also, it would be good to have an implementation that keeps the elevator stationary even if the hold value is slightly wrong.