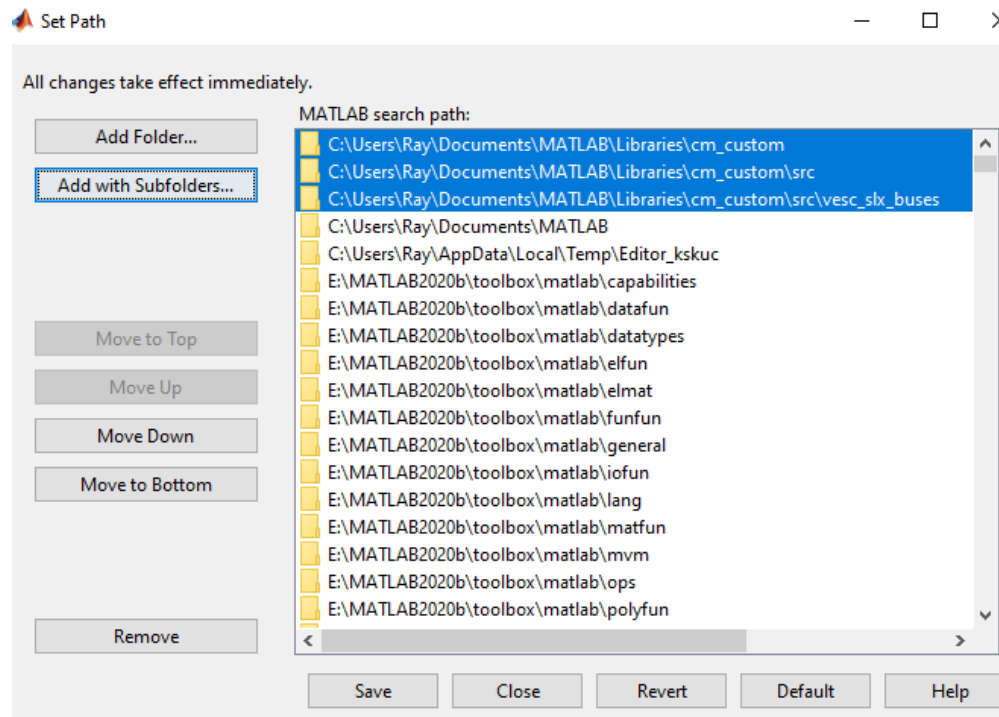
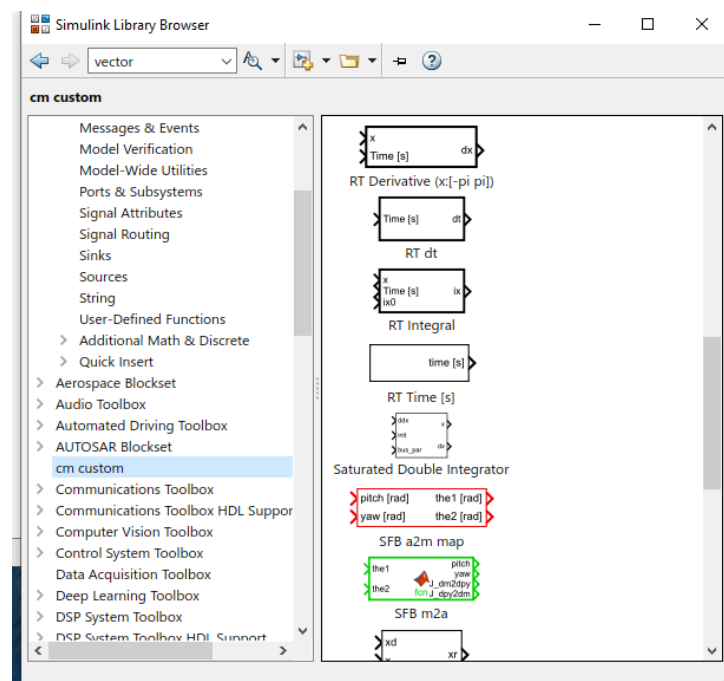


## Simulink VESC Interface

- 1) Set path in MATLAB to the cm\_custom library

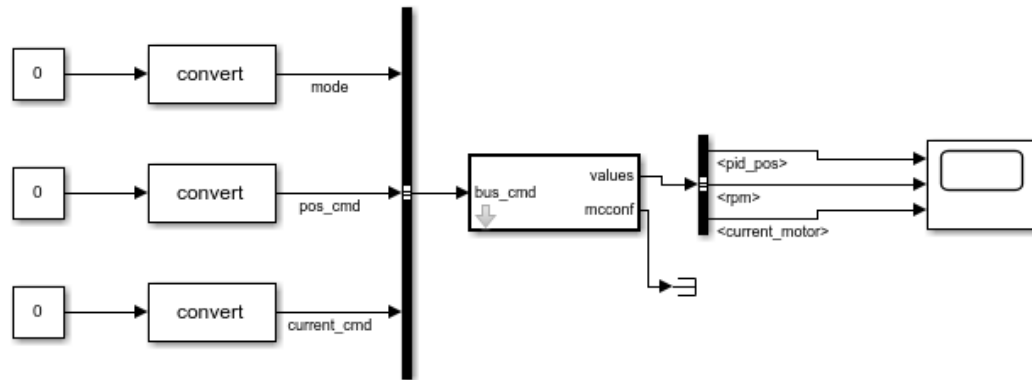


- 2) The cm\_custom library should now show up in the Simulink Library browser



- 3) The VESC\_USB block is the interface between the raspberry pi and the VESC motor controller. Note: the VESC itself must be set up with the motor first (this block is only for the communication between the raspberry pi and VESC)

## VESC\_USB

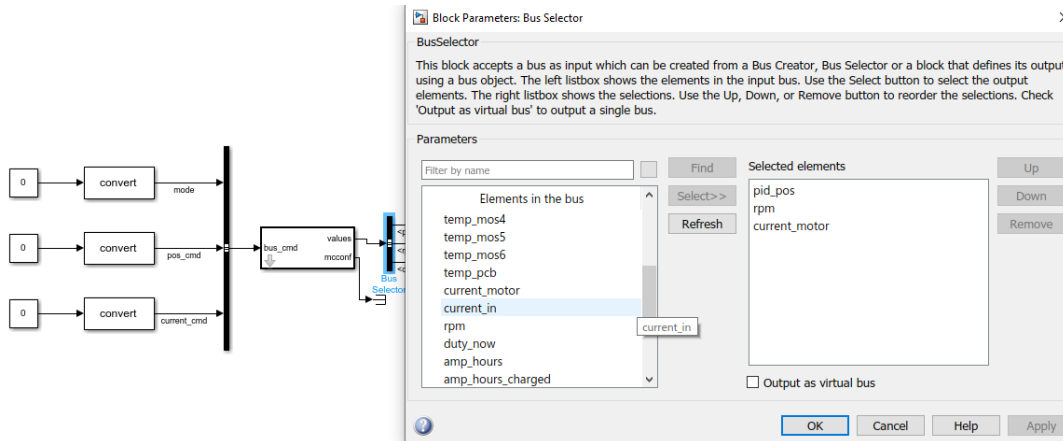


We will divide this section into two. Firstly the general description and functionality of the VESC\_USB block and then we will show some example of the Simulink file to demonstrate how it is used.

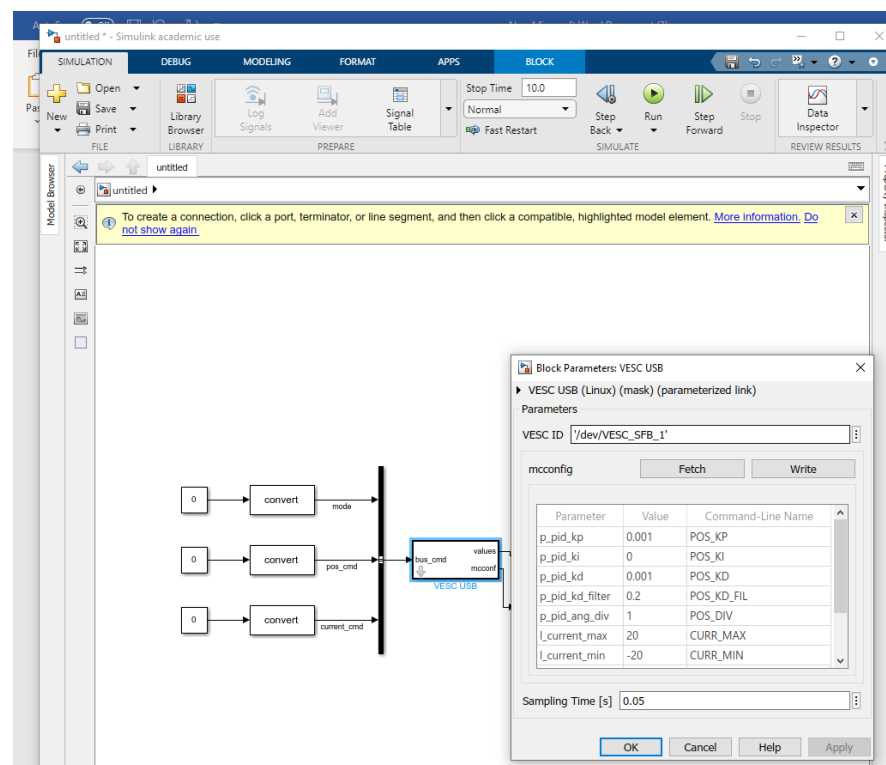
### Description and functionality:

- 1) The VESC\_USB has a command input port (bus\_cmd) and the feedback (values).
  - a. The bus\_cmd expects a bus input of 3 variables. Which are the mode, position command(pos\_cmd) and the current command (current\_cmd). These are responsible for the actuation of the motor.
  - b. The VESC\_USB feedback (values) allows the Simulink model to get the wanted information from the VESC such as the motor position based on the encoder, rpm data or the current in the motor.
- 2) Input port(bus\_cmd):
  - a. Mode: There are 5 possible modes for the VESC\_USB block.
    - i. 0 : If the mode is 0, the VESC\_controller is off and the motor is passive.
    - ii. 1 : Position Command. The input is the desired angle (degrees). The desired angle is then sent to the VESC and the motor will rotate to the desired position (Note:Tune the position controller of the VESC beforehand)
    - iii. 2 : Read the VESC mc config.
    - iv. 3 : Write the VESC mc config.
    - v. 4 : Current Control. The current(Ampere) command to drive the motor.

- 3) Output port (Values): There are numerous data that could be obtained back from the motor controller for the use in the Simulink Controller. Screenshot below shows some the obtainable values:



- 4) The block Parameters are shown in the figure below:



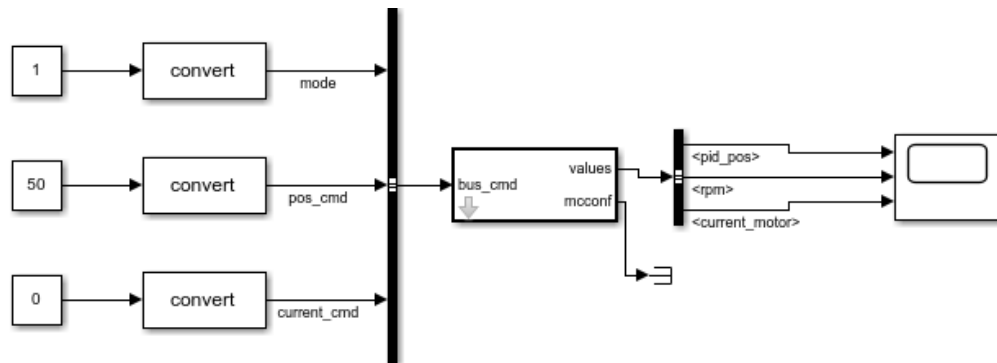
VESC\_ID is the device name of the connected VESC on the raspberry pi which is running linux.

## Examples:

### Position Command:

This example shows the position command given to the motor. Mode 1 means that we are in position mode. The command considered will be the pos\_cmd which has the value 50.

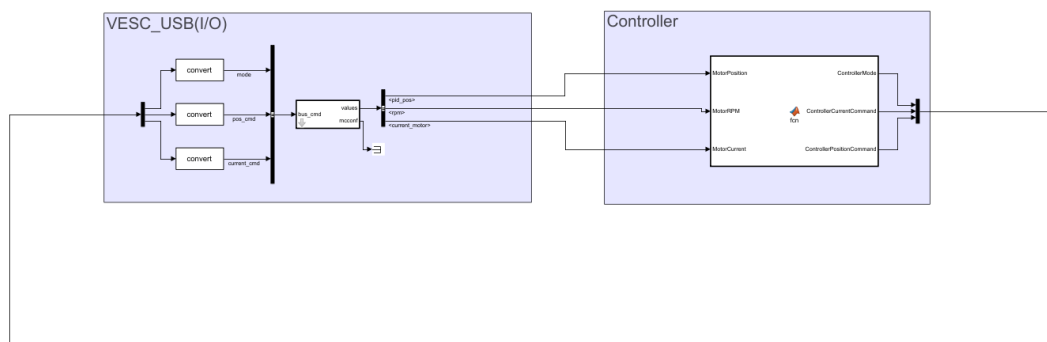
This will tell the VESC to move the motor into the 50 degree position.



Just like the example above, if we want some torque in the motor, we can simply give the current command (Ampere) and set mode to 4.

### General Example:

To build upon the example above, we can then implement some controller in Simulink to drive the hardware. A general example can be seen below:



In this example, the Controller takes 3 feedbacks which are the position,rpm,current of the motor and then outputs the desired mode,desired position command or the desired current command. This is a basic example to show how to implement a controller using the feedback from VESC and then send the command to drive the motor in the hardware.