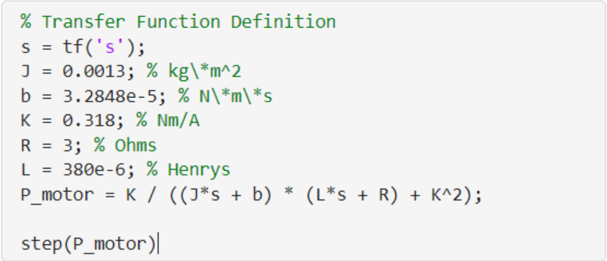
Tyler Johnson – ELEC3024 Logbook

Week 9

Most of my week 9 was spent organizing with my team, establishing communication channels and sharing document access to facilitate collaboration. Not much work was done on the project itself, as we were unsure how best to start with the project.

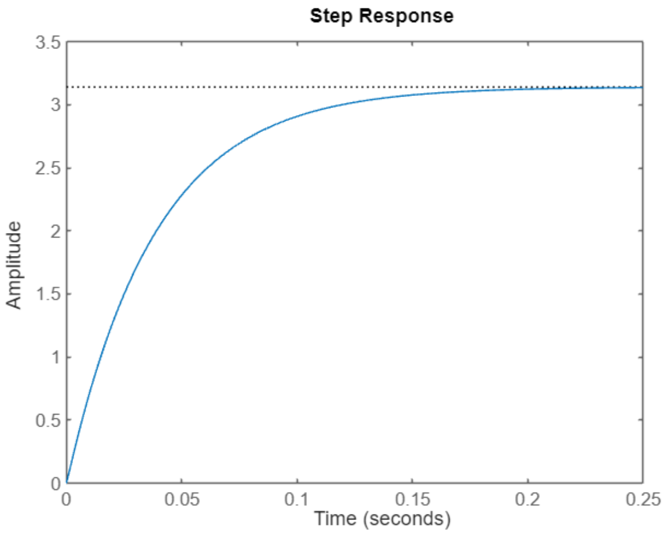
Week 10

Week 10 was spent determining the open loop transfer function of the DC motor using the datasheet as reference. We were advised by the tutor to consult the Control Tutorials for MATLAB and Simulink website, and to work through the steps outlined there to get started. With this information we were able to use the datasheet to model our motor in MATLAB and measure the step response. As shown below:



```
% Transfer Function Definition
s = tf('s');
J = 0.0013; % kg\*m^2
b = 3.2848e-5; % N\*m\*s
K = 0.318; % Nm/A
R = 3; % Ohms
L = 380e-6; % Henrys
P_motor = K / ((J*s + b) * (L*s + R) + K^2);

step(P_motor)
```



Week 11

Week 11 was spent manually tuning our PI controller values, we avoided using an analytical approach as we were limited on time. As the system was relatively simple it was easy to evaluate the effect of each parameter on the step response and tune the controller for our desired response.
Once the continuous time controller was tuned, we worked on creating our discrete time transfer function using Matlab. This was a relatively simple task given Matlab's built in functions for discretising transfer functions. We verified the step response was correct compared to our continuous transfer function, and proceeded to get the hardware setup.

I struggled to get Simulink to connect to the Arduino, we got a number of software errors relating to packages and elected to re-install Matlab. After this, we would still get the same software package errors. Joel and myself tried the hardware on multiple computers to no effect, after consulting with the tutor present at the session we were unable to identify the root cause.

Week 12

Throughout week 12 myself and the rest of my team made efforts to come in outside of class and try to get the hardware working with Simulink. Many teams struggled with this, we tried multiple Arduino boards, multiple controllers, and multiple motors with no change. We were able to communicate with the Arduino using Arduino IDE, and Simulink verified that the Arduino was connected, but some other issue prevented us from using our hardware.

We were able to use another team's hardware that was working to take our measurements using our motor controller design, this let us complete the hardware aspect of the project. We tweaked the parameters used to control the motor in situ, in order to get the desired response in the real world. We noticed noise at steady state that appeared to coincide with the PWM signal being sent to the motor, as the duty cycle the motor is being driven at is 50%. The average speed measured matched our expectedly low steady state error, this is something that could be accounted for in the future.

Week 13

After gathering all the measurements we needed from the hardware, we focused on writing our report. Initially we started in Google Documents but when it was clear we would exceed the page limit we elected to instead format the document in Overleaf. Both myself and Mark are proficient in markdown and LaTeX syntax, and did the majority of the work on the document. Adam and Joel assisted with collecting resources for us while we focused on writing, and re-plotting our results in Matlab using the controlSystemAnalyser such that they were formatted correctly and easily interpreted.