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Development of MATLAB Code for Rat Wheel Revolution Counter

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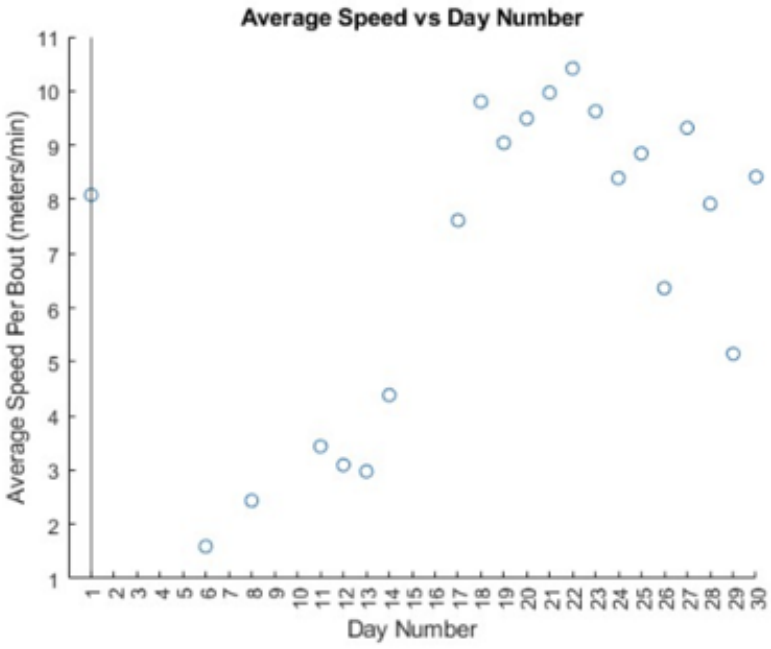
In recent semesters, the Lake Lab has worked to create wheel revolution counters which could be used to track the amount of revolutions run by rats after a surgically induced arm injury. The purpose of the revolution counters is to determine whether there is a relationship between the amount of activity and the level of healing. Because of their recent development, there is no procedure for how to analyze the data collected by the revolution counters. The main task which was completed this semester involved writing MATLAB code to analyze the data collected from a previous set of rats, although I also spent time preparing the cages and revolution counters for the next set of rats. The main purpose of the code was to create a robust and repeatable procedure which can be used on future data. The expected trend is that after their surgery, the number of revolutions per day will increase. The MATLAB code will confirm whether or not this trend is true.

So far, there have been two iterations of code. Although the first set of code produced graphs showing the trends we were looking for, we encountered a few issues which needed to be corrected in the new code. The first iteration involved changing the text files exported from the revolution counter code into excel files which then had to be reorganized and processed before it could be used in the MATLAB code. This process proved to be quite extensive and was not a viable option to analyze all future sets of data. Furthermore, some of the excel files combined multiple days into one day. Ideally the data could be divided into revolutions for each day. The second set of code can handle the raw data produced from the revolution counters so that the data do not need to be manipulated. The following is an example of one of the graphs that the program produced:



The above figure shows the speed in meters/min of one rat over the course of the study. There is a clear trend that shows as the days increase, the speed also increases, which is logical because the rats are healing over this time period.

My final task for the semester was to help other members of the lab with a range of motion device that is used to test the angle of a rat arm's extension and flexion. The device uses Arduino to translate linear motion into angular displacement. The program exports a step count for the linear motion, but there was no existing way to transfer the step count into an angle value. A test was created to measure the number of steps that led to a certain angle value. This was repeated for multiple step values until a regression line was created with the y-axis representing the step count and the x-axis representing the corresponding angle value. The slope of the line was the relationship between the step count and the angle value. The range of motion device can now be used to determine the correct angle based on the number of linear steps.