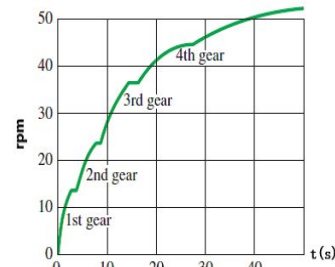
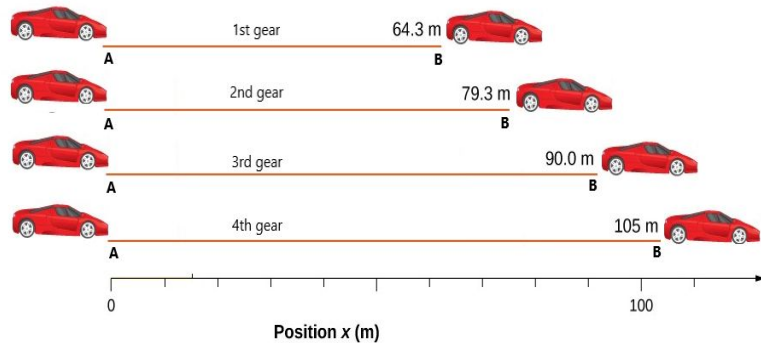


# Empathize

BMW designed a dual-clutch transmission, which allows incredibly fast gear shifting. However, it is not commercially viable, due to lackluster acceleration. The company wants to redesign the transmission to meet the industry acceleration benchmarks.



# Define

- Basic Requirements
  - Read motor position at maximum resolution
  - Control motor position
  - Control motor speed in both directions
- Additional Requirements
  - User Interface (how the user interacts with the basic features)

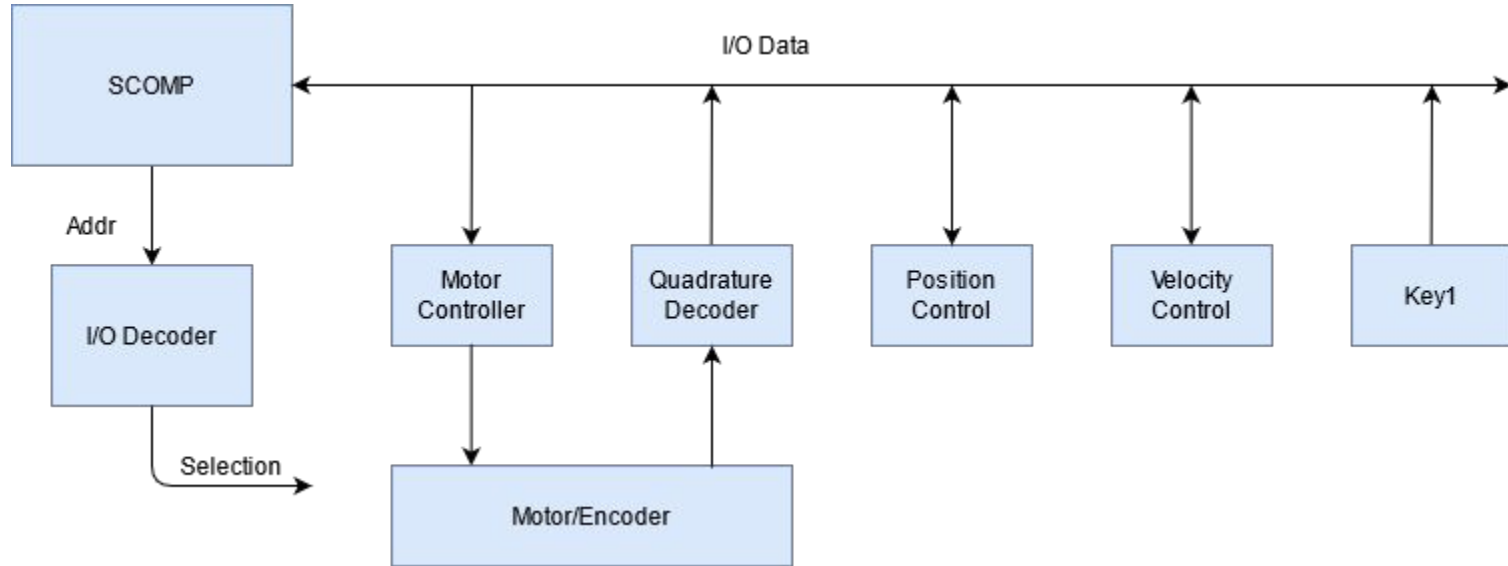


# Ideate

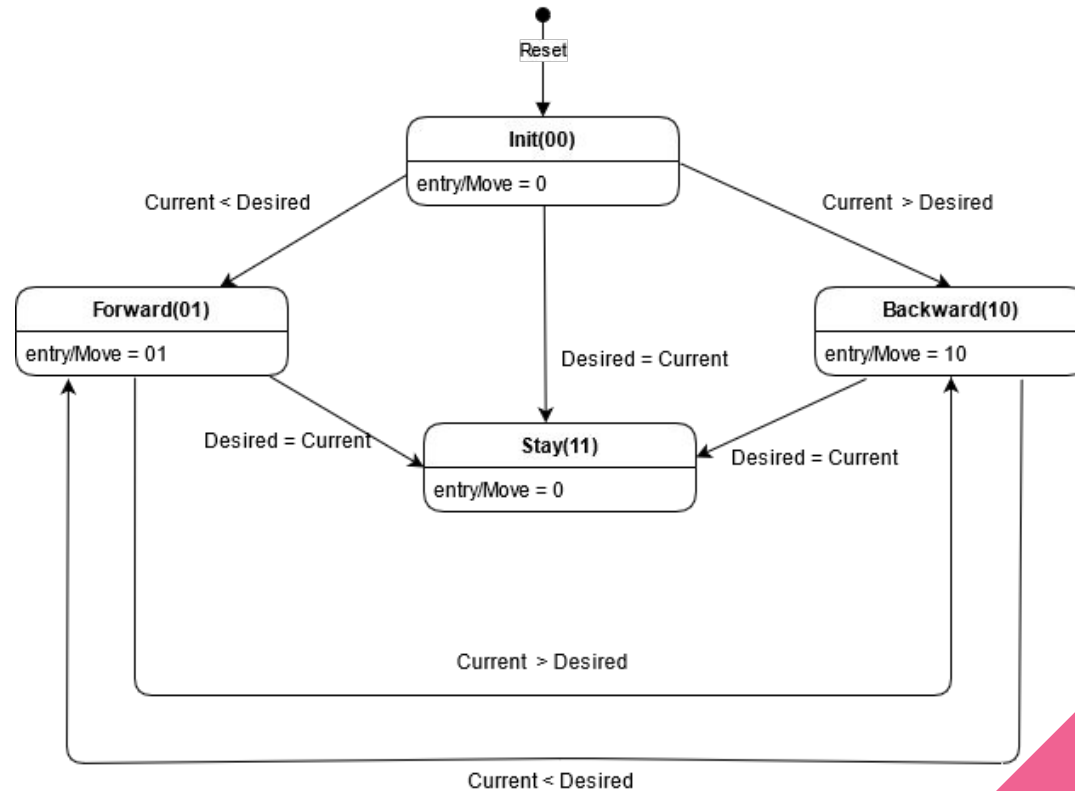
- The user gives two positions and a time value through FPGA switches
- The motor moves to the first position (position control)
- The motor moves to the second position over the given time (velocity control)



# Prototype

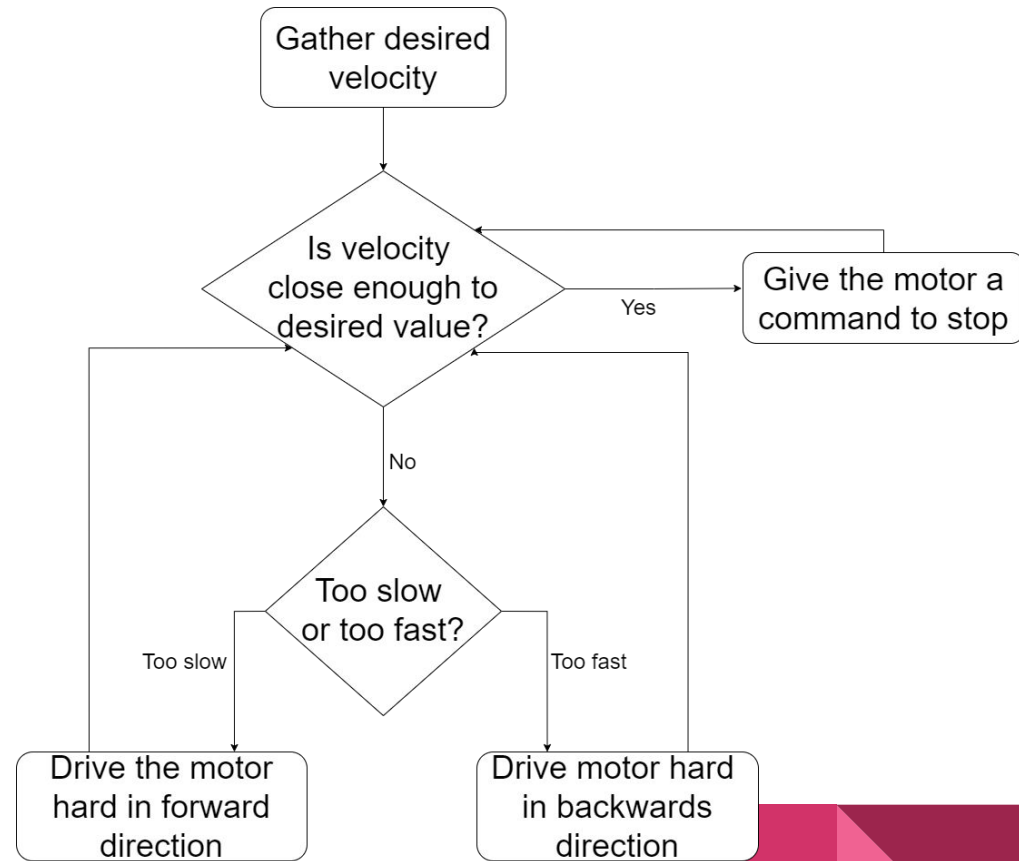


# Position Control



# Velocity Control

- Need to find and control velocity
- Tools that we have available:
  - Quadrature encoder signals
  - Pulse Width Modulation (PWM) signals
  - Bang-zero-bang motor control



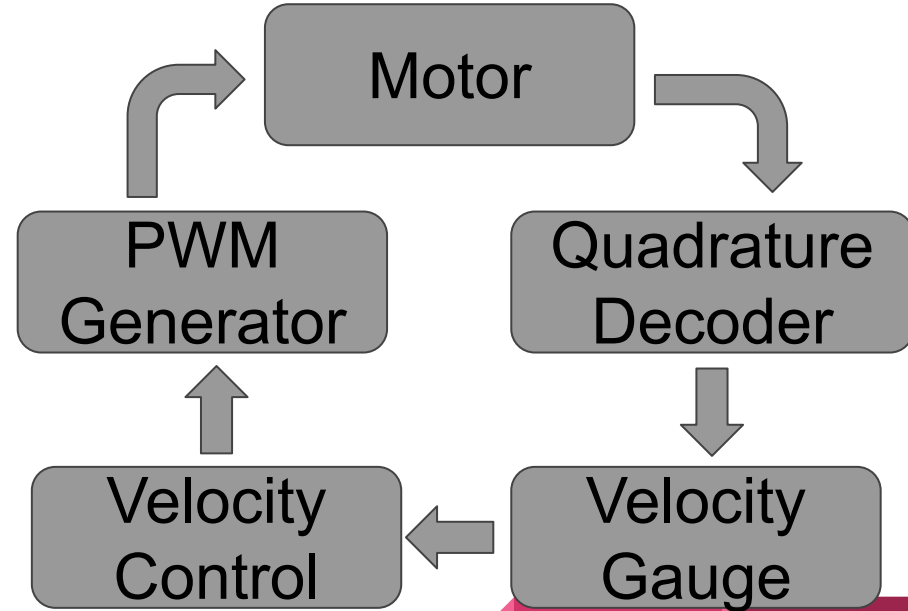
# How can we use these tools to find velocity?

- Create a peripheral to find the velocity
  - Takes in the count value from the quadrature decoder peripheral every .1 seconds
  - Finds change in the count value after each interval
  - Counts per interval can be converted to revolutions per minute



# How can we use these tools to control velocity?

- Peripheral to control the velocity
  - Compares the desired velocity value to the current velocity
  - Apply bang-zero-bang control to determine what the motor should do





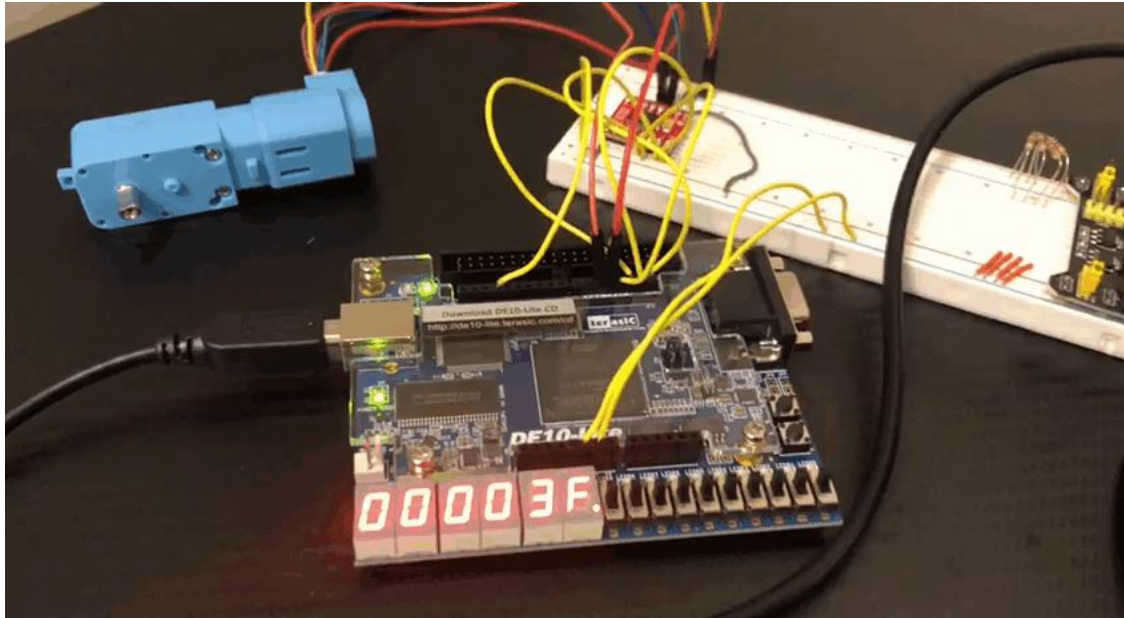
# Justification For Approach

- Approach is similar to bang zero bang
- Approach uses time and length inputs for our problems
  - Transmission Testing
- Fits with position and velocity control parts
- Use of peripherals simplifies software



# Results

- So far, we have
  - Controlled motor position
  - Controlled motor velocity



# Project Parts and Deadlines

- Fulfilling basic requirements
- Implementing user interface
- Project proposal presentation
- Fulfilling advanced requirements
- Project demonstration



# ECE 2031 Final Project Timeline

Task Name		Mar 21							Mar 28							Apr 4							Apr 11							Apr 18							Apr 25						
		S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S							
1	<div><div></div>Fulfilling basic requirements</div>	Fulfilling basic requirements																																									
2	Lab 9 Steps - All	Lab 9 Steps - All																																									
3	Understanding Project - All	Understanding Project - All																																									
4	Brainstorming - All	Brainstorming - All																																									
5	Position Control - Sheshan	Position Control - Sheshan																																									
6	Velocity Control - Ericka & Sathya	Velocity Control - Ericka & Sathya																																									
7	<div><div></div>Implementing user control</div>	Implementing user control																																									
8	Position User Control - All	Position User Control - All																																									
9	Velocity User Control - All	Velocity User Control - All																																									
10	<div><div></div>Project proposal presentation</div>	Project proposal presentation																																									
11	Presentation Creation - Vijay & Ripan	Presentation Creation - Vijay & Ripan																																									
12	Practice - All	Practice - All																																									
13	<div><div></div>Fulfilling advanced requirements</div>	Fulfilling advanced requirements																																									
14	Concurrent position and velocity control - Sheshan, Ericka, & Sathya	Concurrent position and velocity control - Sheshan, Ericka, & Sathya																																									
15	User interface assembly code - Ripan & Vijay	User interface assembly code - Ripan & Vijay																																									
16	<div><div></div>Project demonstration</div>	Project demonstration																																									
17	Testing with various edge cases - Ripan & Vijay	Testing with various edge cases - Ripan & Vijay																																									
18	Assess Work & Adjustments - Ericka, Sheshan, & Sathya	Assess Work & Adjustments - Ericka, Sheshan, & Sathya																																									
19	Practice - All	Practice - All																																									

# Contingency Plan

- We can fall back to a basic version of the project if needed
  - Simpler Version of Bang-Zero-Bang and Velocity Control
- We have a time buffer if more time is needed
  - Allows us to meet more standards requested by the user



# Completing Our Goal

- Our goal:
  - To create a system applicable to our problem space
- We have completed:
  - Position control
  - Velocity control
- Moving forward:
  - We have a plan and timeline in place
    - Make velocity and position control work concurrently
    - Create assembly code for user interface

