Unity data formats for MCU

To make the interaction with the glove and the virtual environment data will be sent to and from the glove and the virtual environment. The interaction will be accomplished by the use a microcontroller. This will be the Teensy 3.5. The general system overview of the embedded system for the glove is shown in figure 1 below.

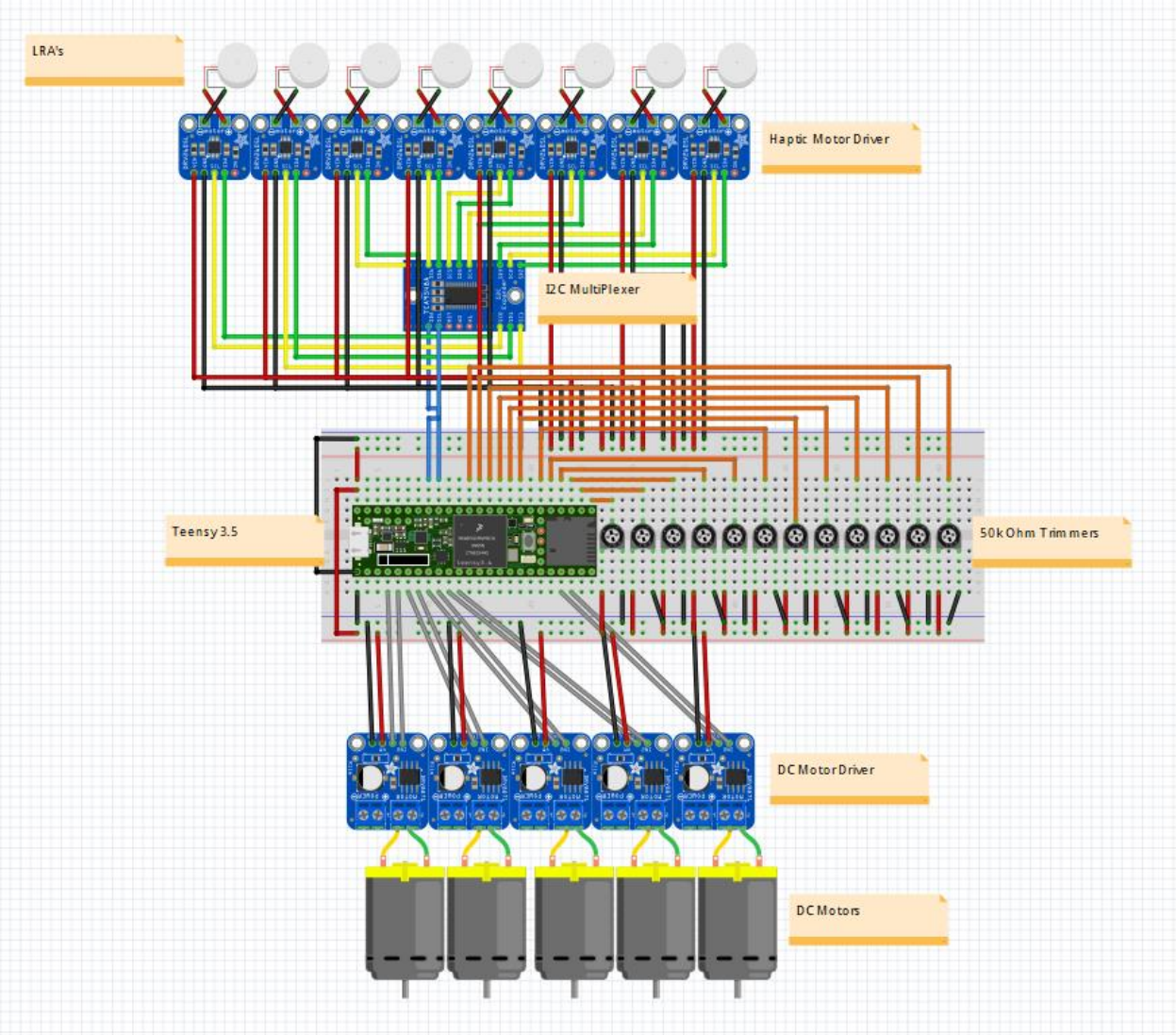


Figure 1: *Embedded system layout*

Data Communication

Between the haptic glove system and virtual environment, the communication path will be done over serial. In addition to serial communication, I2C will also be used to save on the number of pins used. Figure 2 below shows a general overview of interface between the glove hardware and the virtual environment.

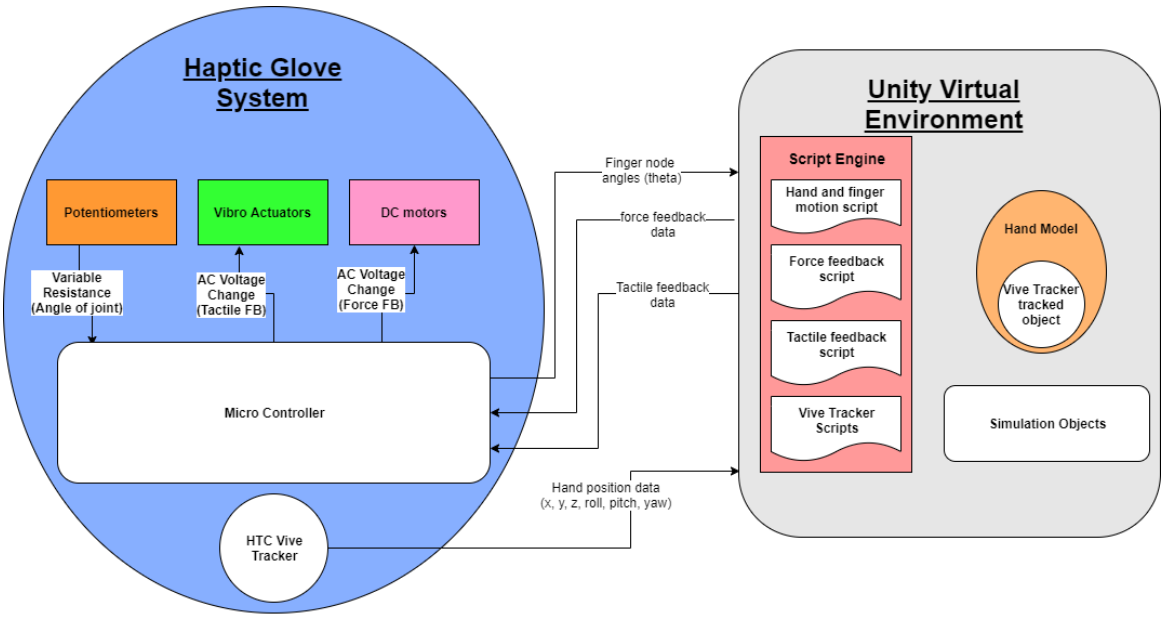


Figure 2: *Embedded system and virtual environment interface*

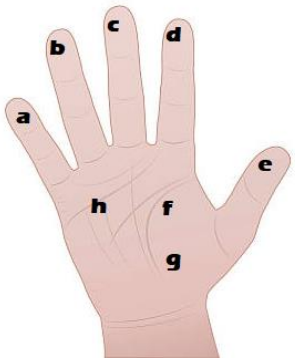
Sensors and their data

- *Potentiometers*: Basically, has a changing resistance/voltage which can be interpreted as an angle for each of the finger nodes on a finger joint.
- *Vibration Motors ([LRA] Linear Resonant Actuators)*: This is explained here. The data needed for this is a change in voltage from HIGH to LOW (5V or 0V) to make it vibrate or not. Will have to control how fast this is done when it comes to achieving close enough tactile feedback.
- *DC Motors*: this is controlled by changing the voltage (positive/negative) to apply the required force for the force feedback and work with the control system to regulate the tension in the cable along a finger.
  Pressure sensor: used mainly with the DC motor in the control system logic to apply and regulate the force feedback. Data description is change in voltage (how hard it is pressed on)

Data formats

LRA

For the LRA motors the following names will be given to the locations on the hand:



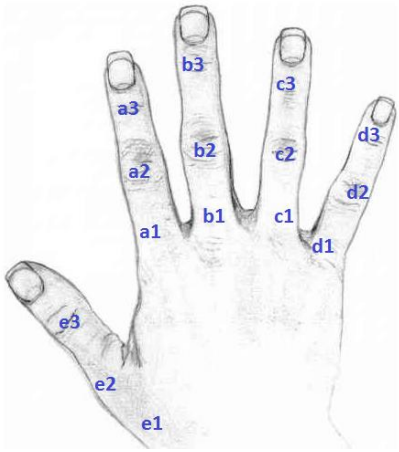
On the unity end, to target individual vibration motors and give them the desired pattern, the following data format will be sent:

"***<location_motor_location>,<id_of_drv_effect>***"

For example: "a,117" or "f,34". This means send to location a or f and play effect 117 or 34 at those locations.

Potentiometers

For the potentiometers that will move the individual fingers the following names will be given to the locations:



This will mainly be input data for each finger knuckle and will be read in the following data format:

"***<knuckle_id>,<potentiometer_angle_reading***

For example: "a1,180", "c2,77", "e3,0". The angle of the pot should be set to the range 0 to 180 degrees.