**User Interface Subsystem:**

The User Interface subsystem was designed as part of the robotic drawing assistant to enable users to be able to easily control the device in order to produce art. The subsystem is made up of two parts, namely, the Teacher Input, and the Student Input. Both parts of the User Interface provide different functionality when operating the device to maximize ease of use and utility.

**Teacher Input:**

The Teacher Input is a digital interface that allows the teacher to input the size of the paper being used, set sensitivity of the device as well as the pressure applied to the paper when drawing, change the drawing utensil being used, and even remotely control the drawing function of the device itself, overriding the student input. The Teacher Input was loaded into a Raspberry Pi microcontroller, and was designed using Python due to ease of use as well as the fact that Raspberry Pi microcontrollers can run Python programs. Figure 1 shows part of the final design of the teacher’s input.

Graphical user interface

Description automatically generated

**Figure 1: Teacher Input Settings UI**

The teacher’s input enables users to move the tool with arrow keys, set the sensitivity and pressure of the tool, set the tool to the base position at one of the corners of the device, stop the tool entirely, and set the width and height of the paper being used. In order to combat the necessity of using a keyboard to enter paper width and height, a number pad was added to the UI. Figure 2 shows the design of the UI number pad.

A screenshot of a computer

Description automatically generated with low confidence

**Figure 2: Teacher Input Numpad UI**

The number pad can be switched to using tabs and contains all the numbers in a grid, along with a clear button to clear the field you are writing into and an enter button to enter the value you input.

**Student Input:**

The student input only allows for movement of the device without any opportunity to set up the device. This was decided upon to make it as easy as possible for the student to use the device. All setup was designed to be done using the teacher input.

The student input makes use of an Arduino Nano for the microcontroller as the Arduino Nano allows for low power and fast execution of code. The microcontroller was connected to four buttons to control the four directions that the tool was able to move while drawing, as well as a fifth button for placing the art utensil in contact with the paper when the intention is to draw, and lifting up the utensil when the intention is to move the tool without marking the paper.