GNG 2101

Deliverable D: Detailed Design and Prototype 1

Due Date: October 3, 2019

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Client Meet Two:

On September 30 was our client meet two, unfortunately Jorge, our client was unable to make it to the meeting therefore we discussed the conceptual design with Steve, his supervisor. Steve suggested to have a bluetooth connection between the device and the surface, so that the wires would be eliminated. He also mentioned that the size of the beds might be too big for his device. As a result, we might have to design a mount for his computer. He suggested that we look at multiple hospital beds so we can confirm if the mount is needed. The final point that he brought up at the meeting was having another button to have the right click role; steve said that it is probably unnecessary, but he would talk to Jorge to see his opinion.

Update of the Detailed Design:

After our client meet 2, we have come up with an improved detailed design. The

most critical component of this prototype is the foot controlled joystick. This part of the design is the only moving part which will have to be made to last a long time while also being easy to use. We’ve made a prototype of the joystick using a playstation controller joystick linked up to an arduino for our proof of concept. This allows our client to move the cursor around the screen in all directions with ease.

The joystick must be bigger, about 20cm in diameter with a larger divit for the clients heel to fit comfortably in.

Currently, our design is wired into the clients’ current device, as a step forward, our client suggested to move to using a bluetooth device to eliminate wires.

Changes: Bluetooth Arduino will replace leonardo on the frame side, on the pc will have leonardo with bluetooth module which will receive and send mouse signals.

The physical ramp surface of our prototype needs to be changed. Originally we were planning to use c-clamps to secure the ramp to the bed but after our client meet, we discussed that it is easier and less expensive to use straps to secure around the bed. The ramp is also too high off the bed making it difficult for our client to access therefore we must make it flush to the bed so it is comfortable for the client to rest their leg on it.

As part of the clients’ wheelchair, we may need to make a new mount for his computer since his current device may not be able to swivel far enough over the bed for the client to see. This device would be attached to their wheelchair and be able to adjust so it can swing out from the chair to over the client while they’re laying in bed.

Electronics:

The electronics are composed of and an Arduino Leonardo, an analog joystick, and a push button.

Arduino Leonardo: This arduino was selected for the integrated USB drivers making it much easier to use as a communication device to a computer. This board runs on an atmega32 microcontroller with 20 digital and 12 analog I/O pins making it more than sufficient for all out needs.

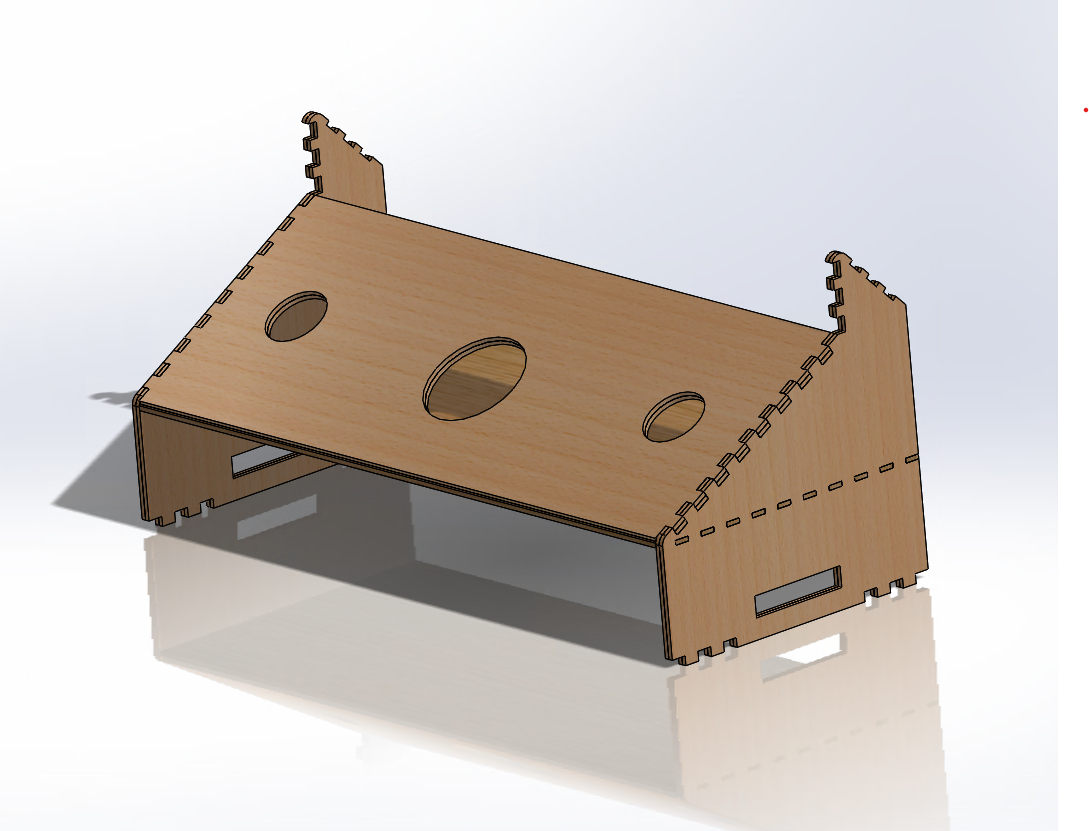
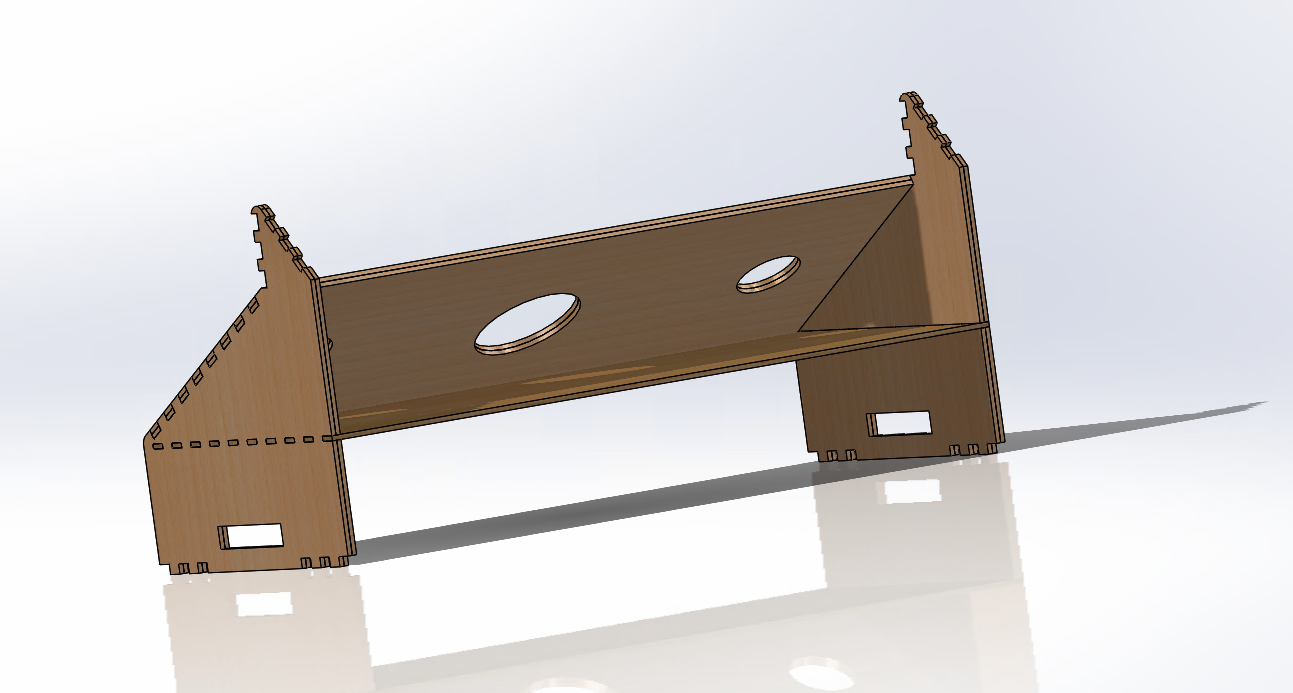
Joystick: Two potentiometers (variable resistors) are used to measure the change in the x and y axis, this can be converted to a digital value which will control how much the mouse cursor will move on screen. This will be integrated into the frame by connecting to a ball and socket joint and a 3d printed disk that the client will interface with.

Push Button: Simple push button that will act as the mouse left click.

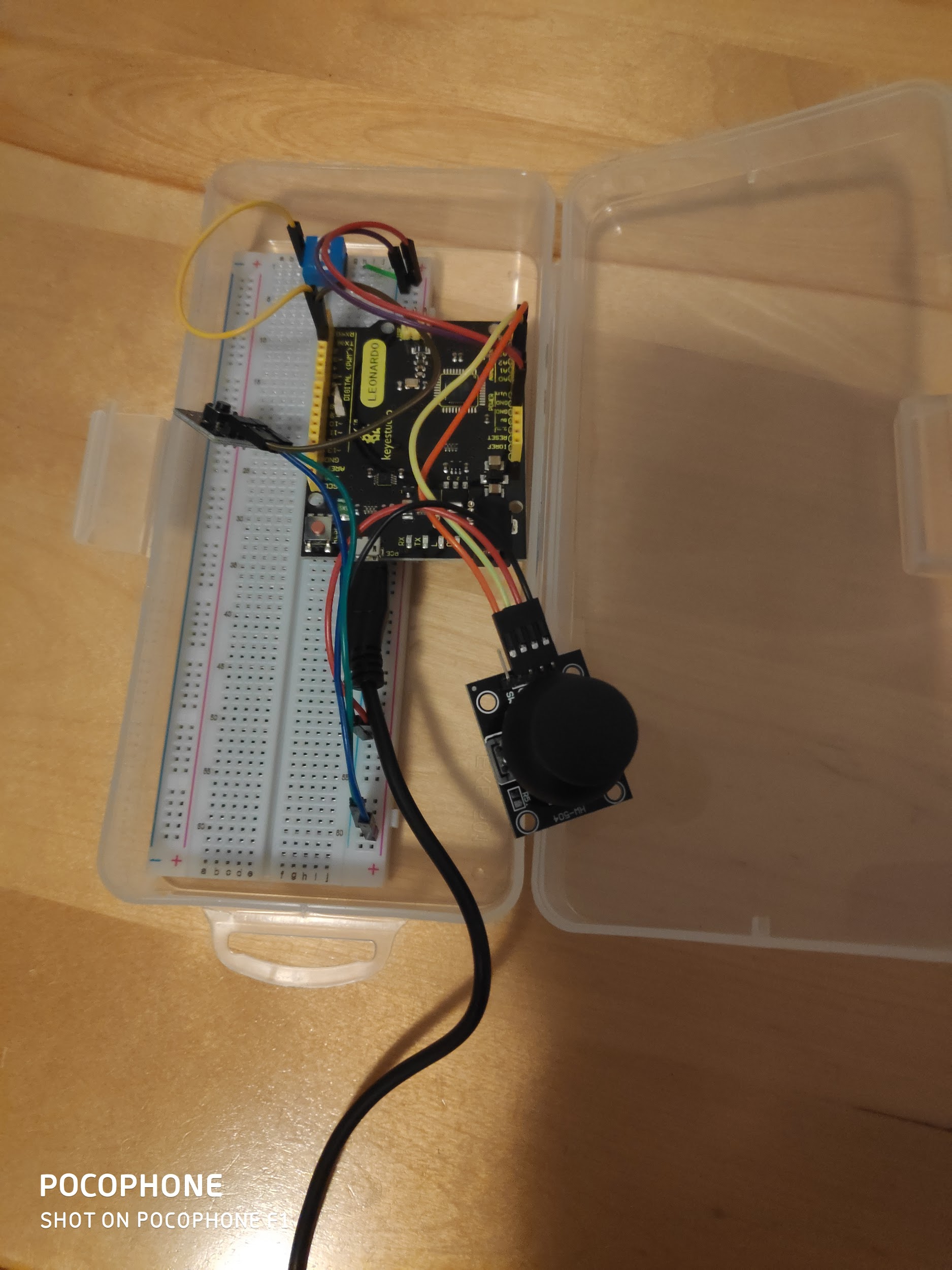
Software: The joystick is connected to two of the analog pins on the arduino and the push button is connected to a digital pin. The Ardiuno sketch repeatedly check if any of these pins have changed state and if the have branch to two separate sub routines.

The push button subroutine checks the previous state of the push button if it was high and went low a signal is sent to the computer that left click has been pressed, if it was low and went high a signal is sent to the computer that the left click has been depressed.

The joystick subroutine takes a measurement of the analog pins returning a value from 0-255 for both potentiometers. A value of 127.5 would mean that the potentiometer is sitting in the center of the axis and means the cursor is not moving any value higher or lower would related to left/right or up/down movement of the cursor and that signal is sent to the computer moving it in turn.

Physical Cad Model

Physical prototype 1:



Prototype Testing:

As part of the prototyping the joystick, we will have two models. The first model will use an arduino with a bluetooth driver already installed onto it. This will make connecting the computer to the arduino and the joystick very easy since it is already mostly setup. The second model will require a sub bluetooth receiver to be plugged into both the computer and arduino. This will require a little more work since we will need to download and instal drivers on both the computer and arduino.

Topics to be discussed in client meeting III:

The client will be asked what he thinks of the material used for the prototype, and if he thinks if wood provides needed support for the device and his foot. Moreover, the team will note whether Jorge is satisfied with the customer needs dimensions of the prototype (functionality, form, usability and cost) : in regards to functionality: the team will ask Jorge if he feels that the prototype presented is functional and meets the needs which he provided in the first meeting. As for the form, Jorge will be asked to give his opinion on the aesthetics of the design. Jorge will also determine if the prototype is easy to use and not too complex and whether the inclination of the frame effective. The joystick sensitivity will also need to be adjusted for Jorge so it matches his original system. Additionally, the team will be pleased to hear if the client has any suggestions on making changes to the prototype.