

Ian Rosado

Team B

Teammates:

Stephanie Chen, Trevor Decker, Ian Hartwig

ILR01

2/5/15

Individual Progress

Since the Last checkpoint, I have worked on general design ideation, creation of our mock-up model, the sensors lab, and creating our website.

For the general design, I finalized the conceptual design of the cleaning unit of the robot design and started to run some calculations that will help us choose the correct geometry for our longer members in the design.

For the mockup, I created a miniature version of the cleaning unit using cad, then figured out how to fabricate it, eventually laser cutting acrylic for the housing and 3D printing the rollers. This required making drawings, cutting, and piecing it all together.

For the sensors lab, as Trevor and Ian H. both had plenty of experience working with and reading sensors, we split up the work so that Stephanie and I would do most of the lab, with help and guidance from them along the way. For the lab, Stephanie and I worked together to create all of the circuitry that was needed and to write the code in Arduino that would display the output of the sensors. Ian and Trevor helped explain to us how to implement a simple moving-average filter, which we applied to the potentiometer data. We then took some of our data and plotted it in Matlab to get a better feel for the effect of different filters (shown in Figure 1). All of this was done with help from Trevor and Ian, who helped us out whenever we got stuck.

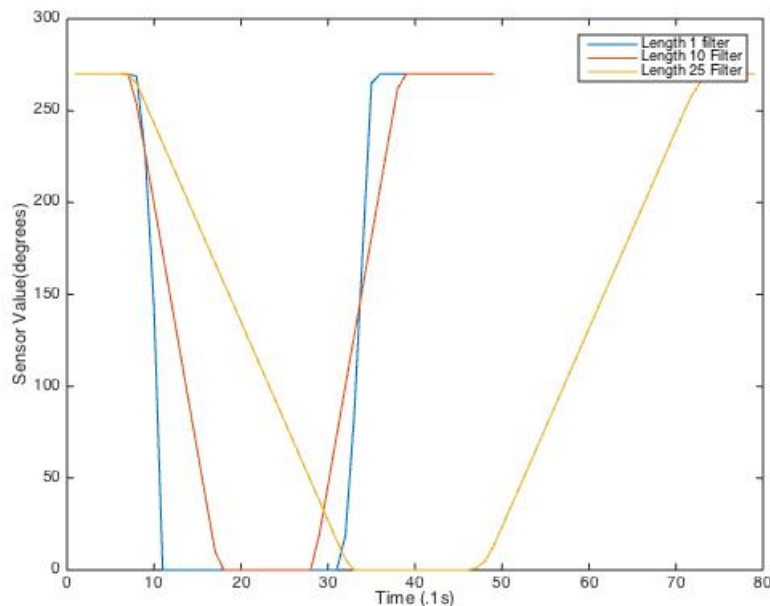


Figure 1: Matlab plot showing the effect of different length filters on potentiometer data.

For the website, my main role so far has been to double check everything that goes onto the web while I learn to use HTML so that I can easily add to the website in the future.

Challenges/Issues

In creating the mockup, we had issues with laser cutting and finding the correct thickness acrylic for the models we had created. This turned out to be a relatively minor problem as the mockup still assembled and worked easily without many changes.

We had originally intended to 3D print several components in the mockup using the MakerBot in Robo-Club, but there was very little printing filament available, so the printing unit, which was originally to be 3d printed, had to be redesigned and made from laser cut material. We were also unable to print all 4 of the rollers we planned to, so the mockup only had 2.

For the sensors lab, we ran into a few bugs in our code that gave us pause for a little. Most notably, we were appearing to be getting a lot of noise in our limit switch data. We struggled with this for a little until Trevor and Ian realized that we had forgotten to implement a pull-up or pull-down resistor. We were able to quickly fix this by using the built in pull-up resistor in the Arduino and changing a few wires in the circuit.

Teamwork

For our general design, Stephanie and I have started to come up with different geometries that we could use to implement our linear slide mechanism effectively with lots of input from everyone. Trevor has started to plan out the software that we will use for sensing the window edges and route planning, and Ian has started to plan out batteries, motors, motor drivers, and other aspects of the electrical system. Trevor and Ian have also started to learn how to use the processor that we plan to eventually implement.

For the mockup, we all met and came up with a final design, then split up responsibilities. Ian designed and made a CAD model of the linear slide mechanism, Steph did the same for the grippers, I worked on the cleaning unit, and Trevor helped everyone with laser cutting and 3D printing. After this, we all met to assemble the mockup-up at which point Ian H. created a small window frame for the demonstration.

For the website, Trevor created the framework and initial version, then the rest of us looked over it and added a few things to polish it up.

For the sensors lab, Steph and I worked on the circuitry and Arduino coding, as well as looking into alternative ways to display the data. Trevor and Ian helped us along the way when we got stuck or had questions.

Future Plans

Within the next week we will be completing the Motors lab, in which we will begin to implement our controls system, hopefully using the microcontroller for our final design. We also plan to have our entire initial design done within the next two weeks so that we can begin to order and build as soon as possible. For that, I will work to create a cad model of mechanical parts and assemblies in order to run in-depth analysis and validate our design further.

Code

```
/*----- Hardware configuration -----*/  
const int PotIn = A0;  
//const int BendBefore = A1;
```

```

const int BendAfter = A2;
const int LimitIn = 7;
const byte debugPin = 13;
double PotVal=0;
double BendVal=0;
double LimitVal=0;

const int numReadings = 25;

int readings[numReadings]; // the readings from the analog input
int index = 0;             // the index of the current reading
int total = 0;             // the running total
int average = 0;           // the average

int inputPin = A0;

/*-----*/
/* Initialization code (run once via call from Arduino framework) */
void setup() {
  // establish direction of pins we are using to drive LEDs
  pinMode(PotIn, INPUT);
  //pinMode(BendBefore, OUTPUT);
  pinMode(BendAfter, INPUT);
  pinMode(LimitIn, INPUT_PULLUP);
  pinMode(debugPin, OUTPUT);

  Serial.begin(9600);

  // initialize all the readings to 0:
  for (int thisReading = 0; thisReading < numReadings; thisReading++)
    readings[thisReading] = 0;
}

/* Main routine (called repeated by from the Arduino framework) */
void loop() {

  PotVal=analogRead(PotIn);
  BendVal=analogRead(BendAfter);
  LimitVal=digitalRead(LimitIn);

  //For this, we only filtered the potentiometer data.
  // subtract the last reading:
  total= total - readings[index];
  // read from the sensor:
  readings[index] = PotVal;

```

```
// add the reading to the total:
total= total + readings[index];
// advance to the next position in the array:
index = index + 1;

// if we're at the end of the array...
if (index >= numReadings)
  // ...wrap around to the beginning:
  index = 0;

// calculate the average:
average = total / numReadings;

Serial.print(average);
Serial.print(" ");
Serial.print(BendVal);
Serial.print(" ");
Serial.print(LimitVal);
Serial.print(";");

Serial.println();

delay(100);

} // end loop()
```