Introduction

This assignment's objective is to develop and test our second prototype to ensure it meets the requirements of our test plan. The prototype's results will be documented, and detailed images will be provided. Finally, a test plan will be created for our third prototype in order to set up clear objectives for next week's prototype.

Review of Last Client Meeting

The client was satisfied with our detailed design and prototype one for our project, he said specifically he liked our design, and how it was demonstrated in our presentation. Since the second client meeting, we changed how the brushing system will work and how the rafts will be cleaned. Instead of one brush we will have three, will also created a different way to stack the boards. This was slightly better than our first design, but the client still wasn't completely happy with it. They liked how it was at the end of our system with the bucket, but there was concern over the way it will be pushed out of the stack. We will be looking into this and come up with a plan to show them how it will move out of the stack for design day or in any other way by improving our design.

Prototype 2 Test

Test ID 1, Prototype is a brush head attached to a servo motor.

Prototype 2 type: focused, physical, medium fidelity

-Focus on one aspect of our system

-Address a critical component

-The total cost for this prototype was $47.3, but all the pieces from this prototype can be transferred to future prototypes

-Requires: Servo motor, Arduino Uno, female-female wires, male-male connectors, 3D printed test raft piece.

Objectives: To learn how the brushes clean the raft, and to reduce the uncertainty that our brushes will fit and clean dirt off our raft.

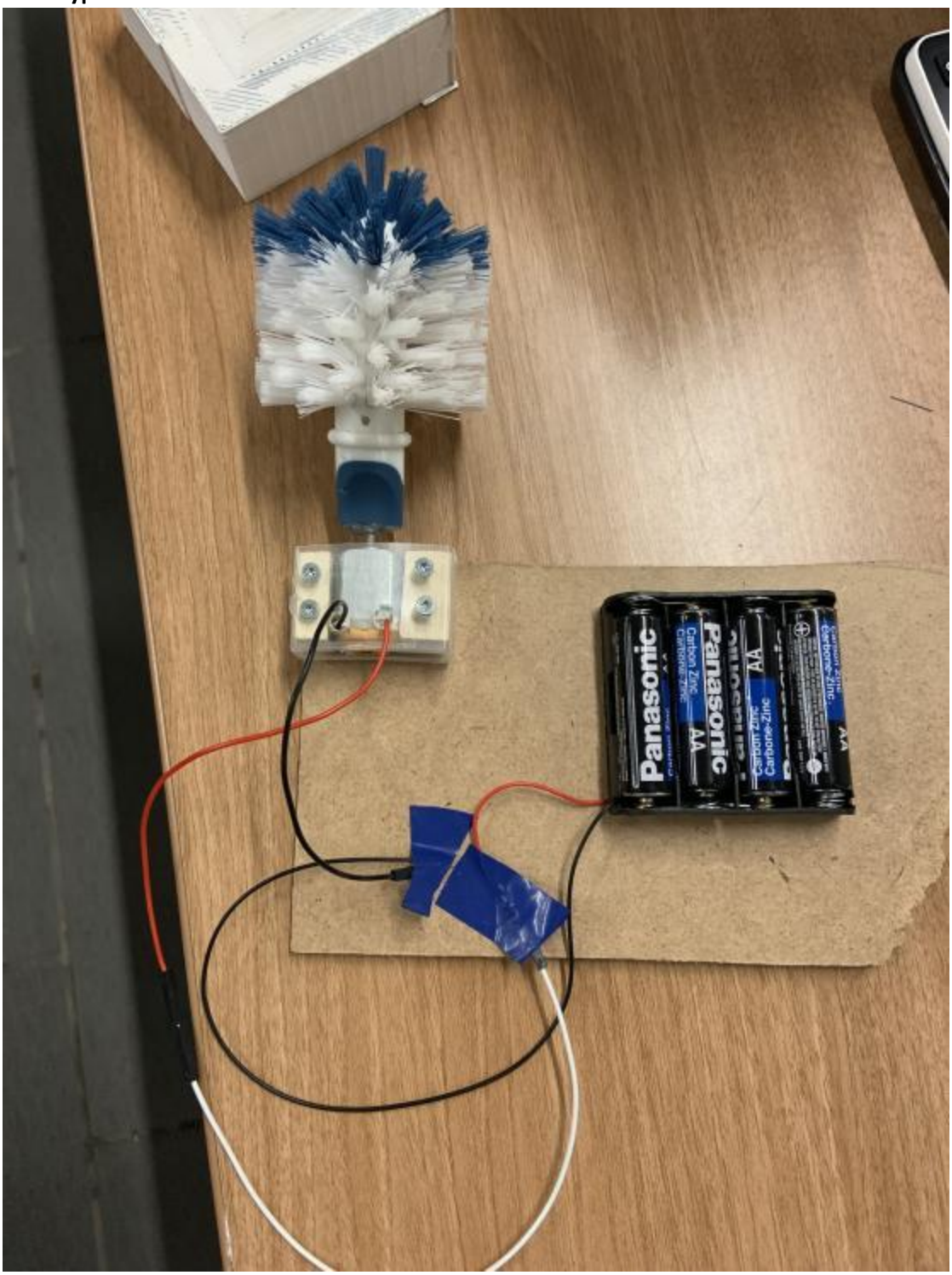
How: We built the prototype. We cut the bush so we only have the head, then bored out the end so we can attach a motor to that. Then we plug the motor into back of 4 batteries, connected all the wires and made sure the motor spun properly. The brush was then attached to the motor. We covered the 3D printed piece in mud, then brought our spinning brush to it to make sure it spun and cleaned the dirt within the hole. Next, we saw how much dirt was left over, this was then our result of the experiment.

Results: It turns out the brush we purchased was too large for the whole. We can still fit the brush into the hole, but it takes too much force to get in. In the future we can use a smaller brush to fit into the holes better, even though the brush we currently have can clean the top, bottom and sides well. The brush spun fast enough to clean all the mud off our 3D printed piece, even though it looks like it's not all clean, some of the mud got into the very small cracks of the 3D printed piece. This would not happen if we used the real raft because it's smooth and doesn't have tiny pieces for dirt or algae to get

into. The brush was also used to clean the sides as well as the bottom. This reduces the uncertainty that our brush system won't clean the system and demonstrates this concept could work. It was also tested the effect of water in the cleaning system, which didn't work well because all the water did was spread the mud all over the board making it still dirty even after it was cleaned. We may need to change where the water is implemented in our system because currently it's before the brushes touch the board, but after reviewing the results of this prototype the water should rinse off excess mud/algae at the end of the system. The client wanted to know if the brush would work properly for cleaning the raft and this should help prove it.

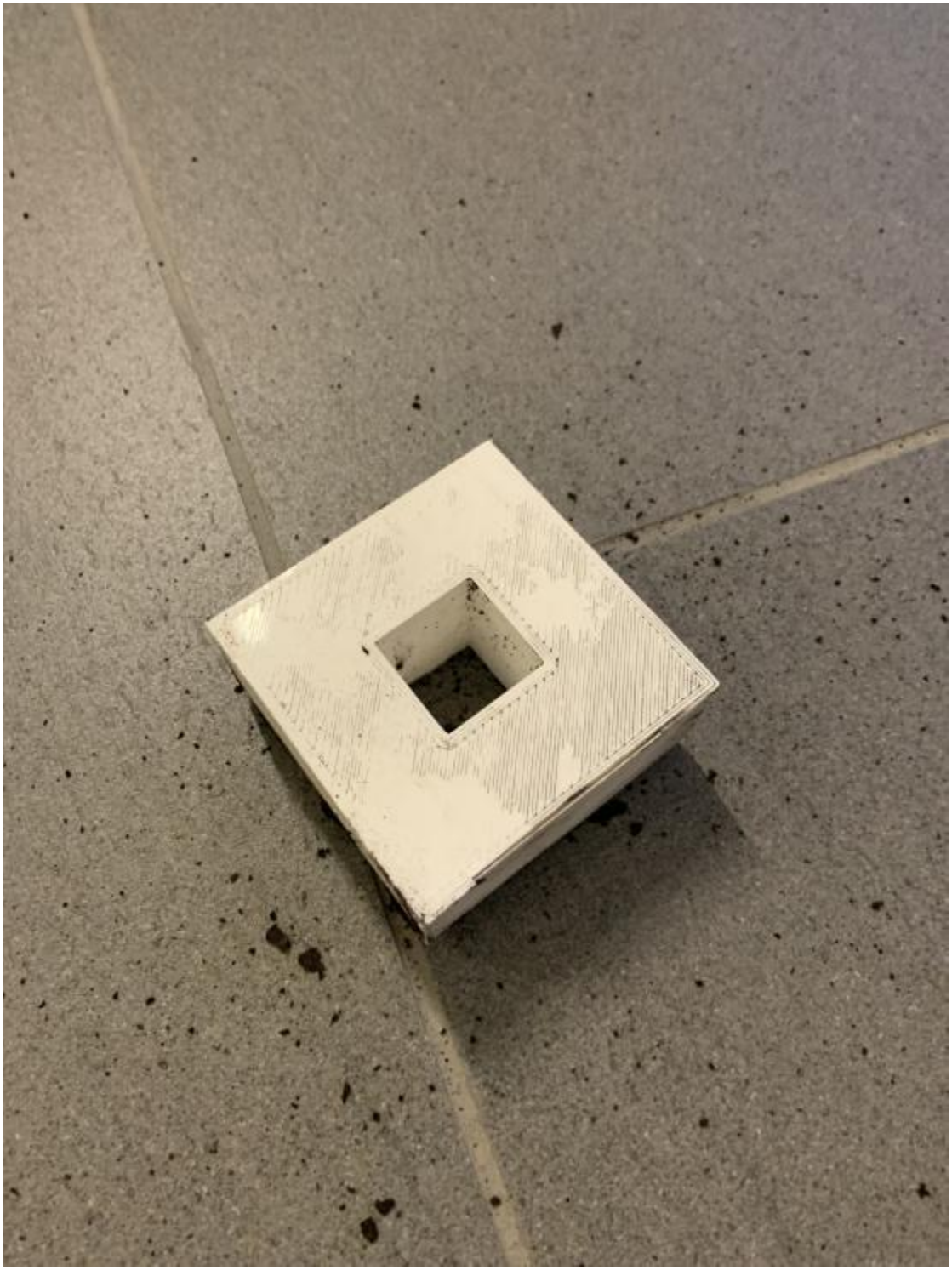
Photos

Prototype 2



Dirty 3D piece bottom

3D Piece after Prototype 2 brush cleaning



3D side dirty

3D side piece after brush cleaning

3D Top Piece dirty

3D Top piece cleaning with water

Bill of Materials was updated (https://docs.google.com/spreadsheets/d/1lCQ2YnYQaJGvfn9f1k6H-oeWfJqrgsRzSLlUE4dv7ek/edit#gid=0)

Project Plan (Green are completed, dependencies can be found on wrike)

Tasks	Duration	Who's Responsible
Prototype 1		
Create test plan	Start 10/21 Due 10/23	Gabe
Plan assembly of prototype one including all parts we will need	Start 10/21 Due 10/25	Gabe, Sharmarke, Aiden
Gather Materials for prototype one	Start 10/23 Due 10/30	Gabe
Assemble Prototype One	Start 10/30 Due 11/2	Gabe, Sharmarke, Aiden
Test Prototype One using our test plan	Start 11/3 Due 11/3	Gabe, Sharmarke, Aiden
Analyze Test results	Start 11/3 Due 11/5	Gabe, Sharmarke, Aiden
Prototype 2		
Review Feedback from prototype one	Start 11/10 Due 11/10	Gabe, Sharmarke, Aiden
Create Test plan	Start 11/1 Due 11/6	Sharmarke
Plan assembly of prototype two including all the parts we'll need and how we will assemble it together	Start 10/23 Due 11/7	Gabe, Sharmarke, Aiden
Gather Materials for prototype two	Start 10/23 Due 11/7	Gabe
Create subassembly of prototype 2	Start 11/6 Due 11/11	Gabe
Create subassembly of prototype 2	Start 11/6 Due 11/11	Aiden
Create subassembly of prototype 2	Start 11/6 Due 11/11	Sharmarke
Assemble the whole prototype	Start 11/11 Due 11/12	Gabe, Aiden, Sharmarke
Test Prototype Two	Start 11/12 Due 11/12	Gabe, Aiden, Sharmarke
Analyze Test Results	Start 11/13 Due 11/13	Gabe, Aiden, Sharmarke
Prototype 3		
Review Feedback from prototype two	Start 11/17 Due 11/17	Gabe, Aiden, Sharmarke
Create Test Plan	Start 11/11 Due 11/14	Aiden
Plan assembly of prototype three including all the parts we'll need and how we will assemble it together	Start 10/23 Due 11/16	Gabe, Aiden, Sharmarke
Gather Materials for prototype three	Start 10/23 Due 11/16	Gabe

Assemble the prototype	Start 11/16 Due 11/26	Gabe, Aiden, Sharmarke
Test Final Prototype	Start 11/27 Due 11/27	Gabe, Aiden, Sharmarke
Analyze Final Prototype	Start 11/27 Due 11/27	Gabe, Aiden, Sharmarke

Test Plan Prototype 3

Reasons as to why we're doing this prototype testing: • To see if the brush will **clean every single hole** in the board • To see if the brush **can easily move left, right, up, and down** without any problem • To find the best programming way which will make the brush go inside from hole to hole **Background**: There will be motors that will make the brush move left to right and one that	**Focus/Physical** • We selected this type of prototype for the purpose of focusing on one aspect of our whole system so that we can give a good time and work to get a satisfying result. **Description of the prototype:** For this test the first thing to be testing is if the brush moves left and right. How to test for this is first having the right materials which are **3 metals, 2 motors, and 1 brush**. The two metals that will be standing straight to help the brush move up and down should have a dimension of **2x2x5 inches**. The metal that laid horizontally should have a dimension of **32 inches (length), 2**	**Measurement:** The number of times that the brush went up and down and the percentage of how successful this part of the testing was. The number of times the brush went left and right and the percentage of how successful this part of the testing was. This information will be recorded on a **spreadsheet** that shows the percentage of how successful the test was. This **data will be very useful** for us since we want to have an automated brush system that cleans the raft and for this to happen, we want a good result.	**How long it will take:** • For this testing it will take about one hour **because this testing is very important to our project** since it is the main part that makes the brush moves which is why we want to take our time to get good result. We will do this testing on **November 18**. **What needs to happen before the test:** • We will need to have all the **materials (3 metals, 2 motors, and 1 brush)** and have all the **equipment(computer)** to do the testing. **When will the result be available:** The result will be available before our next deliverable is due (November 20). We want to get the result

makes the brush spin. There will be materials that will suppose the brush to move left/right and up/down. Two metals or plastic will stand straight to help the motor make the brush go up and down. Another metal or plastic will be laid horizontally so that the motor could help the brush move left to right. This system will **be similar to a 3D printer**. **Learning/De-risking:** We want to learn if our prediction of this part of the system will work and if our plan will succeed. We want to learn if this will work or not and the **reasons why it will or not work**. This is also for de-risking since doing this prototype test will help us have a better solution to our problem statement and make our **final solution be more successful**. **Results:**	**inches (width), 2 inches(height).** The metals will be connected just like a bridge and should be connect just like a 3D printer. Every metal will help the motors to be connected to the brush. Two motors will be needed, one for making the brush move left and right, and one for moving the brush up and down. The motor should be programmed through applications such as Arduino. **Cost/Will it Work:** • Estimated cost, **$20 for all materials**. From our perspective, we have all the required materials, skills, and plan to make this testing work.	**Is it consistent with our defined objectives?** Yes, this is consistent with our defined objectives for this testing.	before we do any other project work since our next prototype and **our final solution depends on this result.** The result be will available in time to make difference to our project.

The result will be placed on a **spreadsheet** that will include all the data that we got from this prototype testing. The spreadsheet will include **how accurate the brush is**: if the brush will go inside of every hole and if it moves left to right and up/down. **Better way of doing the testing:** There isn't any better way we can do this testing since this is probably the best test plan that we came up with for this prototype. This testing **plan has less cost, fewer materials, and a better way of achieving good results**. **Criteria for success:** The brush can move **left and right, up and down** without any problem.			

Conclusion

We can conclude this prototype test to be successful. Our brush system was able to thoroughly clean the surfaces of the raft with little difficulties. However, the brush could barely fit into the hole, let alone spin once it gets inside. In the future it will be required to use a stronger 12V DC motor to power the brush.