Introduction

After reviewing our final solution and our final concept we came up with an outline prototype plan that focuses on one aspect of our whole system. We have created a detailed design drawing that summarizes our final concept, a cost list of the materials that we will be needed, a list of equipment, and a list of significant project risks that helps our plan be more successful. This document goes through the steps we took in order to create an outline prototype plan that will work well for our next prototype.

Project Plan (Green are milestones, 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

https://www.wrike.com/frontend/ganttchart/index.html?snapshotId=CzI5z2rNssVHsteFjYtnUSBLlk7wLNLy%7CIE2DSNZVHA2DELSTGIYA

Prototype Test Plan 1

Test ID	***Test Objective (Why)***	***Description of Prototype used and of Basic Test Method (What)***	***Description of Results to be Recorded and how these results will be used (How)***	***Estimated Test duration and planned start date (When)***
1	Verify if our 3-inch diameter wheels properly grip the raft as it comes out of the dirty pile and moves the raft forward. Based on the results of this test we will find out if we require larger wheels, a more powerful motor for the wheels and/or different wheel placement. Criteria for success: wheels grip the raft on its sides and moves the raft 32 inches without losing contact with the raft side.	Prototype type: focused and physical. We selected this type because we want to focus on only one aspect of our whole system to ensure it works. It is to early in the prototype stage to do a comprehensive prototype covering all aspects. We will require 2 spinning rubber wheels of 3-inch diameter, the raft as well as two stepper motors that will rotate the wheels. We will fix the stepper motors on a wooden surface to make sure the wheels stay in place as the raft moves between the 2 wheels. Estimated cost: $20 for the wheels, motors and wiring	Test number of times wheels successfully grips raft and moves it 32 inches. Wheel performance will be tested when the raft is wet and dry. The number of times the wheels successfully grip the raft in wet and dry conditions will be recorded in a spreadsheet. This data will be important because the wheels are the ones moving the board through the cleaning system and out the other end of the machine to the	This test should take about an hour on November 3. Before the test can occur, we require: 2 spinning rubber wheels of 3-inch diameter, the raft as well as two stepper motors that will rotate the wheels. The results of the test will be available in time to make a difference in the project (we are testing 1 month and a half before the final solution is due).

			clean side of the table.	
2	At the beginning of our cleaning system the user will place a stack of dirty boards on the table. Our objective will be to test if a 6-inch rigid object (like wood) attached to a servo motor will spin when the motor rotates and if the has enough power from the motor to push the bottom raft from the stack to the rotating wheels. This test will allow us to learn about the capabilities of a servo motor and this prototype can also help us communicate our automation idea better to the client. If the test isn't successful, we need to rethink the type of motor we use, or the type/length of object attached to the motor that is pushing the bottom raft. Success criteria: Bottom raft is removed from the stack with one rotation of the motor and the raft moves straight, successfully contacting both spinning rubber	Prototype type: focused and physical. We selected this type because we want to focus on only one aspect of our whole system to ensure it works. Its to early in the prototype stage to do a comprehensive prototype covering all aspects. We can also do this test analytically by calculating the force the top boards exert on the bottom one and than calculating the force the ridge wooden object exerts on the bottom board and make sure through calculations this force is greater than the force of the top rafts+ force of friction. We will require one servo motor, 5-10 objects of similar shape, size and weight of the raft (if we don't have access to the actual raft). We will need to mount the servo on a board, attach the wooden object to the servo and place the stack of rafts in front of this system. Estimated cost: $10 for servo and wood.	We measure if the spinning wooden piece can move the raft 6 inches forward (distance where the 3-inch spinning wheels should grip the raft). We will record the information in a spreadsheet. One column of the spreadsheet will have the distance the bottom raft moved (in inches) and the second column will have the number of rafts that were stacked on the bottom raft to see if there is a correlation between distance the raft moves and the increase in stacked rafts=>higher weight. This is consistent with our objective.	30 minutes; November 3. Before the test can occur, we need: a servo motor, 5-10 rafts, and a piece of wood. The results of the test will be available in time to make a difference in the solution because we will still have 1 month and a half to order new parts. If test isn't successful, we will rethink the type of motor and/or change the spinning object attached to the motor from wood to something else.

	wheels which then move the board forward.			

Bill of Materials and List of Equipment

https://docs.google.com/spreadsheets/d/1lCQ2YnYQaJGvfn9f1k6H-oeWfJqrgsRzSLlUE4dv7ek/edit#gid=0

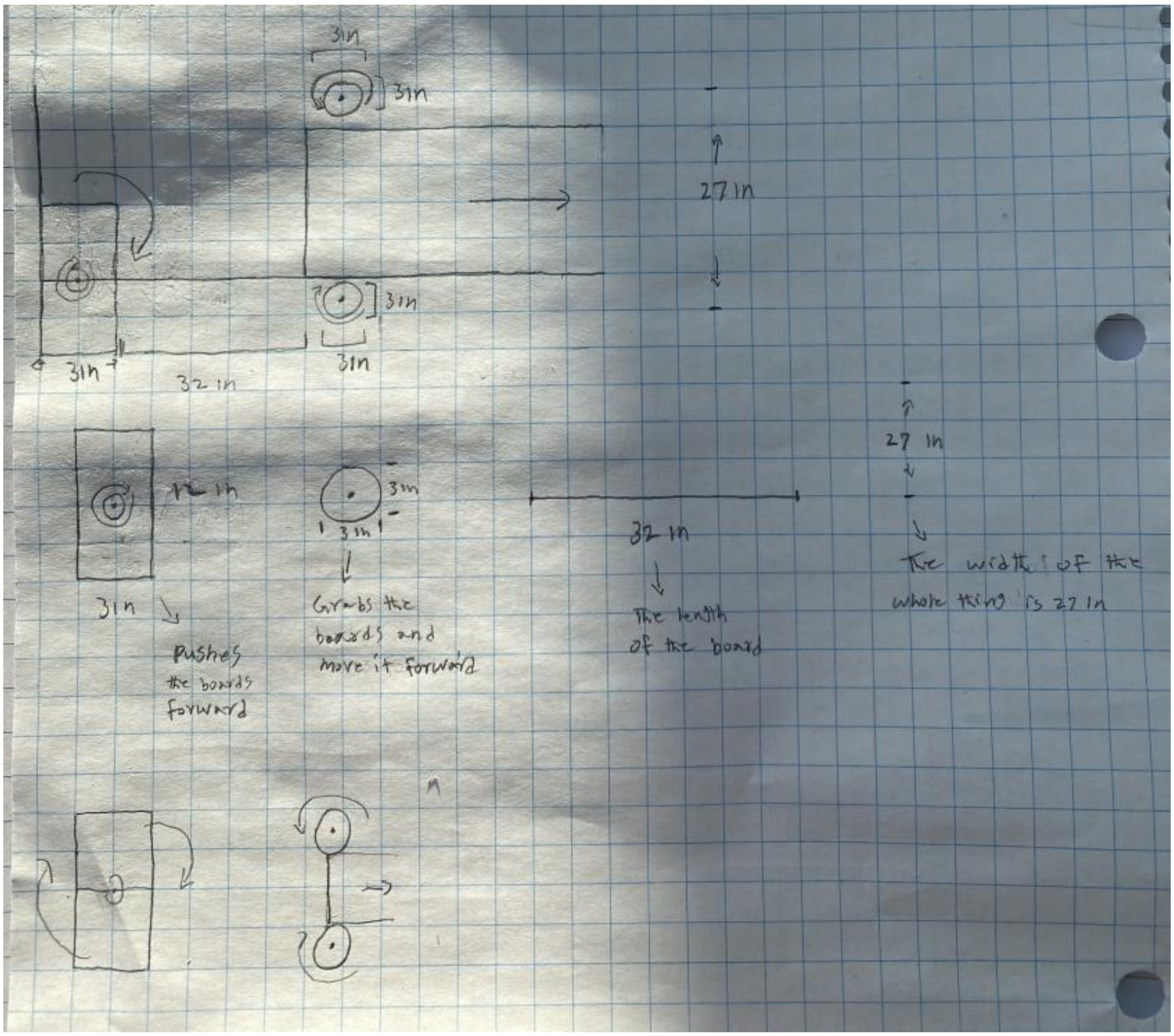
Project Risks

Types of project risks	Severity	Likelihood	Mitigation/Contingency
Technology	High	low	We should look out for this risk since it can significantly impact our test plan. An example could be not using the best programming code that could program the motor in the way our team wanted. Using Arduino would be a great choice for programming the motor and can reduce the problems that we could have with the motor.
Cost	High	Medium	If in the future we decided to replace some materials that we don't want with a more useful material that fits well into our project but doesn't cost the same as the replaced material, then we must take into consideration how we should deal with this issue. If we don't carefully fix that issue, that will affect the total cost. One way to fix this problem would be getting rid of materials that cost the same amount of money as the one that is being added and the materials that are getting rid off shouldn't be as important as the one that is replacing them.
Unplanned work that must be accommodated	High	low	When one of our team members didn't do their work in our project due to them being absent or sick then we should be capable of doing that work on time so that our project succeeds.
Adopt to changes	High	High	If something goes wrong with our plan, we should be able to make quick changes to our plan. For example, if we realize that something is wrong with the measurement, or some aspect parts don't fit in our system then we should be able to make changes to that.
Project assumptions	Medium	Low	Assuming some parts of our project could be labeled as a risk because the parts that we have

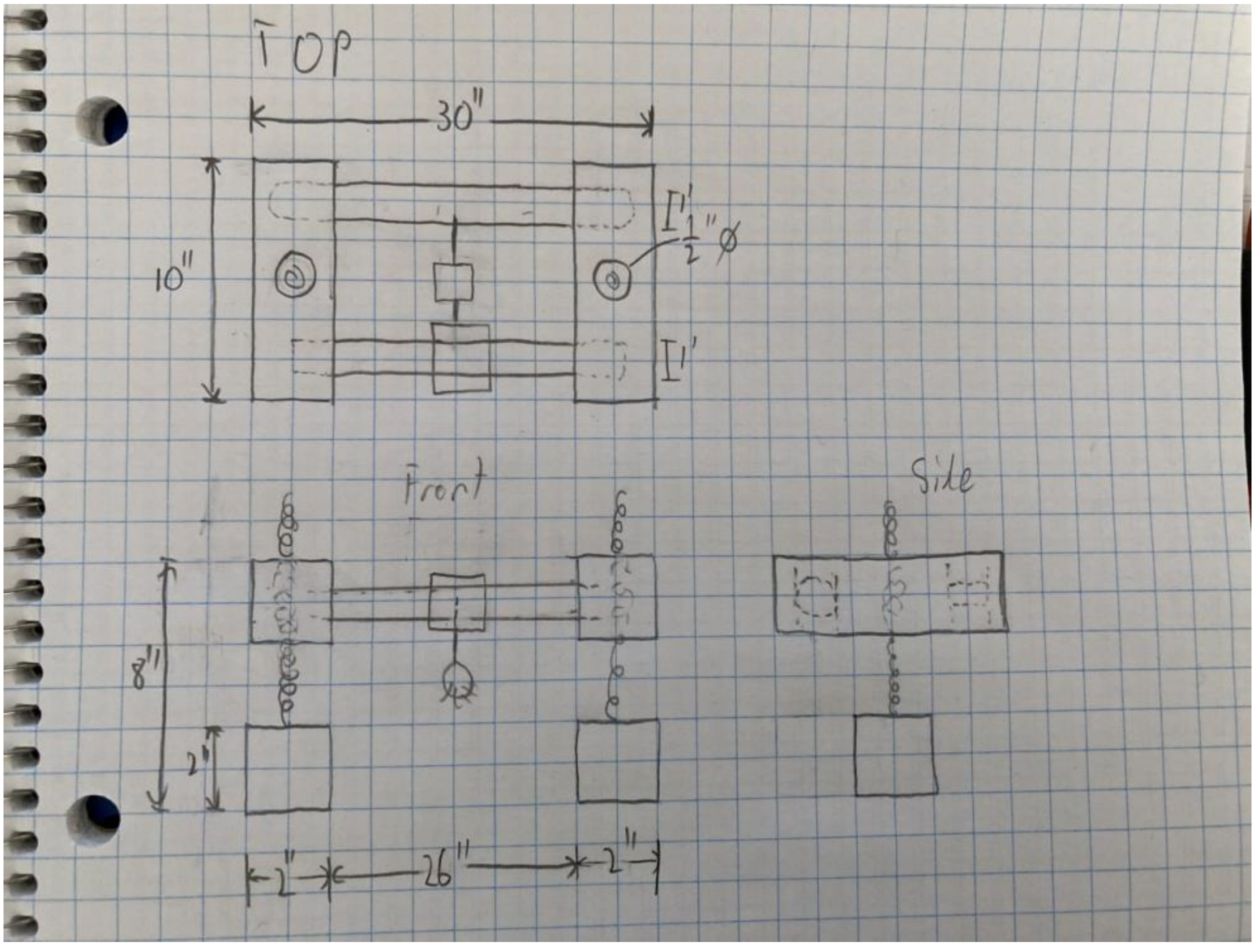
			assumed won't most likely work. We should avoid assuming any parts of our project and have a consistent plan that will likely work.

Detailed Design Drawings

Spinning Wheel Component

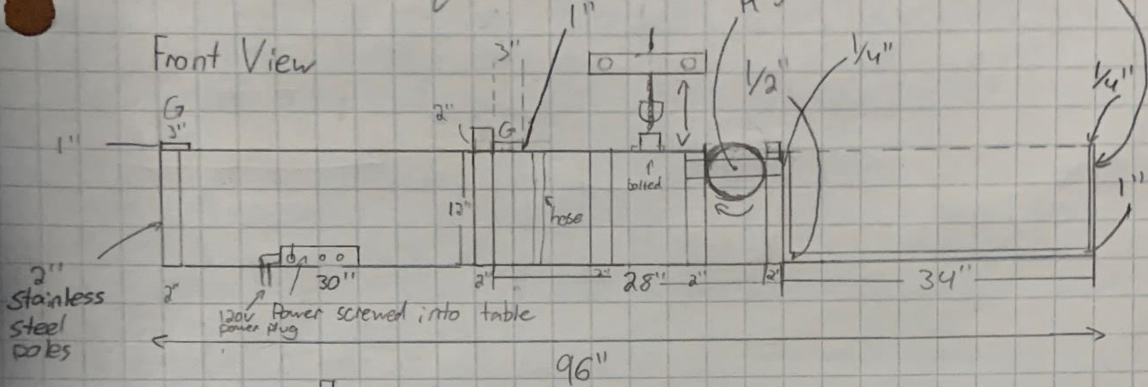


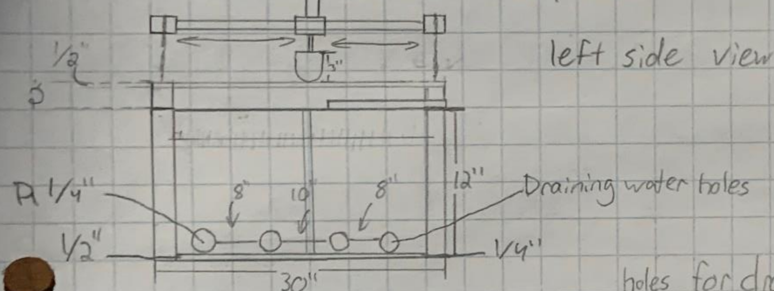
Cleaning Brush Component

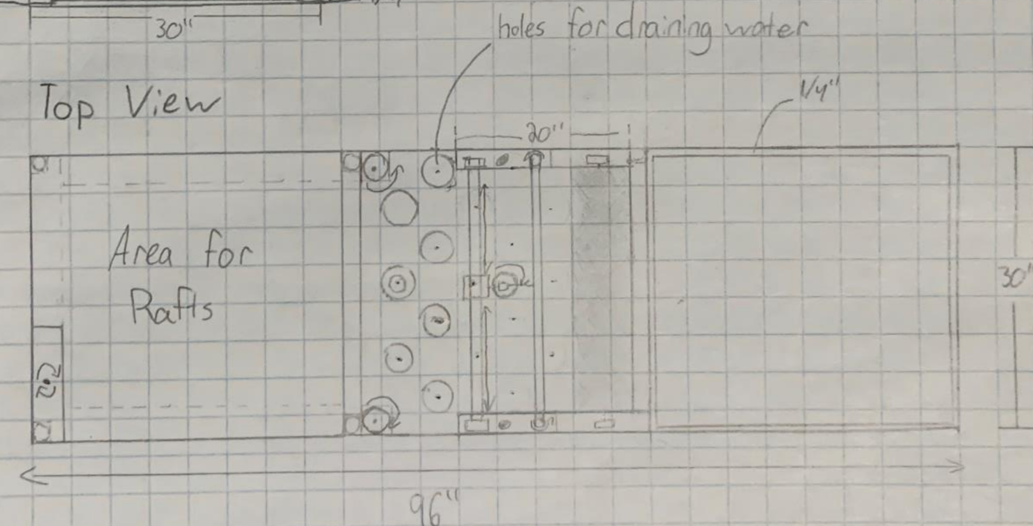


Full Assembly

1 square = 4"


Front View
Plastic Bucket
R 3"
1"
3"
1/2"
1/4"
1/4"
G
3"
1"
2"
G
12"
hose
bolted
1"
2"
stainless
steel
poles
2"
30"
2"
2"
28"
2"
2"
34"
120v power plug
Power screwed into table
96"


left side view
1/2"
3"
R 1/4"
8"
10"
8"
12"
Draining water holes
1/2"
1/4"
30"


Top View
holes for draining water
20"
1/4"
Area for
Rafts
30"
96"