Project Deliverable G: Prototype II and Customer Feedback
GNG 1103 – Engineering Design
Faculty of Engineering – University of Ottawa

Members:

1. Yusuf Mirza - 300021888
2. Thomas Tokarczyk - 300021948
3. Chang Hung (Will) Wu - 300019361
4. Dejun Li - 8338970
5. Abdel Aziz.A - 300028097

Introduction:

Prototyping allows you to perfect and test our ideas for the chosen subsets and to come up with ways to improve them for the final project. This prototype tested most of the remaining critical subsets of our attachment. It allowed us to perfect and test our ideas for the chosen subsets and to come up with ways to improve them for the final attachment.

Prototyping Objective:

To observe a further prototyping and be able to analyze the attachments based on the first created cardboard model. In order to see if there are any physical issues on the attachments, the test plan that can reduce the risk of failure should be generated. The second prototyping will allow us to meet the target range and specifications of critical functionalities and achieve the goal on the final design.

Prototyping Test Plan:

Why:

The purpose of testing the prototype is to ensure the functionality of the critical parts, such as the seed hooper and the rake.

What:

The seed drop rate of the seed hopper is tested as well as the hopper closing/opening mechanism. The seed drop rate is tested with popcorn kernels to stimulate the grass seeds. The closing/opening mechanism was tested with human hands pulling the gate to stimulate the situation where Bowie's arm will be moving up and down. The rake was tested by dragging it on the ground to ensure the strength.

When:

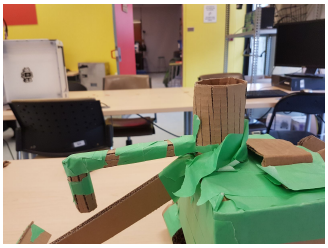
The tests were performed right after the second prototype was being made to ensure that the results can be acquired as soon as possible as well as allowing us to make adjustments to the parts if the tests failed to perform.

Result/Feedbacks:

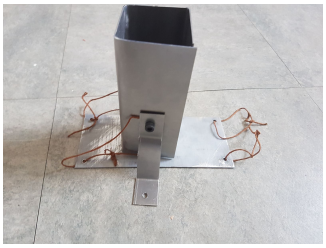
The seed hopper was able to drop the popcorn kernels at a rate about 10 kernels/min. The opening slit is about 2 inches wide and assuming the moving speed of Bowie is about 8 m/min (Robot Mission), that means in 1 minute, it will drop the seeds in an area about 0.4m^2, which means an average of every 0.04m^2 will have one kernel/seed, which is enough to create a fully spread grass field. The opening gate was able to slide under the hopper without affecting it. The rake was able to be dragged on the ground to about 10 meters with a few little bumps (about 5 to 6 bumps), and it was successfully to travel along to the 10 meters mark dragged by human.

Previous Works and Improvements:

The previous prototype was used as the first stepping stone for the group, acting more so as a visual aid than anything else. The ideas of the attachments were there but refinement upon those ideas was evidently needed. The focus of this prototype being the hopper, we made significant changes to the design, from the shape to the functionality. The original idea was cylinder with a nozzle dispenser, and the new idea is a little bit more intricate.



(First Prototype)



(Second Prototype)

The second prototype is a 2in x 2in x 5in rectangular prism with a slanted floor which allows for easier release of the seeds from the hopper. It also has the attachment of a moving floor piece which closes the hopper when the frontal attachment has been raised (to keep seeds from pouring out of the hopper), and when the frontal attachment is down (meaning the robot is in motion) the hopper is opened and grass seed is spread.

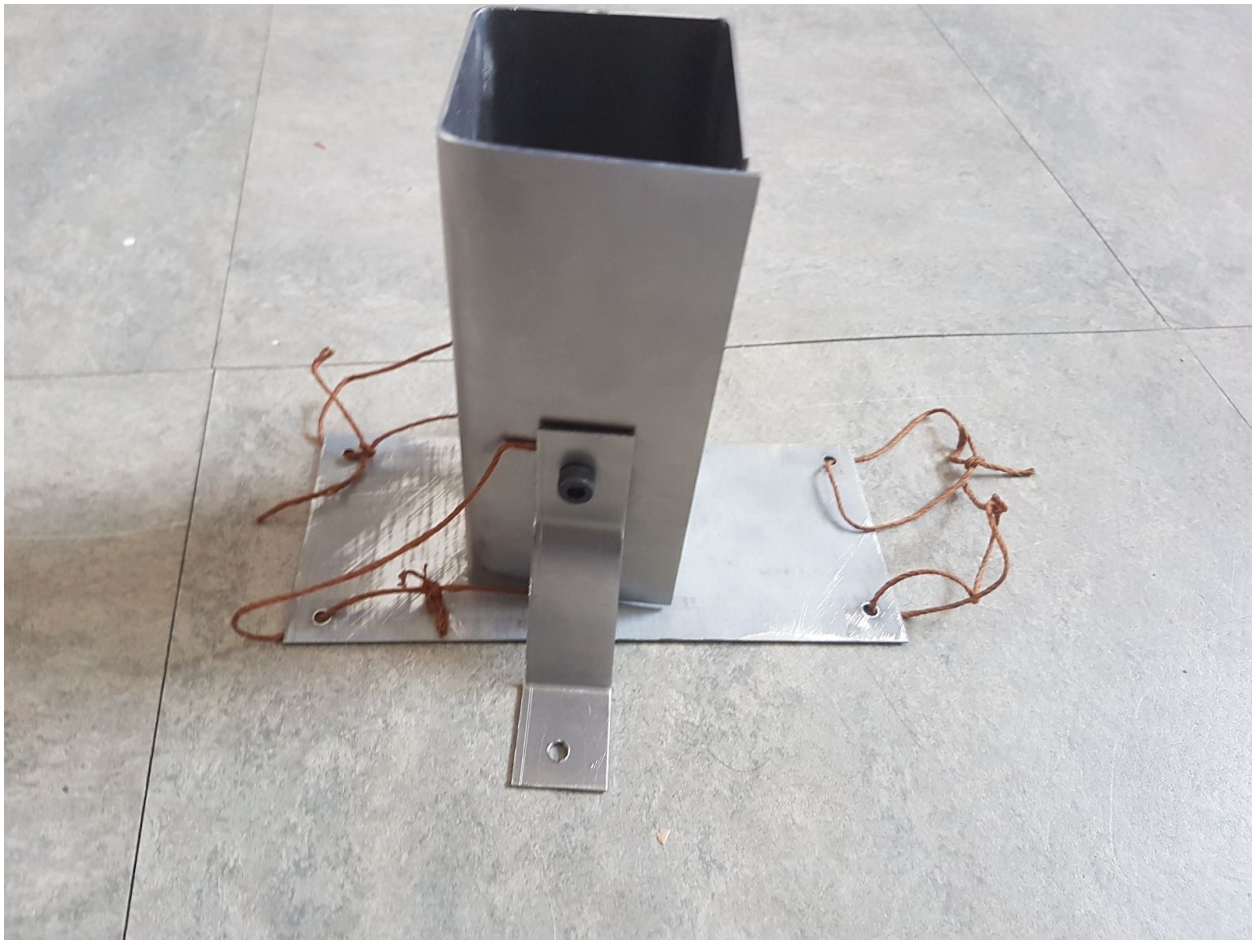
Conclusion:

Prototyping is one of the most vital parts of a design process. It allows you to test your ideas and how they would actually. Using this feedback allows you to continue to improve the design for the final project without actually building the whole project and redesigning it each time something fails. This prototype has allowed us to test our design for crucial subsets and refine them so as to improve our design for the final attachment.

Pictures of Progress:

The Grass-Seed Hopper (with sliding platform, frontal view)

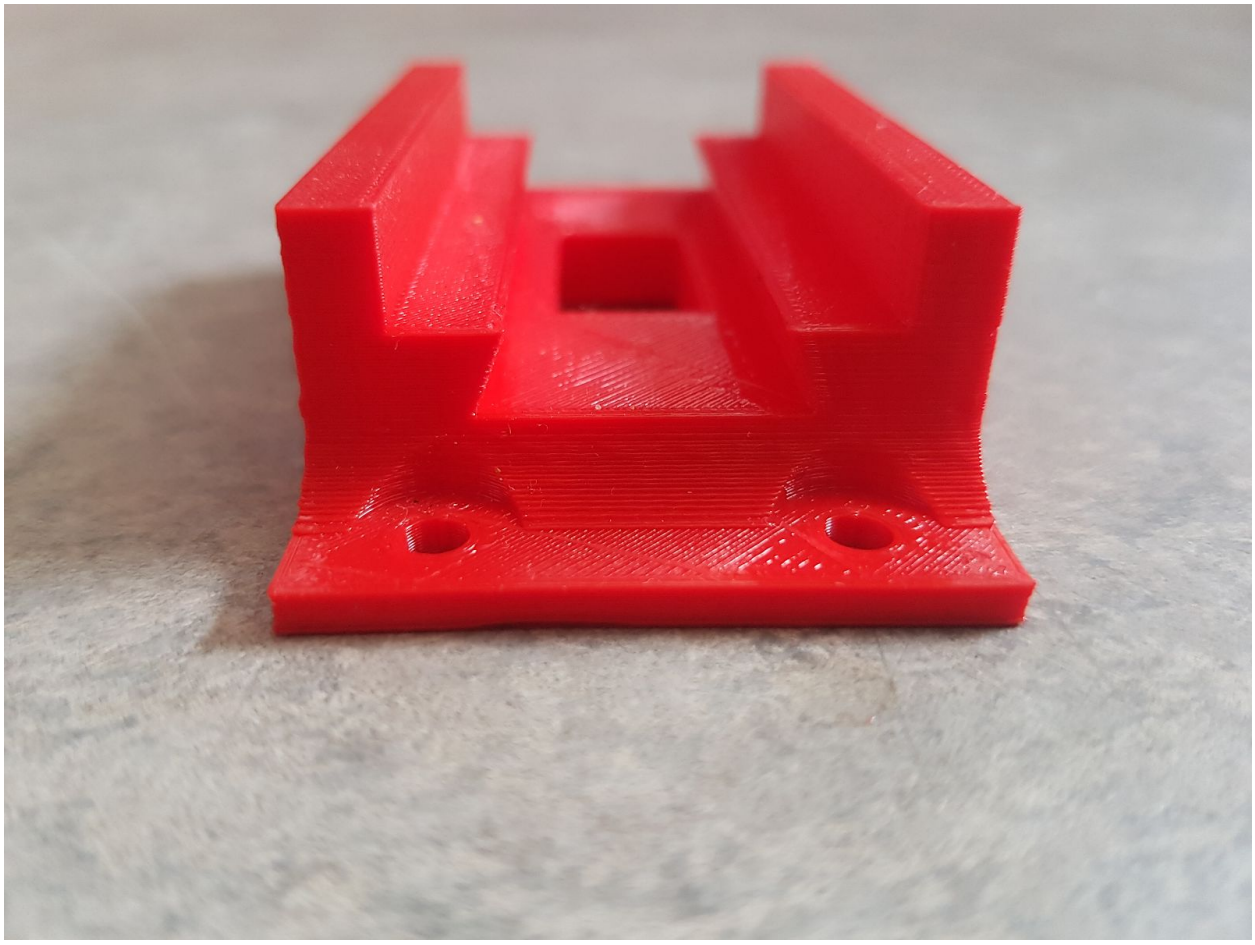
The Grass-Seed Hopper (with sliding platform, side view)



The Grass-Seed Hopper (with sliding platform, bottom view)

Dovetail for frontal attachment (top view)

Dovetail for frontal attachment (frontal view)



Back Rake Attachment (top view)

Back Rake Attachment (front view)

Back Rake Attachment (side view)