Deliverable G – Prototype II and Customer Feedback

GNG 1103[B]

B04-18

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Table of Contents

List of Figures

List of Tables

Prototypes

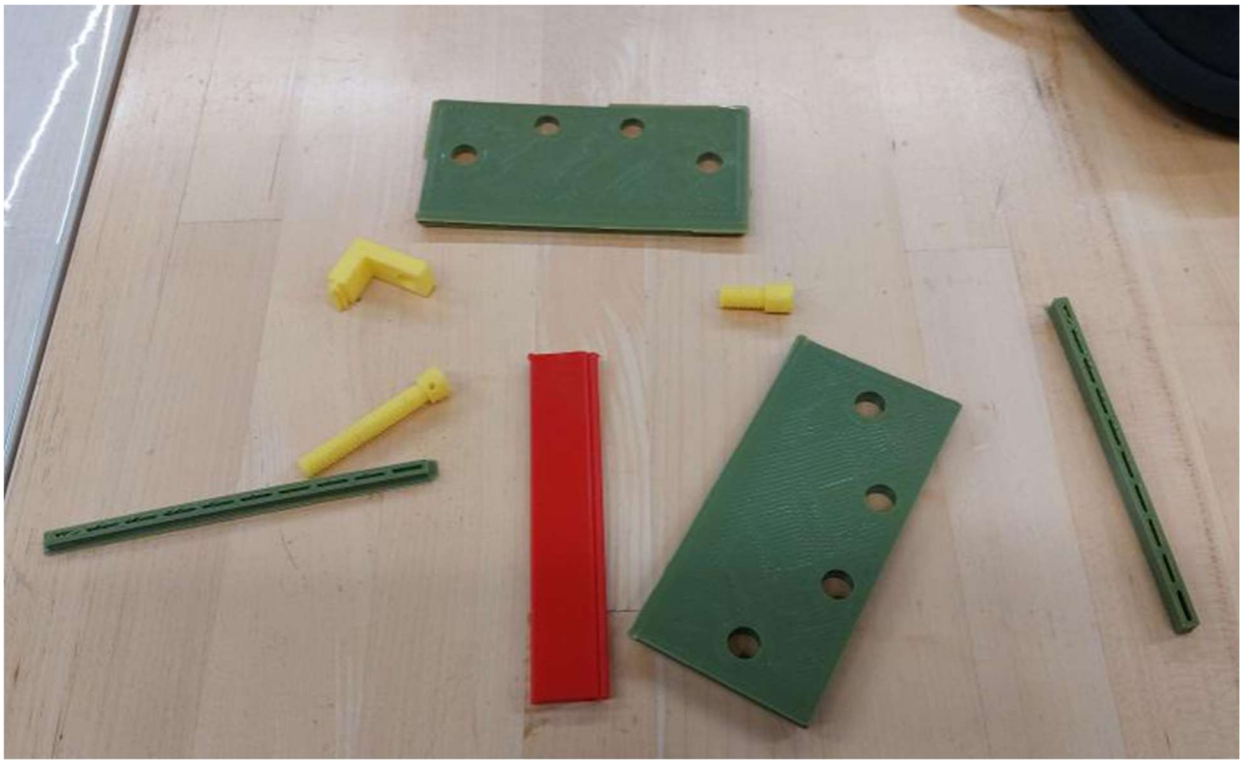

Figure 1: Prototype I

Initial trials of manufacturing the first prototype. The assortment of pieces located above in Figure 1 shows the two attempts that were made to manufacture the jig. We encountered multiple problems when manufacturing. Some of these include support failure, the size of the screw, the threads for the screw, and time constraints. After these problems were found we made multiple changes to accommodate the situation. We changed some of the settings on the 3D printer and made some alterations to the CAD design. For testing, we could not test the entire jig because of the failure to manufacture. However, we did test the parts that did print and they proved to be more durable than initially expected.

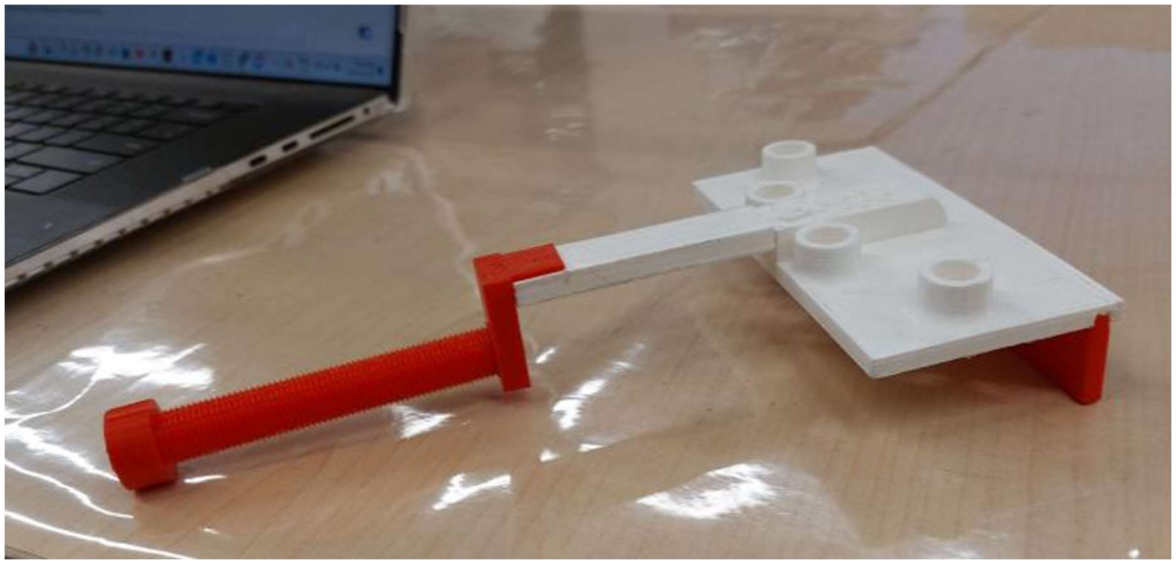

Figure 2: Prototype II Front View

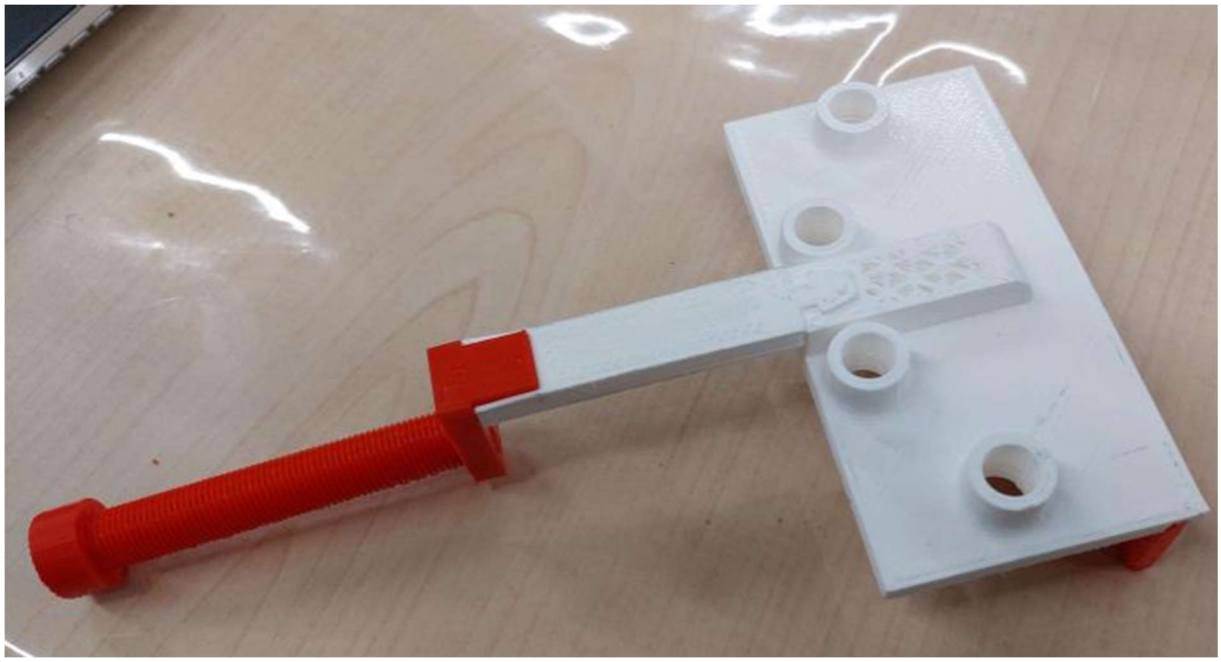

Figure 3: Prototype II Top View

The images above in Figure 2 and Figure 3 showcase the second iteration of the prototype jig. This prototype aimed to fix the problems encountered with the first design. In this jig the dimensions were fixed so that all the parts fit together well. However, even with these

improvements, there were still some issues with the screw threads. Full testing cannot be done until the thread issue is solved. The durability and weight of the prototype are both in the acceptable ranges. The next steps are to find a new material to manufacture the jig out of and make the final prototype. Lastly the tentative plan is to purchase or manufacture a metal screw for the jig.

Table 1: Prototype testing plan

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	cost	Use both prototypes, gather materials needed for both.	Make sure the materials for the 4.5" jig do not exceed $10.20, and the cost for the 5" jig does not exceed $10.80	Start: Duration: 1 hour
2	Accuracy	Once again using both prototypes	We will be drilling the holes again, but this time we will be comparing the dimensions of the holes, and making sure they line up with the design criteria.	start: Duration: 1 hour
3	Damage	use both prototypes, no need for any drilling.	We will be fastening the prototypes to a door, and applying varying amounts pressure, to see if the coating really does protect the finish.	start: Duration:1 hour

Stopping criteria

1. For the first test, the accumulation of materials will continue until the total cost meets $27.36 for either jig.
2. For the second test, we will perform drilling until the exact specifications of the client are met for both jigs.
3. For the third test, we will be applying pressure until we either see damage in the finish of the door, or damage in the clamping mechanism of the jig.

Bill of Materials

An important note for the BOM, as a group we have not decided yet if we will build our final prototype out of steel or another material yet. It will be decided during this upcoming lab. The deciding factor is if we have the time to manufacture the prototype out of a different material and the budget. For the time being, we are focused on at least making our prototype functional rather than aesthetic.

Table 2: Bill of Materials for 4.5" Hinge Jig

Component	Workhours	Labour	Material	Material Cost	Total
Base	2.25 hours	N/A	PLA	2.35in3 (38.51 grams) x $0.13/gram [1]	5.01
Base Plate	1.5 hours	N/A	PLA	0.69in3 (11.31 grams) x $0.13/gram [1]	1.47
C-Clamp Base	1 hour	N/A	PLA	0.18in3 (2.95 grams) x $0.13/gram [1]	0.38
Thumb Screw, Knurled 3/8-16x2.5L	N/A	N/A	Stainless Steel	1 x $19.00 [2]	19.00
Screw Head Mount for 3/8 thread	N/A	N/A	Plastic	1 x $1.5 [3]	1.50
				Total	$27.36

Table 3: Bill of Materials 5" Hinge Jig

Component	Workhours	Labour	Material	Material Cost	Total
Base	2.25 hours	N/A	PLA	2.35in3 (38.51 grams) x $0.13/gram [1]	5.01
Base Plate	1.5 hours	N/A	PLA	0.69in3 (11.31 grams) x $0.13/gram [1]	1.47
C-Clamp Base	1 hour	N/A	PLA	0.18in3 (2.95 grams) x $0.13/gram [1]	0.38
Thumb Screw, Knurled 3/8-16x2.5L	N/A	N/A	Stainless Steel	1 x $19.00 [2]	19.00

Screw Head Mount for 3/8 thread	N/A	N/A	Plastic	1 x $1.5 [3]	1.50
				Total	$27.36

Client Feedback

They like the C clamp idea however, with the 3d printed screw they suggested to use a real metal/steel screw from the hardware store to be able to thread the screw into the female part because using the 3d printed screw will be hard to successfully print the threading properly without failure and to thread it through without damaging it and making it inconsistent. The metal/steel screw will help us eliminate the uncertainty of getting a screw to print without failure, cut down on time and won't impact our budget very much since it will be minimal cost.

We showed them the prototypes of the other groups to compare ours with theirs. They thought that ours was the best out of all the other prototypes since we don't have any bulky structures and over complicated parts. This ensures the user-friendly approach that the client desires. Multiple groups wanted to use springs, they thought that wasn't the best idea especially if used for clamping the springs will ware and stretch which won't be cost effective if they must always replace them. So, our simple clamping mechanism is perfect since it won't ware as fast and will be more reliable over a long period of time. We also showed them a group who were using sandpaper for grip which they thought wasn't a very good choice since it would damage the finish. They liked our rubber piece on the end of the clamp since it would supply the proper amount of grip and stability to the end of the clamp to prevent any slippage as well as not damaging the wood finish. We also showed them our materials that we have decided to use. They thought it was the best we could do with the 50$ budget that we were given while keeping it durable. They did say that we should add as much metal and steel components as we can to help reinforce the jig but still stay within the desired budget.

Wrike link

https://www.wrike.com/workspace.htmacc=4975842&wr=20#/folder/1215239062/timeline3?viewId=202489442