

Accessible Tactile Graphic Printer

2nd Progress Report

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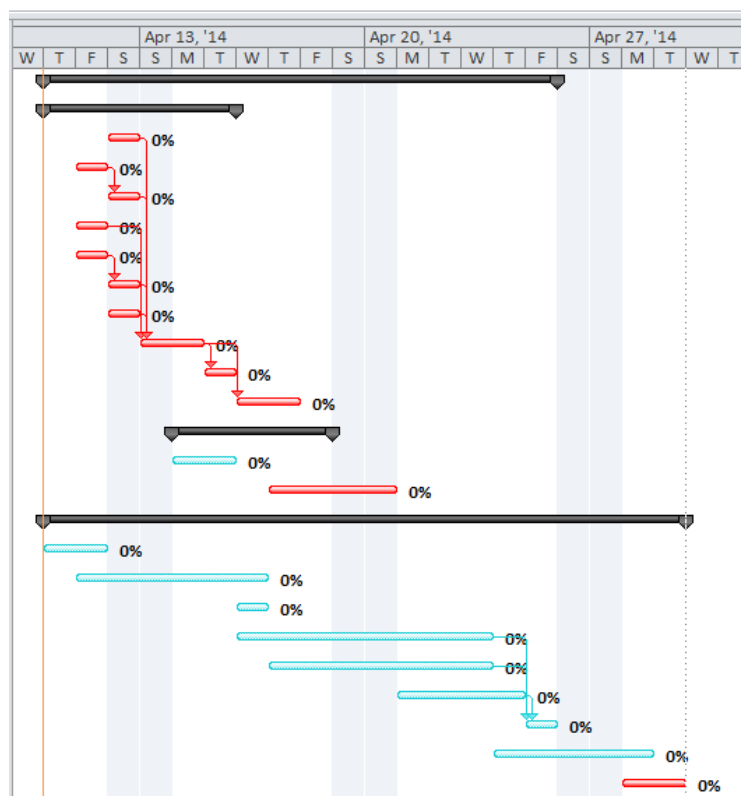


Sponsor: Resource Center for Persons with Disabilities
Faculty Facilitator: Hassan Khalil

4/10/14

After examining the progress our group has made against the Gantt chart we found that we have fallen behind. At this point in the semester we should have completed the project, but we encountered some major problems that have slowed our progress. To complete our project on time we organized a new Gantt chart (See figure below) for the next few weeks.

	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1		Tactile Graphic Printer Project	12 days	Thu 4/10/14	Fri 4/25/14		
2		Building and Testing	4 days	Thu 4/10/14	Tue 4/15/14		
3		Resolve Z axis Issues	1 day	Sat 4/12/14	Sat 4/12/14		Martez,Brian
4		Install Extruder (Hot Ends Kit)	1 day	Fri 4/11/14	Fri 4/11/14		Martez,Brian
5		Test Extruder with Filament	1 day	Sat 4/12/14	Sat 4/12/14	4	Martez,Caroline,Brian
6		Test End Stops	1 day	Fri 4/11/14	Fri 4/11/14		Caroline,Maram
7		Install Glass onto Heatbed	1 day	Fri 4/11/14	Fri 4/11/14		Eman,Alex
8		Install Heatbed on Printer	1 day	Sat 4/12/14	Sat 4/12/14	7	Eman,Alex
9		Install and Test LCD Screen	1 day	Sat 4/12/14	Sat 4/12/14		Eman,Caroline,Maram
10		Test all Components	2 days	Sun 4/13/14	Mon 4/14/14	3,5,6,8,9	Group
11		Install Electronics/LCD on Printer	1 day	Tue 4/15/14	Tue 4/15/14	10	Group
12		Test Run with Spartan Head Logo	2 days	Wed 4/16/14	Thu 4/17/14	10	Caroline,Maram
13		Print Maps	5 days	Mon 4/14/14	Fri 4/18/14		
14		Locate Map of Campus CAD file	2 days	Mon 4/14/14	Tue 4/15/14		Eman,Maram
15		Print Map of Campus	3 days	Thu 4/17/14	Sun 4/20/14		Group
16		End Game	14 days	Thu 4/10/14	Tue 4/29/14		
17		Team Design Issues Paper	2 days	Thu 4/10/14	Fri 4/11/14		Group
18		Professional Self Assessment Report	4 days	Fri 4/11/14	Wed 4/16/14		Individual
19		Demonstrate Project Prototype	1 day	Wed 4/16/14	Wed 4/16/14		Group
20		Final Reports (Print 5 copies)	6 days	Wed 4/16/14	Wed 4/23/14		Group
21		Poster	5 days	Thu 4/17/14	Wed 4/23/14		Group
22		Practice for Design Day	4 days	Mon 4/21/14	Thu 4/24/14		Group
23		Design Day	1 day	Fri 4/25/14	Fri 4/25/14	20,22,21	Group
24		Evaluation of Teammate's Contributions	3 days	Thu 4/24/14	Mon 4/28/14		Individual
25		Turn in all Lab Equipment (Laptop and Toolbox)	2 days	Mon 4/28/14	Tue 4/29/14		Group



Mechanical Kit

From the last progress report, the team managed to finish building the whole mechanical kit. While doing so, many issues were encountered. One issue was increasing the length of the Shapeoko mechanical kit. Because the team custom-ordered a larger x-axis, many of the parts that came with the kit were either useless or needed some work to increase their length. One example of this is the base for the frame. The team needed to purchase a new wood frame that is as long as the new x-axis.

Heatbed

Another issue the team faced working on the printer was the heatbed. All the available heatbeds are considerably smaller than the needed printing area. Thus, the team had to build a heatbed. After discussing this issue for a while, the team decided that the best way to do this is by buying a griddle to heat up the printing area. Afterwards, a smooth heat-resistant glass should be attached to it. A glass piece was provided by the sponsor. However, the size of this glass was an inch smaller in width and height than the needed printing area. To build the heatbed, the griddle needs to be attached to the wood frame and the glass piece to the griddle. To attach the griddle to the frame, the team decided to drill four holes and have four screws attaching the two pieces together. As for attaching the glass piece to the griddle, a heat-resistant glue could be used to put the two pieces together as the team could not afford to lose any more printing area. However, this proved to be a bad idea as when testing this design the griddle and the glass detached when heated. Not only did this idea not work, but it also ruined the glass the team was planning to use. To solve these two new issues, the team ordered a new glass piece and decided to go about attaching the glass and griddle differently. On the four corners of this glass, the team will drill four holes and use four screws screw directly over the griddle and into the wood frame. In order not to minimize the printing area, the new glass piece was made larger.

Software

Another issue we encountered was problems with our software. After many successful tests with our Marlin firmware it suddenly stopped working. We spent about a week reloading and debugging our code with no success. Finally we decided to start over with another firmware called Sprinter. This issue slowed our progress because the rest of our testing depended on working software. Once our new firmware was uploaded we modified our code and successfully ran a few tests to move the X, Y, and Z axis.

Budget extension

Since the first progress report we requested for another budget extension. When we calculated our budget at the beginning of the semester we forgot to take into consideration shipping costs. Once we received the approval we were able to proceed and buy the rest of our supplies which consisted of belts and filament.

Extruder Attachment

Since the Shapeoko 2 kit which is being used as the frame for the 3D printer was originally designed to serve as a CNC mill, alterations needed to be made to accommodate the extruder assembly. The z-axis carriage for the Shapeoko by default is designed for a drill to be attached, however in this particular printer, an extruder would be utilized instead. Therefore, an extruder attachment construction was necessary to attach the extruder assembly to the z-axis of the printer. The first extruder attachment design consisted of using a half-inch thick square piece of plywood cut slightly larger than the area of the z-axis carriage extension. The original screws for the extruder assembly which fastened the extruder to the stepper motor were to be replaced with longer M3-.8 thread screws to compensate for the additional half-inch created by the plywood, which would now connect the stepper motor, extruder and plywood together. Next, with the piece of plywood serving as the base for the extruder, it would be affixed to the z-axis carriage extension using the initial M5 screws, in which case these didn't need to be

replaced because they were already of adequate length. However, upon drilling the appropriately sized holes into the plywood to insert the screws, the team encountered quite a bit of difficulty obtaining the desired metric screws of the required length to complete this attachment. Hence, a simple modification was manufactured to solve this issue, the half-inch thick plywood was replaced with a quarter-inch thick piece of plywood in which case the metric screws of the desired length were easier to obtain. The team was then able to successfully attach the extruder to the z-axis carriage.

Built a glass box to put all the electronics and LCD

A metal case with a glass front will be used to house the electrical components of our 3D printer. This includes the LCD display, Arduino MEGA 2560 microcontroller, and RAMPS stepper drivers board. This case will keep our sensitive electronics out of harm's way while still allowing maintenance if necessary. A glass front covering was chosen to be able to provide an aesthetically pleasing display and still allow use of the LCD component.