Sean Ding

Mr. Speice

ISM I

2 March 2018

Product Proposal

For my final product I am proposing to somewhat expand upon my previous research and original work as well as create something quite different as I did for my original work. For starters, I would like to continue expanding upon the topic of 3D printing as I did previously, but this time I plan to focus more on 3D printing rather than CNC machining as I did not find much success or info on the subject. I also want to focus on the tolerances and accuracy of 3D printed parts once again as they are crucial aspects to consider in the design, creation, and application of 3D printed parts. In addition, I would also like to focus on the rapid prototyping aspects of 3D printing once again, but this time showcasing more revisions and the time taken to create each part. For the actual final product itself, I am proposing to take into account the dramatically reducing costs of 3D printers, the research I have done on the rapid prototyping capabilities of 3D printing, the various materials involved with 3D printing, and of course: the application of 3D printed parts in both industrial as well as commercial applications. To do this, I plan to assemble a 3D printer from scratch, design and print several parts showcasing rapid prototyping, compare the quality of these prints when created with commercial 3D printing, and showcase improvements that can be made to 3D printers to improve quality significantly.

With this final product, I plan to combine the research I have done in the past with CAM software, reverse engineering, product design, rapid prototyping, printed accuracy, and FDM

printing, with the interviews I have also conducted in the past which were all pertaining to various aspects of engineering and 3D printing. I also plan on taking the things I learned from my experience with my original work and implementing them into my final product such as the process of designing parts, measuring tolerances, and the process of knowing how something works “on paper” vs. “in practice”. From my research in the past I learned about the various processes of designing parts specifically for FDM printing, the accuracy of 3D prints, and rapid prototyping. In my final product I will have to keep the design process in my own mind when designing certain parts to demonstrate rapid prototyping capabilities, measuring the accuracy of 3D prints and designing to account for various factors such as shrinkage, and having to create multiple revisions of a part using rapid prototyping. From many of my interviews I also learned about the bright future for 3D printing as prices begin to drop lower and lower, leading to a more consumer-oriented market. By choosing to create a 3D printer from scratch, I will showcase either the difficulty or relative simplicity of creating a seemingly complex machine.

For the actual creation and design process of my product, I must first acquire the parts needed to build my printer. Once acquiring the parts, I then must assemble the printer properly, but during this phase I will have to take into account the difficulty of the assembly and how this difficulty may affect the viability of the printer amongst less technologically savvy people. Luckily, there are several readily-available guides and organized communities for building such printers which I can use to my advantage. During this assembly phase I will have to create a CAD model in order to understand the placement of each component. After assembly, I will then have to use the Solidworks software once again for the design phase of my product. During this phase, I plan on creating parts which demonstrate various aspects of 3D printing as I did in my

original work such as with the inclusion of support material and “impossible structures” while also including factors such as cost, limitations, rapid prototyping, and accuracy. Some potential designs for this may include parts with overhangs, complex shapes or designs, and multiple revisions of a design before a final stage. After designing these parts, I will then have to print them first on the assembled 3D printer, then compare these parts to those printed on either a pre-assembled printer or from a commercial 3D printing service. I will then try to create various improvements such as brackets which I hope will greatly improve quality of the 3D printer and then once again compare these to the commercially created parts. During the “improvement stage” when I have to create brackets and various other improvements, I will also showcase the rapid prototyping capabilities of 3D printers by making several revisions and improvements to the design itself.

For the actual materials which will be required for this ambitious project, I will have to once again utilize the Solidworks software as I did in the past with my original work, materials and parts to build a 3D printer, a commercial 3D printing service such as 3D hubs which I had done research on previously or use of a pre-assembled printer, and various FDM filaments such as PLA or ABS. Regarding the cost of each of these, I will not have to pay for Solidworks as I had acquired an educational license for free, but for the 3D printer itself I have calculated the total cost of the parts to be roughly $160. For the commercial 3D printing service I anticipate the costs to be around $50 as the combined cost for every part or much lower if I can find a local option or someone with a pre-assembled printer, and for the various filaments I aim to spend about $15 on each roll or material of my choosing which in this case would be one roll of ABS and PLA or possibly a flexible filament. My total estimated cost for this project is to be around

$100-220 considering if the cost of the ordered 3D printed parts will be as low as I anticipate them to be. While this cost may seem high, it is still a significant improvement over the cost of 3D printers just a few years ago when they were nearly $3000.

For the most part, my main takeaway from the creation of this final product is to learn more about the future of 3D printing and FDM printing and its application in the real world. From the assembly process, I will be able to learn roughly how cheap or how expensive 3D printers may be while also being able to understand sort of the difficulty required to assemble a seemingly complex machine. I also plan to learn more about various CAD modeling techniques I can use which will both save material costs as well as time for manufacturing and methods which make the 3D printing process more efficient. I also want to evaluate how similar low-end to mid-range 3D printers are becoming to high-end 3D printers in terms of cost to quality ratio and overall aesthetic appeal as well as safety. From this product I also hope I can adequately demonstrate the rapid prototyping capabilities of 3D printing which have already had a significant impact in the engineering world. I also hope that with this product I am able to show the capabilities of 3D printing to the fullest extent as both an engineering tool as well as an educational tool in my community. I hope to help educate others on how 3D printing works as a process, how it can be used in everyday life as well as industries, and how it can help us interpret things in a physical manner rather than digital. I hope that my findings will also open the possibilities for more application of 3D printed parts in other fields of engineering other than mechanical and possibly influence others to take part in this innovative technology. While this final product may be just another creation I make in ISM, I also aim for it to have a lasting impact on those around me.