Jason Li

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Section 3

FINAL DESIGN

PROJECT DESCRIPTION

The goal of this final project is to collaboratively design and manufacture a large-scale statue/bust using CNC machining. Due to size limitations, the project involves splitting the structure into 3" x 2" x 2" blocks, with each sub-team responsible for designing and milling specific blocks. The final assembly will be evaluated based on design fitment, material wastage, and peer evaluation.

Upon importing the STL file of the scanned miniature bust into Fusion 360, our team went on a post-processing journey to ensure a clean and workable model. We strategically chose a miniature bust with simpler features, minimizing concave and intricate shapes, as well as edges. When using the software to scan the bust we used certain operations to optimize. The Repair operation proved essential in addressing any missing holes or irregularities in the bust's geometry. This step was crucial for ensuring a complete and accurate representation of the scanned data. To refine the mesh and enhance its quality, we applied the Remesh operation. This helped to achieve a smoother and more uniform representation of the miniature bust, eliminating unnecessary complexities. The Reduce operation played a pivotal role in

optimizing the mesh by eliminating excess details without compromising the overall shape. This step was particularly useful in streamlining the model for efficient machining. Furthermore, the process of converting the mesh body, imported as an STL file, to a solid body was a crucial step in preparing the bust for use in AutoCAD. By transforming the mesh into a solid body, we ensured a robust and well-defined 3D model that could seamlessly integrate into the subsequent design and milling processes. The overall goal of this process was to clean and analyze the head, ensuring that it could be utilized effectively in AutoCAD for further modifications and design considerations. Although are first file was used, if given the opportunity to modify the bust further, our team would have introduced more straight edges instead of the curved and round parts. This modification aimed to simplify the milling process, making it more straightforward and efficient. Additionally, we decided to flatten the base of the bust to facilitate stability when standing upright. With the file imported to AutoCAD with precision and optimization, our team carefully measured and analyzed the miniature bust to devise an effective strategy for splitting it into 12 individual blocks. The chosen blocks were Face, Right Head, left Head, right Upper torso, left Upper torso, center Upper torso, right Lower torso, left Lower torso, center Lower torso right, Base right and Base left. This division allowed us to maximize the use of all 12 blocks provided to us, ensuring an efficient and comprehensive utilization of the milling resources. Each block was strategically defined to capture specific features of the bust, enabling a cohesive and systematic approach to the CNC machining process.

I was tasked with milling the face block of the bust, initially thinking it would be a straightforward task. However, challenges arose during the setup and milling process. The face, being a critical feature, demanded careful consideration and precision. During the milling process, I made some modifications to the block. Firstly, in the setup, I ensured that the level of detail chosen for the AutoCAD import was optimal—neither too highly detailed to avoid excessive milling time nor too low to maintain the essential features. Within my block (the face), I strategically added extrusions to enhance clamping for a tight and stable grip on the 3" x 2" x 2" block, crucial for accurate milling. When configuring the setup in Fusion 360, I defined the point of axis for the mill initiation and configured the setup for the

given block's dimensions. For clamping, I used 1 by 3/8 spacers to secure the block, ensuring a tight clamp and preventing any movement during the milling process. In terms of tools, I utilized a 1/4 flat end mill for the initial front face milling and employed a 1/16 taper mill for fine detailing of the face. I adjusted the step size to reduce milling time in subsequent processes. The difficulties faced during milling were related to excess block clearance. Challenges arose due to an offset setup for the front face, prompting me to modify the setup for the z and x directions to address this issue. Another challenge was the limitation in milling drill length, which became apparent midway through the process. I had to emergency stop the mill to find a solution. The solution to the milling drill limitation involved placing an additional wooden block under the unmilled excess to create stability. This ensured a secure clamp with straight edges, preventing instability during milling.

In conclusion, despite facing various challenges and unexpected obstacles throughout the milling process of the face block, our team persevered and successfully navigated the complexities. Unfortunately, due to time constraints and unfinished parts, we encountered limitations in assembling all the blocks. However, the experience provided valuable insights into the intricacies of CNC machining and collaborative project work. It emphasized the significance of meticulous planning, adaptability, and efficient problem-solving to overcome hurdles and achieve project goals. Furthermore, there were a lot of things learned in this project. Firstly, the importance of time management became evident as the intricate nature of the milling process required careful planning and execution. Secondly, the necessity for flexibility and adaptability was highlighted, especially when unforeseen challenges arose during the milling of the face block. The incomplete assembly served as a valuable lesson in setting realistic goals and expectations within the constraints of the project timeline. Overall, the experience deepened our understanding of CNC machining, emphasizing the need for collaboration, attention to detail, and effective communication within a team setting.

Teammate Name	Assessment	Reason
Baraa	The collaborative efforts of Baraa, Dillon, Sterling, Andrew, Vivek, Jose, and Kenny created a success and hardworking team. Each member actively contributed to the project, demonstrating strong technical skills, problem-solving abilities, and a positive attitude. The team's cohesive approach and mutual support were key factors in overcoming challenges and achieving success. Overall, it was a pleasure working with a fun group.	N/A
Dillon		N/A
Sterling		N/A
Andrew		N/A
Vivek		N/A
Jose		N/A
Kenny		N/A

FEEDBACK

The project taught us a lot, but we realized we need more time to finish assembling all the blocks, especially with the challenges we faced while milling the face block. The complex design of the chosen to bust unexpectedly made things tougher, and we think using a simpler design could be better for completing the project successfully. Despite these challenges, the project introduced great concepts and provided a fantastic learning opportunity, helping us grow and develop our skills.