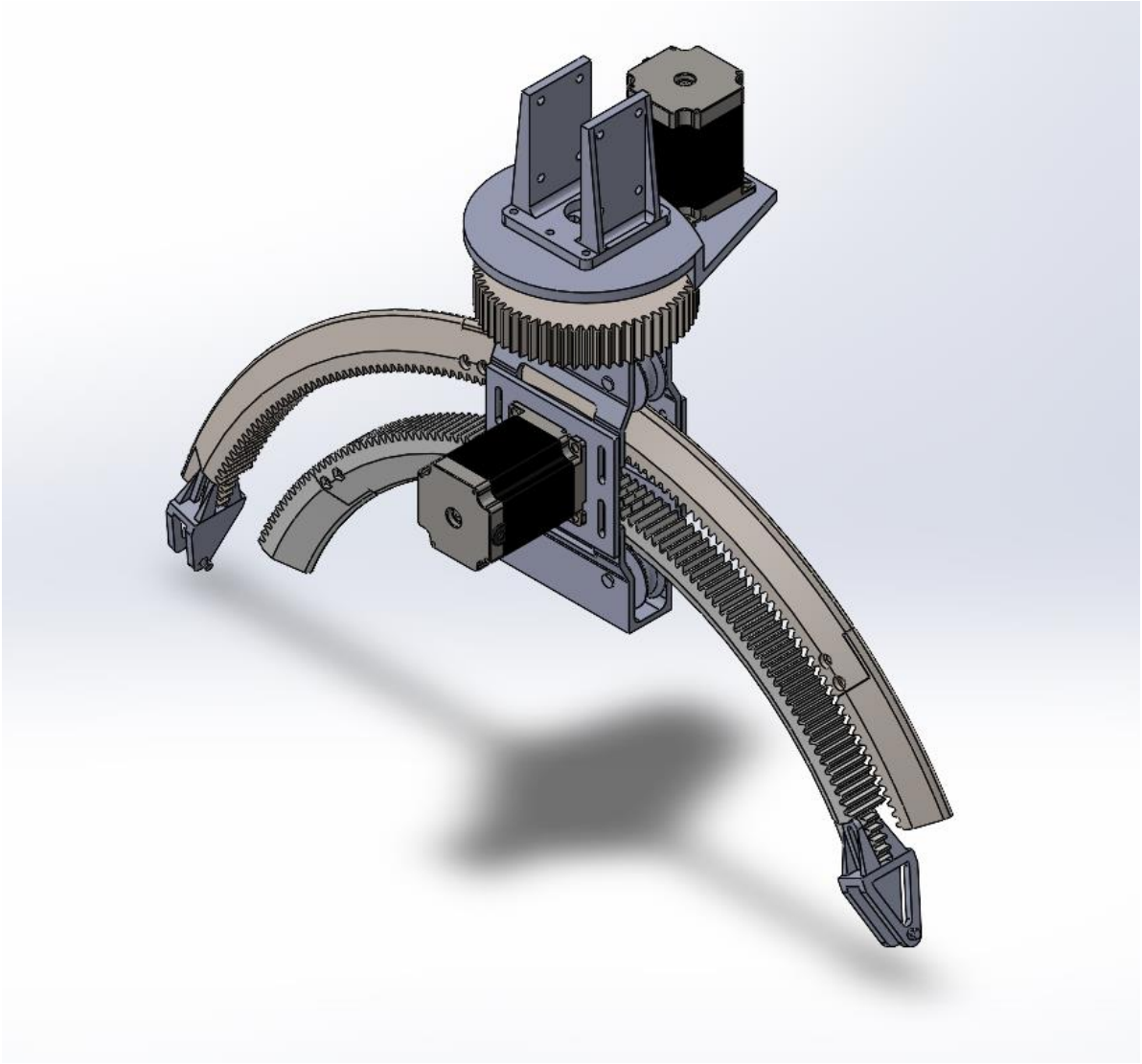
3D Head Scanner Powered by Polycam

Project Portfolio



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Mechanical Engineering Student at Queen’s University

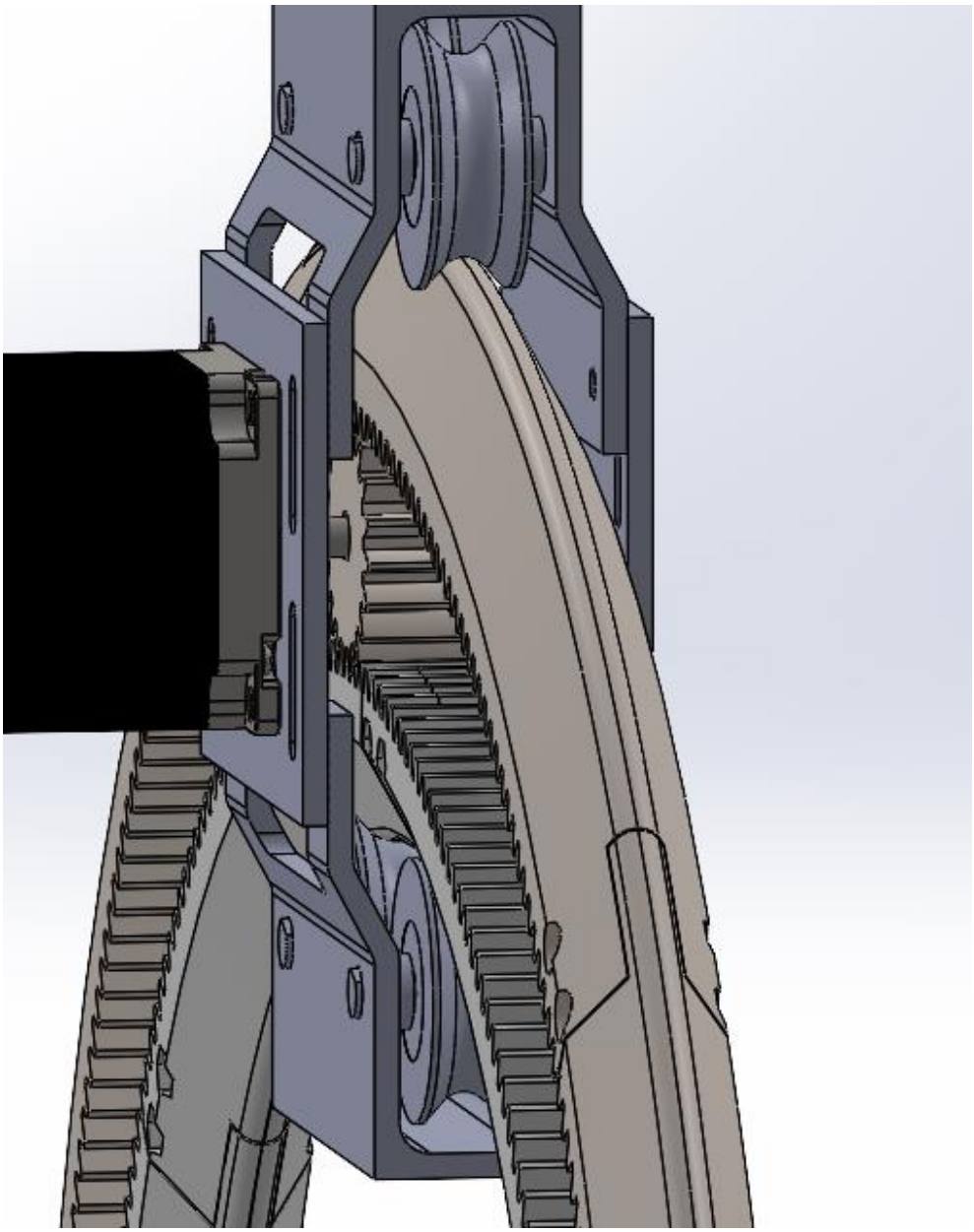
Soft skills:
Mechanical design, Additive Manufacturing knowledge
Technologies:
SolidWorks, Bambu Slicer software

My personal passion project, the 3D Head Scanner, aims to accurately digitize faces. This device captures intricate details of human features, enabling a high level of precision that could be used for various applications. One significant area is the creation of customized prosthetics, where detailed scans can lead to the ability to more accurately recreate a person's facial features, and to better-fitting devices tailored to the unique contours of an individual's face. additionally, the scanner could facilitate the development of personalized digital avatars for use in virtual environments, and the opportunity to digitize memories with more depth and dimensionality of a person's features than traditional photography.

The device utilizes the iPhones Lidar scanner in conjunction with the Polycam app to capture accurate 3D scans of human heads. This project involved designing a custom mechanical setup that uses a system of two NEMA 23 Stepper motors to control the rotation in the vertical axis, and circular panning motion. The integration of various components, such as stepper motors for smooth movement and a sturdy frame for stability, showcases my hands-on skills in mechanical design and engineering.

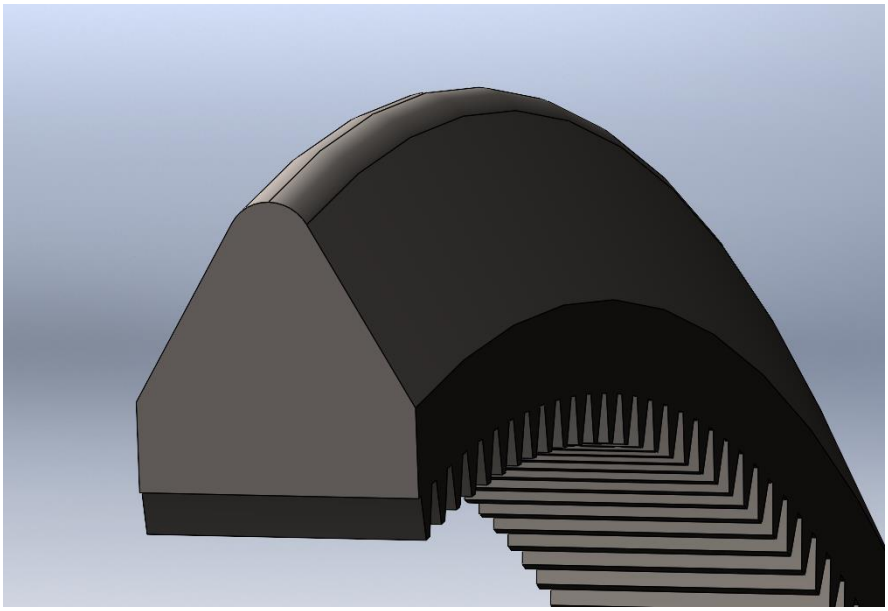
Through this project, I explored the intricacies of additive manufacturing, employing 3D printing to create the scanner's components. The end result not only enhances my understanding of 3D modeling and scanning technologies but also exemplifies my commitment to innovation in mechanical design. This head scanner serves as a testament to my ability to bring concepts to life, bridging the gap between theoretical knowledge and practical application.

Lower Panning Assembly



The head scanner features two mechanical systems. The lower stepper motor controls the circular panning movement of the two arms, which move in opposition on opposite sides of the driving gear. The arms move along a pair of bearing rollers, supporting under and above the lower and upper arms respectively.

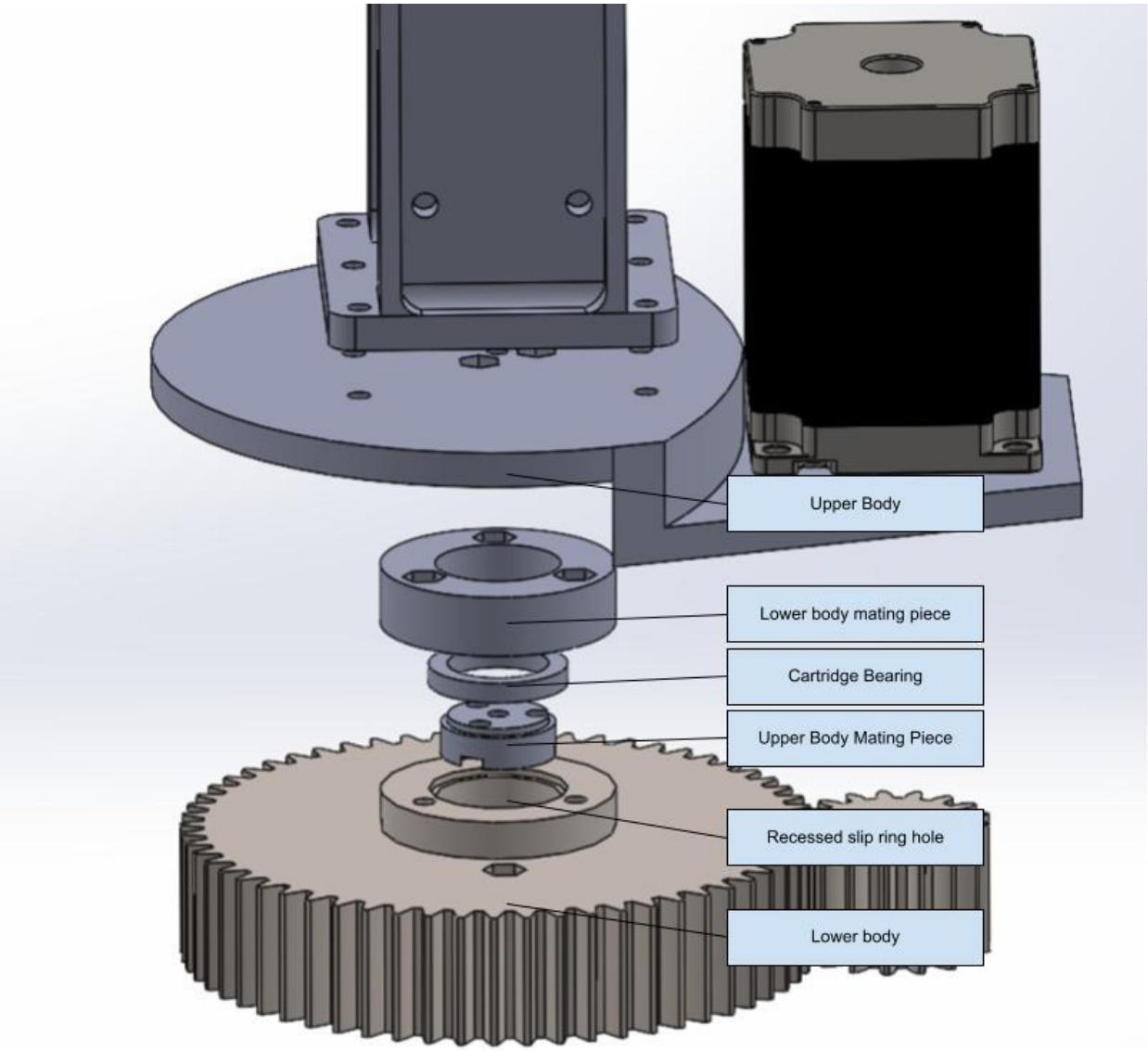
The assembly was designed with a double-arm system to include a counterweight that actively moves in opposition to the phone, maintaining balance and allowing smoother movement of the upper assembly.



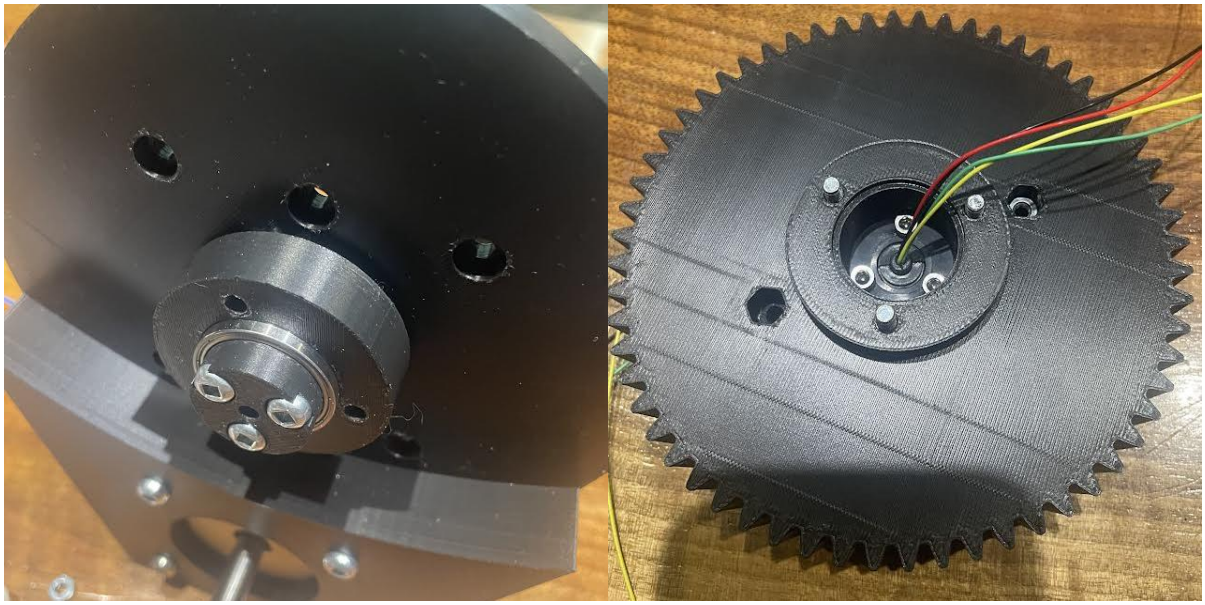
I designed the side profile of the arms in a triangular shape, eliminating the need for additional rollers to support the lateral movement. This prevents unwanted flexing or wobbling during operation and simplifies the overall assembly by minimizing the number of components required.

Restricted by the bed size of the 3d Printer, each arm is made in segments and held together by m4 nuts and bolts with recessed holes for each.

Upper Rotational Assembly



The rotation of the lower panning assembly is supported by a 20x27x4mm cartridge bearing. The upper body is secured to the inner bearing race through a mating piece with a bearing retaining circular cutout, with the same dimensions as the cutout on the upper body. The lower body is designed with a recessed cutout to accommodate the outer bearing race, and another mating piece that mirrors this cutout for precise alignment.



The retainer for the upper assembly also includes a cable passthrough for wires from the slip ring, which is mounted into a recessed hole in the lower body. The slip ring enables control of the lower stepper motor while allowing electrical signals and power to pass through the rotating joint without twisting the wires, which would otherwise limit the range of motion.