Droid Hand/Foot Project

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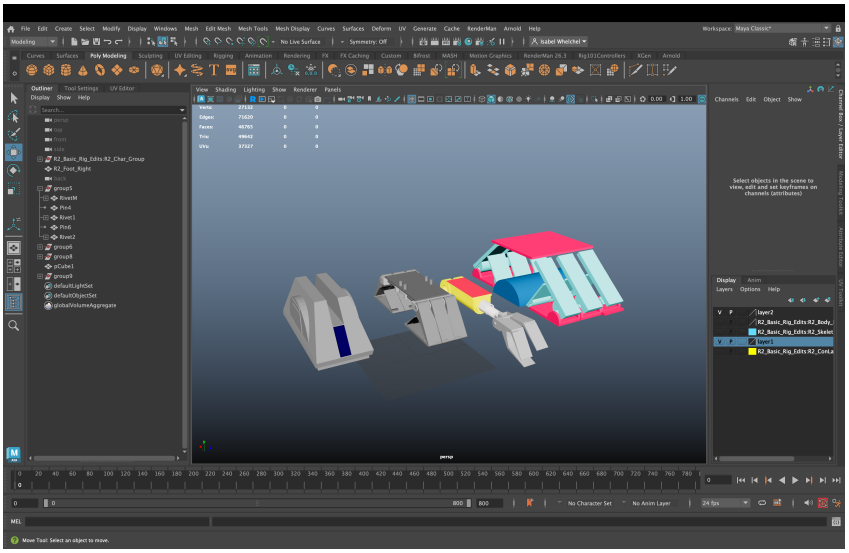

Fig. 1. This is the final design along side all reference material used. From left to right: R2-D2 foot model, the final hand model, WALL.E hand model and the prototype TinkerCad model.

The goal of this project was to take a traditional wheel appendage and adapt it to be multifunctional as both a wheel and a human-like hand. In this project, I chose to reimagine the 'foot' of the droid R2-D2, with the intention of 3D printing the final product.

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Additional Key Words and Phrases: Do, Not, Us, This, Code, Put, the, Correct, Terms, for, Your, Paper

ACM Reference Format:
Isabel Whelchel. 2025. Droid Hand/Foot Project. In *Proceedings of Make sure to enter the correct conference title from your rights confirmation email (Conference acronym 'XX)*. ACM, New York, NY, USA, 5 pages. https://doi.org/XXXXXXX.XXXXXXX

*I did another thing.

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Conference acronym 'XX, April 22, 2025, College Station, TX

ACM ISBN 978-1-4503-XXXX-X/2025/04
https://doi.org/XXXXXXX.XXXXXXX

1 INTRODUCTION AND RELATED WORKS

I started my process by making a rough mock up of my idea in TinkerCad. I initially had the idea to take this prototype into a CAD program such as AutoCAD or Fusion to further iterate upon, but I decided to use Maya instead due to its familiarity. In my design, I wanted to keep the same triangular profile as R2-D2's foot, but I also wanted the foot to be able to "unfold" into a hand. After playing around with my design, I decided to look up some references that were similar to the idea I was going for, and by chance I happened upon someone's CAD model of the robot WALL.E's arm. Since the hands for this model were similar to my prototype, I decided to import this model to use as a launching point for my second iteration. I then deconstructed this model and began tweaking various elements, through the manipulation of faces and vertices, to better match my first prototype. I added an additional joint than what was originally in the WALL.E model to better fit with an anatomical human hand.

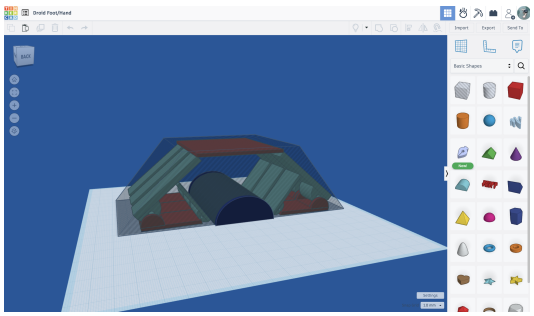

Fig. 2. This was the test model I had roughly put together to "sketch" out my idea. I used a transparent trapezoid to represent R2-D2's foot shape that I needed to keep the design contained within.

2 METHODOLOGY

There was much time spent on making sure my model didn't clip through itself while in motion. This involved smoothing edges so they would glide past each other and creating notches in other models where smoothing wasn't sufficient. My initial plan for this model was for it to be 3D printed, so I tried to keep this in mind when modeling in order to keep the model functional for the physical world. While I was not able to print the model at this time, I am curious to see how it will turn out if I were to try printing it in the future. I started my design with just the center finger and then proceeded down the finger-joint chain. From here I duplicated the completed finger and tweaked these based on their position in the foot. I then had to design a "pin board" in order to anchor the fingers down and allow for the outer fingers to rotate backwards towards the front of the foot to imitate a human pinky finger and thumb when fully unfolded.

3 RESULT AND FUTURE WORK

I feel that my final result came out quite nicely and closely replicates what I had initially envisioned, despite having very little reference to rely on outside of the WALL.E hand model downloaded. The fingers themselves turned out much longer than I had expected, so this adds a bit of an uncanny effect to the design when used as a hand. The design also left enough room in the center for a motorized wheel mechanism, so I'd be curious to see if this could be feasible for use in a robotics project in the future.

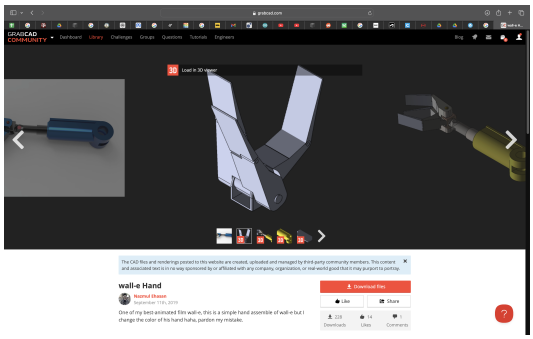

Fig. 3. I am eternally grateful for whomever made the WALL.E hand model I referenced in my final. It sped along the design process exponentially by having some kind of baseline to start from.

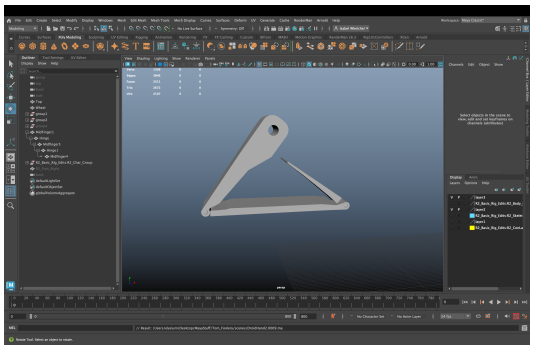

Fig. 4. After much tweaking, I finished the middle finger. This was a tedious process of making changes, testing and revising. I wanted to ensure the model had the same limitations as a human hand while still maintaining its mechanical properties.

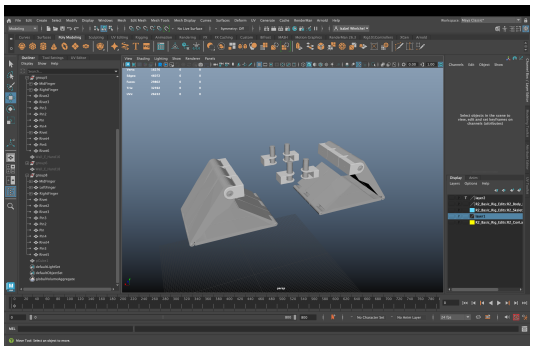

Fig. 5. I began the process of plotting out where the swiveling finger system would go in the model.

4 CONCLUSION

In conclusion, I would love to further explore this prototype to see if it could become a functional replacement for R2-D2's current foot setup. I would also like to see if this idea could, in the future, function as a basic 3D print or potential robotics project.

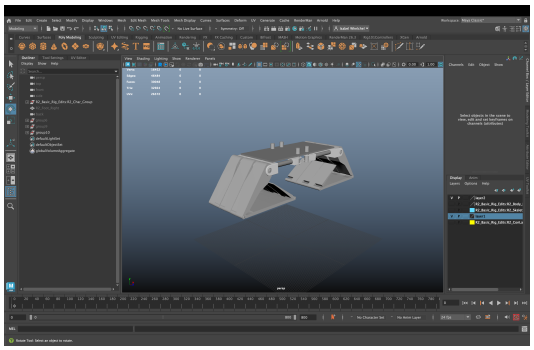

Fig. 6. This is the completed model.

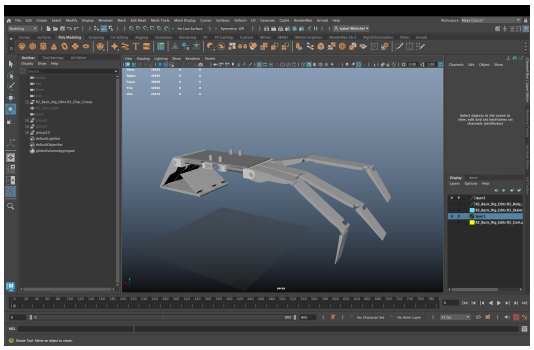

Fig. 7. Final model with front fingers extended.

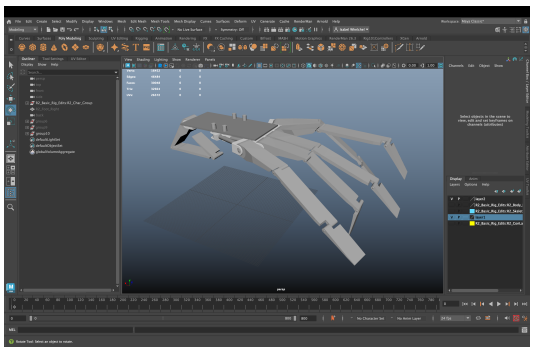

Fig. 8. Final model configured into a human hand. Both fingers from the back swivel forward to act as a human pinky and thumb.

ACKNOWLEDGMENTS

I would like to thank Rockstar Energy for keeping me awake.

WALL.E CAD model can be found here: https://grabcad.com/library/wall-e-hand-1/details?folder$_id$ = 6981378

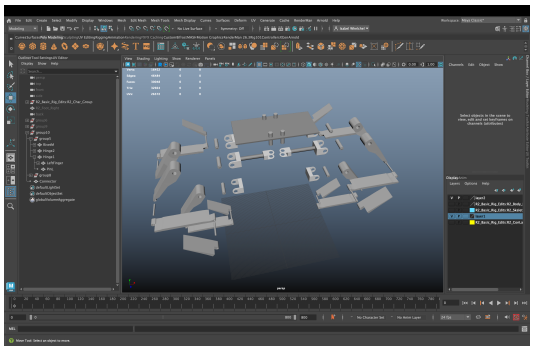

Fig. 9. Final model with all parts exploded

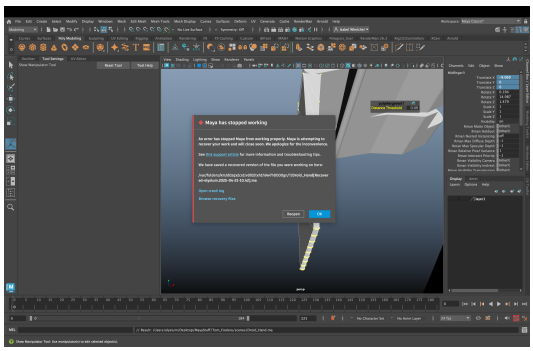

Fig. 10. Obligatory Maya Crash Screen.

REFERENCES

Received April 22, 2025; revised April 22, 2025; accepted never