

My Approach to the Möbius Strip Project

1. code structure

To organize my work, I created two main functions:

⇒ `Generate_möbius`: This function is responsible for generating the Möbius strip using the given parameters. It takes care of the mathematical representation and ensures the strip is built correctly in 3D space.

⇒ `calculate_area`: This function handles the surface area calculation. It integrates the small differential area elements across the surface of the strip to find the total area. This required some careful setup, as I needed to get the integration boundaries and the math just right.

2. Surface Area calculation.

For the actual computation of the surface area, I used numerical integration methods provided by the Scipy library, which made the process more efficient.

Here's how I approached it:

First, I extracted the necessary coordinates from the parameterized surface using variables u and v .

Then, I used `scipy.integrate dblquad`-a double integration method-to evaluate the total area based on those parameters.

This part was both challenging and rewarding, as it allowed me to see the mathematical theory come to life through code.

3 challenges I Faced

- Of course, no project is without its hurdles! A couple of things were particularly tricky:
 - Defining the Domain of Integration:
Getting the limits and setup for calculate-area-just right took several attempts. I had to do a fair bit of experimenting to figure out how to correctly describe the surface so that the integration would produce accurate results.
 - Vertex ordering in `generate_mobius`:
Another issue I encountered was with the ordering of the vertices in the strip. Ensuring they were correctly aligned was crucial to avoid strange visual glitches or incorrect geometries. It took some trial and error, but I eventually figured it out.

Finaly Thoughts

This Project taught me a lot-not just about Möbius strips, but about problem-solving, numerical methods, and importance of structuring code well. It was a great exercise in applying mathematical concepts through programming.