

Additive Manufactured Fractal Antenna

Samuel Cappelli, Cameron Syersak, Jonathan Mudrinich, Mason Shaulis, Robert Dixon
Dr. Pedro Cortes

Abstract

Fractal antennas are communication systems that are used in commercial and military sectors. One potential application of these fractal antennas is the incorporation into an aircraft's structure as a means to enhance communication performance. To accomplish this, it is necessary to embed the antenna into a 3D structure, which can be achieved with additive manufacturing. Hence, this project investigates this consideration based on a 3D printing technique to create the prototype. A fractal design has been assembled inside a polymeric printed specimen, with the antenna being constituted by a conductive silver ink. It is expected that this prototype can be enhanced into a more robust structure via 3D printed binder jetting process. Ultimately the fractal design will be embedded into an aerodynamically shaped TiO₂ structure, with the antenna created using a casted molten metal.

Project Goals & Purpose

To combine the capabilities of additive manufacturing, metal casting and fractal antennas such that a novel solution is implemented to reduce weight and improve functionality of current systems

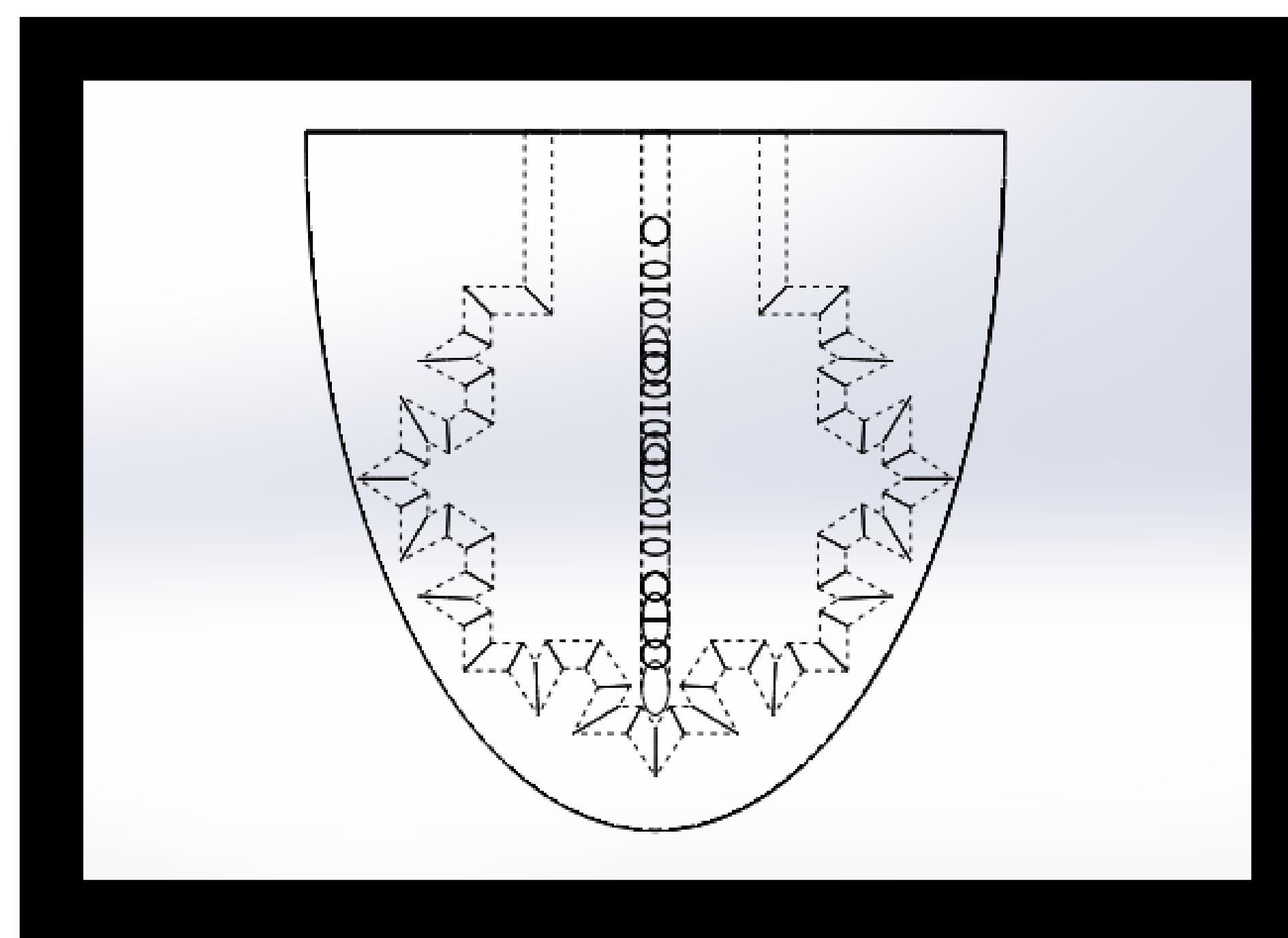
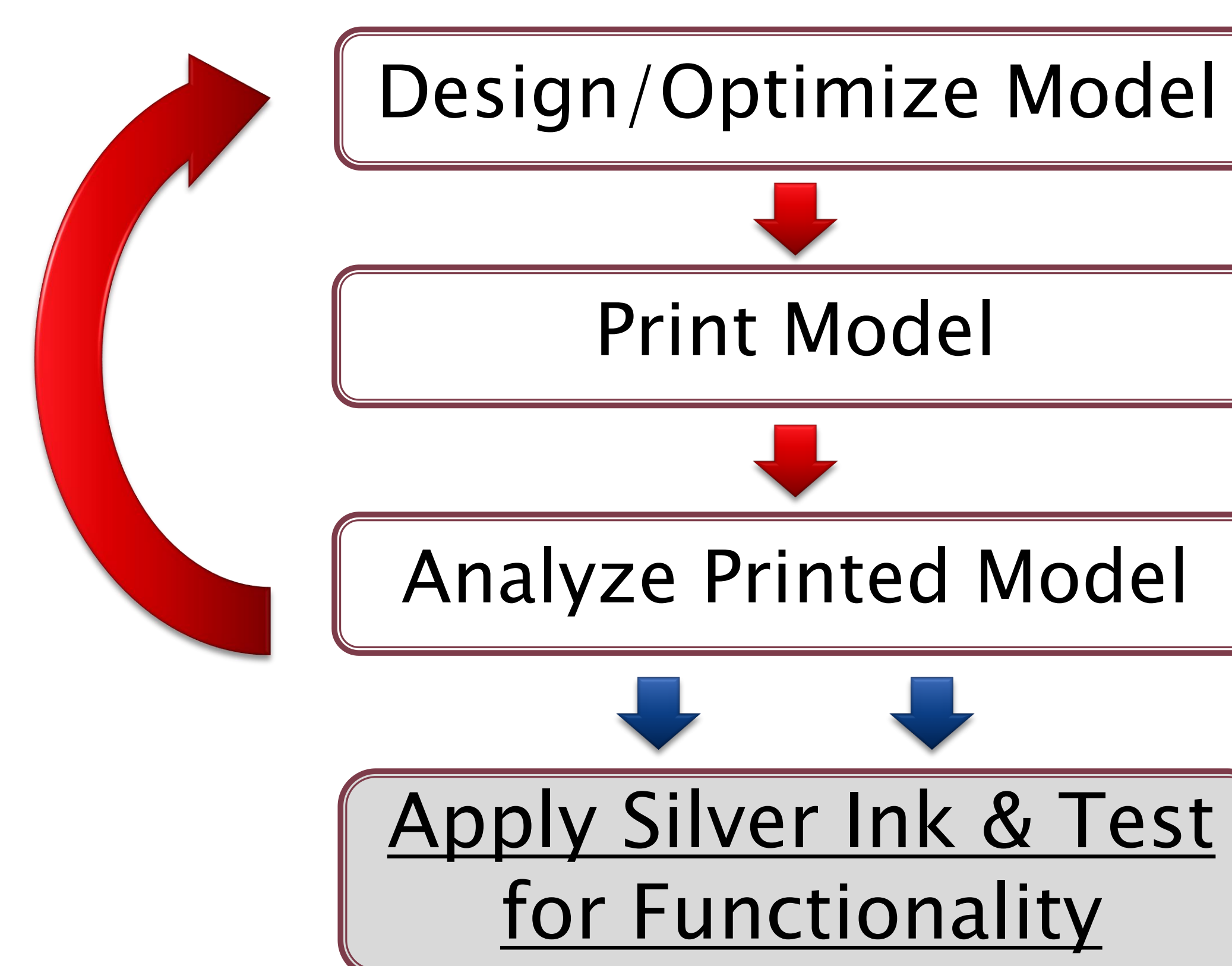
Project Goals:

- Design prototype with embedded system
- 3D print these prototypes using polymers with silver ink as the antenna
- Enhance design for a functional, real-world implementation



CreatorBot Printing System

Methodology



Current Fractal Antenna Design

Project Results & Conclusions

As of March 31st, 2017, five iterations of prototype models have been drafted, printed, and reviewed. A final design was chosen, and will soon be embedded with silver ink, and tested.

Project Conclusions:

- Embedded Fractal Antennas can effectively be 3D printed
- Using materials like TiO₂, similar designs can be incorporated into real-world aerospace applications

Applications & Future Research

Based on project success, implementation into aerospace technologies is a promising concept that will be investigated further.

Additional research will see the continual improvement of the current design, the manufacture of prototypes using different materials, and reveal cost benefits of replacing traditional antenna design with fractal antenna technology.