

HF Antenna Manifold Data Visualization

James Wang - Westwood High School - Austin, Texas
 Supervisors: Amy Fleischmann and David Rainwater
 Space and Geophysics Laboratory



Background:

Numerical Electromagnetics Code (NEC) is a software commonly used to model antennas and antenna systems. It outputs thousands of lines of numbers, detailing information such as:

- Frequencies tested
- Radiation patterns
- Antenna geometry
- Excitation points
- Electric fields

Introduction/Objective:

Although NEC output visualization programs do currently exist, they do not suit our needs for the following reasons:

- Expensive
- Undocumented
- Untraceable intermediate steps
- Outdated
- Platform dependent

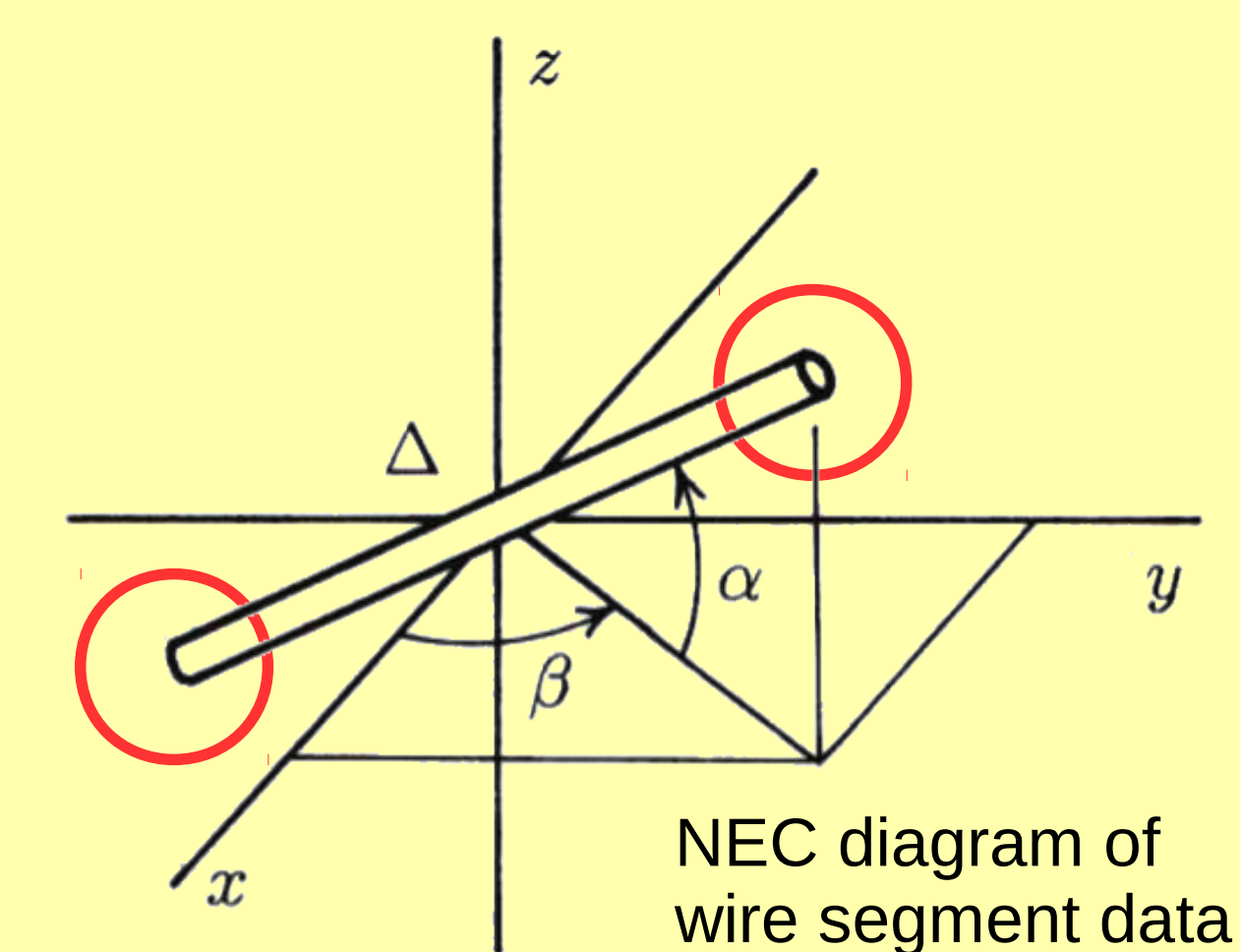
Therefore the goal of this project is to write a Python 3D visualization tool for the latest version of NEC (NEC-4). It should suit the needs of researchers at ARL and be modular in nature, which allows for smooth integration in the future.

Results:

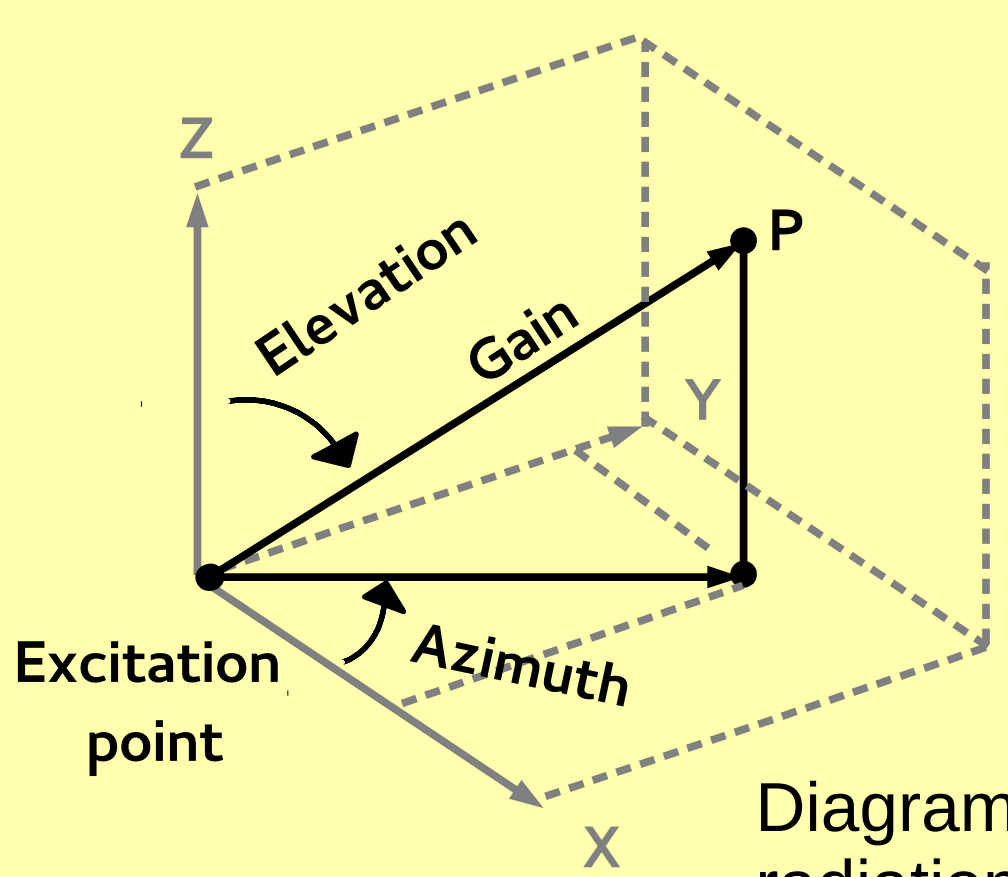
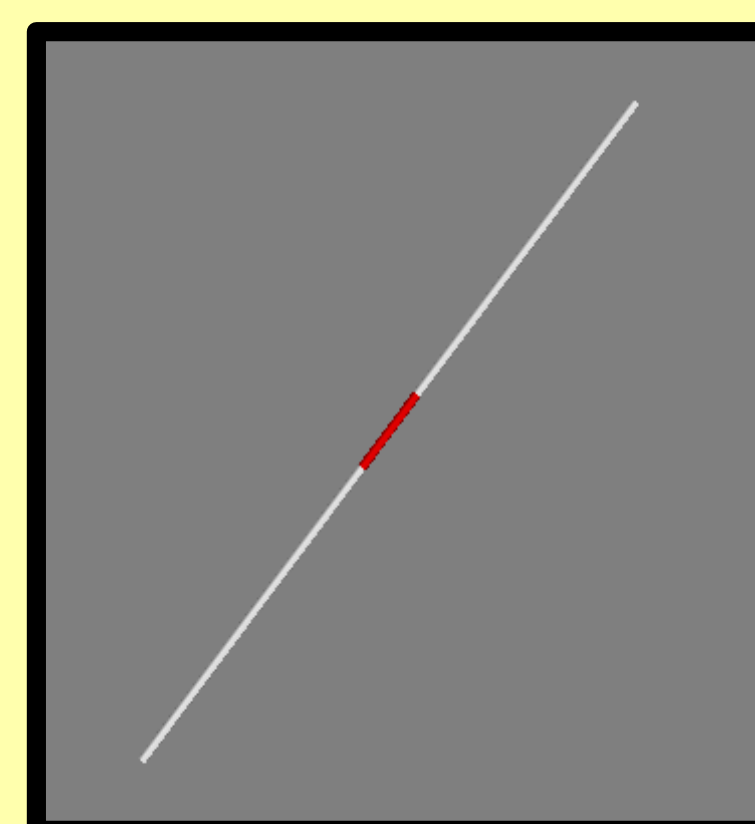
We successfully developed a program that visualizes NEC-4 output. To do so we used Mayavi2, a Python 3D visualization module. The finished tool has several features, including:

- Object toggles that control antenna, gain pattern, electric field, and axes visibility
- Interactive sliders that manipulate frequency, elevation, and azimuth
- Camera reset button for orientation

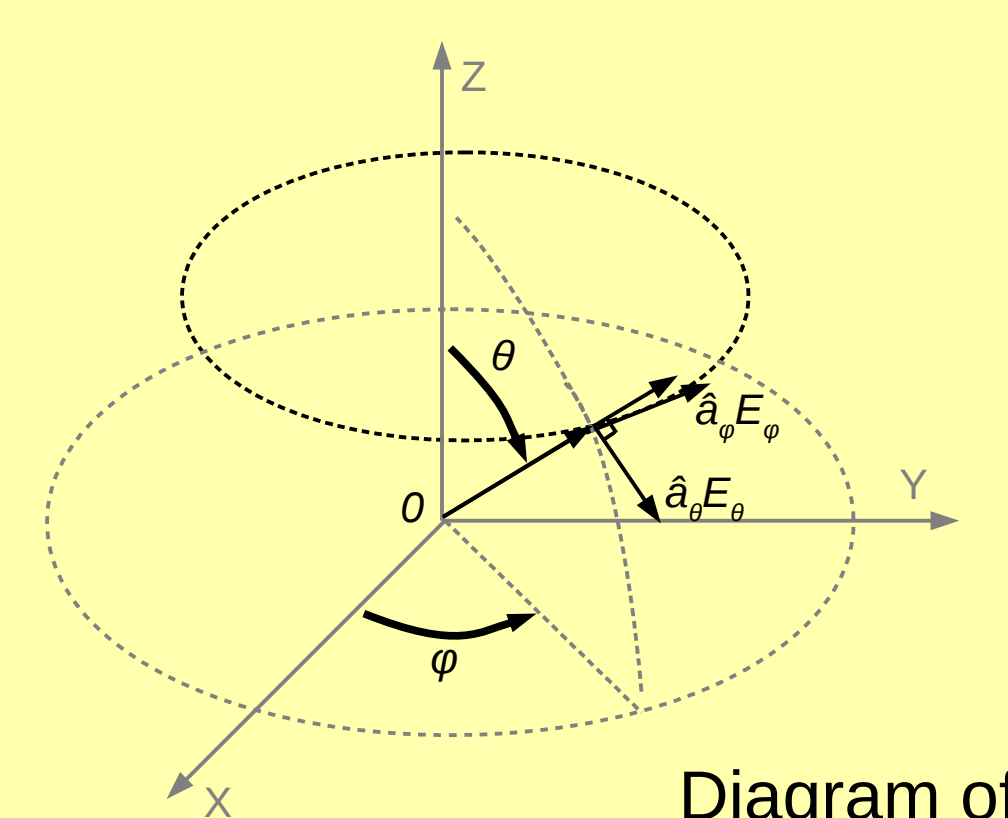
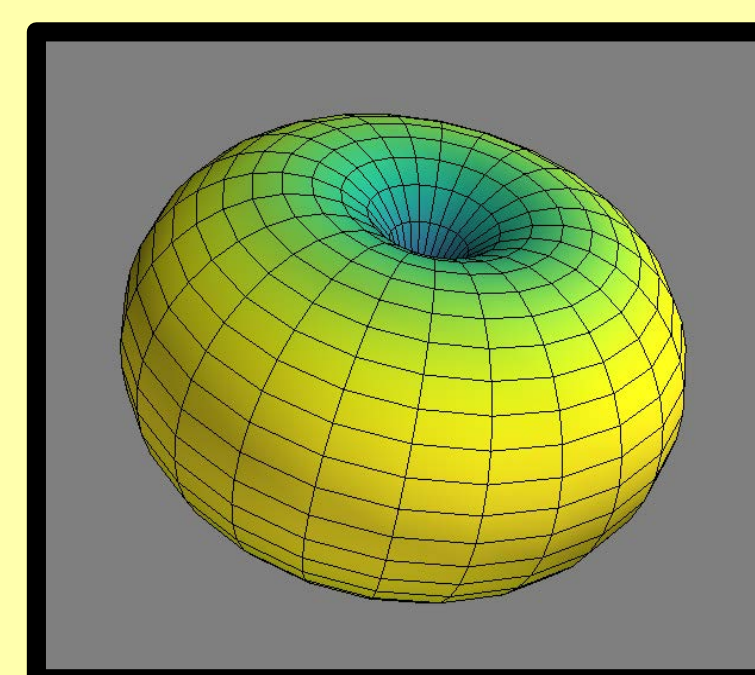
Approach:



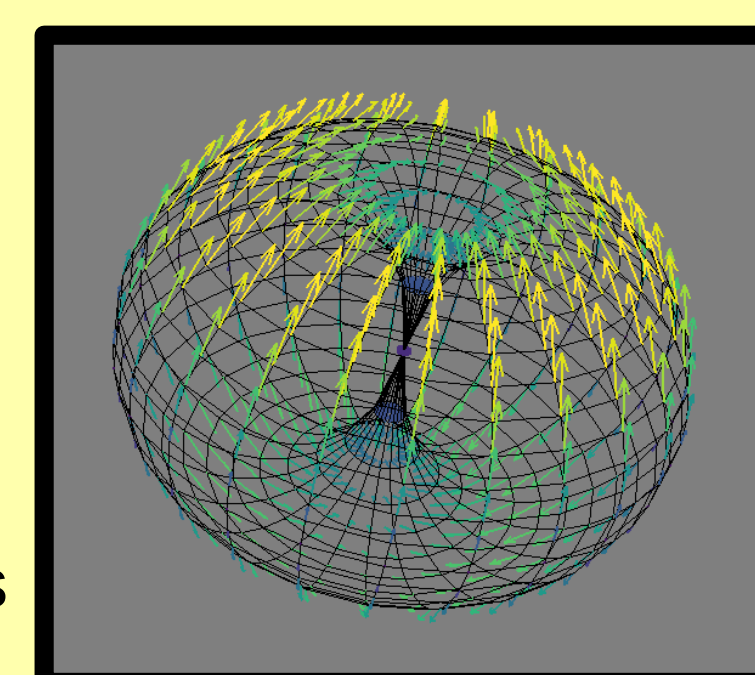
Finding and linking the end points



Forming a surface from the calculated x, y, z values



Drawing a vector field from the calculated u, v, w values



Final Product:

Mayavi Menu

Gain and E-Field Color Bar

Orientation Axes

Variable Sliders

File Name

Frequency and Normalization Factor

Object Toggles

Default View

Example Views

