Linearity Two Final Project Proposal

Anusha Datar and Alison Palmer

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1   Proposed Project Outline

Over the course of this final project, we intend to learn more about partial differential equations, the wave equation and its applications in engineering science. Specifically, we would like to focus on the cable equation and its relationship with concepts including standing waves and impedance matching. After exploring these topics, we hope to create a software tool and/or demonstration associated with impedance matching: this would likely take the form of either a simulation or calculator for impedance matching circuits and configurations.

2   Proposed Material and Resources

Some research papers, videos, and other publications we plan to use for this project include:

1. Dr. Gil Strang's Lecture on the wave equation:
   $https://ocw.mit.edu/resources/res-18-009-learn-differential-equations-up-close-with-gilbert-strang-and-cleve-moler-fall-2015/differential-equations-and-linear-algebra/fourier-and-laplace-transforms/wave-equation/.$

2. Impedance Matching of Transmission Lines:
   $http://www.physics.princeton.edu/~mcdonald/examples/impedance_matching.pdf.$

3. Waves and Impedances on Transmission Lines:
   $http://home.sandiego.edu/~ekim/e194rfs01/tlsmthek.pdf$

4. NPTEL Lecture on Transmission Line Calculations Using Smith Chart:
   $https://nptel.ac.in/courses/117101057/10$

3   Deliverables

Through this project, we hope to expand our current understanding of the wave equation and its applications through expanding both our theoretical understanding and developing a small project. For that reason, our proposed deliverables include:

- A four to five page report covering what we learned and how we developed our project.

- A video lasting no longer than five minutes that includes an explanation of the concepts we learned over the course of this project.

- A software repository and/or other project documentation and an associated demonstration.