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**Linear Inductive Position Sensor**

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Linear Inductive Position Sensor
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Project Description
The aim of this project is to create a linear position sensor with an accuracy of 1 µm. Two ‘driving’ inductors are powered by a frequency generator with a magnitude of 4.5 V and a frequency of 1.5 kHz. The inductors create an oscillating magnetic field which induces a voltage in the unpowered receiving inductor. The change in amplitude of this voltage indicates the position of the receiving inductor in reference to the driving inductors.

This project offers a low cost alternative to laser interferometry for high accuracy incremental position measurement.

Theoretical Modeling
This FEMM model shows the magnetic field lines produced by the driving inductors and their intensity. Because the voltage induced in the receiving inductor is proportional to the magnetic field intensity at its location produced by permanent magnets, the driving inductors can be modeled as such.

Software
The output of the processing circuit was input to an National Instruments myRIO. Because of the complex nature of the magnetic fields, a look-up table was created using NI LabVIEW in order to convert the input voltage to a position.

Circuit Design
An active lowpass filter was designed to amplify and filter the signal output from the receiving inductor. The amplification was necessary to utilize the entire input range of the myRIO’s ADC. The filtering attenuated high frequency noise in the signal to allow for greater accuracy.

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3D Printed Parts
Driving Inductor Spacer
Receiving Inductor Holder