**Introduction**

The objective of this design project is to research, prototype, and test the feasibility of inductively charging a UAV drone from a power line cable. Currently, drones used in surveying, inspecting, imaging, and other industrial and commercial applications are limited by their battery capacity and charging capabilities. The goal of this project was to design a system that would allow a drone to recharge without the need to land and charge.

**Background**

There are limited options when it comes to passive charging systems. One of those options is inductive charging. The relationship between electricity and magnetism makes inductive charging possible. An electric current flowing through a wire produces a magnetic field, and a changing magnetic field that passes through a wire loop will induce a current in that wire illustrated in the image here. The alternating current in overhead power lines emit such a magnetic field. A drone outfitted with an inductor that can perch from the powerline would be able to make use of the magnetic field emitted to recharge its battery.

**Key Components**

- Open-source hexacopter drone
- Pixhawk flight controller
- 14.7 V 4s lithium polymer battery
- 2212 920KV brushless motors (X6)
- 30A ESCs (X6)
- Transmitter & 10 channel receiver
- GPS + compass module

**Perching Device**

- Rack and Pinion gear system
- 2 Pololu 1000:1 gear ratio motors
- Arduino Mega, L298N motor driver board
- Pillow block and shaft design to reduce bending stress on motor shafts
- Limit switch and encoders to control movement
- Integrated housing for inductive core

**Charging**

- Inductor for inductive power harvesting
- Various core materials were tested before selection
- Final core made from Mn-Zn Ferrite cores
- ~ 1800 wire loops of 26 gauge enameled copper wire
- Empirically derived relative permeability of ~30

**Conclusion and Future Work**

Inductively recharging a UAV using powerlines is a promising technology for use in commercial and industrial applications. With some improvements, this basic proof-of-concept could be tailored to meet the specific needs of the UAV in its specific application. Future work on this project may include: inductor redesign for increased charging capability (may include changes to core material and shape of the inductor), flight assistance or full automation to aid in perching, and an integrated application.