Team 304: Image Recognition for Padmounted Equipment

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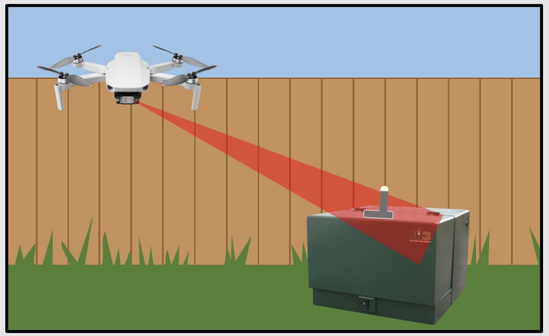
Background

Padmounted transformers have internal fault current indicators (FCI) that turn an LED on when a fault has occurred. This design will create a visual beacon powerd by existing FCIs, to be captured by drone footage and processed through an image recognition system. The recognition model will detect the transformers, beacon, and whether the beacon is on or off to locate faulted transformers.



Targets

Model Confidence 80%

Beacon Cost < $100

Visible up to 50 ft

Installation Time < 1hr

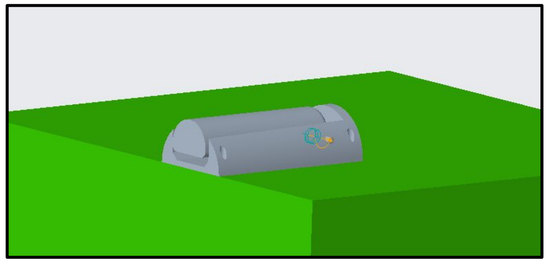
Beacon Lifespan 30-50 years

Model Runtime 45 fps (frames per second)

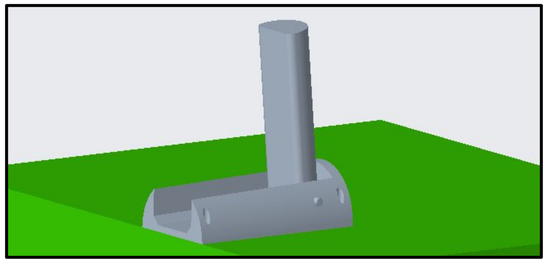
Objective

The objective is to develop a hardware beacon that visually indicates faulted FPL padmounted equipment. The beacon connects to an internal fault current indicator and will trigger and a method of identifying the beacon with computer vision.The vision for this project is to deploy drones to fly over transformers and use an image recognition model to determine if the FCI has triggered. The team will build a beacon that connects to the FCI that will flag the camera on the drone. The model will be able to tell the difference between the beacon being in an on and off state.

Lever Down

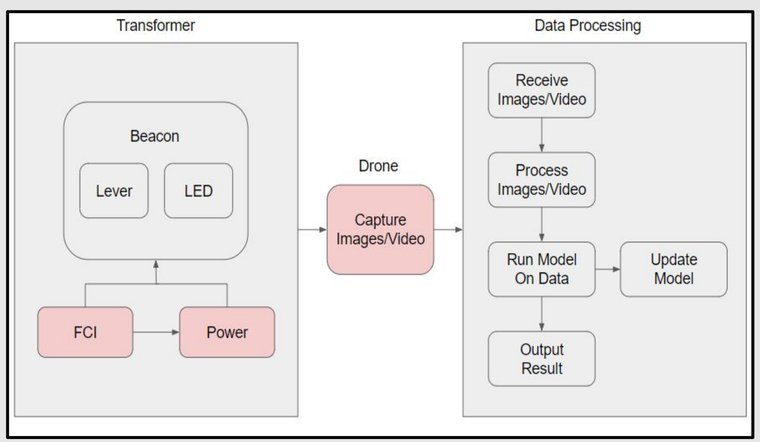


Lever Up



Preliminary Detailed Design

Design incorporates both a mechanical lever arm and LED. The device will receive power and release the lever arm to an upward position. The raised arm and LED on provide two visual signals to the drone captured images will be received and processed by the recognition model before alerting the user.



Potential Challenges

- Power source variations (from different FCIs)
- Camera obstructions - plants, cars, other structures, etc
- Detecting beacon in various weather conditions
- Ensuring device durability and reliability despite range of natural elements
- Ensuring device safety with range of potential physical tampering

Future Work

- Finalize preliminary detailed design and order parts
- Construct mock transformer
- Construct beacon
- Beacon testing
- Train computer vision algorithm
- Computer vision testing

References

- FPL Internal resources (pictures, schematics, videos)
- YOLO v5 Documentation
- Faculty and Advisors