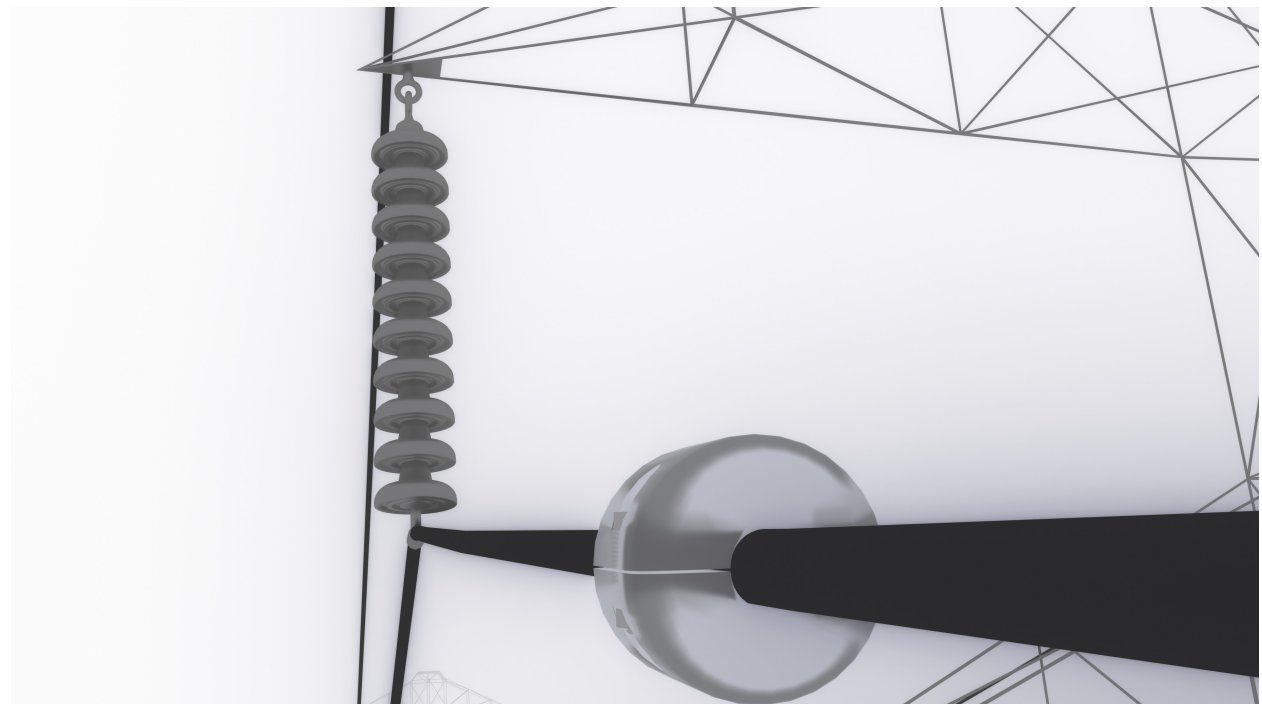




Project Description

Wildfires are a major problem in California and across the world. Many devastating fires are initiated by power lines that have not been inspected or maintained frequently enough. In order to prevent or limit the impact of power line-initiated wildfires, power lines need to be routinely inspected, monitored, and shut down in dangerous conditions. If a fire does start, quickly identifying it and tracking its spread is critical to putting it out before it gets out of hand.

LineAlert is a device intended to address these requirements. It is a package of sensors that is cheap enough to put on every span of a power line that can remotely take pictures for inspection, report environmental conditions affecting the line (wind and temperature) for accurately gauging the risk of a failure, and report the exact location and type of a fault if one occurs. In order to meet the price target, it cannot require any additional infrastructure, so it must derive its power from the power line itself and communicate using its own network. Instead of sending out people with drones to inspect thousands of miles of power lines every few years, a team could go out once and install LineAlert on a power line using an insulated pole from the ground.



Engineering Challenges

- **Magnetics and power electronics to pull power from the power line**
 - 3D printed case to hold the device on the power line
- Sensors
 - **Simple sensors such as an accelerometer and thermometer**
 - Current sensor
 - Camera (+ JPEG compression)
 - Signal processing to automatically detect problems on-device
- Radio
 - RF PCB hardware
 - **Communication protocol**
 - Message relaying system to carry messages along the power line
 - Public key cryptography to prevent unauthorized use of the network
 - Error correction
 - Two-way communication
 - **“Base station” device to receive data from the network**
- User interface
 - Server to receive and authenticate messages collected by base stations
 - Frontend UI to show the status of every LineAlert device and their collected data
 - App for configuring new LineAlert devices upon installation
- **Test power line**
 - Transformer to generate high current
 - Transformer to generate high voltage

All of these tasks are certainly too much to complete during the given time, so the bold items should be where the team starts, adding more depending on available time and team member interests.

Relevant Skills

Through this project, students will gain experience in the following areas.

- PCB design
- 3D modeling
- Microcontroller firmware
- Radio communications
- Cryptography
- Power electronics

Intellectual Property (IP)

In order to allow for the possibility of commercializing this product, all team members must agree to assign the rights to any patents or other IP developed during the course of this project to Daniel Van Dalsem or to any company that he forms for the purpose of commercializing the product.

Point of Contact

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