

Wooden Pole Condition Sensor

Cost effective condition monitoring technology for wooden poles

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Background

Worldwide, there are millions of wooden poles supporting utilities such as power distribution lines and telecommunication lines. The normal lifespan of wooden poles is around 40 years before they succumb to decay, fungal and/or insect attacks. Early failure of poles also occur due to unpredictable events such as weather (strong winds, lightning, fire, etc.) or human activities (car accidents, theft, etc.). Apart from the threat to public safety, falling lines cause significant financial losses to the utility from damage to property, direct expenses for repairs and replacement, and loss of income due to interrupted power or service delivery. Current methods of inspecting distribution lines are costly, labour intensive and provide limited information of the internal integrity of wooden poles.

Technology Overview

Researchers at UCT developed a pole condition sensing technology which measures the state of health of wooden utility poles. The technology was developed to be cost effective, easy to install and to actively provide information concerning the state of the pole via a communication interface. The UCT technology aims to perform the following:

1. Measure pole attitude and altitude: Detect if the pole has fallen over or fallen vertically
2. Measure vibration signature: Detect changes in the vibration signature between nearby poles indicating changes in pole condition or local events such as motor vehicle accidents, broken/cut conductors. Detect wind speed (can be used with temperature to change the load limit dynamically) and detect changes in mechanical pole resonance at given wind speed if the pole fails at the ground contact
3. Measure magnetic field: Detect anomalous changes in magnetic field indicating a potential fallen conductor or current tee-off. Detect failures in geometry or current by comparing relative changes in magnetic field between poles.
4. Measure temperature: Sense environment temperature and fires under the line Communicate field data to server or substation via low power IoT wireless network
5. Report per-pole condition using low power BlueTooth 5 (or similar) to a central server for safety tripping decisions, operator action, or planned maintenance decisions.

The technology is currently at a TRL6 with prototypes being tested in representative environments i.e. tested in an electrical distribution network.

Benefits

The UCT technology provides a cost effective and easy to install IoT device with innovative processing algorithms to extract the information from low cost sensors. The system was designed to integrate into existing pole management infrastructure, or act as a stand alone system. The technology aim to provide the following benefits:

- reduce general maintenance costs for the network by replacing labour intensive practises with automated functions
- reduce the risk of pole failures and as a result, critical network failures, by acting as an early warning mechanism
- reduce the risk for environmental impact due from line and pole failures
- improve response time when responding to pole failure or issues by better localising the point of the failure

Applications

The technology is suitable to the following applications:

- Active and more automated condition monitoring system or pole integrity monitoring system for wooden pole distribution systems
- UCT technology can easily be added to an existing pole condition or maintenance system to reduce labour and/or add additional insights of the infrastructure
- UCT technology can further assist with fault finding through better localisation of potential faults, or theft incidents.

Opportunity

UCT is seeking the following interested partners:

- Organisations in the field of developing or delivering condition monitoring products and services to utilities
- Organisations performing a maintenance and/or inspection function on wooden poles and seeking technology to improve their service offering
- Distribution system owners and operators seeking technology to improve the maintenance function of the wooden pole distribution system
- IoT companies seeking to build new products and services for the utility or telecommunication market

Patents

- PCT Application - PCT/IB2019/054666

IP Status

- Patent application submitted

Seeking

- Development partner
- Commercial partner
- Licensing