Boreal Ecosystem Recovery & Assessment
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SENSOR NETWORK TEAM FALL 2017: *HUMAN/ANIMAL FOOTPRINT MONITORING USING IOT*

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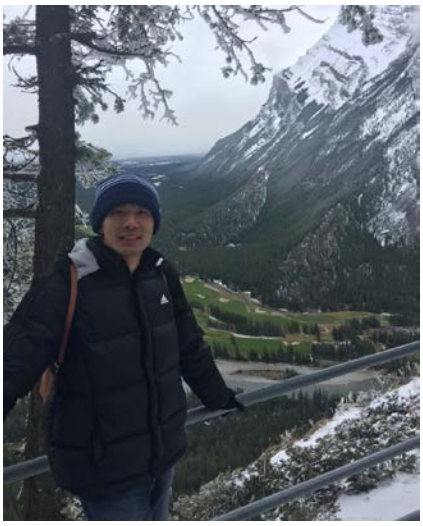

Project summary

Footprints monitoring can be one of the most effective and least expensive ways to detect many human/animals activity. However, it is difficult in boreal areas due to the harsh environment and the uncertainty of human/animal movement patterns. Furthermore, due to the cost, it's difficult to deploy the traditional wireless sensor networks(WSNs) widely. Also, sending the sensed information promptly is costly and impractical. Is that possible to use the open source hardware, software, and open standard to develop an accurate, practical, inexpensive WSN to monitor human/Animal footprint? The objective of our project is to build an accurate and cost-effective tool to detect the impact of human footprint and monitor the habit of the wild animal through open hardware, software, and interoperable IoT standard. We build three types of trail counter which is a low-cost, open-source measurement device that counts pedestrian, bikes, ATVs(All terrain vehicle) and cars on trails, paths, and sidewalks. The first one is based on ultrasonic ranger; the second one is based on passive infrared motion (PIR) sensor; the last one is based on the differential pressure sensor. To let device send data in a remote area, we build a private LoRaWAN network and test the network coverage. For allowing device run longer in the field, we also make a solar system to supply power.

Progress to date

We deployed the ultrasonic-based solution and PIR based solution on Steve's backyard and monitored for a week. Based on the data we collected, PIR based solution can provide relevant, accurate results, whereas the ultrasonic-based solution is not credible right now. Due to the safety reason, the differential pressure sensor based solution wasn't tested and will be verified in the next field session. Our LoRaWAN network can receive sensed information from the client, and upload to SensorThings API cloud. The most extended communication range of this network can reach to 5 KM in the condition of no high obstacles. For the solar system, it can provide consistent power to the device under sufficient sunlight, but it will only offer three days power to the device if there is no sunlight. We are at the stage of prototype verification. Our next important task is deploying the prototype in the field and build a LoRaWAN network to support device communication in the following summer.

Management implications

The trail counter we try to build compares to the commercial trail counters, should be a cost-effective solution to detect the impact of human footprint and monitor the habit of them. Thanks to open hardware and IoT standard, we're able to build a functional trail counter effortlessly, and it's possible to large-scale deployment of this trail counter. The solar power system can extend the running time of one device from several days to several weeks. LoRaWAN network can help us build a low-cost, mobile, and secure bi-directional communication system in the remote area.

Geographic location

Calgary City