Structural monitoring of large outdoor assets

Introduction

Motivated by commercial interests, huge amounts of large billboards were standing up along the city streets, usually installed in shopping centers or along the highway, displaying various advertisements. The city faces some billboard management issues, think about this —— how many times have you encountered a huge billboard with a torn and rust poster panel? It's a frequent phenomenon but very dangous because they can become serious security risk for the urban residents like causing accidents of falling or collapse.

It is the same case with street lights. With so many street lights in the city, how does the lighting network operator find out that a certain street light came out of action and needs to be repaired? Traditionally operators need to visit every street light from time to time to check their statuses, but this is obviously not only tiresome but difficult, if some emergency happens to a street likes falling or leaning, it should be detected immediately.

Monitoring demands of outdoor assets: Collapse of billbords and street lights

Structural monitoring of outdoor assets

Because of the above reasons, the real-time monitoring of large outdoor assets (ie, billboards and street lights) has been paid more attention by the department of municipal management. WiiHey proposed a monitoring and early warning method for these assets based on accelerometer sensors and IoT wireless communication technologies, which can be used to collect and analyze the status information of inclined angle of an asset and make an early alerts when the inclined angle exceeds a certain value.

As such, this system could provide monitoring and warning service to following outdoor assets and potential dangerous conditions:

- Street lights/billboards/towers/poles leaning badly;
- Street lights/billboards/towers/poles bent badly;
- Street lights/billboards/towers/poles loose in ground;
- Street lights/billboards/towers/poles knocked over;

Accelerometer-based fall-portent detection devices

Tech specs

- ± 70º dual axis angle measurement;
- 0.1º resolution - digital serial output;
- ± 1º accuracy - differential;
- High reliability solid-state MEMS accelerometer;
- NB-IoT/UNB-IoT(868MHz) wireless communication;
- Powered by long-life battery for 5 years;

Key features

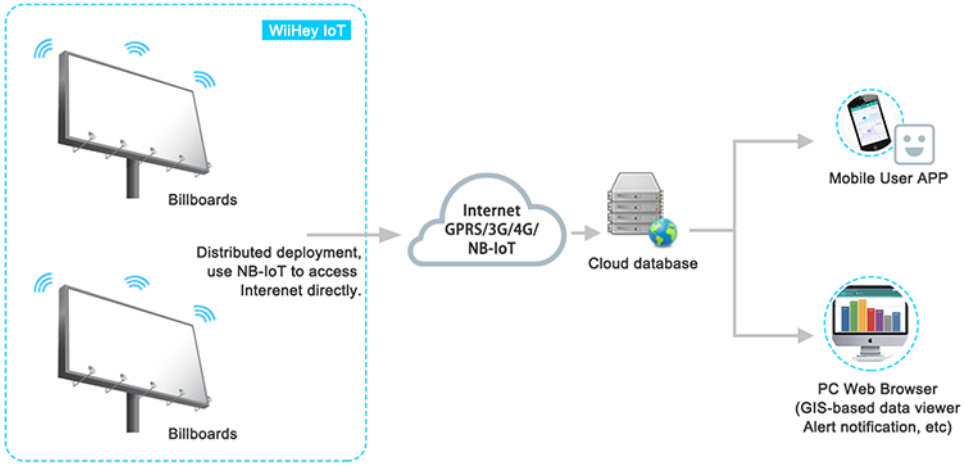
- Angle detection with digital filtering for stable measurement;
- Factory calibrated angle output with low temperature drift;
- Wireless communication for ease of installation and minimal costs;
- Powered by long-life batteries for low maintenance;
- Cloud-enabled real-time monitoring of asset status;
- Early warning information for potential faults;

Benefits

- Enable remote monitoring of outdoor assets' statuses;
- Enable tracing to visualize assets' performance and health;
- Enables the identification of asset faults and give early warnings;
- Better asset management to skip the costly old-fashioned manual inspections;
- Prevent asset failures and avoid potential accidents;

Architecture

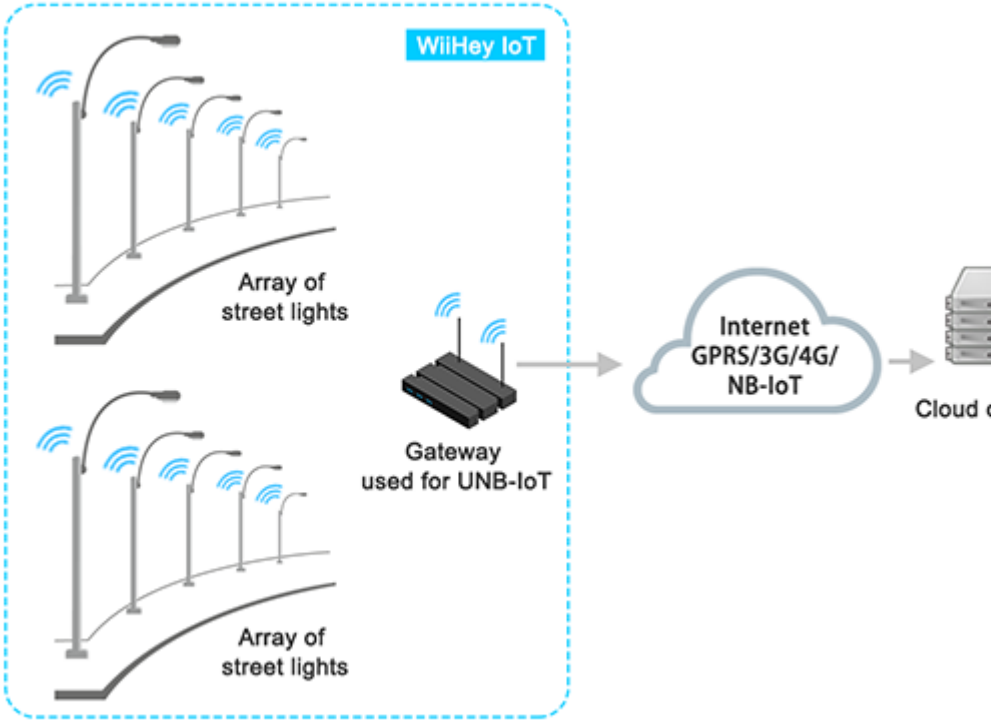
For fall-portent monitoring of billboards, because billboards are often located separatedly from each other, we would suggest to use IoT devices integrated with NB-IoT (NarrowBand IoT) wireless technology. NB-IoT is a Low Power Wide Area Network (LPWAN) radio technology standard that allows the device to access the Internet directly.



Monitoring system achitecture for billboards

For fall-portent monitoring of street lights, because street lights are put up along the street and they usually have a relatively high density, we would suggest to use IoT devices with UNB-IoT (Ultra NarrowBand IoT) wireless technology. WiiHey has a proprietary IoT protocol called

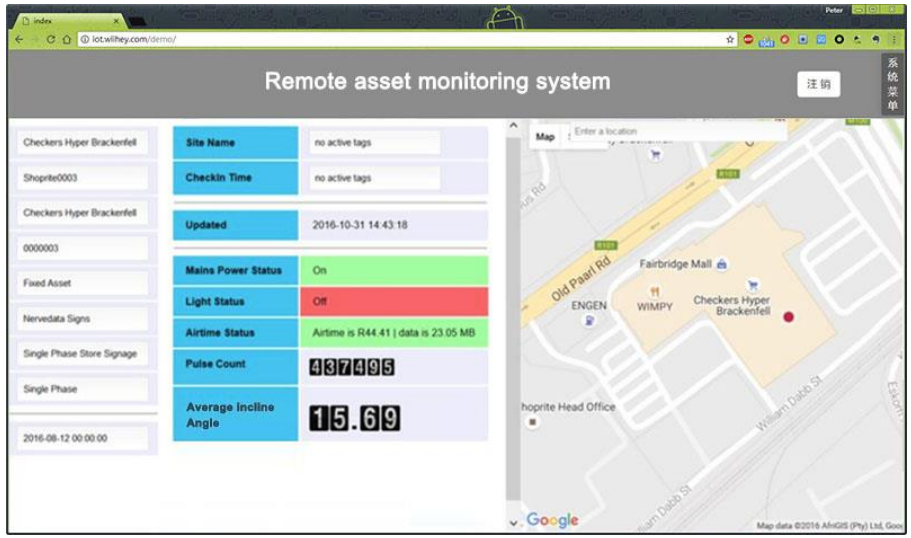
HOHNet™ which amounts of devices could form a mesh network and access the Internet via a IoT gateway. Compared with NB-IoT solution, devices using UNB-IoT technology have lower price, they are more economical for large-scale, high-density deployments.



Monitoring system achitecture for street lights

Software

The cloud based platform provides real-time status information that could be accessed by any web-enabled device.



The asset monitoring platform

Summery

The implementation of IoT on billboards and street lights is in its initial stages and has been initiated in a few cities in China. WiiHey would continue to assist in monitoring and maintaining of these large outdoor assets, to enable a better way of asset management as an essential part of safety and quality assurance.