

Environmentally powered structural monitoring solution for bridges and viaducts



WiseSensing operation does not rely on any battery replacement, being powered by solar and vibrational energy (patent pending).

The WiseSensing sensor nodes provide a reliable, easy-to-mount and cost effective solution designed for dynamic and static structural health monitoring of large structures, as bridges and viaducts.

WiseSensing is capable of harvesting clean energy from the environment, transforming it into usable electrical energy in order to power sensors (as accelerometers, inclinometers, shock and temperature sensors) and a Zigbee module for data communication.



Features

- Transforms environmental energy into clean electrical energy: fully autonomous operation.
- No battery to change and dispose of.
- Zigbee wireless communication: no need for cabling.
- Communication collisions management from the gateway.
- Easy and fast to install: no cables or fragile parts.
- Measurement data rate, length, resolution and treshold for shocks reconfigurable from remote.
- Data available and easily cosultable online through a dedicated Web App.
- Possibility of on-board spectral analisis



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- Data acquisition and transmission with customisable intervals (typically one transmission every 2hrs and a synchronisation every 1hr).

Specifications

- Synchronised operation of each and every node in the network.
- UV resistant and IP68.
- Acceleration measured with 3.9-15.6 $\mu\text{g}/\text{LSB}$ sensitivity and $25\mu\text{g}/\sqrt{\text{Hz}}$ noise over the three axes.
- Inclination measured with 0.02° sensitivity.
- Shocks detected, with custom thresholds.
- Zigbee range up to 400 m (clear view).
- Size: 17.5 cm x 12 cm x 8 cm.
- Working voltage: 2.5-3.6 V.
- RFID tag for easy identification of nodes during installation.
- Possible to recharge a Li-ion battery (2.6 Ah, 9.62 Wh recommended) by harvested energy.



Hardware components

- 32-bit ARM® Cortex®-M4 microcontroller at 40MHz.
- 4 Mb F-RAM.
- 3 axes MEMS accelerometer with $\pm 2\text{g}, 4\text{g}, 8\text{g}$ configurable full-scale.
- 3 axes MEMS accelerometer with selectable wake-up thresholds.
- Zigbee module.



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- Python application for data collection and communication and for synchronisation handling.
- Web application for data visualisation and interpretation.

Related products

- DIGI Xbee Industrial Gateway.
- RFID Scanner.

Applications / Use-cases

- Structural health monitoring of civil structures, as bridges and viaducts.
- Structural monitoring of tall buildings.
- Structural health monitoring of wind turbines (with modified enclosure features).
- Shocks and seismic events sensor.
- Vibration sensor.

