Structural Monitor

First delivery for IoT project

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Concept

This project aims to monitor the structural integrity of bridges, buildings and infrastructures in real-time.

The system uses a network of sensors, installed on the key points of the structure, to measure the vibrations and movements.

Each device analyzes the frequency components of the vibrations and if any abnormal vibrations are detected, the device will trigger an alert to relevant personnel.

The data collected by devices will also be uploaded to a cloud database for long-term storage and analysis.

Constraints

- **Energy autonomy and efficiency**

  Sensors could be placed in areas that are hard to access and we want to avoid as much as possible manual intervention on them. Devices should run autonomously for possibly their entire lifetime (years).

- **Long range connectivity**

  Due to the potentially large scale of the infrastructure to be monitored, long-range connectivity is required, in the order of hundreds of meters.

- **Response time**

  In order to take action in a timely manner during potentially dangerous events, the time between the occurring of the physical event and the alert to the relevant personnel should be less than one minute.

Components

Node

- Microcontroller
- Accelerometer module
- LoRa module
- Solar panel
- LiPo battery

Cloud

- MQTT broker
- Database

LoRa gateway

Architecture

Nodes connect via LoRa to a gateway that provides the internet access.

Nodes send events and data to our cloud via MQTT.

Cloud application receives events and triggers specific actions. It also stores data in a database for later reporting and analysis.