Alma Mater Studiorum   -   Università di Bologna

Development and optimization of microcontroller-based sensor networks for monitoring structures

Advisor

Prof. Ing.
Luca De Marchi

co-Advisor

Prof. Ing.
Alessandro Marzani

PhD student

Matteo Zauli

Objective of research

Problem

- Online monitoring of structural integrity.
- More compact, efficient and energy sustainable sensor platforms to increase safety, reliability and reduce maintenance and operation costs.
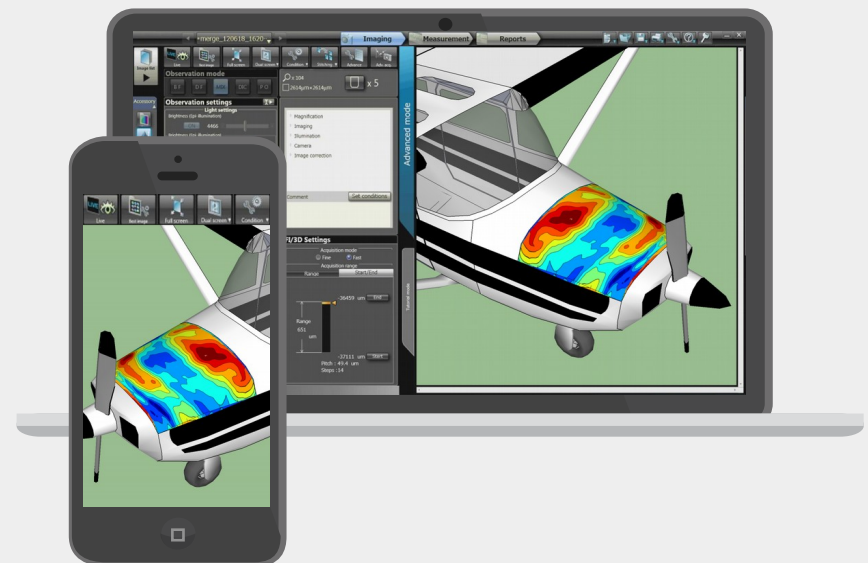- Switch from scheduled to on-event and on-demand maintenance plans.

Solutions

- Use piezoelectric sensors for guided waves detection, or accelerometers, to investigate structural health.
- Wireless data communication.
- Energy harvesting techniques.
- Dramatically reduce the overall sensor network mass and cost.
- User-friendly GUI.

Objective

An innovative approach for sensor-based monitoring system.

High end solutions and processing for a compact, easy to install and easy to use monitoring solution.

It will revolutionize the structural health monitoring.

Collaborations

Civil Engineering

Detect the best way to interface the sensor network with civil infrastructures, in order to perform an efficent monitoring. Also to understand the needs of a civil engineer, what could be interesting to monitor to give a reliable infrastructure survey.

Mechanical Engineering

About monitoring structures like laminate composite and metalic structures used in field such air, land and marine transportation, besides industrial infrastructures, it will be foundamental how to best fit these fields. It's a matter not only about the materials interact, but in particular about how to integrate the sensors with such materials.

Information Engineering

An IoT infrastructure would be very important to enable a connected system, a real time and easy to access approach for structural monitoring. So, experts about IoT and how to act a data collector, like a MQTT communication, it's crucial.

Moreover, provide a user-friendly interface to final user on a portable device like a laptop or a tablet it will help to spread the monitoring technology.