Fakultät
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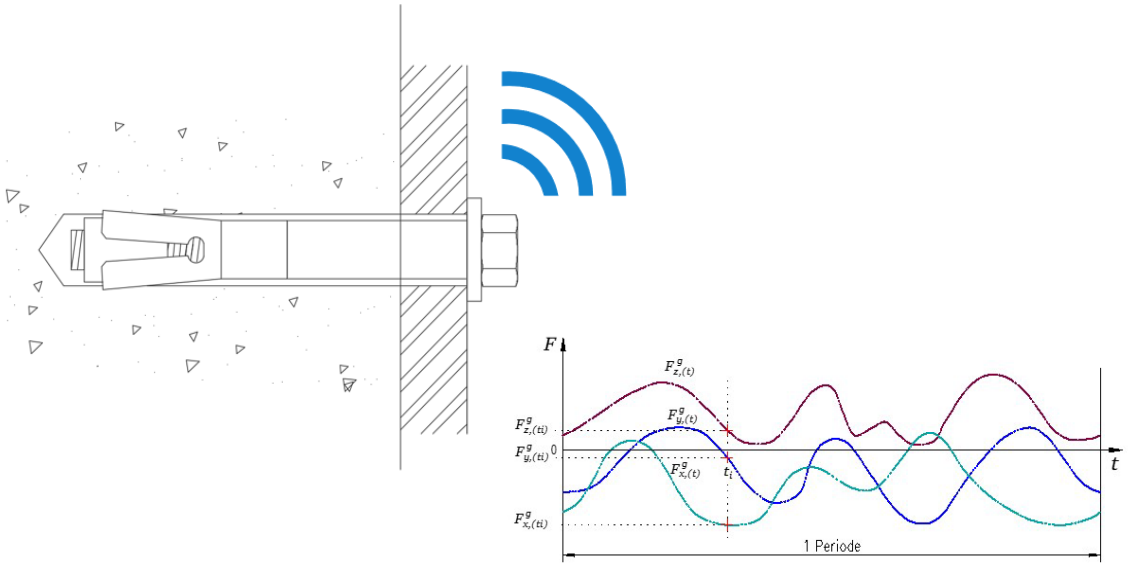
Master thesis

Static and dynamic sensors in structural connections



In recent years, maintenance of built infrastructure confronts unprecedented demands. Increase in population, densification of cities, climate change and extreme natural phenomena, and an urgency toward more sustainable development pose great challenges that existing and future built assets. Although maintenance of infrastructure components is unavoidable at some point in time, recent research has recognized the benefits and promoted predictive – as opposed to reactive – maintenance. This strongly relies on the collection of measurement and inspection data, interpretation of the data to metrics of the condition of the system (remaining safety and service life), and then planning of future interventions. Information and Communication Technology (ICT) relies on data collection and transmission devices, which can also be produced at very small sizes and costs and they can be integrated to physical objects in the sense of IoT.

This situation presents a unique opportunity to integrate sensor and communication devices in factory manufactured construction products used in the built environment. Fastening technology lends itself as a target element, for the integration with ICT hardware systems for four main reasons:

(a) Fastening products are manufactured by highly specialized processes and factories

(b) They are diffused in the built environment.

(c) Deterioration of fastenings is hard to recognize, because defects are generally hidden

(d) Failure thereof can be detrimental to the structure safety and functionality.

This thesis will lead to the conceptual design and testing of prototype sensors based on pressure cells, electrical resistivity, and heat release, integrated with fastening components, and allow for interpretation of results for static and dynamic loads.