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DETECTION, LOCALIZATION, AND CHARACTERIZATION OF DAMAGE

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ABSTRACT

Reinforced concrete structures are vital components of our society's infrastructure. Therefore, maintaining their functionality and reliability is essential. There are for example ultrasonic methods for detecting tendon damage, corrosion, stress corrosion cracking, grouting faults, and interface failure. If one focusses on damage due to fracture, common methods to simulate fracture propagation include for example the insertion of cohesive elements or a regularization with a phase-field method. Moreover, Structural Health Monitoring (SHM) is a proper means to increase the service life of an engineering structure such as bridges. The continuous SHM allows for substantiated conclusions regarding the structure's current health state. With this knowledge an efficient maintenance work can be planned and performed. Since a Structural Health Monitoring using the aforementioned numerical models strongly relies on useful measurement data, it is of tremendous interest to determine the optimal number and the optimal position of the respective sensors. In general, it is desirable to place the sensors in locations that provide the most information about damage and impact to the structure. A non-negligible challenge in optimizing sensor placement is the large number of possible locations. For practical applications the accessibility of the possible positions to place the sensors also needs to be taken into account.

The topics to be treated within this session range from more theoretical approaches for detection, localization, and characterization of damage over optimal sensor placement to the practical realization and implementation of methods and its application. Thus, contributions from the research fields (i) wave propagation in heterogeneous and/or damaged media, (ii) modelling of fracture propagation, (iii) optimization in the context of the Session's topic, or (iv) challenges in practical measurement campaigns are highly welcome.