Virtual Corrosion Initiation Monitoring for Infrastructures Considering Environmental Uncertainty

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Abstract

Material decay and corrosion of reinforced concrete infrastructures have long been recognized as major damage indicators in modern structural health monitoring. In order to further transform from reactive monitoring to proactive prediction and risk prevention, the key resides in the developments of high-fidelity physics-based modelling method to generate robust prior estimates considering uncertainty. To this end, this paper is concerned with a novel metamodeling on the chloride-induced corrosion initiation of reinforced concrete infrastructures. The physics-based modelling of uncertain material decay represents a chemophysical process, involving various coupling effects and environmental uncertainties, leading to a complex stochastic system that requires computational-heavy approaches to generate useful statistical analyses. In this regard, the computational intensiveness is addressed by the recently reported extended support vector regression (X-SVR) method. The advanced performance of the proposed approach is explored by modelling a real-life reinforced concrete parking infrastructure.