

ANDERS: merging of automated and minimally invasive technologies for concrete bridge deck evaluation and rehabilitation (Presentation Video)

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ABSTRACT

The Automated Nondestructive Evaluation and Rehabilitation System (ANDERS) aims to provide a uniquely comprehensive tool that will transform the manner in which bridge decks are assessed and rehabilitated. It is going to be achieved through: 1) much higher evaluation detail and comprehensiveness of detection at an early stage deterioration, 2) comprehensive condition and structural assessment at all stages of deterioration, and 3) integrated assessment and rehabilitation that will be minimally invasive, rapid and cost effective. ANDERS is composed of three physical systems that merge novel NDE technologies together with novel intervention approaches to arrest the deterioration processes. These technologies are incorporated within a series of human-operated and robotic vehicles to allow rapid, comprehensive application across large populations of bridges. To perform assessments, ANDERS is equipped with two complimentary nondestructive approaches. The first, Multi-Modal Nondestructive Evaluation (MM-NDE) System aims to identify and characterize localized deterioration with a high degree of resolution. The second, global structural assessment system named STAR aims to capture global structural characteristics and identify any appreciable effects of deterioration on a bridge structure. Output from these two approaches will be merged through a novel Automated Structural Identification (Auto St-Id) approach that constructs, calibrates, and utilizes simulation models to assess the overall structural vulnerability and capacity. These two systems comprise the assessment suite of ANDERS and directly inform the Nondestructive Rehabilitation (NDR) System. The NDR System leverages robotics for the precision and rapid delivery of novel materials capable of halting the early-stage deterioration identified. The paper covers the details of the three ANDERS components developed through the support from National Institute of Standards and Technology-Technology Innovation Program (NIST-TIP). Specifically, the paper will provide a description of the components, their principle of operation and applications, and describe how the components work together.

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