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Department of Civil and Environmental Engineering
Case Western Reserve University
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10900 Euclid Ave
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Civil and Environmental Engineering Department Seminar

Transforming Decisions on the Performance and Health of Bridge Structures using Wirelessly Telemetry and Cyber Integration: Lessons Learned and Future Outlooks

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Abstract. The field of civil engineering is radically changing based on the emergence of sensing, data and modes of automation previously unimaginable. One of the most successful advancements has been wireless sensors that can be used to collect structural response data with high nodal density and low installation costs. As wireless sensors proliferate across our industry, the ability to collect data related to the performance of infrastructure is shedding new light on how infrastructure systems perform including how they deteriorate over time. A secondary benefit of wireless telemetry is their seamless integration with Internet-based computing resources which is rapidly transforming monitored civil infrastructure into cyber-physical systems (CPS) capable of automating their data collection in response to their operation. This presentation describes the development of wireless sensors for structural health monitoring (SHM) including an overview of experiences with long-term field deployment of wireless SHM systems on highway bridges. The presentation also describes expansion of SHM system functionality by integrating them into a broader CPS architecture. The presentation describes the deployment of a CPS architecture along a 20-mile segment of I-275 in southeast Michigan that has been designed to track heavy trucks loading a network of monitored bridges. An emphasis is placed on the use of long-term response data generated by the CPS architecture to transform the decision making of the bridge owner, leading to more efficient asset management.

Biography: Dr. Jerome Lynch is the Donald Malloure Department Chair of Civil and Environmental Engineering at the University of Michigan; he is also Professor of Civil and Environmental Engineering and Professor of Electrical Engineering and Computer Science. In 2016, Dr. Lynch was appointed the Director of the University of Michigan Urban Collaboratory, a research institute that works closely with city stakeholders to prototype solutions to urban challenges using smart city technologies. Prior to the University of Michigan, Dr. Lynch completed his graduate studies at Stanford University where he received his Ph.D. in Civil and Environmental



Engineering in 2002, M.S. in Civil and Environmental Engineering in 1998, and M.S. in Electrical Engineering in 2003. Dr. Lynch also received his B.E. in Civil and Environmental Engineering from the Cooper Union in New York City. His current research interests are in the areas of wireless cyber-physical systems, cyberinfrastructure tools for management of sensor datasets, computer vision methods for assessing societal resiliency, and advance sensors for damage detection and structural health monitoring. Dr. Lynch has been awarded the 2005 ONR Young Investigator Award, 2009 NSF CAREER Award, 2009 Presidential Early Career Award for Scientists and Engineers (PECASE), 2012 ASCE EMI Leonardo da Vinci Award and 2014 ASCE Huber Award. He is also an entrepreneur having started two high-tech companies including Civionics Inc. (Ann Arbor, MI) which was recently sold in 2018 to Perceiv, LLC (Davenport, IA).