Conventional methods for visual assessment of civil infrastructures have certain limitations, such as subjectivity of the collected data, long inspection time, and high cost of labor. Although some new technologies (i.e. robotic techniques) that are currently in practice can collect objective, quantified data, the inspector’s own expertise is still critical in many instances since these technologies are not designed to work interactively with human inspectors. This study aims to create a smart, human-centered method that offers significant contributions to infrastructure inspection, maintenance, management practice, and safety for the bridge owners. By developing a smart Mixed Reality (MR) framework, which can be integrated into a wearable holographic headset device, a bridge inspector, for example, can automatically analyze a certain defect such as a crack that he or she sees on an element, display its dimension information in real-time along with the condition state. Such systems can potentially decrease the time and cost of infrastructure inspections by accelerating essential tasks of the inspector such as defect measurement, condition assessment and data processing to management systems. The human centered artificial intelligence (AI) will help the inspector collect more quantified and objective data while incorporating inspector’s professional judgement. This study explains in detail the described system and related methodologies of implementing attention guided semi-supervised deep learning into mixed reality technology, which interacts with the human inspector during assessment. Thereby, the inspector and the AI will collaborate/communicate for improved visual inspection.

Major: Civil Engineering

Educational Career:
Bachelor’s of Civil Engineering, BS, 2012, Bogazici University
Master's of Civil Engineering, MS, 2015, Middle East Technical University

Committee in Charge:
Necati Catbas, Chair, Civil, Engineering and Construction Engineering
Ulas Bagci, Department of Electrical Engineering & Computer Science
Joseph J. LaViola Jr, Department of Electrical Engineering & Computer Science
Hae-Bum Yun, Civil, Engineering and Construction Engineering

Approved for distribution by Necati Catbas, Committee Chair, on October 4, 2019.

The public is welcome to attend.