## Augmented Reality Software Development For Infrastructural Inspection And Characterization

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In the present study, the authors developed Augmented Reality (AR) software to assist the infrastructural inspectors in the virtual marking of the structural defects found during the inspections. For this purpose, the research group provided virtual marking software on the Microsoft HoloLens 2nd generation (HL2) platform. Also, the authors develop a virtual menu for the AR software to provide usage flexibility for the software. Hence, inspectors can use the virtual menu for the following purposes: 1. To specify their inspection by entering their name and date in the software. 2. Manipulate the defect marker based on the defect's size and location. (3) Utilizing specific colors to distinguish inspectors' work and defect tracking. Also, the software is integrated with AR software that can characterize the crack width and surface density as two critical factors in crack severity in structures. The crack characterization process includes two main steps. First, a modified Canny algorithm is applied to capture the edges of cracks. Then, cracks' widths and areas are measured using pixel analysis. The benefits of this integration include but are not limited to 1. A hands-free standalone AR tool allows inspectors to receive real-time cracks' information during field inspections 2. A tool for field inspections that enables users to superimpose the virtual data of the mentioned cracks' information on the actual cracks and keep them on the cracks for the next site visits 3. A crack database saves the mentioned cracks' information inside the AR software for further inspection and defects change tracking. This study includes testing both software and verifying their integration using several experiments. Overall, the field and laboratory experiments conducted for the present study confirm the efficiency of the integrated tool developed in this study.