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3D METROLOGY-ASSISTED ASSEMBLY AND AUGMENTED REALITY

Kanali Mohamed Hosame[1], M. Souheil-Antoine Tahan[2], M. Lucas Hof [3]
[1]Mechanical Engineering Department, École de technologie supérieure (ÉTS), Montréal, Canada

ABSTRACT

Augmented reality (AR) offers significant potential for enhancing operator efficiency and optimizing industrial processes. This study investigates the integration of Microsoft HoloLens 2 and iGPS technology—a real-time tracking system for assembly and quality control—to develop an advanced assembly assistance tool. The proposed system employs I5 sensors affixed to both the assembly components and the HoloLens 2 headset, enabling real-time localization of the operator and tracked objects. A dedicated script extracts sensor positions, ensuring precise tracking, while an interface facilitates the seamless transmission of information between the system and the operator.

A key challenge arises from the misalignment between the I5 sensors mounted on the HoloLens 2 and the device's camera. To address this issue, we utilize ArUco fiducial markers to compute the transformation matrix between the I5 sensor reference frame and the HoloLens 2 camera frame. This transformation enables accurate spatial mapping of the tracked objects relative to the camera.

All computations are processed on a central processing unit before being transmitted to the HoloLens 2. An additional transformation is then applied to convert the camera reference frame into Unity's coordinate system, ensuring precise hologram placement. This approach eliminates the need for iterative manual adjustments, improves the accuracy of visual guidance, and enhances the overall efficiency of assembly operations.