Innovative Augmented Reality Based Rehabilitative Tool for Arm Injuries Utilizing HoloLens 2

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Arm injuries are common among all age groups. However, there are not many accessible ways for a patient with an arm injury to perform their rehabilitation while in a home-based environment with observation and performance-based guidance from a medical professional. The proposed solution involved developing a Unity-based rehabilitation game environment on the HoloLens 2 that could be monitored by therapists using real-time data recorded from the player's arm joints. To do this, several levels of the game were developed such that the objectives of these levels would aid in the rehabilitation of the player's arm joints. Data was collected using a C# script that located the shoulder and elbow according to the positions of the headset and the wrist and inputs regarding the body dimensions of the player. Using the positions, range of motion (ROM) data was collected from the player's arm joint's different degrees of freedom using simple trigonometry and kinematics. This data was then exported to the HoloLens 2 file directory using another C# script. To test the validity of the generated data, we compared it to data generated from a published study and found significant results. These results not only displayed the fact that the different degrees of freedom of the arm joints are independent of each other but also that the generated data does not show any statistically significant differences from the expected data of the published study.

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