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ABSTRACT

An Artificial Intelligence Framework to Calculate True Depth during the Biomechanical Assessment of General Movements in Neonates

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Precise depth estimation is essential in neonatal biomechanical assessments, mainly when digital image-based methods like virtual reality (VR) technologies are implemented. This work presents an Artificial Intelligence (AI)-based framework designed to accurately calculate actual depth values for neonatal movement analysis using the Microsoft HoloLens 2 platform. The proposed methodology involves synchronizing and recording video and depth data from the Articulated Hand Tracking (AHAT) and Long-Throw sensors allocated in the headset [1]. Once the biomechanical data is captured, the MediaPipe Pose Landmarker tool detects key anatomical landmarks, including wrists, shoulders, elbows, and hips, and extracts their two-dimensional coordinates (x,y) from the video stream [2]. The coordinates are then correlated with the depth data obtained from the Microsoft HoloLens 2 depth sensors. Machine learning algorithms subsequently analyze the computed joint angles and general movement patterns identified as potential neurodevelopmental disorders [3]. The framework employs a hybrid data storage procedure that keeps detailed and accurate reconstruction of three-dimensional (x, y, z) landmark positions, facilitating comprehensive and granular analysis. Integrating AI methodologies, including MediaPipe pose detection, alongside precise depth data significantly improves diagnostic capabilities, allowing early detection and intervention for neurodevelopmental disorders in neonates.

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