ABSTRACT

This research introduces the development of an automated photogrammetry-based 3D reconstruction system designed for the assessment and classification of children's foot postures using the Foot Posture Index-6 (FPI-6). By leveraging photogrammetry, the system generates highly detailed 3D foot models, enabling accurate measurement of critical FPI-6 parameters, such as talar head palpation and talonavicular bulging, which are challenging to quantify using conventional 2D imaging methods. The methodology involves multi-angle image capture with a single camera integrated with a Raspberry Pi, followed by automated 3D reconstruction using Structure from Motion (SfM) techniques. The resulting 3D models are processed to extract quantitative data for each of the six FPI-6 parameters, facilitating the classification of foot postures into normal, supinated, or pronated categories. While the system demonstrates high precision in 3D reconstruction under controlled conditions, its classification accuracy for foot postures is limited to 40%, primarily due to challenges such as subject movement and inconsistent environmental conditions. This study highlights the potential of automated photogrammetry to enhance clinical foot posture assessment while identifying critical areas for further refinement in data acquisition and processing methodologies.

Keywords: *Automated Photogrammetry, 3D Reconstruction, Foot Posture Index-6, Foot Posture Classification, Clinical Assessment, Structure from Motion.*