Posture Detection and Multi-Dimensional Feedback System for AIS Rehabilitation Training

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Adolescent Idiopathic Scoliosis (AIS) is an illness common among teenagers. AIS patients have 3D deformation in Sagittal plane, Transverse plane and Coronal plane of their spines. Schroth Gymnastics is the main rehabilitation training method for non-surgical treatment. Whether the posture is accurate during practice has a direct impact on the treatment's effectiveness. However, current posture detection methods are either expensive or require the therapists' assistance while training. Thus, this project designed a posture detection and multi-dimensional feedback system suitable for at-home AIS rehabilitation training. Four household cameras are placed in four corners of the room's ceiling to detect postures at any position and direction. The video streams are then transmitted to a computer through Wi-Fi. OpenPose algorithm is used to extract the 2D coordinates of the human body's main joints. Then, 3D coordinates of six key points of the human body are obtained through stereoscopic vision methods, by converting World Coordinate System to Pixel Coordinate System and solving the least-squares problem by Singular Value Decomposition (SVD) method. The posture is then compared with the standard posture which has been recorded in advance and feedback is provided to the trainee. In the feedback, seven parameters are refined, which can fully reflect the 3D characteristics of AIS rehabilitation training postures. The system shows high accuracy in detection and feedback. It is easy to use, low-cost, adaptive to all kinds of postures, doesn't require the assistance of others, etc. Keywords: AIS, Rehabilitation Training, Posture Detection, Multi-dimensional Feedback

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