Kinect for Rehabilitation

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ABSTRACT

We have developed a low-cost automated assistant to help patients perform rehabilitative physical therapy (PT) at home, reducing the need for expensive one-on-one sessions with physical therapists and limiting the need for frequent travel to and from therapy sessions – a boon for the many patients with limited mobility due to strokes and major muscular and skeletal problems. The core component of the system is a Kinect camera which efficiently tracks full body human motion in real-time. Combining color and depth information, our tracking algorithm performs more accurate and robust than other methods. The PT assistant sends a summary of the completed exercise session to the attending physical therapist, allowing the therapist to support a larger case load while still providing traditional one-on-one physical therapy sessions in the clinic whenever needed. The assistant provides instructions on how to do the exercise, analyzes the video feed, and gives continual feedback on the patient's performance. Computer human interaction interface allows the system to deliver the guidance for the movement of patient effectively and corrects incorrect movement in real-time. The assistant can be bundled with video chat facilities to allow the therapist to observe the session remotely. If desired, portions of the session can be recorded and sent to the therapist after the session.

Figure 1. (a) (left) Pei performs a shoulder rotation while the assistant shows him the degree of rotation. (b)(middle) The screen reminds Pei how to do pendular exercises, while preparing to count his repetitions. (c)(right) The assistant's screen shows a menu of assigned exercises, while reporting the degree of flexion for Pei's elbows in the current exercise.

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