

Design of a Frozen Shoulder Expert Rehabilitation System

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Abstract: Frozen shoulder is a musculoskeletal condition that is characterized by insidious stiffness in the shoulder joint, leading to pain and loss of range of motion (ROM) in the shoulder. Treatment of frozen shoulder consists of a combination of supervised in-office physical therapy and home exercises to increase the patient's ROM. Currently, practitioners are unable to monitor patient compliance with exercises and whether they have been performed correctly. This paper describes the Systems Engineering Design, Implementation, and Testing of a prototype that provides at-home rehabilitation with remote monitoring. The developed prototype consists of a wearable device that measures ROM using an Inertial Measurement Unit (IMU) and a software application to analyze sensor data and recommend exercises based on progress results. Verification testing consisted of measuring the accuracy of the IMU. Validation testing included a usability test to measure user experience and identify possible design flaws.

Keywords: Frozen Shoulder, Range of Motion, Physical Therapy