Design And Implementation Of Exoskeleton Robotic Arm Using Gesture Control

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Abstract- *An exoskeleton for a human arm (which will provide physiotherapy to the patients as well as enhance their power) will be controlled using the processed data from the accelerometer sensor signals collected from the patient. Partially paralyzed people who are not able to make bodily movements or people who have met with severe accidents who needs physiotherapy, can be fitted with our robotic exoskeleton on their arm. This exoskeleton will have motorized control. A controller will be fitted on to the physiotherapeutic exoskeleton for controlling it and to be connected with the signal processing unit attached to the working arm of the patient.*

Keywords- Physiotherapy, Gesture Control, Signal processing, Arduino Uno, Arduino Mega, Physiotherapeutic Exoskeleton, Servo, Servo 500, Bluetooth ,HC-05, Tinker Cad

I. INTRODUCTION

The basic assumption of project reports the design, construction and a testing replica of the human arm which aims to be dynamically as well as kinematically accurate. The delivered device tries to resemble the movement of biological human hand by reading the signals generated by accelerometer. The accelerometer is placed on the working arm .Accelerometer signal is processed by the microcontroller and the movement is then generated to the artificial hand via servo motors. Patients that suffer from amputee below the elbow can benefit from this bio-robotic arm.

II. LITERATURE SURVEY

A study of Modern treatments in Physiotherapy [1]

Modern medical treatments incorporate technology on a huge basis. Use of robotics and technology in medical treatment of patients is efficient and effective. In physiotherapy especially, new techniques using robotic science are developed for ease in treatment. Limbs of patients dealing with amputee or paralysis are treated with bionic and exoskeleton limbs respectively. The patients can train their paralytic limbs on their own using this exoskeleton arm system instead of long treatments with a physician.

III. BLOCK DIAGRAM

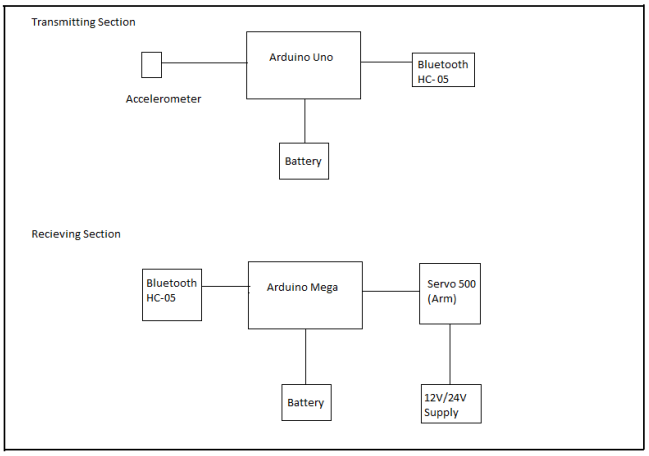

Fig. 1 Block Diagram of Exoskeleton Robotic Arm

IV. PROPOSED SYSTEM WORKING

The proposed system works on the basis of mapping the movement of working arm with accelerometer and then using those signals to move the exoskeleton arm. This exoskeleton is placed over the affected arm. The exoskeleton arm will be driven by a servo motor. The paralysed or strained arm works in conjuncture with the working arm.

V. METHODOLOGY

The proposed system works on integration of gesture control with a servo motor operated exoskeletal arm.

1.Gesture Control: The gesture control comprises of a transmitter and a receiver section. The transmitter section consists of an accelerometer, bluetooth module HC-05, Arduino Uno and a power supply. The receiver section consists of a Arduino Mega which directly operates the motor.There is a bluetooth HC-05 module interfaced to Arduino Mega. The accelerometer maps the movements of the working arm and sends signals to Arduino Uno. The transmitter sends data to receiver for movement which has 3 commands i.e up, down and stop. On the basis of this data the Arduino Mega controls the servo motor

2.Exoskeleton arm: The exoskeleton arm is designed on Tinker Cad software. It facilitates shoulder and elbow movements. It moves by the rotation of servo 500.

VI. RESULT

Hence we have controlled the operation of exoskeleton arm by gesture control for its effective and efficient use in physiotherapy.

VII. ACKNOWLEDGMENT

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