Synopsis on AUTOMATED REHABILITATION GLOVES

1) **Project Reference Number**
   46S_BE_4080
2) **Title of the project**
   AUTOMATED REHABILITATION GLOVES
3) **Name of the College & Department**
   Canara Engineering College, Department of Electronics and Communication Engineering
4) **Name of the students & Guide(s)**

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5) Keywords

Rehabilitation Gloves, Automated Assistive technology, Hand therapy, Sensor technology,Rehabilitation engineering,Wearable devices,Fine motor skills,Physical therapy

6) **Introduction / background (with specific reference to the project, work done earlier, etc) - about 20 lines**

If you have had an injury or have a condition that is limiting your range of motion, you will continue to feel less and less capable of participating in your daily activities unless you receive physiotherapy. Physiotherapy is the most commonly prescribed treatment to assist in the recovery of many injuries and conditions. Chronic pain, car, and sports injuries, and challenges with mobility can all be greatly improved with the use of physiotherapy. If you do not follow your physiotherapy plan it may lead to stiffness of muscles resulting in pain and suffering.

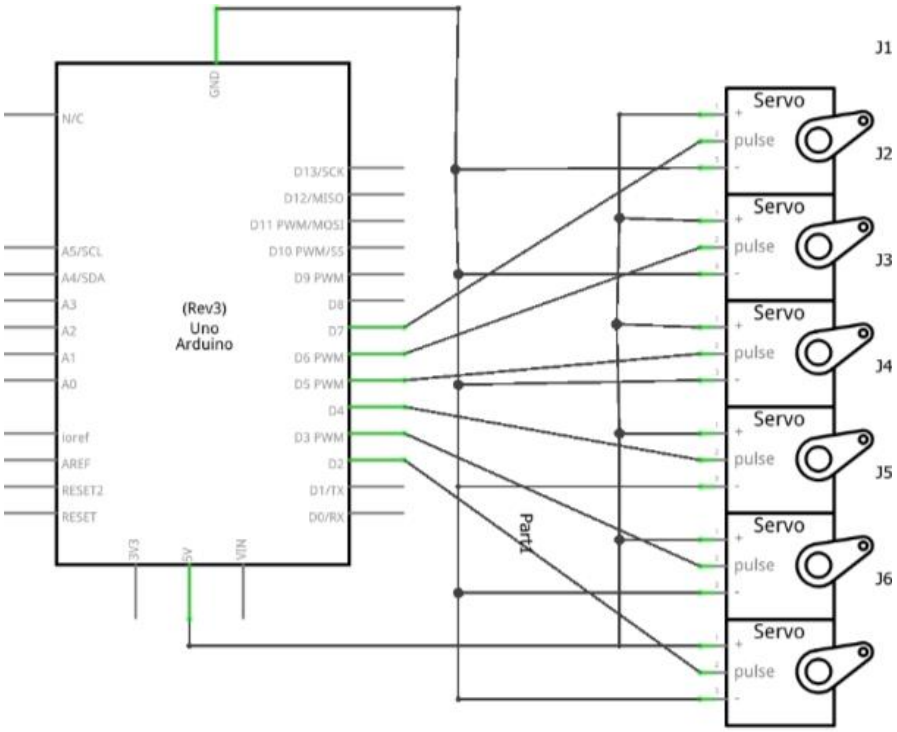
An estimated 5.4 million people worldwide, or close to 1 in 50 people, have paralysis, according to the research. Any portion of the body can become paralyzed, including the face, one side, an arm, a leg, or both. The body's impacted parts might eventually become hard and useless. Physiotherapy is one of the solutions available to solve this issue. Physiotherapy improves recovery of function and mobility after stroke. National Institute for Health and Care Excellence (NICE) recommends a minimum of 45 minutes of physiotherapy five days a week as high-intensity therapy is needed to relearn lost abilities.

The development of robotic systems for rehabilitation has emerged as a fast-growing topic and has garnered the interest of several researchers. This project aims to deliver an automated and affordable rehabilitation glove by 3D modeling a lightweight robotic arm and performing basic finger exercises. Further extending the structure up to the wrist, to perform the wrist exercises. Trying to achieve a flexible range of motion for joints, unlike most devices that are available in the market. Patients can practice independently, without a therapist's constant presence, allowing them to exploit their full potential for recovery. The multifunctional hand physiotherapy equipment can also increase the time of treatment, at a limited cost.

7) Objectives (about 10 lines)

The goal of this project is to design a portable, lightweight, and low-cost rehabilitation system for people with paralyzed hands. Designing a wearable device allows the user to perform specific movements and exercises to train the patient's impaired hand. Also focusing on the efficiency of the product such that even severely impaired patients can practice independently, without the constant presence of a therapist, allowing patients to exploit their full potential for recovery. Thereby helping the user to gradually restore the functionality of his hand.

8) **Methodology (about 20 lines on materials, methods, details of work carried out, including drawings, diagrams etc)**



The project consists of a 3D-printed robotic hand, whose finger segments are constructed by passing an elastic thread, followed by a fishing wire attached to the tip of each finger. The elastic thread is used for the reflex action and the fishing wire to fold and release the fingers. Each finger is controlled by an individual servo motor and also an additional servo is used to perform wrist exercises.

Arduino is used to control and coordinate the movement of the robotic hand. It controls by sending data signals to the particular servo motor as per the program on the board. When the data signal is received by the servo motor, it rotates by a particular angle. This in turn pulls the fishing wire which is kept intact with the servo. The elastic thread which is passed into the finger helps in a reflex action to get back the fingers to their normal position.

A glove is going to be attached at the top of the robotic hand in which the patient will have to enter his hand, and when the device is turned on, the fingers of the robotic hand provide structural support to the fingers of the patient and helps him to perform basic finger and wrist exercises.

9) Results and Conclusions (about 20 lines with specific reference to work carried out)

Rehabilitation gloves are designed to support hand and finger movement during rehabilitation exercises and activities. The specific results that can be expected from using rehabilitation gloves can vary depending on the individual's condition and goals. However, some potential benefits of using rehabilitation gloves include: Increased range of motion: By supporting hand and finger movement, rehabilitation gloves can help increase the range of motion in the fingers and hands. This can be particularly helpful for individuals recovering from injuries or surgery.

In this project, we have to developed an affordable rehabilitation gloves by 3D modeling a lightweight robotic arm for performing basic finger exercises, so that the Patients can practice independently, without the constant presence of a therapist, allowing patients to exploit their full potential for recovery. We have done a lot of literature survey and also kept doctors in loop to take their feedbacks and inputs regarding the same. We have also printed the 3D model and experimented with its ease of movement to achieve the required movements for rehabilitation.

Overall, the specific benefits of using rehabilitation gloves will depend on the individual's needs and goals, as well as the type and quality of the gloves being used. It's important to consult with a healthcare professional or occupational therapist to determine if rehabilitation gloves are appropriate and how they can best be used to support your rehabilitation goals.

10) Scope for future work (about 20 lines).

Further, the 3D structure can be extended up to the wrist, in order to perform wrist exercises and also try to achieve a flexible range of motion for joints, unlike most devices that are available in the market. Once, we are ready with the product, will then try implementing it on the patients keeping the doctors in the loop. Finally apply for legal certificates and bringing the product into the market with as low cost as possible.