Prosthetic Hand based on 3D Printing and Controlled using Flex Sensor

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Abstract–This project presents the development of a physiotherapy-focused prosthetic hand using 3D printing technology, Arduino Uno microcontroller, EMG sensor, and an LCD display. The objective is to create a customizable, affordable, and technologically advanced prosthetic hand that not only assists users in daily activities but also serves as a tool for rehabilitation and physiotherapy.The prosthetic hand's design leverages 3D printing for lightweight and customizable components, ensuring a tailored fit for individual users. The integration of an Arduino Uno microcontroller as the central control unit enables precise control over hand movements, offering a wide range of functionalities. An EMG sensor detects muscle signals, providing a natural and intuitive interface for users to interact with the prosthetic hand.

Our project pioneers an innovative physiotherapy method leveraging a 3D-printed robotic hand controlled by glove based flex sensors, designed to enhance hand control for individuals facing physical challenges.Through precise translation of hand movements into signals,This system facilitates targeted exercise and rehabilitation, customizable to each patients needs .It improve overall hand function , offering a promising solution for those with various hand related conditions or injuries .

Keywords: Flex sensor , Arduino UNO, Power Supply, 3D printed hand .

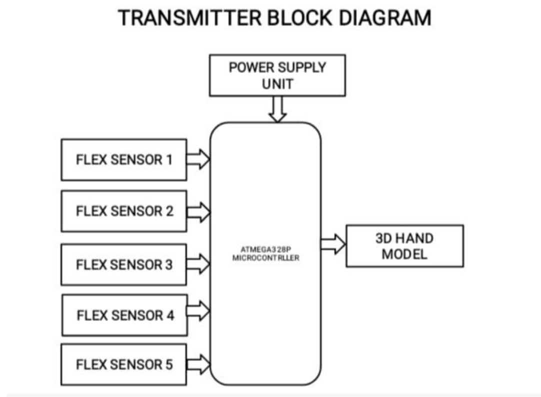
I. INTRODUCTION

In the realm of rehabilitative technology, there exists a critical need for innovative solutions to aid individuals with hand-related conditions or injuries. Traditional physiotherapy methods often lack personalized feedback and targeted exercises, hindering effective rehabilitation outcomes. To address this challenge, our project introduces a groundbreaking approach: an assistive 3D-printed robotic hand controlled by glove-based flex sensors. This system aims to revolutionize hand rehabilitation by providing tangible feedback and customizable exercises tailored to each patient's specific needs.Through precise translation of hand movements into signals, our technology seeks to enhance hand control and overall function, offering a promising avenue for individuals facing physical challenges. Upper limb amputations can significantly impact an individual's daily life, limiting their ability to perform various tasks that many take for granted. The field of prosthetics has evolved to address these challenges, aiming to provide amputees with solutions that restore both functionality and dignity. This project introduces a novel approach to prosthetics by developing a 3D-printed prosthetic hand.

II. SYSTEM DESIGN AND DEVELOPMENT

The existing system control for arm is given through the pic microcontroller and the RF signals are transmitted. The transmitted signals are received in the receiver side that is connected to the patient's arm. Thus, this paper proposes a method of arm control for paralyzed patients.The model of this paper is useful to teach the basic exercise which useful to recover the handicap's usual working habits. An arm to arm controller will reduce the effort of the doctors to give the treatment to more patients. All the process will be done simultaneously. The flex sensors serve as the primary input mechanism, detecting and translating hand movements into electrical signals. These signals are processed by the ATmega328P microcontroller, which controls the functionality of the 3D hand model. The microcontroller interprets the signals and commands the hand model to mimic the desired movements, providing a responsive and intuitive interface for users. A power supply unit ensures uninterrupted operation, supplying sufficient power to drive the components effectively. Together, these components form a cohesive system that enables precise control and feedback, facilitating targeted exercises and rehabilitation for individuals with hand-related challenges.

The current landscape of rehabilitative technology for hand-related conditions or injuries often falls short in providing personalized feedback and targeted exercises, leading to suboptimal rehabilitation outcomes. Traditional methods lack the adaptability and customization needed to address the diverse needs of individuals with varying degrees of hand impairment. Consequently, there exists a pressing need for innovative solutions that offer tangible feedback and customizable exercises to enhance hand control and overall function. Our project aims to bridge this gap by introducing an assistive 3D-printed robotic hand controlled by glove-based flex sensors, offering a promising approach to address the limitations of existing rehabilitative methods.



VII RESULT AND DISCUSSION

We The existing system control for arm is given through the pic microcontroller and the RF signals are transmitted. The transmitted signals are received in the receiver side that is connected to the patient's arm. Thus, this paper proposes a method of arm control for paralyzed patients.The model of this paper is useful to teach the basic exercise which useful to recover the handicap's usual working habits. An arm to arm controller will reduce the effort of the doctors to give the treatment to more patients. All the process will be done simultaneously.

VIII CONCLUSION

In conclusion, the development of a physiotherapy-focused prosthetic hand using 3D printing.By combining these advanced technologies, we have created a customizable, affordable, and technologically sophisticated solution that goes beyond the traditional concept of a prosthetic hand. The integration of 3D printing ensures a tailored fit for individual users. It is also transforms the prosthetic hand into a valuable tool for rehabilitation and physiotherapy. This project underscores the potential of technology not only to restore lost functionality but to actively contribute to the holistic well-being of individuals with upper limb amputations. As we strive for continuous improvement and collaboration within the prosthetics community, this innovative prosthetic hand stands as a testament to the transformative power of technology in enhancing the lives of those who have experienced limb loss.In conclusion, our project represents a significant step forward in the field of hand rehabilitation. By introducing an assistive 3D-printed robotic hand controlled by glove-based flex sensors, we have provided a novel solution to address the limitations of traditional rehabilitative methods.

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