Bionic Hand Project Report

Project Overview

This project focuses on creating a cost-effective bionic hand system that replicates human hand movements using visual perception technology. The system integrates Python (OpenCV, MediaPipe), Arduino, and servo motors to provide real-time control of a 3D-printed robotic hand.

Introduction

Bionic hands have the potential to revolutionize healthcare and safety sectors by enabling remote operations with precision and low cost. This project demonstrates a system capable of mimicking human hand movements in real-time for applications such as remote surgery and handling hazardous materials.

Methods

The project employs a camera to capture hand movements and uses Python libraries like OpenCV and MediaPipe for image processing. Hand movement data is then transferred to an Arduino using PyFirmata, which controls servo motors connected to a 3D-printed robotic hand. Calibration is performed to ensure accurate mapping of hand gestures to servo motor angles.

Results and Discussion

The system successfully replicated human hand movements with high accuracy and minimal latency. Testing showed effective control of various hand gestures, with the potential for further improvements such as wireless control and enhanced motor precision.

Appendices

Additional materials such as system diagrams, calibration data, and test results are included to provide detailed insights into the project's development and performance.