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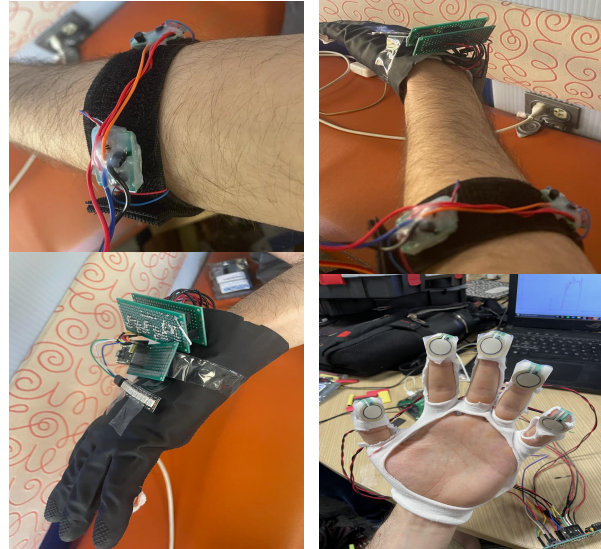
ASU

BARROW Neurological Institute

Introduction

Numbness or the inability to feel (impaired sensation) is a condition in which a person loses or has diminished sensation in a region of their body. Sometimes it's possible that people with impaired sensations are incapable of feeling textures, pain, warmth, or the position of their affected body parts.

This numbness is usually a result of stroke, diabetics, injuries,etc.

○ An interactive therapeutic device is prototyped to aid people with impaired sensation in pressure measurement while grasping various objects.
○ Usage of this device results in removal of excessive pressure exerted by the user on objects. Hence, resulting in less finger strain.
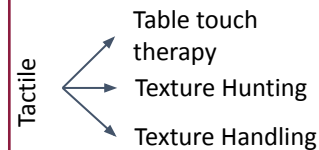
Background

Major causes of Impaired Sensations:
- Stroke
- Diabetics
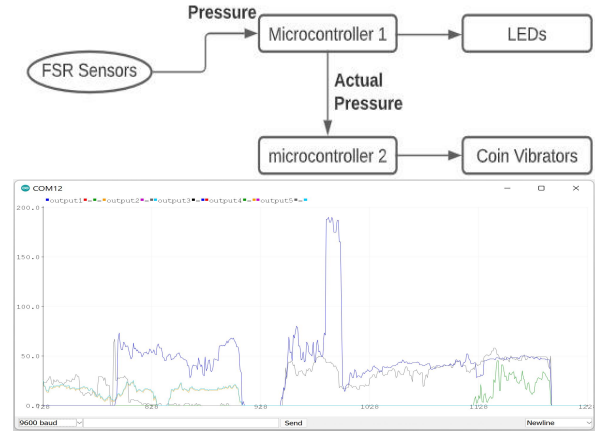- Spinal Cord Injury

Treatments:

Tactile:
- Table touch therapy
- Texture Hunting
- Texture Handling

Technology:
- Neuromuscular Electrical Stimulation
- Electro-acupuncture

Implementation and Results

Proposed Solution

- A wearable device that is capable of indicating the user the appropriate amount of pressure required to hold a specific item via haptic and visual cues.
  ○ Appropriate pressure is determined by holding the object with an unaffected hand, which then this data is stored in an NFC tag via a tag writer
  ○ The glove reads the tag and knows the appropriate pressure range
  ○ Four distinct actuations from the glove's vibration motors and five distinct actuations for LEDs will indicate the user whether they are applying the right amount of pressure, too much or not enough.

Future Work

- Our device can be greatly improved by implementing custom made FSR sensors that follow the natural shape of a human hand.
  ○ This would give more accurate reading and would have a more realistic approach in calculating the actual grip force implemented by every single finger and the palm
- Add a scaling device that would allow users to use any object by determining the appropriate grip force based on the friction coefficient of a material and its dimensions
- Designing an app to write new NFC tags. Hence, making it easier to add new objects.