Motiv – A PhysioRecovery Solution
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HARDWARE

- Consists of a comfortable multiple band system depending on the exercise chosen by the user.
- All electrical housing is stored inside one minimalistic housing that easily attaches to the wearable band using velcro.

ELECTRICAL HOUSING EXPLODED DIAGRAM: SHOWING ALL ELECTRICAL COMPONENTS INSIDE THE HOUSING.

ELECTRICAL COMPONENTS USED

- IMU 6050 - Accelerometer and gyroscope
  Reasons for choosing -
  - 6 Degrees of Freedom
  - Small footprint
  - Affordable and easily available

- TinyPico ESP-32 - Microcontroller
  Reasons for choosing -
  - Small Footprint
  - Enough GPIO/ resources without comprising footprint
  - ESP-NOW allows board to board wifi communication.

WHAT IS THE PROBLEM?

1) Physiotherapy is expensive! - Sessions can cost upwards of $100/hr.
2) People don't follow at-home programs - Non-adherence can be as high as 50 - 65% in most patients.

PROJECT GOAL

"To help patients perform physiotherapy exercises correctly at home, and to increase adherence to their exercise plans"

OUR PROJECT

Our solution is a wearable device that works hand in hand with a web app instructing users on how to do desired exercises in proper form and full adherence.

SOFTWARE

Our WebApp has a computer vision model which works in tandem with the IMU hardware to perform the adherence for a user exercise

1) Computer Vision
   Access webcam and send feed video into MoveNet pose estimation model

2) IMU
   Connect to physical device over Bluetooth through Web Bluetooth API
   Calculate leg angle based on keypoint positions received from model
   Request angle GATT characteristic from device

3) Taking readings 20 times/s and use average of last 5 readings as angle value

FUTURE IMPROVEMENTS AND SCOPE

- IMU & CV combination
  Combine CV and IMUs to detect complex, 3D exercises

- Circuitry
  Ameliorate internal component layout of wearable

- Software
  Build native mobile app to have a more user-friendly environment

- Final Product
  Make casing and band production ready

- User Engagement
  Increase adherence by providing a more interactive environment

- Vision
  Increase exercises to incorporate different body parts

SIGNAL PROCESSING

Using a moving average & complimentary filter for sensor fusion

Analysis of data

- Accelerometer
- Gyroscope
- LPF
- HPF
- Tilt
- Sensing
- Integration
- Complimentary Filter