Two Best Project Report :

**1] Project :** Remotely Controlled 3-DOF Manipulator with Hand-Pose Detection

Aim : to control the joints of 3-DOF Manipulator by detecting and analyzing the position/distance between fingers with Hand Landmark model by Mediapipe.

Apparatus Used : Raspberry Pi 4B+ ; PiCam; Arduino UNO; Jumper Wire, 3-DOF Manipulator, Arduino IDE, Pycharm

Implementation and Working :
Connections - In this project, we have used Arduino UNO as a slave controller. Raspberry Pi is attached with PiCam for real-time video feed. The Video processing is done by raspberry pi and the landmark distance data is shared to arduino UNO through A0 analog pin. Then Arduino generate the PWM signals & the servo1, servo2, servo3 are connected with D2, D3, D4 pins respectively.

Here I have show similar implementation with pot :
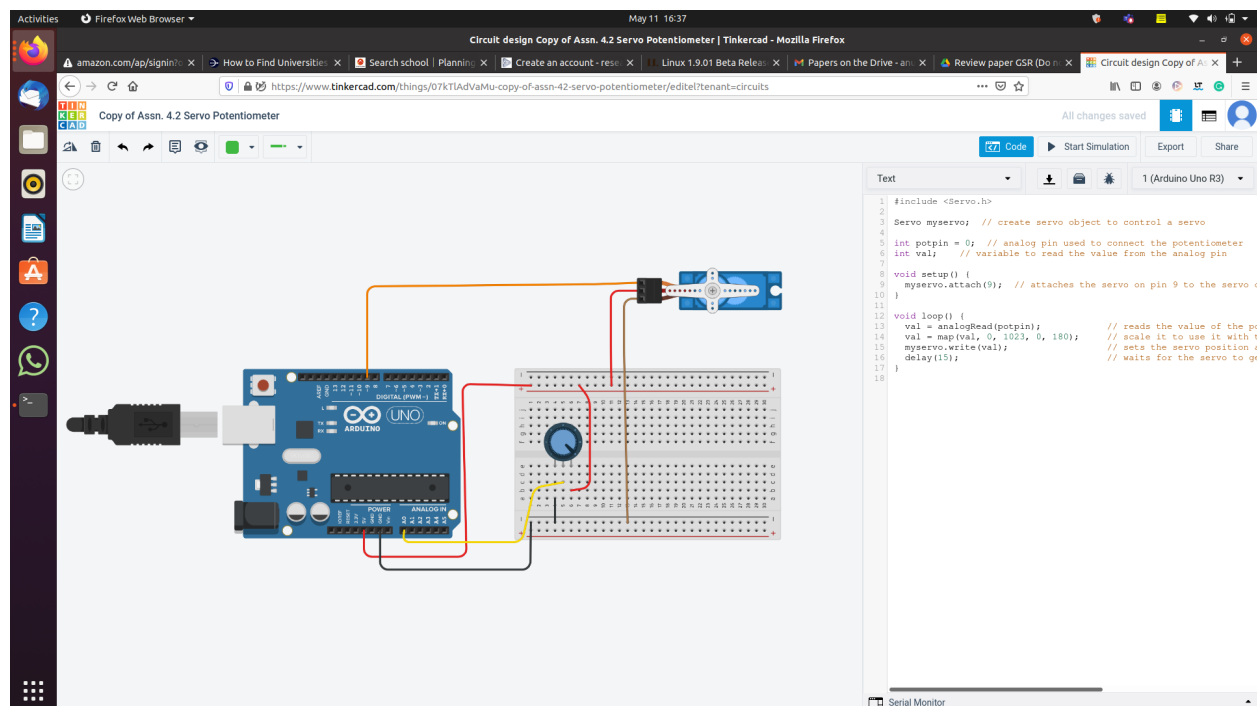
Video processing & Pose Landmark analysis : We have used Opencv, numpy, mediapipe and other libraries. Hand landmarks are generated from real-time video feed. Following figure shows landmarks generated. In our current project we are exploiting 8, 12,16 and 20 hand landmarks

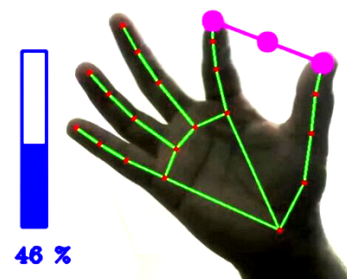where landmark 20 acts as reference and landmarks 8, 12, 16 are for controlling servo1, servo2, servo3 respectively.

Fig 2. 21 hand landmarks.
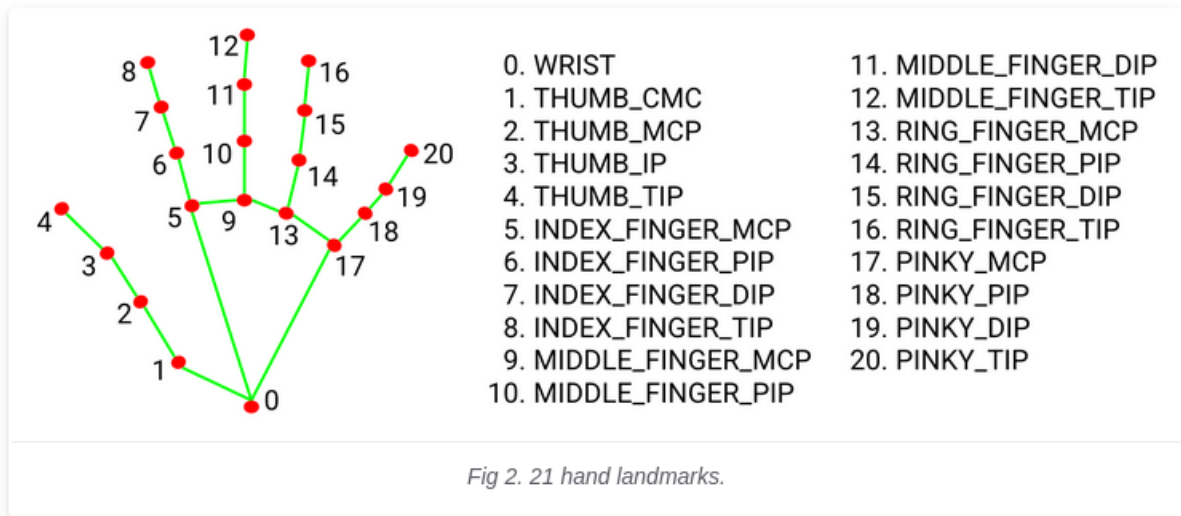
The distance between two landmarks are calculated by : length = math.hypot(x2 - x1, y2 - y1) Then the value generated ranges from 0 - 180 which is later processed by Arduino UNO for PWM generation.
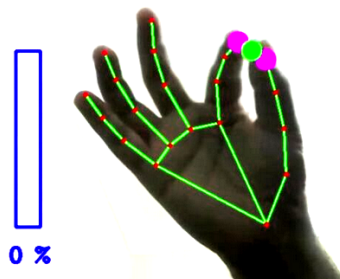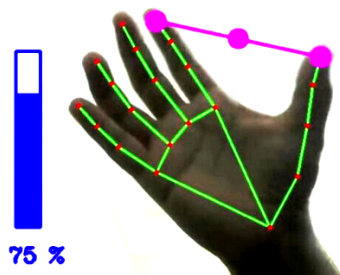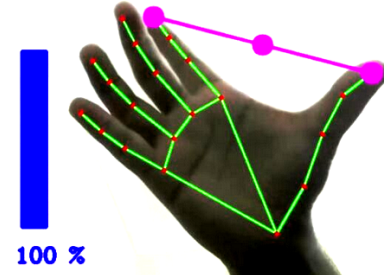

Code :
https://drive.google.com/file/d/1-s3_Ibu1mRLipo9LlQc-hQc5f_B6dDRz/view?usp=sharing

Remark : With this model, we are able to control the manipulator arm with ease as we can understand and imbibe the operation control as our arm extensions. We can implement this kind of model in remote operations where manual control is required. By further development and implementing on higher resolution and computational power it can used in precise remote operations like surgery, search and rescue and similar task.

Application :

1] Industries : In collaborative environment human worker can control large manipulator with ease and without any extensive training.

2] Hospitals : Remote surgeries are also possible with improved version of our model

3] Search and Rescue : Similar model can be implemented in search and rescue operations with high-powered evacuation robots and machinery.

References :

1] https://google.github.io/mediapipe/solutions/hands
2] https://learnopencv.com/

2] **Project : Wearable Device with Real Time I2T Conversion**

Aim : to develop a prototype for wearable device for converting real-time image containing textual data to text based data

Apparatus : Raspberry Pi 3B+, PiCam, Power Bank

Working : The real-time video feed is processed and scanned for presence of text and numerical presence. Pytesseract library is used for converting the textual and numerical data from image to text. Further this converter data can also be converted to any targeted international languages here we have taken German language for preview. Following figure shows implementation of the project on danger sign board.

Connections : The connection and setup for the project as per the given figure.
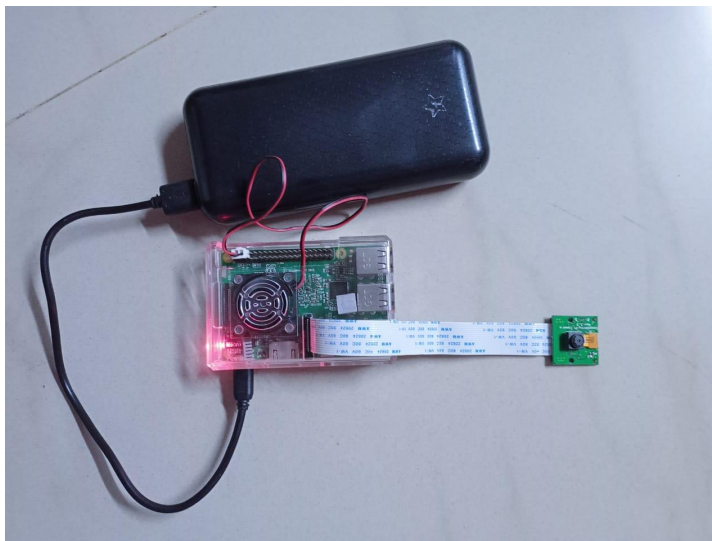
Our target audience are Elderly people (Poor-Eye Sight) , Person with disability and alien .

Code :
https://drive.google.com/file/d/1-s3_Ibu1mRLipo9LlQc-hQc5f_B6dDRz/view?usp=sharing

Future scope : By adding audio conversion mode to this project, it will be able to help people with poor eyesight, vision disorders or even alien visiting foreign cities.

Reference :

1] https://learnopencv.com/learn-keras-and-tensorflow/
2] https://www.raspberrypi.org/forums/