

A series of thin, black, straight lines of varying lengths and orientations are scattered across the upper and middle portions of the page. Some lines are parallel, while others intersect, creating a complex, abstract geometric pattern. The lines appear to be randomly placed but generally trend from the upper left towards the lower right.

Project Title,

Hand gesture recognition for Human-Computer Interaction

AI VIRTUAL MOUSE & GESTURE BASED VOLUME CONTROLLER

ABSTRACT

Gestures are a natural and intuitive form of both interaction and communication. When we take this idea towards human-computer interaction, we recognise human hand gestures through a camera and assign actions to them. Thus, we get Hand gesture recognition using computer vision.

In light of the pandemic, We aim to use contactless interaction technology

- Using computer vision to recognize predefined gestures with a camera and assigning appropriate actions to them **in order to create a virtual computer mouse.**
- Furthermore, we are no longer bound by the limitations of a physical mouse. Hence, we wish to redefine the conventions of operating a computer. Starting with developing a **virtual gesture-based volume controller.**



LITERATURE REVIEW

- **Vision based Hand gesture recognition** system received great attention in the recent few years because of its myriad of applications.
- the ability to interact with machine efficiently through human computer interaction.
- It has been used in fields such as virtual reality, gaming, etc to varying degrees of success
- Key issues of hand gesture recognition system are presented with challenges of gesture system.
- Review methods of recent postures and gestures recognition system presented as well.
- Summary of research results of hand gesture methods, databases, and comparison between main gesture recognition phases were also given

COMPARISON OF EXISTING METHODS WITH MERITS AND DEMERITS

Standard Hand recognition technology uses expensive hardware, Hence, difficult to implement in a large scale.

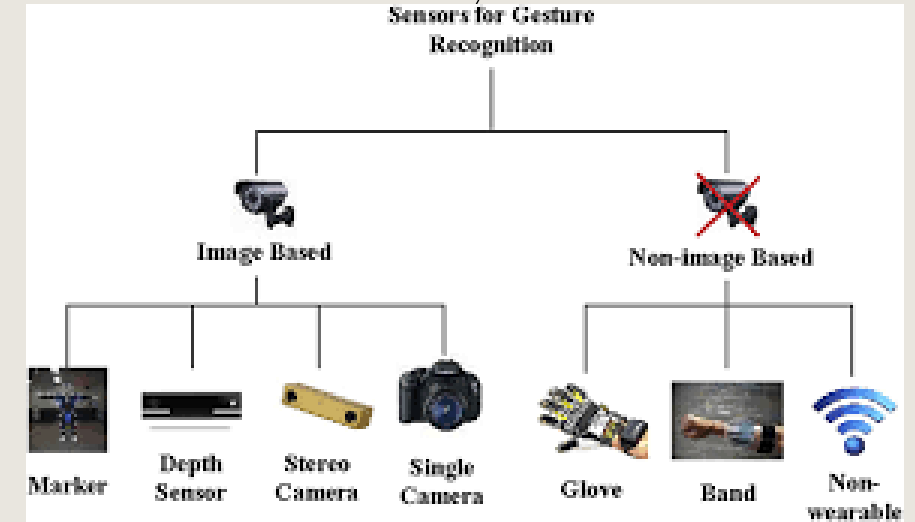
However, With **computer vision**,

+ Our project needs **only a hand, a camera and a basic computer** to function as an AI virtual Mouse.

+ With the right software, it is extremely **cost effective and accessible** to implement widely, Unlike the 'Kinect' developed by Microsoft.

+ **faster to implement** and to bring into action in dealing with time sensitive issues such as the Covid-19 pandemic.

- Convenience comes at **a cost of accuracy**



CHALLENGES TO ADDRESS

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- Raising Hand Recognition Confidence using any standard camera
- Consistency in detection of gestures
- Assigning action to gestures
- Admin access to system functions such as cursor movement, click automation and volume slider
- Dynamic Software to work on any compatible system with a camera and computer
- Improving user interface and experience
- Improving accuracy and quality while maintaining feasibility and accessibility.

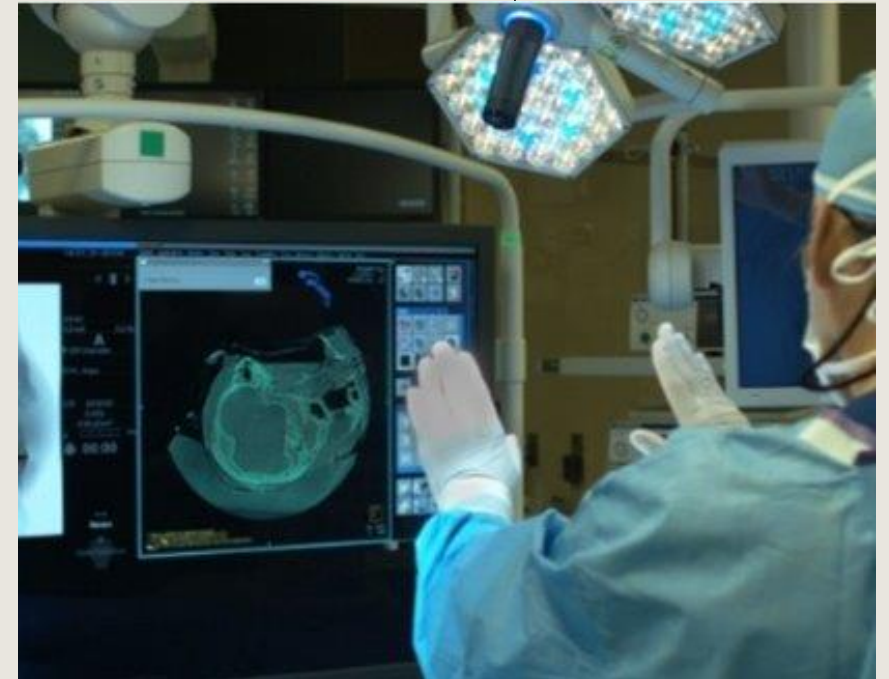
PROBLEM STATEMENT AND OBJECTIVES

Covid-19 Era, There is a need for "Contactless" Common equipment

- Currently, we have social distancing methods, use of disinfectants to reduce rates of spreading
- However, With gesture based 'Little to no contact' systems in place, we reduce points of contact. Thus, Creating a safer environment.

Healthcare

- As of now assistants help out with managing systems and this causes crowding in an enclosed place and is counterintuitive
- Gesture recognition can help to keep surgical wards sterile. By reviewing the computer without touching the screen, the surgeon can reduce the risk of infection.
- Inexpensive accessibility options



Market potential

❖ Consumer Electronics

Smartphones or TVs with embedded cameras allow us to use our hands to interact with media applications – control the playback of songs or movies. Gestures can be used to play/pause content, increase and decrease volume, mute or unmute sound, or to skip to the next song.

❖ Automotive

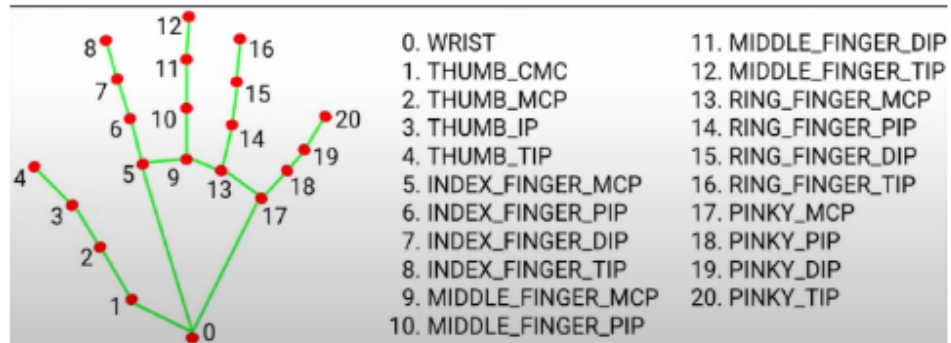
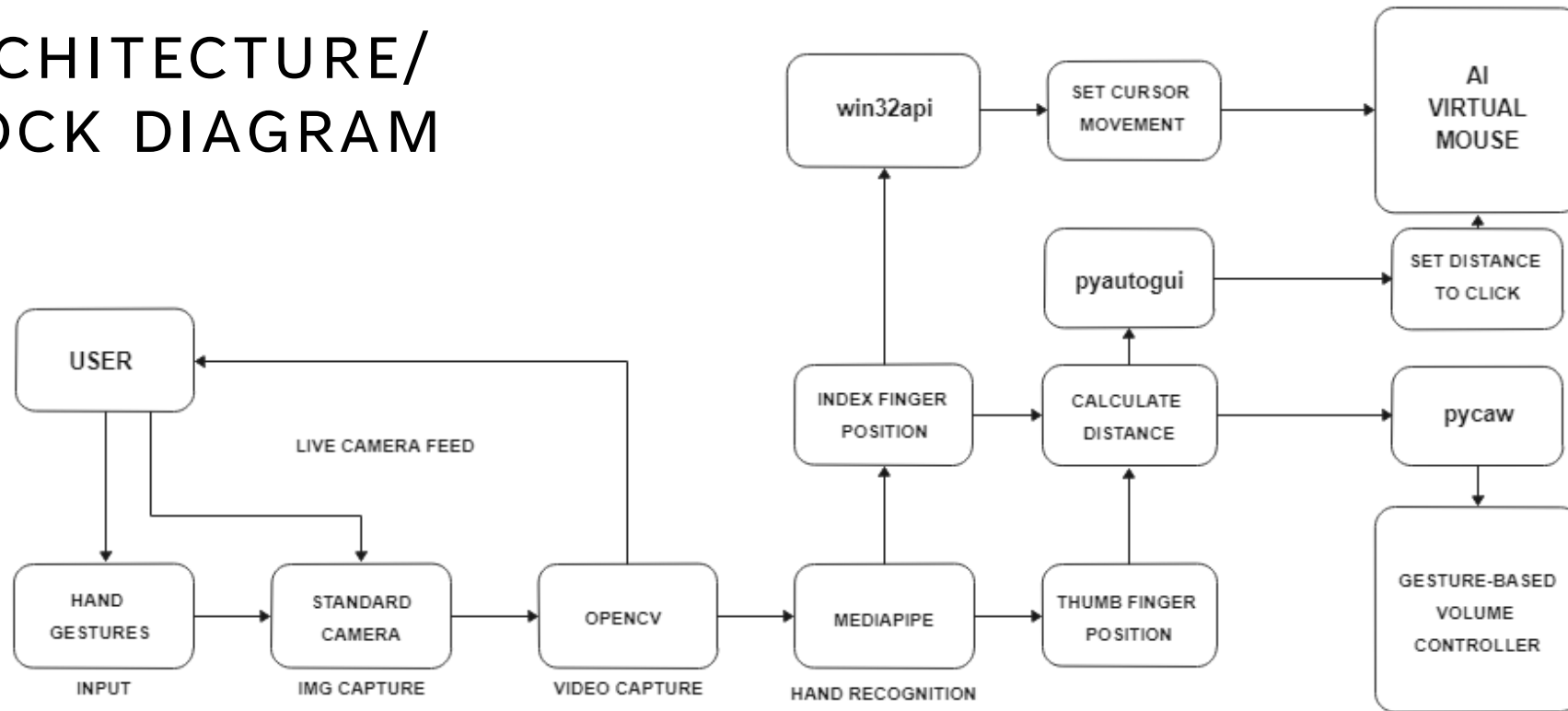
gestures can be used for lights control and GPS navigation. The benefit here is mainly improved convenience and user experience, as the driver no longer has to touch around the dashboard trying to find a button to switch radio stations or answer a phone call through the loudspeaker system.

❖ Entertainment

Virtual Reality is another beneficiary of gesture recognition. Most game consoles require controllers, but Kinect proved that it is not required. Using full-body movements can make your whole body a game controller



ARCHITECTURE/ BLOCK DIAGRAM



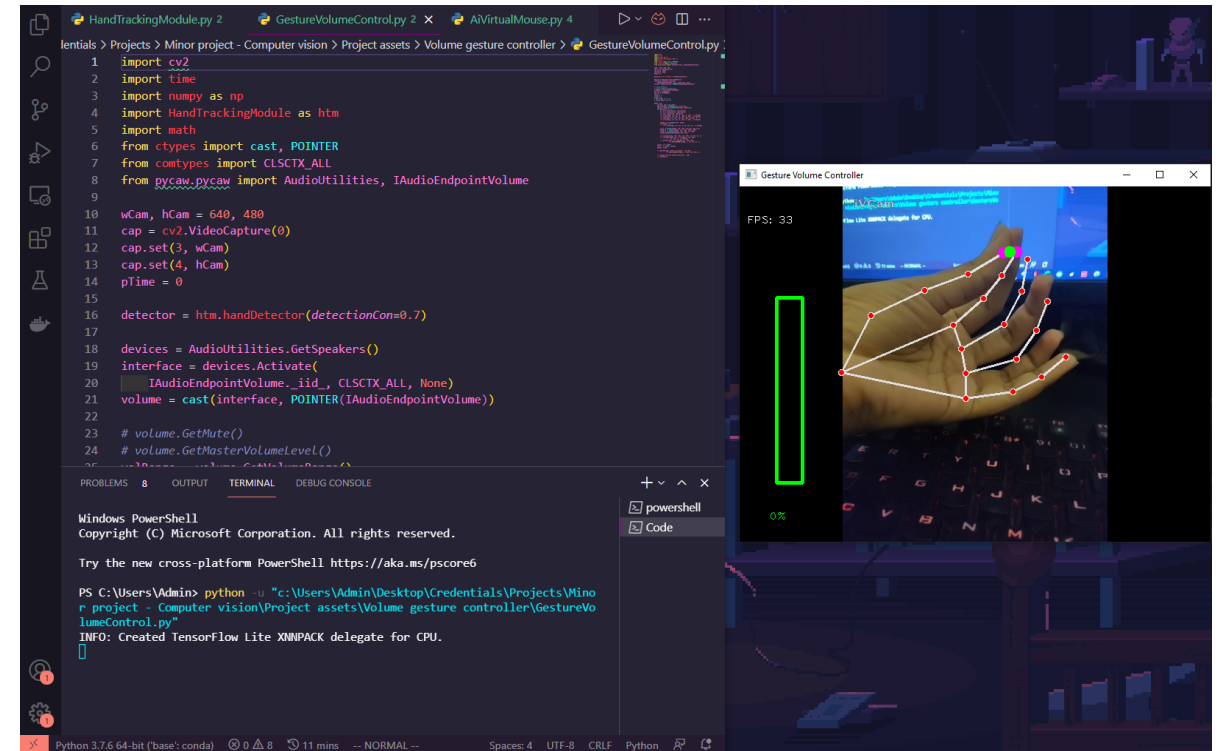
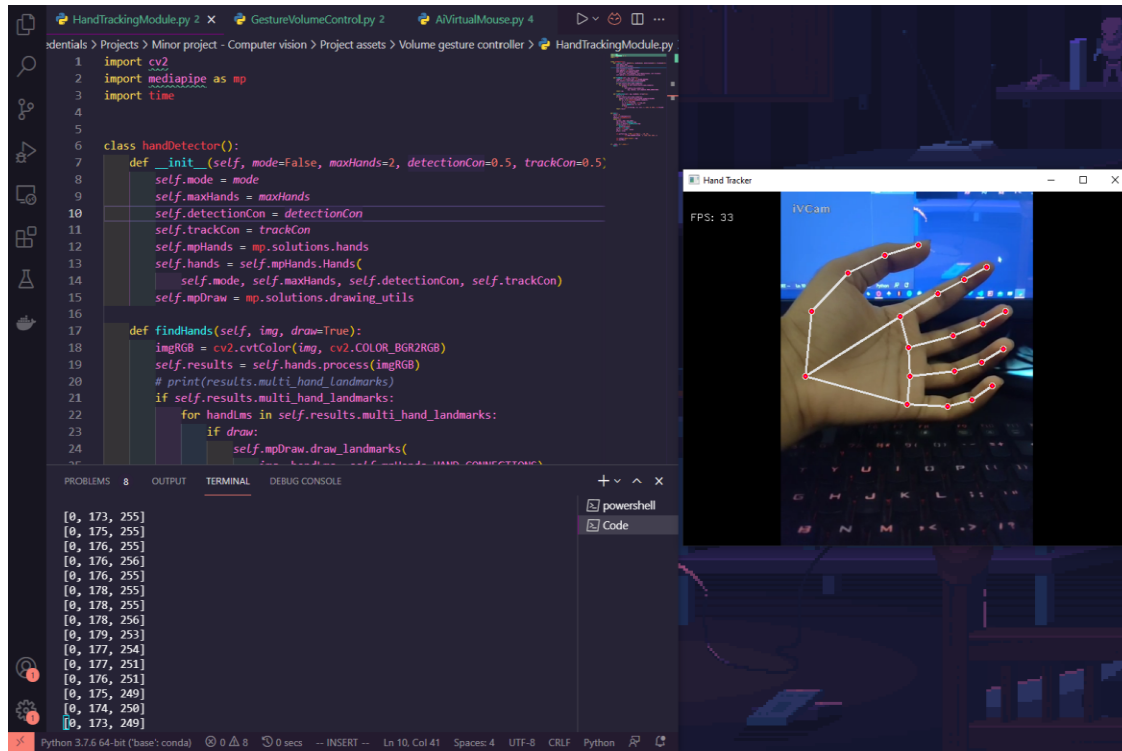
MODULES DESCRIPTION AND IMPLEMENTATION

- **opencv** module is a computer vision library that helps with video capture and displaying output.
- **mediapipe** is an open library of ML solutions which we use to recognize hand landmarks.
- **win32api** is used for cursor movement.
- **PyAutoGUI** allows us to use python scripts to control the mouse and keyboard to automate interactions with other applications.
- We **calculate the distance** between the index and the thumb finger in real time.
- This distance is used for **click automation**.
- **Pycaw** helps us access the windows volume slider and uses the same distance range as a **volume slider**.

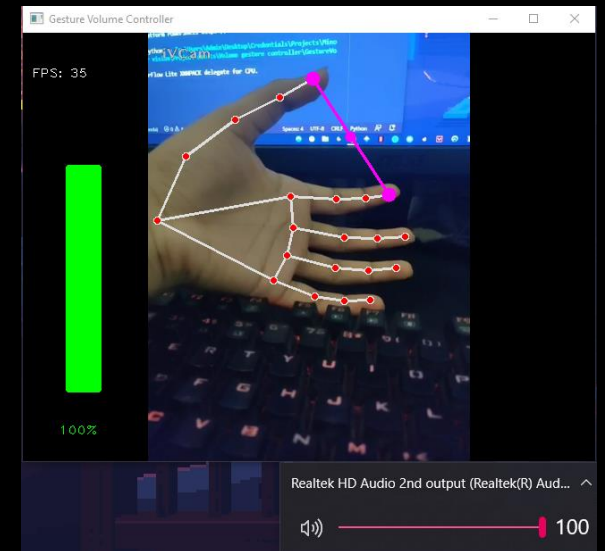
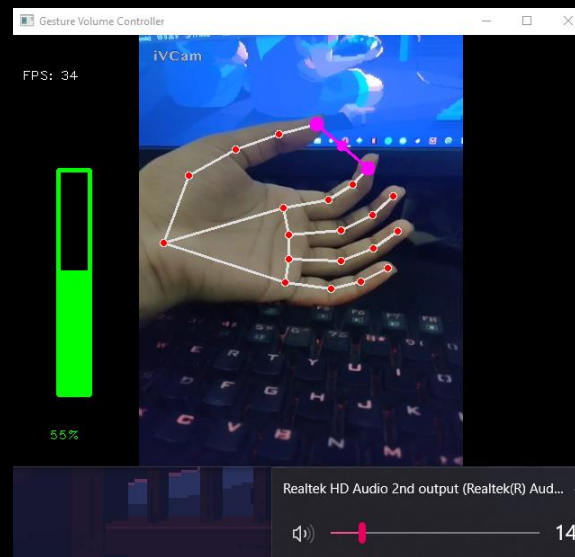
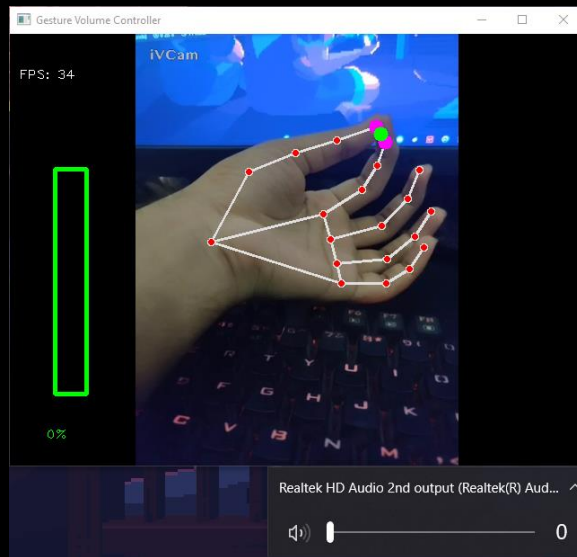
RESULTS AND DISCUSSION

- We incorporate years of research done in vision-based hand recognition technology to assign interactive actions to recognised gestures. Thus, we implement human-computer interaction through computer vision.
- We aim to develop an project that turns the user's hand into a tool for interacting with computers. We started this as a way to overcome the challenges in a pandemic and now we hope to push into the future of interactive technology.

SCREENSHOTS



SCREENSHOTS



REFERENCES

- **REAL-TIME HAND GESTURE RECOGNITION SYSTEM AND APPLICATION**

Hsiang-Yueh Lai,* Hao-Yuan Ke, and Yu-Chun Hsu Department of Electrical Engineering, National Chin-Yi University of Technology, No. 57, Sec. 2, Zhongshan Rd., Taiping Dist., Taichung 41170, Taiwan (R.O.C.) (Received October 30, 2017; accepted January 22, 2018)

- **HAND-GESTURE RECOGNITION USING COMPUTER-VISION TECHNIQUES**

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- **Vision based hand gesture recognition for human computer interaction**

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THANK YOU

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