A PROJECT REPORT ON

MOVEMATE

SUBMITTED TO

Department of Computer Science & Engineering (Artificial Intelligence and Machine Learning),

in fulfilment of Mini Project for the semester-IV of academic year 2022-2023

A Report Submitted in Partial Fulfilment of the

Requirements for the

Second Year B.Tech. of CSE (AIML)

Under the **Mini Project**

By

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SEM IV, AY: - 2022-23

CERTIFICATE

KIT's COLLEGE OF ENGINEERING

This is to certify that, the project entitled "**MOVEMATE: Gesture Controlled Virtual Mouse**", has been satisfactorily completed by,

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Students of S.Y.B.Tech, Department of Computer Science & Engineering(AIML and DS), Specialization in Artificial Intelligence and Machine Learning in fulfillment of Mini Project for the semester-IV of academic year 2022-2023.

This project report is a record of student's own work carried by him/her under my supervision and guidance in satisfactory manner.

Date: 25/05/2023

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Kolhapur Institute of Technology's
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Year 2022-2023

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We express our indebtedness to all who have directly or indirectly contributed to the successful completion of our Mini Project.

Date: 25/05/2023

Place: KIT, Kolhapur

Sincerely by,
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PROJECT OVERVIEW:

The gesture control virtual mouse project aims to develop a system that enables individuals with physical disabilities to interact with computers using hand gestures. The project focuses on accurate gesture recognition and precise cursor control, allowing users to perform common mouse actions through intuitive hand movements. The system prioritizes accessibility and usability, offering customization options and compatibility with various software applications. The project's further work involves refining the gesture recognition algorithm, enhancing cursor control, improving customization and calibration, and optimizing performance and stability. Usability testing and feedback will guide iterative improvements, while documentation and licensing considerations will facilitate deployment. The project also explores future enhancements and collaborations to stay at the forefront of assistive technology advancements.

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INTRODUCTION

The conventional human-machine interaction has evolved as a result of virtualization and shift towards immersive technologies like the metaverse. With the advancement of technology, devices are becoming smaller and smaller. Some devices have gone wireless, while others have gone unnoticed. This study offers a method that could render some devices latent, which is the future of HCI (Human-Computer Interaction). The proposal is to create a virtual mouse that recognises gestures. The goal is to use a simple camera instead of regular mouse to control mouse cursor functions. The Virtual Mouse works as a medium of the user and the machine only using a camera. It helps the user to interact with a machine without any mechanical or physical devices and control mouse functions. The Hand Gesture recognition is moving at tremendous speed for the futuristic products and services and major companies are developing a technology based on the hand gesture system for applications such as:

1. Laptop, Hand held devices,
2. Professional and LED lights.
3. Entertainment
4. Education
5. Medicine
6. Automation

ANALYSIS:

PROBLEM STATEMENT:

Many individuals with physical disabilities face challenges in operating a traditional mouse or touchpad, limiting their access to computers and digital technologies. The aim of this project is to address this issue by developing a gesture control virtual mouse system that provides an alternative and accessible input method for individuals with physical disabilities. The system should accurately track hand gestures, translate them into precise cursor movements, and enable common mouse actions, empowering users to navigate and interact with digital interfaces effectively.

SYSTEM REQUIREMENTS:

- Hardware Requirements:
  - **Camera or Sensor Device:**
    A camera or sensor device capable of capturing hand movements and gestures accurately. This can be an infrared camera, depth sensor, or any other suitable technology.
  - **Computer:**
    A computer system capable of running the gesture control virtual mouse software smoothly. The specifications should be determined based on the software requirements and any additional dependencies.
- Software Requirements:
  - **Operating System:**
    Determine the target operating system(s) for the gesture control virtual mouse system, such as Windows, macOS, or Linux.
  - **Gesture Recognition Algorithm:**
    Develop or select a robust and real-time gesture recognition algorithm to accurately interpret hand gestures.
  - **Gesture Mapping and Calibration Software:**
    Implement software that allows users to customize gesture mapping and sensitivity according to their preferences. Include a calibration process to adapt to different hand sizes and movements.
  - **User Interface:**
    Design an intuitive and user-friendly interface that displays visual feedback and settings for the gesture control virtual mouse system.
  - **Compatibility and Integration:**
    Ensure compatibility with various software applications, such as web browsers, productivity software, and multimedia applications, to enable seamless integration of the virtual mouse system.

REQUIREMENT ANALYSIS:

1. Gesture Recognition:
   - The system should accurately recognize a variety of hand gestures, including swipes, taps, pinches, waves, and other predefined gestures.
   - The recognition algorithm should be capable of distinguishing between different gestures and mapping them to corresponding mouse actions.

2. Cursor Control:
   - The virtual mouse system should enable precise and responsive control of the cursor based on the user's hand movements and gestures.
   - Cursor movement should be smooth, fluid, and accurately replicate the user's hand motions.

3. Click and Drag Actions:
   - Users should be able to perform left-click, right-click, and dragging actions using hand gestures.
   - The system should accurately interpret the gestures and initiate the corresponding mouse actions in a timely manner.

4. User Interface:
   - Design a user-friendly interface that provides visual feedback on recognized gestures, cursor movement, and settings.
   - The interface should be intuitive, accessible, and easy to understand, even for users with limited technological experience.

5. Ensure compatibility with popular operating systems and software applications, allowing seamless integration of the virtual mouse system.

6. The system should not interfere with or disrupt the functionality of other software or input devices.

TECHNOLOGY:

SOFTWARE INTERFACE:

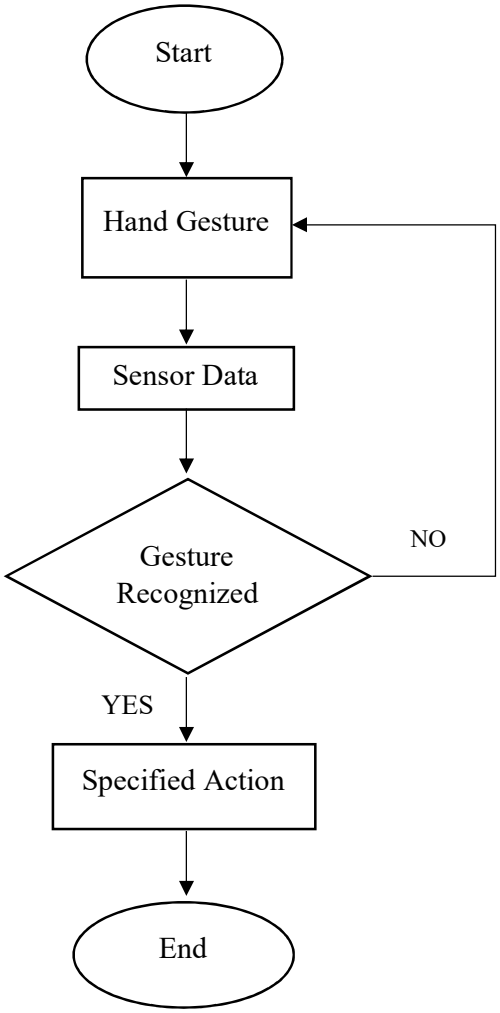
- Operating System: WINDOWS
- Language: Python
- IDE: VS Code
- Packages used: OpenCV, mediapipe, tkinter,

PROPOSED SYSTEM:

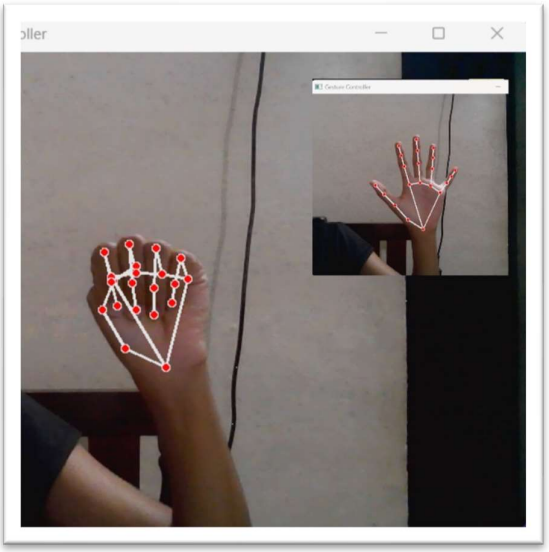
1. Camera or Sensor Device
2. Gesture Recognition Algorithm
3. Cursor Control Module:

SYSTEM DESIGN:

FLOWCHART



SCREEN SHOTS

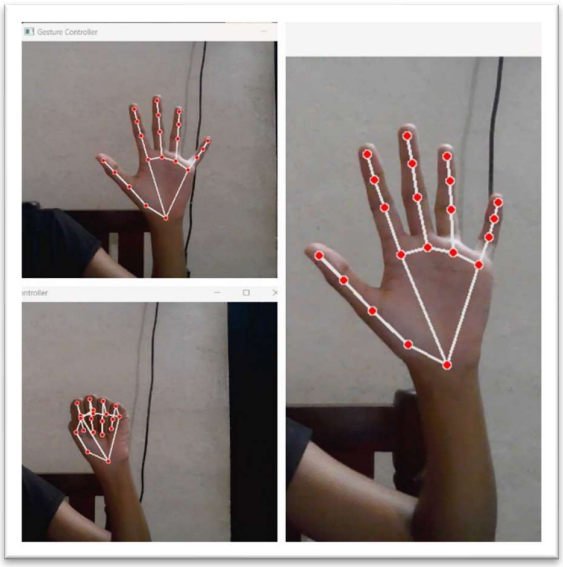


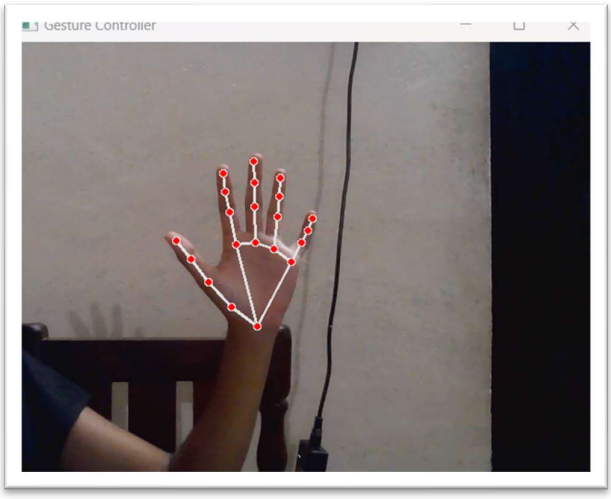
MULTIPLE CHOICE:

Gesture to select multiple items

DRAG AND DROP:

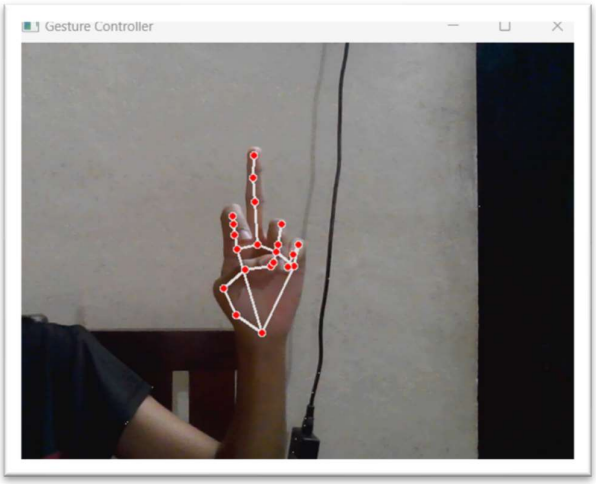
Gesture for drag and drop functionality. Can be used to move/transfer files from one directory to other.





NEUTRAL GESTURE:

Neutral Gesture. Used to halt/stop execution of current gesture.

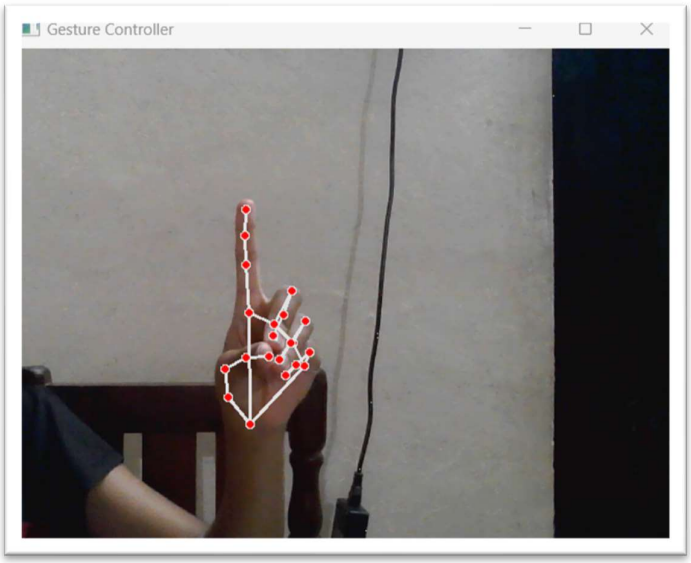


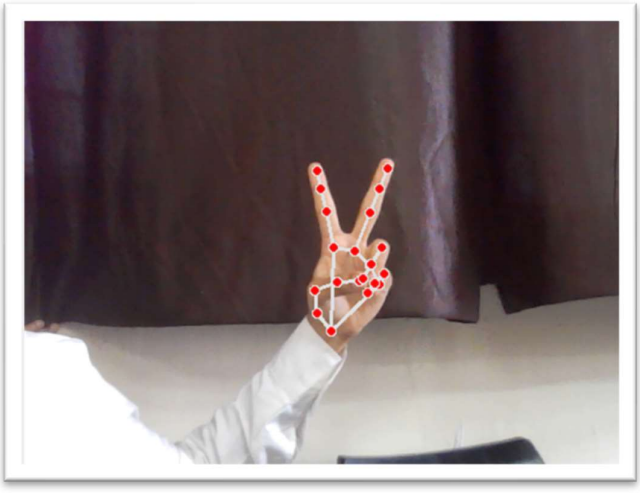
LEFT CLICK:

Gesture for single left click

RIGHT CLICK:

Gesture for single Right click





MOVE CURSER:

Cursor is assigned to the midpoint of index and middle fingertips. This gesture moves the cursor to the desired location. Speed of the cursor movement is proportional to the speed of hand.

FURTHER ACTION & WORK PLAN:

1. Refine gesture recognition algorithm for improved accuracy and robustness.
2. Enhance cursor control and expand supported gestures and actions.
3. Improve customization and calibration options for personalized user preferences.
4. Enhance accessibility features and usability based on user feedback.
5. Conduct compatibility testing and explore integration opportunities.
6. Optimize performance and stability of the system.
7. Conduct comprehensive usability testing and iterate based on feedback.
8. Prepare documentation for deployment and consider licensing options.
9. Explore future enhancements with technologies like eye tracking or voice recognition.
10. Stay engaged in research and collaboration to identify new opportunities for improvement.

SUMMARY:

The gesture control virtual mouse project aims to address the challenges faced by individuals with physical disabilities in operating traditional computer mice or touchpads. The proposed system utilizes a camera or sensor device to accurately track hand gestures and translate them into precise cursor movements. It enables users to perform common mouse actions, such as left-click, right-click, dragging, scrolling, and more, using intuitive hand gestures. The system includes a customizable user interface that allows users to personalize gesture mapping and sensitivity according to their preferences. Accessibility considerations are prioritized to ensure inclusivity and usability for individuals with diverse physical disabilities. The proposed system is designed to be compatible with various operating systems and software applications, seamlessly integrating into existing computing environments. Through extensive usability testing and optimization, the goal is to provide an accessible and efficient means of interaction with computers, promoting digital inclusion and enhancing the overall computing experience for individuals with physical disabilities.

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