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AeroGesture : Aerial Webcam Gestures for Ultimate Control Using gesture prediction

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ABSTRACT

Now a days computer vision has reached its pinnacle, where a computer can identify its owner using a simple program of image processing. In this stage of development, people are using this vision in many aspects of day-to-day life, like Face Recognition, Color detection, Automatic car, etc. In this project, computer vision is used in creating an Optical mouse and keyboard using hand gestures. The camera of the computer will read the image of different gestures performed by a person's hand and according to the movement of the gestures the Mouse or the cursor of the computer will move, even perform right and left clicks using different gestures. Similarly, the keyboard functions may be used with some different gestures, like using one finger gesture for alphabet select and four-figure gesture to swipe left and right. It will act as a virtual mouse and keyboard with no wire or external devices. The only hardware aspect of the project is a web-cam and the coding is done on python using Anaconda platform. Here the Convex hull defects are first generated and then using the defect calculations an algorithm is generated and mapping the mouse and keyboard functions with the defects. Mapping a couple of them with the mouse and keyboard, the computer will understand the gesture shown by the user and act accordingly.

Keywords:-Gesture Recognition, Keyboard, Mouse , Virtual Control, Image Processing

I. INTRODUCTION

to In the ever-evolving landscape of human-computer interaction, one innovation stands out as both intriguing and transformative – gesture-based virtual mouse and keyboard systems. These systems, which enable users to control digital interfaces and devices through natural hand movements, represent a paradigm shift in how we interact with technology.

Traditional input methods, such as physical mice and keyboards, have long been the primary means of communicating with computers. However, as our reliance on digital devices grows, the demand for more intuitive, touchless, and immersive interfaces has intensified. Gesture-based systems have emerged as a compelling solution to meet this demand.

In this discussion, we delve into the world of gesture-based virtual mouse and keyboard systems, exploring their applications, underlying technology, and the opportunities they present in various domains. We will also consider the limitations and challenges associated with these systems, as well as their potential to shape the future of human-computer interaction. Join us on this journey as we uncover the fascinating realm of gesture-based interfaces and their impact on how we connect with the digital world.

II. LITERATURE SURVEY

Sr. No.	Topic Name	Author Name	Year of Publication	Problem solved in this paper: Existing Problem Statement	Technique used to solve problem: Existing Problem Solution	What will be future work: Future Scope
1.	A Novel Segmentation-Registration (SR) based Gesture Recognition Algorithm for Equestrian Images	Hongjun Ma Sports Institute of Wuhan Business University,	2023	Obtaining motion features from the RGB video streams for extraction and prediction is a recent research hotspot	Image segmentation, Image edge detection, Computational modeling, Motion segmentation, Gesture recognition, Streaming media, Feature extraction	Using machine LearningTechnique solve problem
2.	A new 3D Viewer system based on hand gesturerecognition forsmart interaction	Muhammad JehanzebDepartme of Computer Science	2020	the visualization of the3D models is a scorching topic in computer vision andhumancomputer interaction. The demands for 3D models have been increased due to high involvement in animated characters, virtual reality and augmented reality.	3D interaction,multipleviews, handgesture, MicrosoftKinect	By using Pose estimation Algorithm we are improvethe AccuracyofOur system
3.	Gesture Recognition Based Virtual Mouse and	SugnikRoyChowdhury	2020	Generally for personal use in computers and laptops we use a physical mouse or	Convex Hull, Defects, Image Processing, Frame Extraction	The system works well for the simple pointing and

	Keyboard			touchpads invented a long time ago		pinching gestures, there is still room for manyimprove ment.
4.	Fundamentals of automated human gesture recognition using 3D integral imaging	Bahram Javidi, Filiberto Pla, José M. Sotoca, Xin Shen	2020	Automated human gesture recognition is receiving significant research interest, with applications ranging from novelacquisitiontechni ques to algorithms, data processing, and classification methodologies.	3D optical image acquisition techniques	Advancements in machine learning and hardware are expected to play a crucial role in expanding the technology's capabilities and adoption.
5.	Hand Gesture Recognition using Image Processing and Feature Extraction Techniques	Ashish Sharmaa, Anmol Mittala, SavitojSingh a, VasudevAw atramania	2020	The system is currently only tested against static gesture images and can be further extended to recognize dynamic gestures in videos in real-time.	1. Histogram of Gradients (HOG) 2. Principal Component Analysis (PCA) 3. Local Binary Patterns (LBP)	The model can be trained on physical hand models containing sensors utilizing graph theory to provide extra data which can be studied for improving the accuracy.
6.	Digital Image Processing Technology	Changchun Sci-Tech University, Changchun 130600, Jilin China	2018	improvement of computer hardware performance, image processing algorithms have improved the application of digital image processing technology.	Digital Image Processing Technology	With the continuous development of technology, digital image processing technology will continue to be obtained. Progress, these also need more people to

						study.
7.	Qualitative Analysis of a Multimodl Interface System using Speech/Gesture	MuhamdZeeshan Baig1andManola Kavakli	2018	The aim of the system is to analyse the designerbehavior and quality of interaction, in a virtual reality environment. The system has the basic functionality for 3D object modelling. The users have performed two sets of experiments	Speech, Gesture, MMIS, 3D Modelling, CAD, Object anipulation	By usingPose estimation Algorithm we are improve the Accuracy ofOur system
8.	Immersive Gesture Interfaces for 3D Map Navigation in HMD-Based	Yeasom Lee, Wonjae Choi	2018	Virtual reality is a technology that provides users with a virtual 3Denvironmentcreated on acomputer and at the same time	3D GeometryVarious studies have been conducted to improve ealism through real-	By usingPose estimationAlgorithmwe are improve the
9.	Detecting Centroid for Hand Gesture Recognition using Morphological Computations	Mrs.A.V. DehankarPriyadarshini College of	2017	with the evolution of computing technologies the current usercomputer interaction devices like mouse,keyboard,joysticks, pen etc. are gettingreplaced by touch screen and hand gesture .	Hand Gesture Recognition, Centroid Detection, Morphological Computations.	Using machine LearningTechnique solve problem
10.	Lossless multitasking: Using 3D gestures embedded in Mouse devices	Franz J, Menin A, Nedel L	2016	Desktop-based operating systems allow the use of many applications concurrently, but the frequent switching between two or more applications distracts the user	3D hand Gesture and 2D hand Gesture	By usingPython Programming language we are develop Desktop application.

III.LIMITATIONS OF EXISTING SYSTEM

1. Accuracy and Precision: Gesture recognition systems may not always accurately interpret complex or subtle hand movements, leading to errors or unintended actions.
2. Limited Gesture Vocabulary: Predefined gesture libraries can be restrictive, and accommodating a wide range of gestures for various applications can be challenging.
3. Ambiguity: Sometimes, similar hand movements can represent different gestures, leading to misinterpretation by the system.
4. Lighting and Environmental Conditions: Changes in lighting and background environments can affect the system's performance, potentially causing recognition issues.
5. Fatigue and Ergonomics: Holding one's hand in the air for extended periods to control a virtual mouse and keyboard can be physically tiring and less ergonomic than traditional input devices.
6. Calibration and Setup: Users may need to go through calibration processes, which can be time-consuming and require adjustments for different users.
7. Learning Curve: Users may require time to become proficient with gesture-based systems, which can be a barrier to adoption.
8. Hygiene Concerns: In public settings, concerns about hygiene and germ transmission may limit the widespread use of touchless interfaces.
9. Complex Gestures: Recognizing complex or multitasking gestures can be challenging, limiting the system's ability to handle intricate commands.
10. Cost: Implementing robust gesture recognition technology can be expensive, which may limit its adoption in certain applications.
11. Privacy and Security: Gesture data capture raises privacy and security concerns, especially in sensitive environments.
12. Software Support: The availability of software and application support for gesture-based systems may be limited compared to traditional input methods.

IV.CONCLUSION

Gesture-based virtual mouse and keyboard systems represent a promising technological advancement with a wide range of practical applications. These systems offer touchless and intuitive interaction, making them valuable in various domains, from accessibility and healthcare to gaming and education. As we continue to innovate in the field of human-computer interaction, these interfaces have the potential to transform the way we interact with technology, enhancing convenience, accessibility, and user experiences across diverse industries. The future holds exciting possibilities for the continued development and integration of gesture-based

V. REFERENCES

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