IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

# CONTROLLING COMPUTER USING HAND GESTURES

[1] Dr. Thaiyalnayaki S, [2]Lakshmi Narayana G, [3]Pavan Kumar Reddy G, [4]Teja Mani G, [5]Vinay G

[1]Associate professor, Department of Computer Science and Engineering, Bharath Institute of Higher Education And Research, Chennai, India- 600073.

[2, 3,4,5] Student, Department of Computer Science and Engineering, Bharath Institute of Higher Education And Research, Chennai, India- 600073.

## I. Abstract:

In the realm of human-computer interaction (HCI), the integration of webcams and various sensors has become increasingly accessible and widespread. Hand gestures serve as a powerful mode of interaction between individuals and systems, offering a seamless means of transmitting data and commands. This paper explores the significance of hand gestures as a form of non-verbal communication, applicable across diverse contexts. It includes an analysis of hand gesture control applications, leveraging techniques supported by sensor technology and computer vision. Keywords such as Machine Learning, Android Application, Diabetes Mellitus, and Monitoring underscore the interdisciplinary nature of this research.

**Keywords:** Gesture control, Hand tracking, Computer interaction, Human-computer interaction, Motion sensing, Gesture recognition, Hand gesture technology, Natural user interface, Gesture-based control, Computer vision, Motion control, Hand movement tracking, Gesture input, Hand gesture recognition, Gesture-driven computing.

## II. INTRODUCTION

Human-Computer Communication Technology has witnessed significant advancements, encompassing areas like Virtual Environment Management, Medicine Applications, sign language translation, robotic control, music production, and home automation. Recent emphasis in HCI research highlights the pivotal role of hand gestures in facilitating communication and control within digital environments. The versatility of hand gestures as a mode of expression underscores their importance in human interaction and understanding.

## III. Objective

This paper aims to develop gesture-based interfaces that enable seamless interaction with computer systems. It explores various projects leveraging hand gestures for tasks ranging from robotics control to device manipulation through computer vision. The objective is to enhance user experience and efficiency through intuitive gesture-based interactions.

## IV. LITERATURE SURVEY

### *1.* Hand gesture Detection and Recognition for student, Jireh Jam

This paper presents algorithms for detecting and recognizing hand gestures, focusing on applications in classroom settings for student interaction and engagement. It highlights the importance of hand gestures in educational environments and proposes practical solutions for enhancing student-teacher interaction.

**2. Webcam Based hand gesture recognition system, Shraddha Shinde, Ms. Patil Priyanka**

The proposed system automates student attendance tracking during classroom lectures using hand gesture recognition, enhancing accuracy and efficiency. By continuously observing hand gestures, the system provides real-time attendance updates, reducing the burden on teachers and minimizing the possibility of errors.

**3.Automatic attendance system using Webcam, Simran Raju Inamdar, Aishwarya Vijay Kumar Patil, Ankita Digambar Patil, Dr. S. M. Mukane**

This paper addresses the challenges of manual attendance marking in classrooms, proposing a webcam-based system for automated attendance management. The system leverages webcam technology to identify and record student presence, streamlining the attendance tracking process and improving overall classroom efficiency.

**4. Attendance System Using Multi-Hand Gesture Recognition, P. Visalakshi,, Sushant Ashish**

This project utilizes multi-hand gesture recognition to monitor classroom attendance, offering a robust solution for accurate and efficient attendance tracking. By integrating hand gesture recognition with existing surveillance systems, the proposed solution provides a seamless and non-intrusive method for recording student attendance.

**5. Automated System Based On Facial Recognition, Rakshitha, S R Dhanush, Shreeraksha Shetty, Sushmitha**

This project explores an automated attendance system based on facial recognition, incorporating hand gesture identification to prevent proxy attendance. By combining facial recognition with hand gesture authentication, the system ensures accurate and reliable attendance tracking, mitigating the risk of fraudulent activities.

**6. Smart System Based On hand gesture Recognition Algorithm, M.Kasiselvanathan, Dr.A.Kalaiselvi, Dr.S.P.Vimal, V.Sangeetha**

Facial recognition technology, a cornerstone of biometric systems, has found widespread applications in diverse sectors including security, human-computer interaction, and image processing. This paper presents a novel approach to streamline the process of student attendance calculation through the introduction of an automated attendance management system driven by hand gesture recognition. By harnessing the power of facial dimensions, this system aims to relieve faculty members of the tedious task of manual attendance tracking.

## *V.* EXISTING SYSTEM

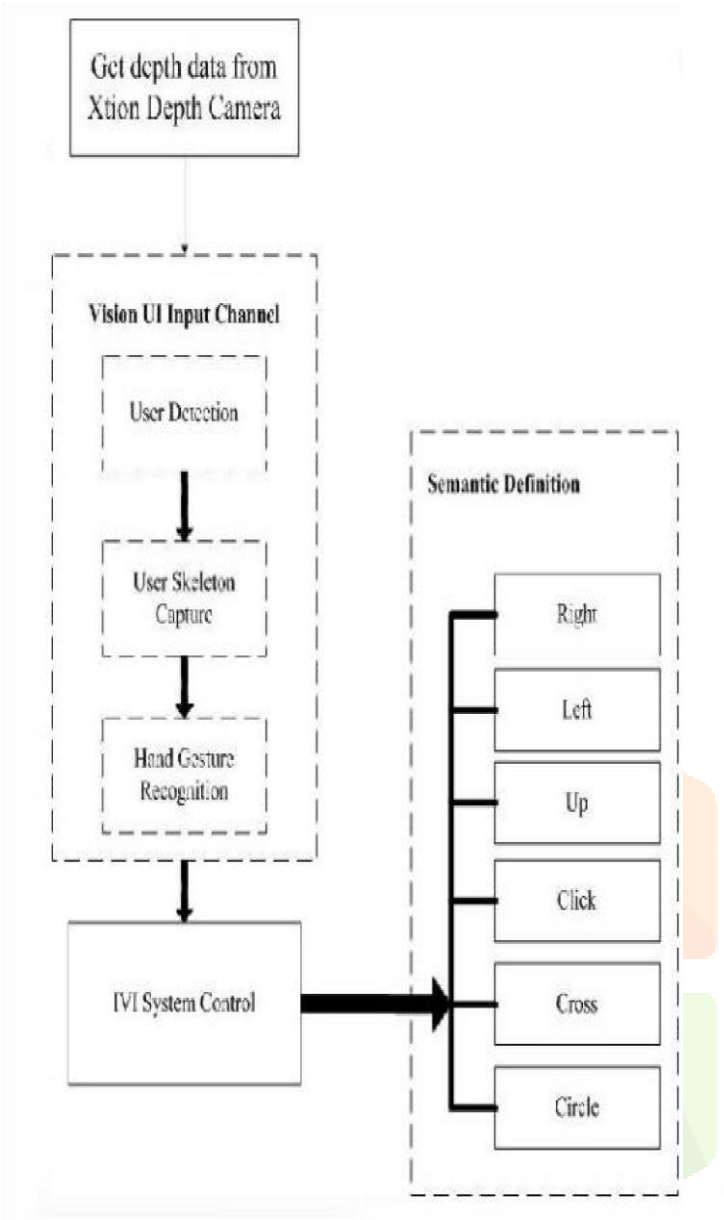
The current methodology relies on the utilization of two Ultrasonic Sensors in conjunction with Arduino to measure the distance between a hand and the sensor. This distance data is then leveraged to trigger specific actions on the computer system. The precise positioning of these Ultrasonic Sensors is essential for ensuring accurate detection and reliable performance..

## *VI.* PROPOSED WORK

The proposed system introduces a sophisticated computer vision engine capable of tracking hand movements captured by a camera. Through this mechanism, users can control the computer's mouse pointer with ease. Furthermore, intuitive.

Hand gestures enable users to adjust system settings such as volume and brightness seamlessly. The implementation of this innovative project involves the integration of Python 3.7, OpenCV, MediaPipe, and PyAutoGUI, offering a robust and user-friendly solution for attendance management.

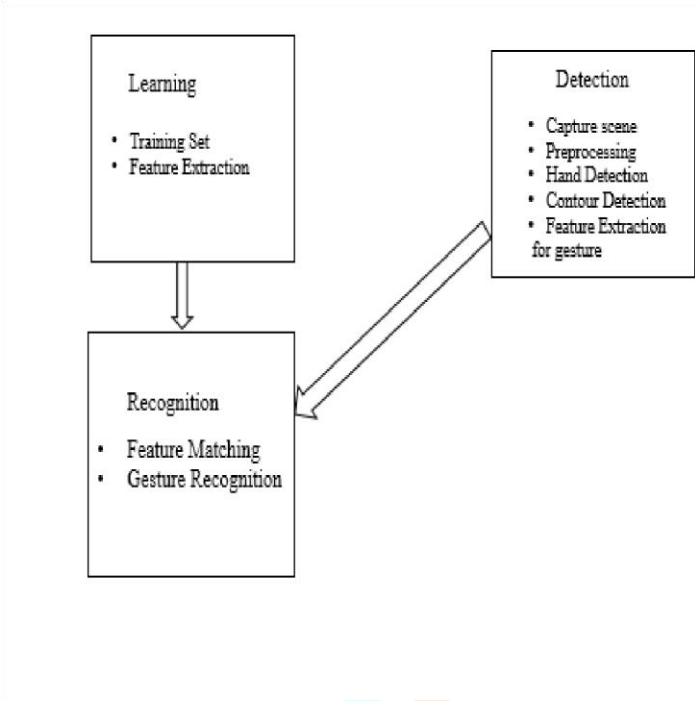
## VII. SYSTEM ARCHITECTURE




## VIII. IMPLEMENTATION

• The widespread integration of computers across various industries underscores the importance of leveraging technological advancements to streamline processes and enhance productivity. Python, a versatile programming language, offers a myriad of libraries including modifiers for facial recognition, motion detection, and more. In any professional setting, the ability to deliver impactful presentations, often facilitated by PowerPoint, holds significant value. • The proposed system operates by capturing motion and executing specific actions or commands accordingly. OpenCV, a renowned library for computer vision, plays a crucial role in supporting motion detection. By interfacing with the camera, OpenCV scales and analyzes visual data, enabling the system to delineate areas of movement and establish spatial constraints. This forms the basis for gesture control, wherein users can perform various actions with simple finger movements such as sliding across slides, clicking, or even writing on the screen. A notable feature of this system is the delineation of a green line, serving as a visual cue for initiating digital interactions. • At the core of this gesture control project lies an understanding of behavioral patterns and how they can be expressed, detected, and utilized to facilitate tasks, thereby improving workflow efficiency. The entire process of gesture recognition hinges upon a structured sequence encompassing multiple components, namely the image sensor module, detection module, and connection module, which collectively form the system's internal architecture. • The image sensor module serves as the conduit for communication, capturing, and transmitting image signals to facilitate the identification process. Within the detection module, images undergo a rigorous processing pathway wherein noise is filtered out, and relevant visual cues are extracted to prepare the image for signal recognition. Finally, the connection module assumes the pivotal role of correlating hand gestures with predefined movements or actions.

• Upon successful recognition, these gestures are mapped to corresponding actions within the software application, such as advancing slides or activating features in a PowerPoint presentation. The systematic approach adopted in our software ensures robust gesture detection and seamless integration with user interactions. • The behavioral detection tasks in the context of gesture recognition are effectively handled through the utilization of the cvzone library, alongside OpenCV and the handprint module. Let's delve into the methodology employed for achieving this:




• The cvzone library plays a crucial role in handling gesture detection and processing requirements. Here's an overview of how it accomplishes this:

• Region Segmentation: This involves the manual removal of irrelevant data from the video stream, focusing specifically on segmenting the region of interest. By isolating the hand region, unnecessary background information is eliminated, facilitating more accurate gesture detection.

• RGB Values: The library leverages RGB values to distinguish the hand from the background image. Since the RGB values for the hand typically differ significantly from those of the background, this contrast enables effective segmentation and identification of the hand region.

• Removal of Background Noise: To enhance the accuracy of gesture detection, background noise, such as unwanted movements or objects, is filtered out. This step ensures that only relevant hand gestures are detected and processed.

• The predefined hand gesture features encompass actions such as clicking, scrolling left and right, and drawing with colored pencils on a canvas. When a user performs gestures, the resulting hand movements are captured and compared against predefined gesture patterns using the hand tracking module from OpenCV and the hand gesture recognition capabilities provided by the cvzone

## *IX.* RESULTS AND DISCUSSIONS

• To evaluate the effectiveness of the prototype, a study involving ten users was conducted. Each user performed five sequences of gestures, with each sequence comprising six gestures (ranging from zero to five) performed in a random order. This resulted in a total of 600 gesture-detection attempts.

• The outcomes of the evaluation are presented in Table 6, showcasing the percentage of correctly detected gestures categorized by the specific gesture made and the hand used. This comprehensive analysis provides valuable insights into the performance and reliability of the gesture recognition system across different users and gesture types.

## *X.* CONCLUSION

In conclusion, while our system for hand gesture detection and recognition has shown promising results, there are areas that warrant further attention in future research endeavors. One such aspect is the system's sensitivity to varying lighting conditions, which can impact the accuracy of skin-color filtering, particularly in the presence of reflections and shadows. Addressing this challenge would not only enhance the accuracy of the detection system but also alleviate the cognitive burden on end-users, eliminating the need to consciously maintain finger separation, which can be easily forgotten.

## *XI.* FUTURE SCOPE

• Moving forward, there is considerable scope for enhancing our methodology and implementation. We have presented a robust approach for detecting hand gestures using computer vision techniques, coupled with real-time implementation on a standard webcam. Our method integrates skin-color filtering, edge detection, convex-hull computation, and rule based reasoning to analyze the depths of convexity defects. Furthermore, user experiments have demonstrated a high detection accuracy, correctly identifying nine out of ten hand gestures made on either hand within a controlled environment.

• To further advance our research, future efforts could focus on:Addressing Sensitivity to Lighting Conditions: Developing techniques to mitigate the impact of varying lighting conditions on skin-color filtering and gesture detection accuracy.

• Enhancing User Experience: Exploring methods to improve the overall user experience by reducing cognitive load and increasing the system's adaptability to diverse user preferences and environments.

• Extending Gesture Recognition Capabilities: Expanding the repertoire of recognized gestures to encompass a broader range of actions and commands, catering to diverse application scenarios.

• Integration with Machine Learning: Investigating the integration of machine learning algorithms to enhance gesture recognition performance and adaptability to movements. user-specific gestures and

• By pursuing these avenues of research, we aim to further refine our gesture recognition system and contribute to advancements in human-computer interaction technology.

## *XII.* REFERENCES


1. A Novel Approach to Improve User Experience of Mouse Control using CNN Based Hand Gesture Recognition Yash Gajanan Pame; Vinayak G Kottawar 2023 7th International Conference On Computing, Communication, Control And Automation (ICCUBEA).
2. Obtaining hand gesture parameters using image processing Alisha Pradhan; B.B.V.L. Deepak 2015 International Conference on Smart Technologies and Management for Computing, Communication, Controls, Energy and Materials (ICSTM).
3. A Robotic Hand: Controlled With Vision Based Hand Gesture Recognition System Jobair Hossain Gourob; Sourav Raxit; Afnan Hasan 2021 International Conference on Automation, Control and Mechatronics for Industry 4.0 (ACMI).
4. Development of a Learning-aid tool using Hand Gesture Based Human Computer Interaction System Bidyut Jyoti Boruah; Anjan Kumar Talukdar; Kandarpa Kumar Sarma 2021 Advanced Communication Technologieand Signal Processing (ACTS).
5. Hand Gesture Recognition System as an Alternative Interface for Remote Controlled Home Appliances Marvin S. Verdadero; Celeste O. Martinez-Ojeda; Jennifer C. Dela Cruz 2018 IEEE 10th International Conference on Humanoid, Nanotechnology, Information Technology,Communication and Control, Environment and Management (HNICEM)
6. Volume Controller using Hand Gestures Saransh Tiwari; Abhineet Mishra; Deepak Kukreja; Anup Lal Yadav, 2023 14th International Conference on Computing Communication and Networking Technologies (ICCCNT).
7. Hand Gesture Recognition-Based Control System Using Computer Vision for Transporter Robot
8. Bagas Martinus Rianu; Akio Kitagawa; Wahyu Dirgantara; Subairi, 2023 International Conference on Radar, Antenna, Microwave, Electronics, and Telecommunications (ICRAMET).
9. An Approach to Control the PC with Hand Gesture Recognition using Computer Vision Technique Kirti Aggarwal; Anuja Arora, 2022 9th International Conference on Computing for Sustainable Global Development (INDIACom)
10. Real-Time Hand Gesture Recognition for Device Control: An OpenCV-Based Approach to ShapeBased Element Identification and Interaction Nishant Kumar; Hridey Dalal; Aditya Ojha; Abhinav Verma; Mandeep Kaur, 2023 3rd **International Conference on Technological Advancements in Computational Sciences (ICTACS)**