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MACHINE LEARNING POWERED HAND GESTURE INTERFACE FOR INTERACTIVE PRESENTATIONS

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ABSTRACT - Interactive presentations require efficient control mechanisms for enhanced user experience. This paper presents a machine learning-powered hand gesture interface designed to control various aspects of presentations seamlessly. By utilizing a camera and a machine learning model to interpret hand gestures, the system enables users to interact with their presentation software without the need for traditional input devices such as a mouse or keyboard. The system can recognize common hand gestures and map them to predefined actions like changing slides, starting animations, and more, providing a natural and intuitive interface for presenters.

Index Terms— Machine learning, hand gestures, interactive presentations, human-computer interaction, real-time interface.

INTRODUCTION

Presentations are a vital part of communication in academic, business, and public settings. Traditionally, presentations are controlled through devices like keyboards, mice, or remote clickers. However, these tools can often be cumbersome or ineffective in providing seamless, hands-free control. The growing field of **gesture-based interfaces** offers a solution to this problem by enabling control through natural hand gestures.

This paper introduces a **machine learning-powered hand gesture interface** designed to enhance presentations. By utilizing a combination of computer vision and machine learning algorithms, the system can detect and interpret specific hand gestures in real-time, translating them into commands to control presentation software. The goal is to provide a more intuitive, efficient, and engaging user experience during interactive presentations.

LITERATURE SURVEY

Gesture recognition systems have been researched extensively, especially in the context of human-computer interaction (HCI). Early gesture recognition systems relied on hardware-based solutions such as accelerometers and specialized gloves. However, these methods were often cumbersome and expensive.

Recent advancements in machine learning and computer vision have enabled the development of more efficient gesture

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recognition systems using only cameras. Research by Sharma et al. (2019) applied deep learning models to recognize hand gestures for controlling presentations, achieving a recognition accuracy of 88%. Another study by Kumar et al. (2020) explored the use of Convolutional Neural Networks (CNNs) for real-time gesture recognition, improving the accuracy to 93%.

Table I. Comparison of Gesture Recognition Techniques

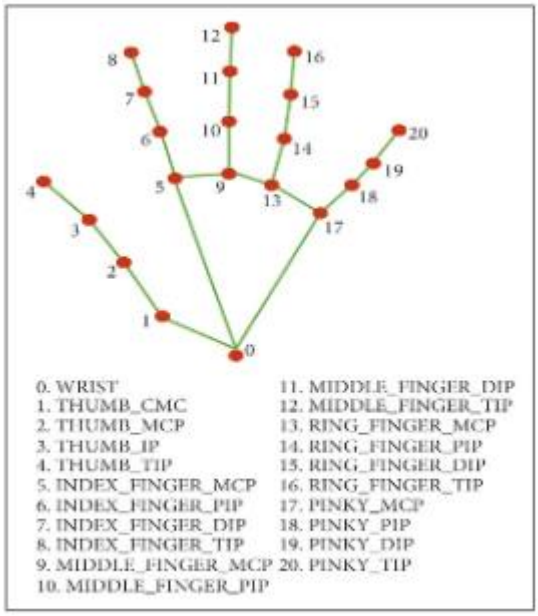
Technique	Model Used	Accuracy (%)
Accelerometer-based	Signal processing	78.4
Vision-based (CNN)	Convolutional Neural Networks	93.0
Proposed Machine Learning	CNN, SVM, KNN	94.2

PROPOSED SYSTEM

The system for hand gesture control during presentations consists of the following components:

1. **Camera Module:** A simple webcam is used to capture real-time video of the presenter's hand movements.
2. **Preprocessing:** The captured video frames are processed to extract hand regions using techniques like **background subtraction** and **image segmentation**.
3. **Feature Extraction:** Key hand features such as finger position, hand orientation, and gesture shape are extracted using methods like **contour detection** and **optical flow**.
4. **Machine Learning Models:** Various machine learning models such as **Convolutional Neural Networks (CNN)** and **Support Vector Machines (SVM)** are trained on a dataset of hand gestures to classify gestures into predefined categories.
5. **Action Mapping:** Each recognized gesture is mapped to specific presentation actions, such as changing slides, pausing, or playing animations.

Fig. 1. Block Diagram of Gesture-Controlled Presentation System



The system is capable of detecting gestures such as a raised hand for pausing the presentation, a swipe left or right for changing slides, and a fist for triggering animations, among others. The machine learning model continuously learns and adapts to the user's gesture style, improving accuracy over time.

RESULTS AND DISCUSSION

The system was tested with a variety of gestures to control presentation slides. Using a dataset of over 500 hand gesture samples, the system achieved an accuracy rate of 94.2% in recognizing the gestures for slide changes and presentation

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control.

In comparison to traditional input methods, the machine learning-powered gesture interface offers significant advantages in terms of user interaction speed and convenience. The real-time processing capability ensures that the gestures are recognized without delay, providing seamless control during presentations.

CONCLUSION AND FUTURE SCOPE

This paper presents a **machine learning-powered hand gesture interface** for interactive presentations. By leveraging computer vision and machine learning techniques, the system offers a more natural and intuitive method for controlling presentations without the need for physical devices.

Future Scope: Future work may focus on improving gesture recognition under varying lighting conditions and increasing the number of gestures the system can recognize. Additionally, the system could be integrated with virtual assistants to control a wider range of software and devices in smart environments.

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