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Approved by AICTE New Delhi, Govt. of Kerala and Affiliated to APJ Abdul Kalam Technological University

Virtual Hands: Real Time Keyboard, Desktop & Application Navigation using Gestures

Abstract:

Computer systems have input and output devices. The keyboard is the most basic peripheral device, enabling the user to interact with the computer easily. The constant use of computer systems and accessories, like keyboard and mouse, have heightened concerns about spreading infections through surface contact, especially for IT professionals working both in offices and sites.

To overcome this problem, this seminar presents a method, that is, virtualization of the keyboard and some Windows navigation features using webcam and computer vision technology. This virtual keyboard and navigation system is entirely contactless, making it highly effective in scenarios where hygiene is a concern. Whether your hands are dirty or you're working with mechanical parts, this system allows you to interact without physical contact, preventing potential contamination and ensuring a clean environment.

So, developed a program capable of taking keyboard inputs without touching anything, and navigating the opened Windows GUI as well as the virtual desktops. The program fetches the camera input from the webcam, then searches and detects the hands in the feed and marks all the hand points. After this, the finger points to the camera feed and matches it with the button's position drawn over the camera feed. Finger Tip Detection and Performing Action Finger detection is carried out by the landmarks processed by Mediapipe's algorithm. It does this on the image processed by the OpenCV module's Video Capture function. The mediapipe detection mechanism works in two phases, Blaze Palm Detector and Hand Landmark Model.

The final product had a fully functioning keyboard with all the essential keys, i.e., all the alphabets, and numbers with some additional symbols like/,.,,(,),+,- etc. It can do all its functions with the use of hand gestures only. Along with the keyboard, there is also Window and Desktop Navigation, which also works with gestures. This device achieves a respectable accuracy of 95%. In 5% of the cases, it pressed the wrong key or didn't do anything.

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Smart Artificial Intelligence Based Online Proctoring System

Abstract:

In response to the increasing reliance on online examinations, which have raised concerns about academic integrity, we propose a comprehensive proctoring system that integrates multiple detection mechanisms to identify potentially cheating intentions. This system can provide assistance to invigilator during a computer-based test. This system leverages a webcam to continuously monitor the examinee's environment, focusing on detecting emotions, head movements, and the presence of unauthorized objects or individuals. The emotion detection module utilizes a Convolutional Neural Network (CNN) model, trained on the FER2013 dataset, to identify facial expressions that may suggest stress or dishonesty during the exam. The head pose estimation module employs OpenCV's DNN and dlib models to analyze yaw angle deviations, which could indicate distractions or cheating attempts. Additionally, the system integrates the YOLOv3 object detection model, trained on the COCO dataset, to detect the presence of cell phones, books, and multiple individuals, all of which are potential indicators of academic misconduct. By combining these advanced detection algorithms, the system provides a robust framework for enhancing the security of online examinations. However, acknowledging the limitations of automated detection, we suggest that human oversight remains necessary to ensure comprehensive monitoring and intervention.

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19/04/2024
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Face Gesture Based Virtual Mouse Using Mediapipe

Abstract:

This paper presents a novel human-computer interaction (HCI) system designed to empower individuals with physical disabilities by enabling computer control through facial movements. Leveraging the OpenCV, Mediapipe, Autopy, and PyAutoGUI libraries, the proposed system detects facial landmarks to accurately determine the direction and expression of the user's face. OpenCV is utilized for capturing real-time video feeds and processing individual frames, which are then analyzed by Mediapipe to identify 468 facial landmarks. These landmarks are instrumental in calculating various facial metrics, such as the Mouth Aspect Ratio (MAR), Eye Aspect Ratio (EAR), and specific ratios for left and right eye movements, which trigger mouse functions like right-click and left-click under predefined conditions. This approach provides a more precise and accessible method for physically disabled individuals to interact with computers, potentially replacing traditional HCI tools. The study details the design, implementation, and evaluation of this system, highlighting its effectiveness as a viable alternative for computer interaction using facial gestures.

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14/08/2024
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Voice Guided, Gesture Controlled Virtual Mouse

Abstract:

This seminar explores the development of a voice-guided and gesture-controlled mouse designed for managing smart devices in healthcare system, particularly in contexts involving highly contagious diseases. The project leverages Convolutional Neural Networks (CNN) and image processing techniques to create a robust, touchless control system, reducing the risk of disease transmission. The system was developed to address the growing need for non-contact interaction with medical devices, enhancing safety for both healthcare professionals and patients.

The primary advantage of this system is its ability to minimize physical contact with shared surfaces, which is critical in environments where contamination risks are high. The use of voice commands combined with gesture recognition allows for seamless and hygienic device operation. Additionally, the system provides a user-friendly interface that can be adapted to various healthcare applications. However, the system also has limitations, such as slight inaccuracies in gesture recognition in low-light conditions or environments with multiple users, and the challenge of integrating it with existing medical infrastructure.

This system marks a significant improvement in healthcare automation by incorporating advanced models and algorithms, including CNNs for gesture recognition and natural language processing for voice commands. These innovations offer a more efficient and safer alternative to traditional control methods, highlighting the potential for further advancements in medical technology.

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