

Webcam Wizardry: A Virtual Keyboard and Mouse for Frictionless Computing

Domain: OpenCv, Machine Learning.

Abstract

The aim of this project is to develop a system that uses a webcam to track the movement of a virtual mouse cursor and finger air writing on a computer screen. It can be used as an assistive technology for people with limited mobility or disabilities, allowing them to control their computers using hand gestures. A virtual mouse cursor is a software-generated cursor that simulates the behaviour of a physical mouse cursor. Some of its features include position tracking, click and drag, multi-touch support like zooming or scrolling using two or more fingers. The virtual mouse cursor can be implemented with the following steps - Capturing video frames from a camera or webcam, Preprocessing the frames to remove noise and enhance the hand contour, Detecting and isolating the hand from the background, Tracking the hand and finger movements, Mapping the hand and finger movements to cursor movements on the computer screen. The finger air writing method is a way of inputting text, allowing users to write in the air without the need for a physical keyboard. The system captures video of the user's hand and finger movements using a camera or webcam and processes the video using OpenCV to detect and track the hand and fingers. It can be implemented by following steps - Capturing video frames from a camera, preprocessing the frames to remove noise and enhance the hand and finger contours, detecting and isolating the hand and fingers from the background, tracking the hand and finger movements, recognizing the hand gestures as characters or letters, displaying the recognized text on a computer screen. We recognize the hand gestures using various machine learning algorithms like Random Forest Classifier, Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN), Hidden Markov Models (HMMs), K-Nearest Neighbors (KNN). The ensemble process is used to find the best and accurate algorithm and the output is stored in a text file initially, after finishing the air writing process the software prompts the user to choose to speak or save the text in a particular format(.txt, .csv, .docx) and based on the choice of the user the software responds correspondingly. Finally the goal is to create an intuitive and user-friendly interface that allows users to control their computer without the need for a physical mouse and a keyboard.

Keywords: OpenCv, Virtual Mouse, Finger air writing, User friendly, Ensemble.

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