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Virtual Desktop Assistant

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Abstract: The project introduces an application using computer vision for Hand gesture recognition. A camera records a live video stream, from which a snapshot is taken with the help of interface. The system is trained for each type of count hand gestures (one, two, three, four, and five) at least once. After that a test gesture is given to it and the system tries to recognize it. Nowadays many things are automated and developed using gesture recognition. But the thing that we are using from many years was still being using in the traditional manner. That is the Operating system interactions we are using. So why don't we automate and made the interactions possible using hand gestures . In this project we develop a python based desktop program to do the simple tasks like opening files or apps and many other tasks like taking screenshot , pausing video, increase and decrease volume , using a virtual mouse etc using just our hand signs and finger movements. It will increase the user engagement with the os and makes tasks easier to the users.

Keywords: OS, HAND GESTURE, VIRTUAL MOUSE, RECOGNITION, GRADIENT METHOD,

I. INTRODUCTION

As in the modern era in our world everything becomes digital and automated.Many things in today world are automated and people are used to do the things and tasks in a simpler and easier way. As most of the time we are working and spending in most of out time with systems or laptops, so why don't we use the regular methods to use them. so we have implemented a simpler way using which we can do these repetitive tasks and most used tasks in an easier way using our hand gestures .So to do these repetitive tasks in an easier way using hand gestures we can use computer vision technology. Computer vision is a field of artificial intelligence (AI) enables computers and systems to derive meaningfiil information from digital images , videos and other visual inputs and take actions or make recommendations based on that information.

If AI enables computers to think, computer vision enables them to see observe and understand . Computer vision works much the same as human vision, except humans have a head start. Human sight has the advantage of lifetimes of context to train how to tell objects apart, how far away they are, whether they are moving and whether there is something wrong in an image.

II. METHODOLOGY

There have been numerous researches in this field and several methodologies were proposed like Principle Component Analysis (PCA) method, gradient method, subtraction method etc. PCA relates to Linear transformation consist on statistical approach. This gives us powerful tool for pattern recognition and data analysis which mostly used in image processing techniques for data (compression, dimension and correlation). Gradient method is also another image processing technique that detect colour patches applying low pass filters is also known as edge detection method. Subtraction method is very simple that subtract input image pixel to another image or constant value to provide output. I have also studied different approaches to hand gesture recognition and came to know that implementation of such techniques like PCA and Gradient method is complicated, we can produce same output as these techniques gives us by simple and easy implementation. So, I have tried four different algorithms and finally selected the one, which was most efficient i.e. diagonal sum algorithm. This algorithm is able to recognize maximum gestures correctly.

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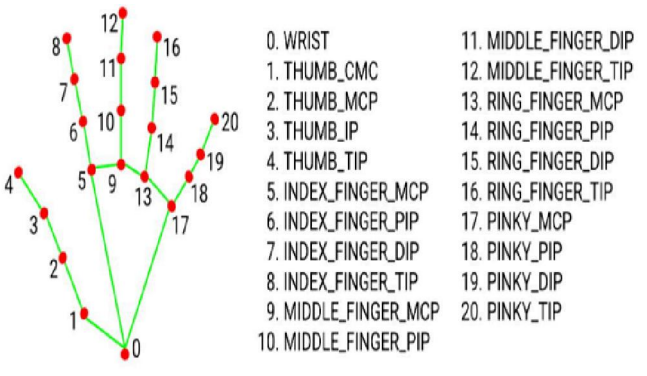

Fig 1. HAND TRACKING

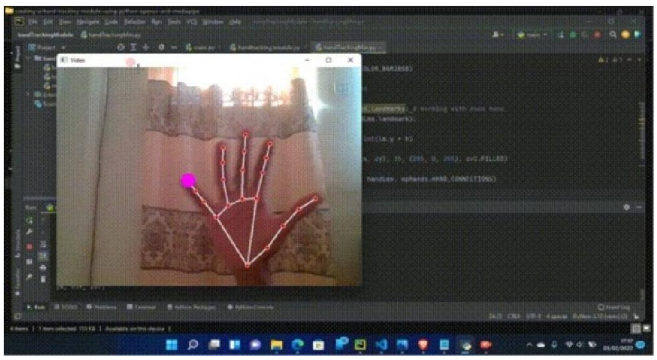

Fig 2. HAND TRACKING SAMPLE

Hand tracking is the process in which a computer uses computer vision to detect a hand from an input image and keeps focus on the hand's movement and orientation. Hand tracking allows us to develop numerous programs that use hand movement and orientation as their input. We tend to write the same code in different projects to perform hand tracking as part of our program. Creating a hand tracking module solves this problem since we write the code once.We then convert this piece of code into a module. We can import this module into any python project that we are working on and it will perform hand tracking.

Introduction

To create the program that will perform hand tracking, we will need 2 libraries.These are openCV and MediaPipe. We will use openCV to perform operations associated with computer vision. We will use MediaPipe to perform the actual hand detection and tracking on our input image. We will finally need an IDE. For this tutorial, we will use the Pycharm IDE.

Creating a hand tracking program

Before we jump into coding, let us discuss how MediaPipe performs hand tracking. Hand tracking using MediaPipe involves two stages:

Palm detection - MediaPipe works on the complete input image and provides a cropped image of the hand.

Hand landmarks identification - MediaPipe finds the 21 hand landmarks on the cropped image of the hand.The 21 hand points that MediaPipe identifies are shown in the image below:

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III. SYSTEM ARCHITECTURE

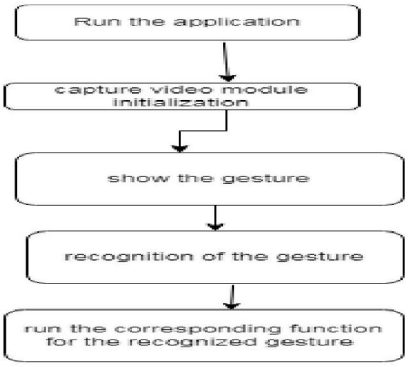

FIG 3. System Architecture

We propose a vision-based approach to accomplish the task of hand gesture detection. As discussed above, the task of hand gesture recognition with any machine learning technique suffers from the variability problem. To reduce the variability in hand recognition task we assume the following assumptions: Single colored camera mounted above a neutral colored desk.User will interact by gesturing in the view of the camera.Training is must.Hand will not be rotated while image is capturing.

IV. RESULTS AND DISCUSSION

The hand gesture recognition and virtual assistant system has been tested with hand images under various conditions. The performance of the overall system with different algorithms is detailed in this chapter. Examples of accurate detection and cases that highlight limitations to the system are both presented, allowing an insight into the strengths and weaknesses of the designed system. Such insight into the limitations of the system is an indication of the direction and focus for future work. System testing is actually a series of different tests whose primary purpose is to fully exercise the computer-based system. It helps us in uncovering errors that were made inadvertently as the system was designed and constructed.We began testing in the „small" and progressed to the „large". This means that early testing focused on algorithms with very small gesture set and we ultimately moved to a larger one with improved classification accuracy and larger gesture set . In this chapter also Includes the output view of the project, analyzed output in the form of figures

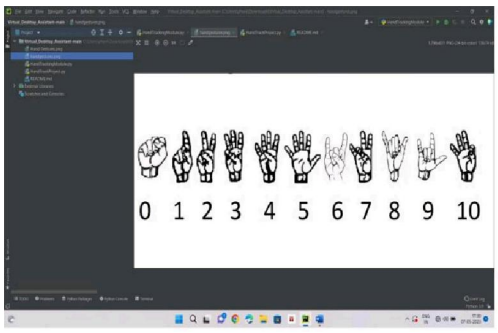

FIG 4. Model results

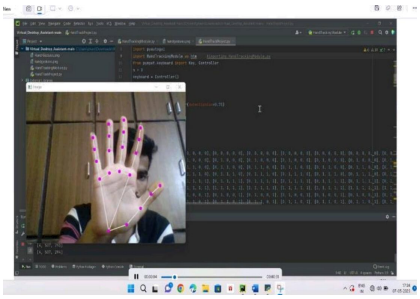

FIG 4 PROCESSING

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OUTPUT IMAGE :-

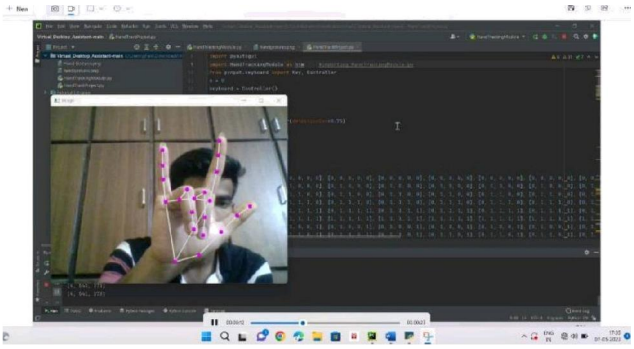

FIG4: Output 1[2]

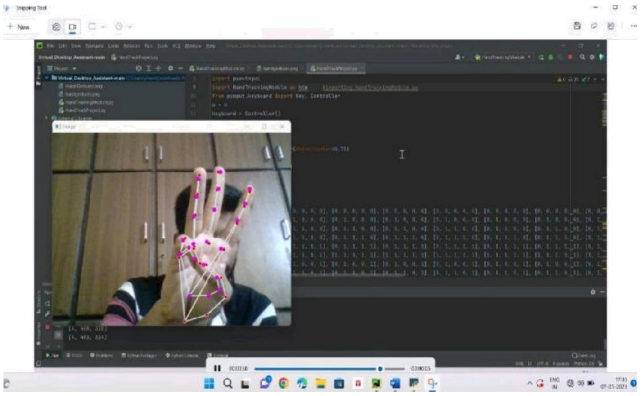

FIG5:Output 2[2]

APPLICATIONS

- In Virtual Assistants
- Voice recognizers
- Context-based systems
- Social media
- In Natural Language Processing Application

V. CONCLUSION

The hand gesture recognition and virtual assistant system has been tested with hand images under various conditions. The performance of the overall system with different algorithms is detailed in this chapter. Examples of accurate detection and cases that highlight limitations to the system are both presented, allowing an insight into the strengths and weaknesses of the designed system. Such insight into the limitations of the system is an indication of the direction and focus for future work. System testing is actually a series of different tests whose primary purpose is to fully exercise the computer-based system. It helps us in uncovering errors that were made inadvertently as the system was designed and constructed. We began testing in the „small" and progressed to the „large". This means that early testing focused on algorithms with very small gesture set and we ultimately moved to a larger one with improved classification accuracy and larger gesture set.

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