HAND TRACKING USING COMPUTER VISION

MINOR PROJECT SYNOPSIS

SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF

BACHELOR OF TECHNOLOGY
(Information Technology)

Submitted by:
Darshdeep Singh, Simranpreet Kaur,Ridhim
URN-1905320,1905402,1905387
CRN-1921119,1921100,1921088

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Guru Nanak Dev Engineering College
Ludhiana-141106, INDIA

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1 Introduction

Computer vision is a field of artificial intelligence (AI) that enables computers and systems to derive meaningful 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. Computer vision trains machines to perform these functions, but it has to do it in much less time with cameras, data and algorithms rather than retinas, optic nerves and a visual cortex. Because a system trained to inspect products or watch a production asset can analyze thousands of products or processes a minute, noticing imperceptible defects or issues, it can quickly surpass human capabilities.

OpenCV is a library used for computer vision applications. With help of OpenCV, we can build an enormous number of applications that work better in real-time. Mainly it is used for image and video processing. Along with OpenCV, we are going to use the MediaPipe library.

MediaPipe is a framework mainly used for building audio, video, or any time series data. With the help of the MediaPipe framework, we can build very impressive pipelines for different media processing functions.

In the field of gesture recognition and image processing, hand tracking is a high-resolution technique developed in 1969 that is employed to know the consecutive position of the fingers of the user and hence represent objects in 3D. In addition to that, the hand tracking technique is used as a tool of the computer, acting as an external device in our computer, similar to a keyboard and a mouse. The hand tracking system is focused on user-data interaction, where the user interacts with virtual data, by handling through the fingers the volumetric of a 3D object that we want to represent. This system was born based on the human-computer. Human computer interaction problem. The objective is to allow the communication between them and the use of gestures and hand movements to be more intuitive, hand tracking systems

have been created. These systems track in real time the position in 3D and 2D of the orientation of the fingers of each marker and use the intuitive hand movements and gestures to interact.

2 Rationale

Gestures play an important role in our everyday communication and expression. Thus, using them to communicate with tech devices needs very little intellectual data processing from our side. That means we can control different things such as vending machines almost without thinking, just by using our fingers and hands. Using gesture control, we can interact with the system without physically interacting with the device. A desire for contactless sensing and hygiene concerns are the top drivers of demand for touchless technology. Gesture recognition can also provide better ergonomics for consumer devices. Another market driver is the rise of biometric systems in many areas of people's lives, from cars to homes to shops. A desire for contactless sensing and hygiene concerns are the top drivers of demand for touchless technology. Gesture recognition can also provide better ergonomics for consumer devices. Another market driver is the rise of biometric systems in many areas of people's lives, from cars to homes to shops.

3 Objective

1. To perform pre-defined function using hand gestures.

2. Contactless interaction with the system.

4 Feasibility Study

In this project, we will look into all the possibilities and analyse whether it is profitable to work on it or not: -

1. Economical: The cost of hardware and software are normal, and it can be performed on any operating system.

2. Efficient: If we will deploy the software on play store, it is going to provide the desired results.

3. Operationally and Accessibility: The software is easy to understand and operate and can be understood and used by people of any age groups to detect hand gestures. Anyone can easily download and access the software and can also provide review and feedback.

5 Methodology/Planning of work

In the field of gesture recognition and image processing, hand tracking is a high-resolution technique developed in 1969 that is employed to know the consecutive position of the fingers of the user and hence represent objects in 3D.The hand tracking system is focused on user-data interaction, where the user interacts with virtual data, by handling through the fingers the volumetric of a 3D object that we want to represent.

The program is supposed to change the volume of the computer system by using gestures. After running the program, the camera turns on which observes and detects the hand. The opencv library of python is used to access the camera and capture the world in real-time. The mediapipe library of python already has in-built dataset to detect the landmarks on hand. Once the hand is detected, the program measures the distance between the 4th and 8th landmark of the hand and using the pycaw library it changes the volume of the system.

Human computer interaction problem. The objective is to allow the communication between them and the use of gestures and hand movements to be more intuitive, hand tracking systems have been created. These systems track in real time the position in 3D and 2D of the orientation of the fingers of each marker and use the intuitive hand movements and gestures to interact.

6 Facilities Required

1. PyCharm Community Edition 2021.3.2 :

-For developing python projects.
-It is used for training and testing of datasets.

2. Packages :

-OpenCV: It is used for computer vision applications.
-MediaPipe: It is a framework mainly used for building audio, video, or any time series data.
-Pycaw: It is mainly used to interact and modify the system audio.

7 Expected Outcomes

1. The hand was detected and tracked by the program

2. Volume of the system could be changed using gesture.

8 References

- https://youtu.be/NZde8Xt78Iw

- https://mediapipe.dev/

- https://github.com/AndreMiras/pycaw/