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April 28, 2024

BRIGHTNESS AND VOLUME CONTROLLER USING HAND GESTURE RECOGNITION

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Abstract—Hand Gesture Detection is receiving a great deal of attention these days because of its numerous uses and capacity to effectively interface with machines through human interaction. We are attempting to gain knowledge of hand gesture detecting systems in this work. In this study, we are attempting to figure out how image processing works and how we can utilize it to create a hand motion recognition system that allow us to operate the computer without touching it. The work mainly focuses on controlling the brightness and volume of the computer. This is useful for the people that are not mentally stable or weak from mind can also benefit by technology and can operate the computer. This technology can be used to make computers even more user-friendly.

Index Terms—Gesture recognition, Human computer Interaction, Object detection, Image processing, Feature extraction.

I. INTRODUCTION

The majority of the time, hands are employed for daily physical activities involving manipulation, although communication is occasionally also done with them. We use hand gestures to help us communicate accurately throughout the day. Hand gestures are essential for sign language communication since mute and deaf persons rely on their hands and gestures to communicate. In order to communicate with and engage with machines, people most usually use their hands. The two primary input/output devices for computers the mouse and keyboard both need the use of hands to operate [2]. The most crucial and immediate method of communication between a computer and a human is through visual and audible aids, yet this interaction is one-sided. Computers can better grasp human body language thanks to gesture recognition. Rather of relying solely on graphical or basic text user interfaces, this aids in creating a stronger connection between humans and technology (GUIs). In this project, a computer webcam analyses the movements of the human hand. This information is subsequently used as input by the computer to handle applications. In this project, we'll create a Python script that makes use of OpenCV and Mediapipe to recognize hand

gestures and adjust the system's brightness and volume from a range of 0-100. To monitor every point on the hand and identify hand landmarks, we used the Hand tracking module. To control the level of brightness and volume it calculates the distance between thumb tip and index finger tip.

II. OBJECTIVE

It would be a major advance in the field of human computer interaction if computers could translate and comprehend hand gestures. The problem is that today's photos are information-rich, and in order to complete this work, substantial processing is needed. Each gesture is distinguished from others by a few unique characteristics [1]. This project's goal is to develop an interaction that dynamically records human hand motions and regulates volume and brightness. Basic principle: This project makes advantage of our device's camera. It recognizes our hand as having points on it so that it can measure the space between the tips of our thumb and index fingers [3]. The volume of the gadget is exactly proportional to the distance between points 4 (thumb tip) and 8 (index finger tip).

III. RELATED WORK

Sharma et al. [1] discussed the concept of hand gesture detection using the methods for extracting data and extraction of characteristics. The system is classified in three steps Extraction Method, features extraction and classification and it is being used for different applications in different fields. Oudah et al. [2] proposed the algorithm that relies on collecting image characteristics to represent visual appearances like hands and comparing these parameters with features collected from the input picture frames. Viraj Shinde et al. [3] used the mediapipe library to detect hand landmark positions and handedness. If the frame detects one hand, it finds out if it's a left hand or right hand and triggers the brightness control and volume control function respectively. Shaikh et al. [4] showed how gesture recognition is pre-processed. Color space detection,

TABLE I
SUMMARY OF LITERATURE SURVEY

Reference	Methodology	Outcome/Results	Remarks
Devendra Kumar Sharma, Mala Saraswat [1]	Here the concept of hand gesture detection using the methods for extracting data and extraction of characteristics. The system is classified in three steps Extraction Method, features extraction and classification.	Hand gestures detection system is being used for different applications in different fields. Some hand gesture detection application fields are mentioned below. 1.Recognition of Sign Language 2. Controlling Features of computer 3.Virtual Environments	1. Unsuitable for long distance travel 2. Occasionally inaccurate 3. Needs a good camera 4. Two palms might be confusing.
Munir Oudah, Ali Al-Naji and Javaan Chahl [2]	In this instance, the algorithm relies on collecting image characteristics to represent visual appearances like hands and comparing these parameters with features collected from the input picture frames. where the characteristics are computed straight from the pixel intensities without first undergoing any segmentation.	The end result is identification and the introduction of a system that can identify certain human gestures and utilise them to communicate or exercise command and control. Consequently, it comprises monitoring human movement and interpreting that movement as important directives.	The main remark will be if any person of physically handicapped hand who don't have proper no of fingers, then it will be difficult to detect.
Viraj Shinde; Tushar Bacchav; Jitendra Pawar; Mangesh Sanap [3]	In this they mentioned about mediapipe library to detect hand landmark positions and handedness. If the frame detects one hand, it finds out if it's a left hand or right hand and triggers the brightness control and volume control function respectively.	So, it can identify the hand and we can control the volume and brightness with different hands at a time, like left hand to control brightness and right hand to control volume. It detects hand and control respective feature it is assigned to it.	The idea of image processing is the foundation for hand gesture recognition using a camera. There has been a lot of study in recent years on gesture recognition utilising sensors on HD cameras, but the cameras and sensors are more expensive.
Salman Shaikh , Raghav Gupta , Imran Shaikh , Jay Borade [4]	This article shows how gesture recognition is pre-processed. Color space detection, colour space conversion [RGB] & differentiation, Skin colour detection using open cv, and lastly line segment detection for finger detection is used to pre-process the acquired picture.	The outputs are: 1: Image pre processing 2: Tracking of fingers 3.Recognition of gestures	The biggest remark of the system is the background should be white if there is any other background than white the system will fails to recognize the Hand.
Soeb Hussain; Rupal Saxena; Xie Han; Jameel Ahmed Khan [5]	In the research analysis, they included a method for controlling a computer by means of six static and eight dynamic hand gestures. Hand form detection, tracing of the identified hand (if dynamic), and turning the data into the necessary command are the three basic phases.	This technique identifies the hand gesture and converts data into required command.	It can identify only a few gestures and commands.



Fig. 1. Proposed System

colour space conversion [RGB] differentiation, Skin colour detection using open cv, and lastly line segment detection for finger detection is used to pre-process the acquired picture. Table 1 summarizes the related work of the hand gesture recognition.

IV. PROPOSED SYSTEM

The interaction between social life and information technology has grown increasingly intimate in recent years as a result of advancements in computer hardware and software technologies. Future consumer electronics devices' interfaces, particularly those for smart phones, video games, and infotainment systems, will have an increasing number of features and be more complicated. It has become crucial to figure out how to create an easy-to-use human-machine interface (HMI) for every consumer electronics product. The most popular form of interaction is still via a mouse, keyboard, or joystick, which are all classic examples of electronic input devices. It does not imply, however, that for the majority of users, these devices offer the most practical and simple input options. Gestures have been an important form of human contact and communication since ancient times. Before the development of language, people could simply convey their ideas through gestures. Many individuals still use gestures in everyday life, and deaf people in particular find gestures to be the most natural and important form of communication. Many human-based electronics items, including computers, TVs, and games, have adopted the gesture control technology in recent years. With the aid of the current system, this method enables users to operate the items in a more natural and intuitive manner.

Figure 1 shows the major steps used in the proposed system for the gesture recognition systems. The detection of objects is the initial stage. The objective of this stage is to locate hand objects in digital photos or videos [4]. In order to guarantee that hand contours or regions can be extracted accurately at this stage in order to increase identification accuracy, a number of environment and image obstacles must be overcome [5]. Common visual problems include fluctuating brightness, noise, poor resolution, and poor contrast. These issues can be successfully improved by a better atmosphere and camera technologies. So when gesture recognition technology is in use in a real-world setting, it might be challenging to regulate. Object recognition is the second stage. To identify the movements, the detected hand objects are identified. Differentiated

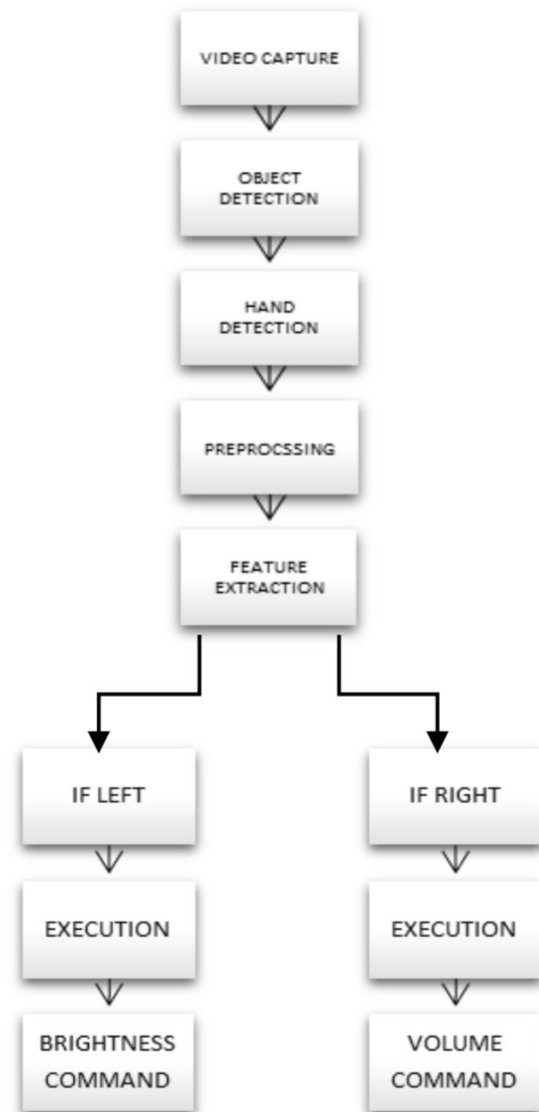


Fig. 2. Flow diagram of the Proposed System

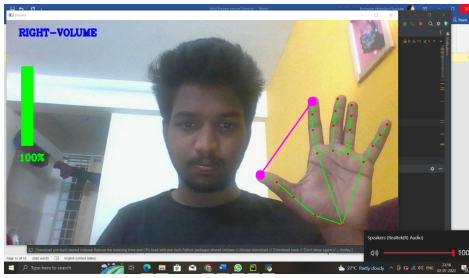


Fig. 3. Right hand - Volume is at maximum (100%)

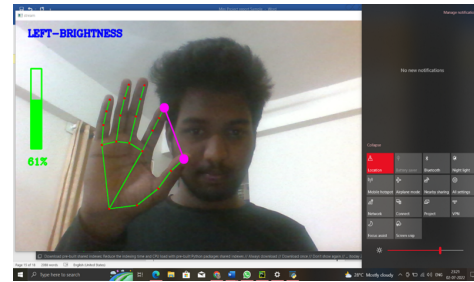


Fig. 4. Left hand - Brightness at 61%

characteristics and successful classifier selection are important issues in most studies at this point. The third stage is analysing successive motions in order to determine what users are instructing or doing. Once the camera initial begins, it uses mediapipe (a built-in library for Python) to determine if it is an object or a hand. If it is a hand, it then extracts a feature from the hand and performs gesture control using that feature. Figure 2 shows the flow of execution. While we execute the program in the system, it first asks for permission to access the camera. Once it receives that permission, it begins recording video and detects hands in the frame. Using mediapipe (a built-in library in Python), it determines whether the hands are left or right hands. If the hands are left, we can control the brightness; if they are right, we can control the volume.

A. Algorithm

The majority of gesture recognition include three steps: Step 1. Identify Hand landmarks Step 2: Determine how far apart the tips of your thumb and index finger are from one another. Step 3. Measure the distance between the tips of your thumb and index finger using a volume and brightness range. In this case, the distance between the tips of my thumb and index finger was between 15 and 220, the volume ranged from 0 to 100, and the brightness ranged from 0 to 100. To calculate the distance between Thumb tip and Index finger tip: $Dist = \text{math.hypot}(xr2 - xr1, yr2 - yr1)$ Here we used just distance formula Here $(xr2, yr2)$ are the coordinates of index finger tip and $(xr1, yr1)$ are the coordinates of thumb fingertip.

V. RESULTS

The camera records our hand, identifies it, and uses the movements of our hands to determine the distance between the tips of our thumb and index finger. By this we can finally we control the volume and brightness by using our hand gesture. Fig. 3 and Fig.4 shows the movement of fingers in different hands to increase and decrease the volume and brightness.

VI. CONCLUSION

Using opencv and mediapipe, we planned, created, and constructed a system allowing hand gestures to control brightness and volume. We programmed a code that can identify hand movements and then map those gestures to particular system activities. This paper showcases a program that enables hand gesture as a practical and simple method of software

control. Since it does not require high-definition cameras to identify the hand movements, a gesture-based volume and brightness controller may be utilized in real life on affordable webcams-equipped basic PCs. The method keeps track of the locations of each hand's index finger and counter tips. This kind of system's primary goal is to essentially automate system components so that they are easy to control. Therefore, using this technique, we have made the concept realistic. Finally, we can control the volume and brightness of our laptops and other related gadgets by based on our hand gesture.

VII. FUTURE ENHANCEMENT

Future research can focus on improving the ability to recognize different lighting circumstances and recognize both hands also recognize improper hands for handicap which is encountered in this project. In Future we would like to improve the accuracy further and add more gesture to implement more functions. The problem of processing and extracting video frames is efficiently resolved by this method for hand gesture recognition. Different hand gestures can be recognised and eventually utilised as computer input. The hand gestures used to signify numbers can also be converted into directives that will promptly carry out the necessary action. Other system apps like Explorer, Media Player, etc. may be operated by using the hand gesture recognition technology. To design a website that can be navigated using hand gestures. JavaScript and the logic for gesture detection may be merged dynamically for the same.

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