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GESTURE CONTROLLED COMPUTER SYSTEM

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Abstract

Gesture Controlled Computer System is a utility software to cater to the daily needs of various working professionals including teachers, educators etc. by providing a comprehensive solution of the basic problems. The software comes with various utilities like touch less keyboard, mouse and whiteboard, all just controlled with the help of our hand gestures. Minimization of hardware has been one major focus of this software thus minimizing overhead cost associated with the general computer system. The GCCS software is easy to install, making it extremely user friendly and sound for meeting daily needs.

1.INTRODUCTION

Gesture control technology is developing quickly and changing many aspects of our life. Gesture control devices began from the very primitive input devices to fine detail recognition. These devices are used in a much wider range, from research experiments and prototypes to day-today commercial products.

GCCS is primarily based on the usage of hand gesture tracking out of many available gesture recognition techniques, various utilities supported by the system can be utilized just by the usage of our fingers. This all is possible subject to utilization of various new technologies available now a days [3] and making them work in the right direction for achieving a common purpose. These technologies may include the Media pipe library provided by Google acting as a base for our various hand tracking requirements, usage of open CV for various camera related operations and many more.

All the utility functions are in housed in a single software making it extremely user friendly and sound. This software is easy to install and comes with accurate security standards.

2.LITERATURE SURVEY

Numerous research papers and survey articles have been published highlighting the need of such a technology especially in today's technology driven era. Reference [6]'s author has indicated of how hand gestures are presented as an appealing means of interacting with computers, offering a more natural and intuitive interface compared to traditional input devices. the research area [6] overviewed to computer vision-based analysis and interpretation of hand gestures, highlighting its importance in Human computer interaction. There is a distinction made between using 3D models of the human hand and image appearance models. 3D hand models allow for more detailed representation but pose computational challenges, particularly for real-time HCI applications. Appearance-based models are computationally efficient but may lack the generality required for diverse HCI contexts. The discussion extends to future research directions in gesture recognition, including integration with other natural modes of human-computer interaction. This suggests a

holistic approach to HCI that combines multiple interaction modalities. Reference [7]'s discusses the advantages and disadvantages of wearable and neat glove technology versus computer vision for hand input in HCI. glove-based sensing may fulfill certain requirements but hinder natural interaction, require extensive calibration. whereas computer vision offers non- contact solutions that can provide a more natural HCI experience. It focuses on categorizing hand gestures to extract abstract information corresponding to motion patterns or postures. It aims to interpret user intentions based on recognizable hand movements. Several technologies are continually developing in today's technological world. The human-machine interaction is one such innovative concept. For instance, the limit of a wired mouse cannot be raised. Bluetooth hardware and a Bluetooth dongle need to be installed on the computer in order to use a wireless mouse. Such limitations would not apply to the suggested system[9], which depends on gesture recognition. The technologies for object identification and image processing are primarily employed in this study. The objective is to use only finger motions to move the mouse pointer on the screen, a process known as gesture recognition, rather than using any hardware, like a mouse.

3. METHODOLOGY

3.1 Objective

GCCS aims to develop comprehensive, easy to use utility software which will cater to the daily needs of the people by providing tech driven and innovative solutions. The solutions are provided at nearly no cost making it pockets friendly thereby cutting the overhead cost involved with a computer system. In this technology driven era where everything has revolutionized with the growth of technology, minimization of hardware.

Various features of this software are as follows :-

1. Utility Control
2. Mouse Control
3. Air Canvas (White Board)
4. Keyboard

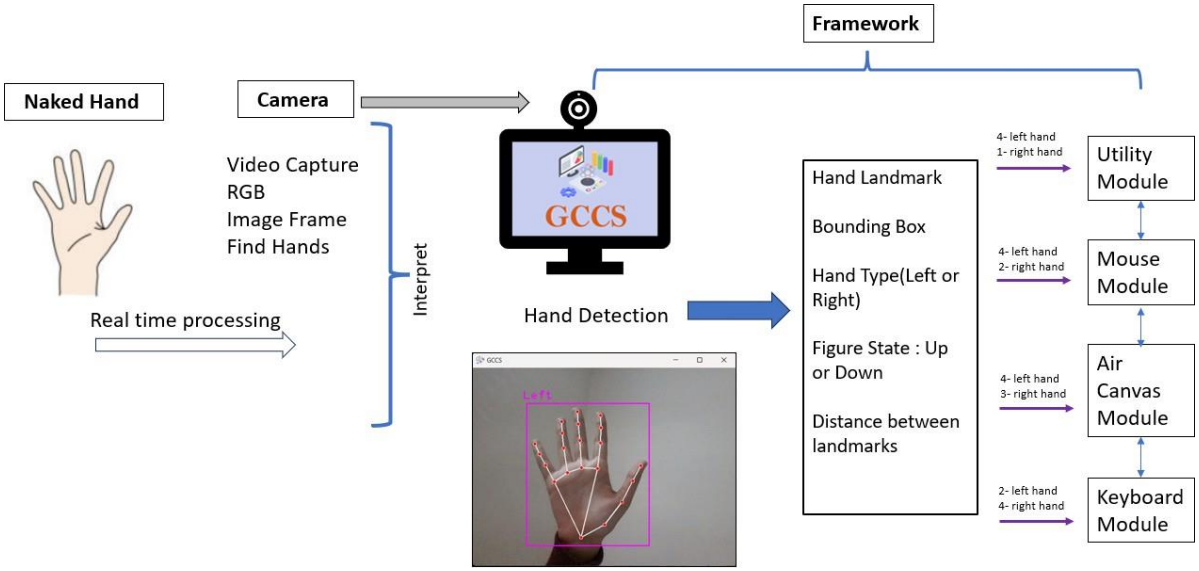

Fig 1 : Working of GCCS

32. Utility Control

The very first module of this software, the utility control aims to provide various controls using hand recognition such as volume control, brightness control and shutdown. Tracking hands with the help of mediapipe library and utilising it to cater to all the above mentioned requirement.

All the functionalities of utility control can be used by utilising 4 fingers of the left hand and index finger of the right hand. The software will then detect the same and will enter into utility mode. On entering the utility mode single left finger will make us enter into volume control, two fingers will make us enter brightness control and three fingers will make us enter into power control. All can further be controlled by measuring the euclidean distance between the thumb and the index finger the greater the distance, more the intensity of brightness, volume and vice versa. In power control the distance of zero will signify shut down as shown in Fig 2 and 3.

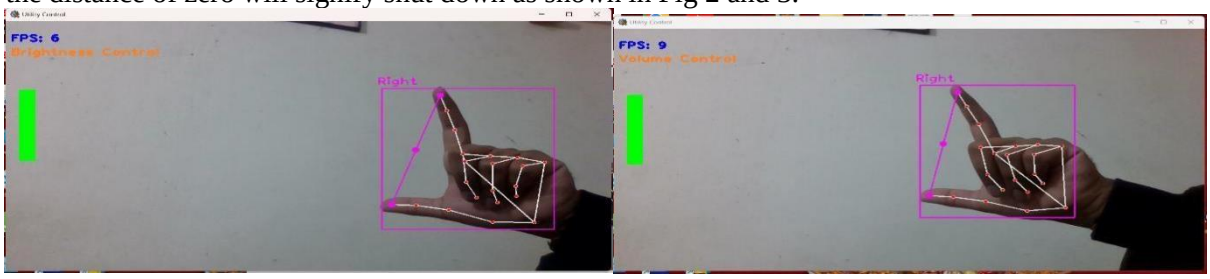

Fig 2: Brightness and Volume Control

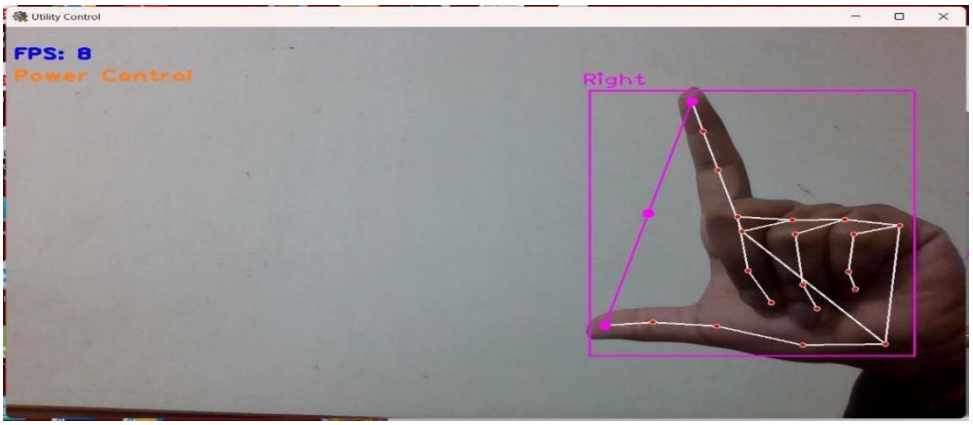

Fig 3: Power Control using Hands

3.3 Mouse Control : Revolutionising Point and Click

Another functionality provided by the software include mouse control by utilising hand tracking and movement. A physical mouse can be simulated with the help of this functionality including left click , right click , scrolling and drag , all can be performed just by utilising the various combinations of our fingers of both the hands. Like for instance hand landmarks are used to detect various position of our fingertips which are then mapped to various functionalities of our mouse making it easy to navigate (Fig 4). The combination of fingers are used to simulate left and right click as prescribed in the software. The drag and drop facility can be utilised by simulating our thumb and utilising left click functionality. The mouse control can be incorporated to utilise various background functionalities like media playback without interfering with the normal workflow.

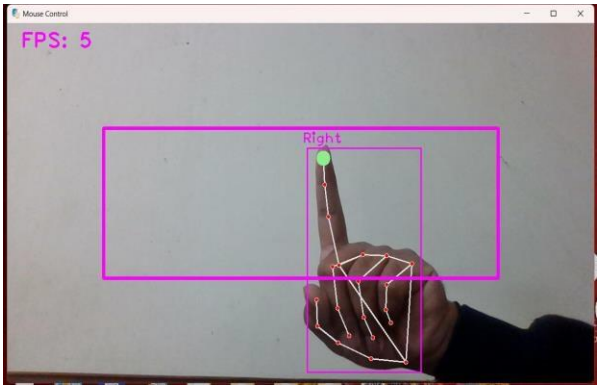

Fig 4 : Mouse Control using Hand tracking (simulation of right click)

3.4 Air Canvas : Interactive Screen Writing

The heart of the software lies in this functionality provided by air canvas, here we try to simulate normal white board without utilising any physical pentab or a white screen making it extremely convenient and easy to work with. All the required functionalities like drawing, saving , color change, modifications can be easily performed on this software . One can also download the required work as a as a pdf which can than later be utilised for various other works . Once understood the various functionalities of the software it would be easy for one to simulate and understand the software thereby.

This software is very useful for someone who is not able to buy a physical hardware for teaching and is not able to carry his usual routine job in most efficient and productive manner.

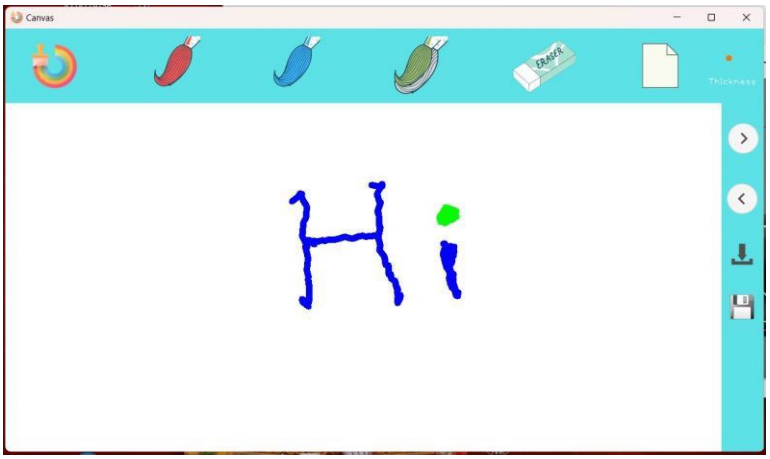

Fig 5 : Air Canvas (White Board)

3.5 Virtual Keyboard : The Future of Typing

Virtual Keyboard is the software simulation of the hardwired keyboard providing all the necessary functionalities of a keyboard i.e. typing and various keyboard related functions. Extremely useful in a situation when physical keyboard is not available but providing the same experience without touching the surface. This keyboard like other functionalities utilises the hand tracking and webcam for simulating the desired functionality.

The hand gestures are fed into the software beforehand utilising which the keyboard can be realised easily. Two left fingers and four right fingers will make us enter the keyboard module and then using our fingers it would be easy to type on the screen giving a seamless experience like bringing index and middle finger closer to each other would mean pressing a key which would then be typed on the notepad.

All the necessary keys which are available on a normal physical keyboard are used in this virtual keyboard. The functionality is made possible by utilising the mediapipe and pyautogui library for handtracking and movement.

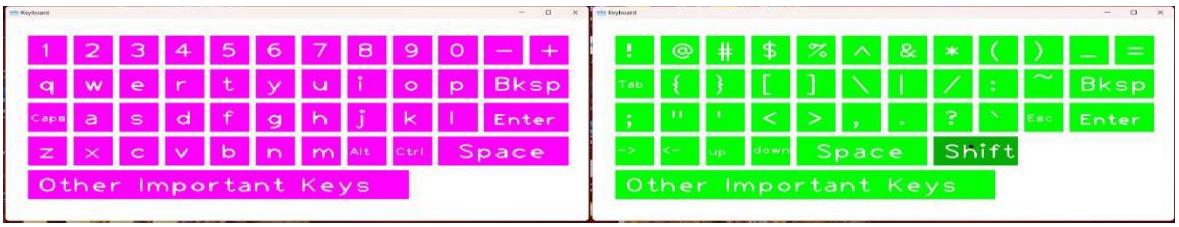

Fig 6: Virtual Keyboard

3.6 GCCS as a Software

All the above explained functionalities are bundled together in a package termed as Gesture Controlled Computer System (GCCS) software making it easily accessible and use . All the scattered utilities are bought together so that the load of downloading and installing multiple software (each for a specific utility) can be eliminated. Also the software is safe and secure to be downloaded on our computer system and eliminate any sort of risk and vulnerabilities associated with it.

Fig 7 : Gesture Controlled Computer System

4.CONCLUSION

GCCS is a one stop comprehensive solution for solving problems of our daily needs . The software comes up with various features like utility control, mouse control, air canvas and keyboard control system helping everyone in their daily routine work by utilising various tech driven solutions as provided by the software like hand tracking and movement which is at the core of this software as provided in its functionality. Being in a technology driven world where everything is just getting minimised in terms of hardware, GCCS aims to develop a software which is both budget friendly as well as functionally sound making it easy to work with in an elegant and interactive way. The hand tracking module which is at the core of this software is a technology which is improving day by day and hence with those improvements GCCS is also to be improved considerably.

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