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Virtual Mouse by Means of Manual Gestures

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Abstract: *The main aim to perform the mouse cursor operations and scrolling function and also move the cursor. A professional webcam, novel process of managing mouse click was developed. The integration of different efforts would include changing keypad elements, integrating more keys, or shifting the monitoring ball's placement. However, they recommend that the hardware design be altered. The proposed approach solves present inadequacies as well as utilized of a hardware mouse, but also numerous motions cause injury in the palms. It should be predicated on a visualization impact of motion, accompanied by artificial intelligence technology, image classification, and motion tracking, to regulate mouse tasks (left and right-clicking, double- clicking, and scrolling), as well as Machine Cognitive approach to obtain a greater virtual touchpad to the current systems. A camera should be used to capture palm motions.*

Keywords: Machine Cognitive approach, Virtual mouse, Manual gestures

I. INTRODUCTION

Within the past few years, as computer technology continues to develop, people want more compact electronic devices. Human Computing Interaction, particularly gesture recognition and object recognition, is becoming increasingly important. In this project, we introduce a method for controlling the mouse events and cursor movements through live webcam. In today's world, most cell phones communicate with the user via touch screen technology. However, this technology is still prohibitively expensive for use on desktops and laptop computers. The most efficient and expressive way of human communication is through hand gesture, which is a universally accepted language. It is pretty much expressive such that the dumb and deaf people could understand it. In this work, real-time hand gesture system is proposed. Experimental setup of the system uses fixed position low-cost web camera high- definition recording feature mounted on the top of monitor of computer or a fixed camera on a laptop, which captures snapshot using Red Green Blue [RGB] color space from fixed distance. In this project we use the edge detection which is generally an image processing discipline. It is used to find the edges of the digital images through some mathematical methods. There are generally two types of edges detections are there. They are Search Based Edge Detection and Zero Crossing Based Edge Detection. There are a finite number of edge detection methods are present.

1.1 Motivation

In the present-day scenario, most of the mobile phones are using touch screen technology to interact with the user. But this technology is still not cheap to be used in desktops and laptops. Our objective was to create a virtual mouse system using a Web camera to interact with the computer in a more user-friendly manner that can be an alternative
Approach for the touch screen. This activity on the gesture-based user interface (UI) has been proliferating in the last decade. The main reason for these technologies becomes more popular is because it can be applied to many different fields easily and efficiently.
Human-Computer Interaction today greatly emphasizes on developing more spontaneous and natural interfaces. The Graphical User Interface (GUI) on Personal Computers (PCs) is quite developed, well defined and provides an efficient interface for a user to interact with the computer and access the various applications effortlessly with the help of mice, trackpad, etc.

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1.2 Problem Statement

Computer vision-based mouse can easily be applied to the web services, smart home systems, robot manipulation, and games. That is why tracking non-rigid motions from sequential videos have been a great interest to the computer vision community. We grew up interacting with the physical objects around us. How we manipulate these objects in our lives every day, we use gestures not only to interact with objects but to interact with each other and this brings us a step closer to Human-object relationship by using gesture recognition technique. In this research still webcam has been used to recognize the gestures. There is no need for 3D or stereo cameras and above research has also been tested on low-cost 1.3-megapixel laptop webcam.

II . LITERATURESURVEY

Gesture recognition gives the best interaction between human and machine. Gesture recognition is also important for developing alternative human computer interaction modalities. It enables human to interface with machine in a more natural way. Gesture recognition can be used for many applications like sign language recognition for deaf and dumb people, robot control etc. This technology has wide applications in the fields of augmented reality, computer graphics, computer gaming, prosthetics, and biomedical instrumentation.

Digital Canvas is an extension of this system which is gaining popularity among artists, by which the artist could create 2D or 3D images using the Virtual Mouse technology using the hand as brush and a Virtual Reality kit or a monitor as display set. This technology can be used to help patients who don't have control of their limbs. In case of computer graphics and gaming this technology has been applied in modern gaming consoles to create interactive games where a person's motions are tracked and interpreted as commands.

Researchers around the world are now focused on to make our devices more interactive and trying to make the devices operational with minimal physical contact. In this research, we propose an interactive computer system which can operate without any physical keyboard and mouse. This system can be beneficial to everyone, especially to the paralyzed people who face difficulties to operate physical keyboard and mouse. We used computer vision so that user can type on virtual keyboard using a yellow-colored cap on his fingertip, and can also navigate to mouse controlling system. Once the user is in mouse controlling mode, user can perform all the mouse operations only by showing different number of fingers. We validated both module of our system by a 52yearsoldparalyzed person and achieved around 80%accuracy on average.

There are some related works carried out on virtual mouse using hand gesture detection by wearing a glove in the hand and also using color tips in the hands for gesture recognition, but they are no more accurate in mouse functions. The recognition is not so accurate because of wearing gloves; also, the gloves are also not suited for some users, and in some cases, the recognition is not so accurate because of the failure of detection of color tips. Some efforts have been made for camera-based detection of the hand gesture interface.

Banerjee. A, A. Ghosh, K. Bharadwaj, H. Saikia introduced a new method using the web camas the source to control the movements of the mouse using color detection. In their work, have tried to control mouse cursor movement and click events using a camera based on color detection technique. Here real time video has been captured using a Web Camera. The user wears colored tapes to provide information to the system. Individual frames of the video are separately processed. The processing techniques involve an image subtraction algorithm to detect colors. Once the colors are detected the system performs various operations to track the cursor and performs control actions, the details of which are provided below.

No additional hardware is required by the system other than the standard webcam which isprovided inevery laptop computer.

Following are the steps in our approach:

- Capturing real time video using Web-Camera.
- Processing the individual image frame.
- Flipping of each image frame.
- Conversion of each frame to a grey scale image.
- Color detection and extraction of the different colors (RGB) from flipped gray scale image
- Conversion of the detected image into a binary image.

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- Finding the region of the image and calculating its centroid.
- Tracking the mouse pointer using the coordinates obtained from the centroid.
- Simulating the left click and the right click events of the mouse by assigning different color pointers.
- For the system to work they need a sensor to detect the hand movements of the user. The webcam of the computer is used as a sensor. The webcam captures the real time video at a fixed frame rate and resolution which is determined by the hardware of the camera. The frame rate and resolution can be changed in the system if required.
- Computer Web cam is used to capture the Real Time Video
- Video is divided in to Image frames based on the FPS (Frames per second) of the camera
- Processing of individual Frames

When the camera captures an image, it is inverted. This means that if we move the color pointer towards the left, the image of the pointer moves towards the right and vice-versa. It's similar to an image obtained when we stand in front of a mirror (Left is detected as right and right is detected as left). To avoid this problem, we need to vertically flip the image. The image captured is an RGB image and flipping actions cannot be directly performed on it. So the individual color channel soft he image are separated and then they are flipped individually. After flipping the red, blue and green colored channels individually, image is obtained

III. EXISTING METHOD

Though the wireless or Bluetooth mouse technology is invented still, that technology is not completely device free. A Bluetooth mouse has the requirement of battery power and connecting dongle. Presence of extra devices in a mouse increases the difficulty to use it.

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Fig 1: Virtual mouse using the colored tapes

3.1 Disadvantages of Existing System

- The virtual mouse which are already present are quite inaccurate i.e., they need a more than required amount of light to process the movements of the hand or the finger.
- In some other systems even though the accuracy of the mouse movements is high, the usage of unwanted properties like colored tapes or clothes are wrapped around the finger or sensors are used in order to detect the

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movements of fingers through color detection.

IV . PROPOSED METHOD

- The system is to present an approach for Human-computer Interaction (HCI), where we have tried to control the mouse cursor movement and click events of the mouse using hand gestures.
- Hand gestures were acquired using a webcam.
- This method mainly focuses on the use of a Web Camera to develop a virtual human-computer interact interaction device in a cost-effective manner.
- The Hand movements are recognized with the help of media pipe which offers across platform customizable Machine Learning solutions for live and streaming media.
- These media pipe is trained with more than 30 thousand of pictures of hands of different people.
- The movements of the hands are tracked using the 21 points in the hand.

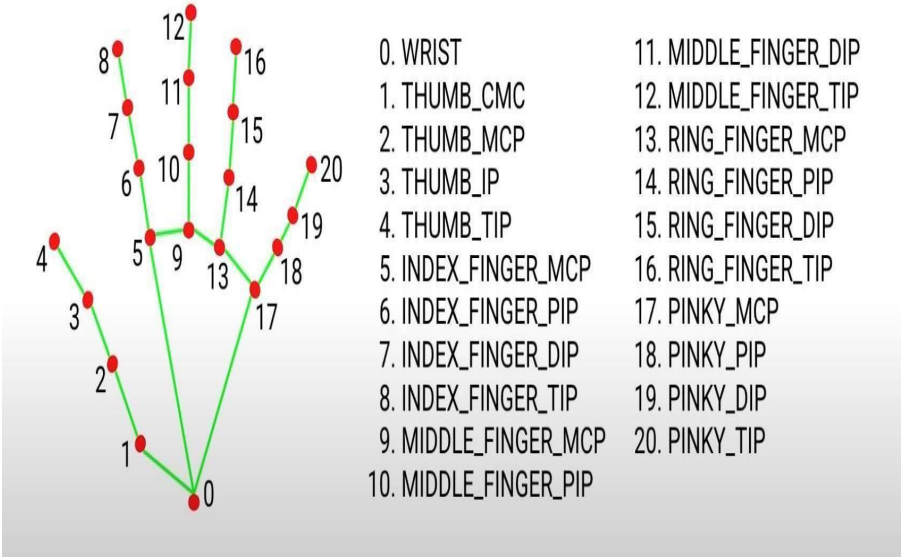

Fig 2: All 21 points of a single hand.

4.1 Advantages of Proposed System

- The main advantage of using hand gestures is to interact with computer as a non-contact human computer input modality.
- Reduce hardware cost by eliminating use of mouse.
- Convenient for users not comfortable with touchpad.
- The framework maybe useful for controlling different types of games and other applications dependent on the controlled through user defined gestures.
- Less prone to physical damage and mechanical wear and tear.
- Avoidance of mouse related wrist damage.

V . PROJECT ALGORITHM

Edge Detection, is an Image Processing discipline that in corporates mathematics methods to find edges in a Digital Image. Edge Detection internally works by running a filter/Kernel over a Digital Image, which detects discontinuities in Image regions like stark changes in brightness/Intensity value of pixels. There are generally two types of edges detections are there. They are Search Based Edge Detection and Zero Crossing Based Edge Detection. There are finite number of edge detection methods are present. One of the most famous one is Canny Edge Detector.

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5.1 Algorithm

Procedure: Click_Sparm Gaussian_filter(noisex)
Detect the remaining edges after filtering
For i = 1 < k do
    If $f_X(x)\%N==0$ then
        Return
    end if
end for
Employ a sobel algorithm
For i=1 < k do
    Parallel loop(click for) If threshold p>0 then
    If threshold p>0 then P □ G (x,y)Θ□arctan(G(x) ÷G(y)) End if
End for
Perform hysteresis
End procedure

In Canny edge Detection we have following steps for the image processing, those are

- Grayscale conversion
- Gaussian blur
- Determine the intensity gradients
- Non-maximum suppression
- Double thresholding
- Edge tracking by hysteresis
- Cleaning up

5.1 Feasibility Study

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

Three key considerations involved in the feasibility analysis are:

- Economical Feasibility
- Technical Feasibility
- Social Feasibility

A. Economical Feasibility

The purpose of an economic feasibility study(EFS) is to demonstrate the net benefit of a proposed project for accepting or disbursing electronic funds/benefits, taking into consideration the benefits and costs to the agency, other state agencies, and the general public as a whole. This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus, the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

B. Technical Feasibility

A technical feasibility study assesses the details of how you intend to deliver a product or service to customers. Think materials, labor, transportation, where your business will be located, and the technology that will be necessary to bring all this together.

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed mustnot have a high demand on the available technical resources. This will lead to high demands on the

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available technical resources. This will lead to high demands being placed on the client. Apart from that, the modules like Open Computer Vision (OpenCV), Py Auto GUI, MediaPipe, Win32api are used. The main objective of the virtual mouse system is to control the mouse curs or functions by using the hand gestures instead of using a physical mouse.
The proposed system can be achieved by using a webcam or a built-in camera which detects the hand gestures and hand tip and processes these frame stoper form the particular mouse functions.
Digital Canvas is an extension of this system which is gaining popularity among artists, by which the artist could create 2D or 3D images using the Virtual Mouse technology using the hand as brush and a Virtual Reality kit or a monitor as display set. This technology can be used to help patients who don't have control of their limbs. In case of computer graphics and gaming this technology has been applied in modern gaming consoles to create interactive games where a person's motions are tracked and interpreted as commands.
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VI. RESULTS

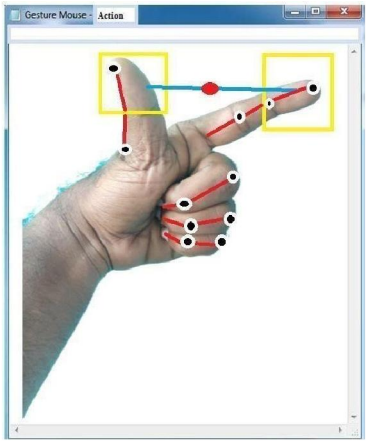

Fig 3: Mouse Movement- Open Gesture

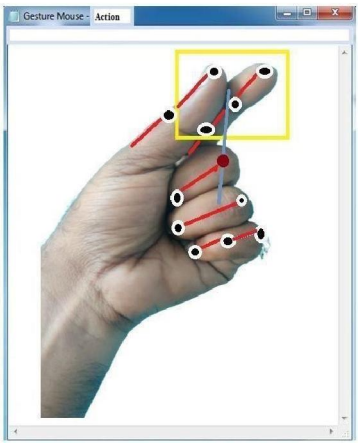

Fig 4: Left Button Click-Clouse Gesture

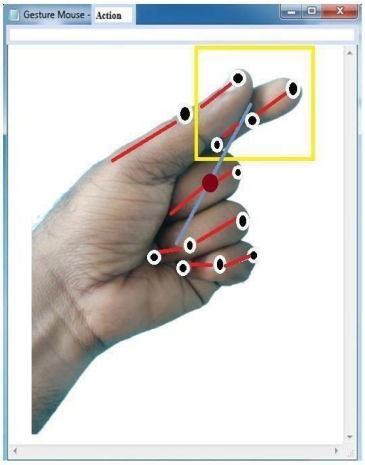

Fig 5: Perform Double Click -Clouse Gesture

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Considering Fig: 7.1 is a Neutral or Open gesture, usually hand consists of 21 landmarks, the black dots indicate the hand landmarks. The red lines between the dots are used to detect hand by media pipe function named as drawing_utils. In Fig: 7.2, performing left click operation using pinch gesture, this gesture identified when the distance between 4(thumb tip landmark) and 8(index tip landmark) is less than 20. Fig: 7.3 shows Double Click operation by hold in pinch gesture for 3 sec(time module is much responsible for this operation)

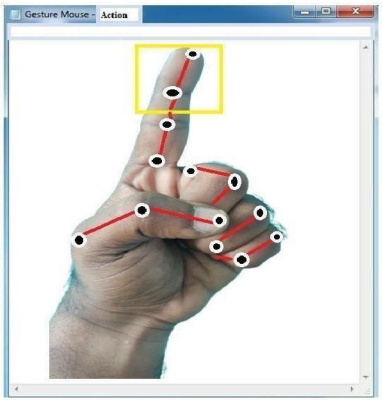

Fig 6: Right Button Click – Open Gesture

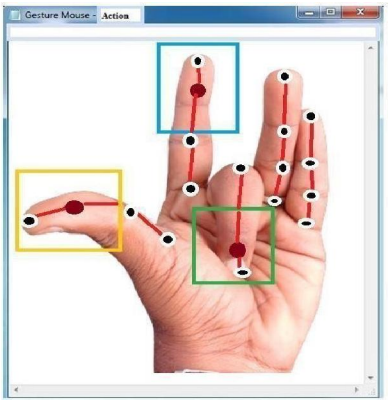

Fig 7: Scrolling up Movement

In Fig: 7.4, Indicates right click operation when the 4th landmark moved close to the 12th landmark but Index finger should be static position. Considering Fig: 7.5 scroll up movement can be performed when the thumb(4th) and index(8th) fingers are static but middle(12th) finger moves from down to up

VII. CONCLUSION

The proposed system will definitely change the way we use the computer. Until now microphone, webcam and mouse are the integral part of the system. This system will completely change the necessity of the mouse which will also leads to the new way of interaction between the human and the computer since there is no need of physical contact with device. Apart from that, the modules like Open Computer Vision (OpenCV), Py Auto GUI, MediaPipe,Win32api are used. The main objective of the virtual mouse system is to control the mouse curs or functions by using the hand gestures instead of using a physical mouse. The proposed system can be achieved by using a webcam or a built-in camera which detects the hand gestures and hand tip and processes these frames to perform the particular mouse functions. From the results of the model, we can come to a conclusion that the proposed AI virtual mouse system has performed very well and has a greater accuracy compared to the existing models and also the model over comes most of the limitations of the existing systems. Since the proposed model has greater accuracy, the virtual mouse can be used for real-world applications, and also, it can be used to reduce the spread of COVID-19,sincetheproposedmouse system can be used virtually using hand gestures without using the traditional physical mouse.

VIII . FUTURES COPE

The proposed virtual mouse has some limitations such as small decrease in accuracy of the right click mouse function and also the model has some difficulties in executing scrolling particularly. Also, the virtual mouse cannot perform the scroll down as well as drag operations, because of implementation of these events are too hard to handle with the gestures. These are some of the limitations of the proposed virtual mouse system, and these limitations will be overcome in our future work. Even though the proposed system can recognize both hands of a human, the problem arises when multiple hands are recognized during the execution. The program always in execution (unless we terminate it), which causes problems in as the unwanted events may be trigger. Furthermore, the proposed method can be developed to handle the keyboard functionalities along with the mouse functionalities virtually which is another future scope of Human-Computer Interaction

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REFERENCES

[1]. Banerjee, A. Ghosh, K. Bharadwaj, H. Saikia, Mouse Control using a WebCamera based on Colour Detection, Int. J. Comput. Trends Technol. 9 (2014) 15-20. doi:10.14445/22312803/ijctt-v9p104.

[2]. A.A. Argyros, M.I.A. Lourakis, Vision-based interpretation of hand gestures for remote control of a computer mouse, Lect. Notes Comput. Sci. (Including Subser. Lect. Notes Artif. Intell. Lect. Notes Bioinformatics). 3979 LNCS (2006) 40–51. doi:10.1007/11754336_5.

[3]. Yu-Luen Chen, Application of tilt sensors in human-computer mouse interface for people with disabilities, IEEE Trans. Neural Syst. Rehabil. Eng. (2002) 289–294. doi:10.1109/7333.948457.

[4]. D.G. Evans, R. Drew, P. Blenkhorn,Controling mouse pointer position using an infrared head-operated joystick, IEEE Trans. Rehabil. Eng.8 (2000) 107–117. doi:10.1109/86.830955.

[5]. Y. Chen, E.R. Hoffmann, R.S. Goonetilleke, Structure of Hand/Mouse Movements,IEEE Trans. Human-Machine Syst. 45 (2015) 790–798. doi:10.1109/THMS.2015.2430872.

[6]. D.G. Evans, R. Drew, P. Blenkhorn, Controling mouse pointer position using an infrared head-operated joystick, IEEE Trans. Rehabil. Eng. 8(2000)107– 117. doi:10.1109/86.830955.

[7]. Y. L. Chen, F. T. Tang, W. H. Chang, M. K. Wong, Y.Y. Shih, and T. S. Kuo, "The new design of an infrared-controlled human–computer interface for the disabled," IEEE Trans. Rehab. Eng., vol. 7, pp. 474–481, Dec. 1999.

[8]. Kannadhasan and R.Nagarajan, Design and Development of Environmentally W-Shaped Structure Antenna for Wireless Applications, International Web Conference on Smart Engineering Technologies(IWCSET 2020), 26-27 June 2020, Ramco Institute of Technology, Rajapalayam, ISBN:978-93-5407-648-0, Published in Journal of Green Engineering, Volume 10, Issue 9, September 2020

[9]. R. D. Richard, B. Stein, B. J. Andrews, K. B. James, and M. Wieler, "Application of tilt sensors in functional electrical stimulation," IEEE Trans. Rehab. Eng., vol. 4, pp. 63–71, Mar. 1996.

[10]. Z. A. Keirn and J. I. Aunon, "Alternative modes of communication between man and his surroundings," IEEE Trans Biomed. Eng., to be published.

[11]. S.Kannadhasan, M.Shanmuganantham, R.Nagarajan, and S.Deepa, Future Progress in Artifical Intelligence: Process and its Applications, Virtual International Conference on Metamorphosis of Modern Management and Research, 13 August 2020, Bannari Amman Institute of Technology, Sathyamangalam, Published for International Journal of Innovative Research in Computer and Communication Engineering, e-ISSN: 2320-9801, p-ISSN: 2320-9798, Volume 8, Issue 12, December 2020, DOI: 10.15680/IJIRCCE.2020.0812007, Impact Factor: 7.488

[12]. Dhuddu Haripriya, Venkatakiran S, Gokulachandar A, "UWB-Mimo antenna of high isolation two elements with wlan single band-notched behavior using roger material",Vol 62, Part 4, 2022, Pg 1717-1721, https://doi.org/10.1016/j.matpr.2021.12.203

[13]. Gokula Chandar A, Vijayabhasker R., and Palaniswami S, "MAMRN – MIMO antenna magnetic field", Journal of Electrical Engineering, vol.19, 2019.

[14]. Rukkumani V , Moorthy V, Karthik M , Gokulachandar A, Saravanakumar M, Ananthi P, "Depiction of Structural Properties of Chromium Doped SnO2 Nano Particles for sram Cell Applications", Journal of Materials Today: Proceedings, vol.45, pp.3483-3487, 2021. https://doi.org/10.1016/j.matpr.2020.12.944

[15]. GokulaChandar ,Leeban MosesM; T. Perarasi M; Rajkumar; "Joint Energy and QoS-Aware Cross-layer Uplink resource allocation for M2M data aggregation over LTE-A Networks", IEEE explore, doi:10.1109/ICAIS53314.2022.9742763

[16]. G.Srividhya, R.Nagarajan and S.Kannadhasan, Enhancement of Clustering Techniques Efficiency for WSN Using LEACH Algorithm, International Conference on Advances in Smart Sensor, Signal Processing, and Communication Technology (ICASSCT 2021), Goa University, Goa, 19-20 March 2021, Published for IOP Journal of Physics: Conference Series, Vol No: 1921, 2021, doi:10.1088/1742-6596/1921/1/012013

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