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Virtual Mouse Using Hand Gestures Recognition

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***Abstract*— This project presents an approach to develop a real-time hand gesture recognition based in —Vision Based that uses only built-in-camera and Computer Vision technology, such as image processing that can acknowledge many gestures for use in computer human interaction.**

The application of real time hand-gesture recognition in the real world are countless, due to the fact that it can be used almost anywhere where we interact with computers. The Principle application of this project is to imitate the mouse as a visual inputting device with all of its tasks such as left click, selecting, curser moving and scroll.

I. INTRODUCTION

Human computer interaction is a growing field in which computer scientists study novel ways in which humans can interact with computers naturally and inherently. One of the most broadly researched matters in this field is hand gesture. recognition, where hand gestures are used to control systems.

The key problem in gesture interaction is how to make hand gestures understood by computers. The application present can be mainly divided into —Data-Glove based and —Vision Based|| approaches.

The Glove based methods use gadgets for digitizing hand and finger movements into multi- parametric data. The extra detectors make it easy to collect hands and movement. However, the devices are quite expensive and bring much cumbersome experience to the users.

This approach is the low cost and the most lightweight. Hence, such systems must be develop to meet the requirements, including accuracy and robustness.

II. LITERATURE SURVEY

The captured hand image is divided using two different methods; skin color based segmentation by applying HSV color model and clustering based thresholding techniques. Some functions are performed to capture the shape of the hand to extract hand feature; the alter Direction Analysis Algorithm are adopted to make a relationship between statistical parameters (variance and covariance) from the data, and used to compute object(hand) slope and trend by finding the direction of the hand gesture. Gaussian distribution is applied on the segmented image, and it takes the direction of the hand.

Form the outcome Gaussian function the image has been separated into circular regions in other words that domains are formed in a terrace shape so that to abolish the rotation effect. The shape is classified into 11 terraces with a 0.1 width for each and every terrace. 9 terraces are outcome from the 0.1 width division which are; (1-0.9, 0.9-0.8, 0.8-0.7, 0.7-0.6, 0.6, 0.5, 0.5-0.4,0.4-0.3, 0.3-0.2, 0.2- 0.1), and one terrace that has value less than 0.1 and the last one for the outer area that extended out of the outer terrace. An explanation of this division is demonstrated. Terraces division with 0.1 likelihood. Each and every terrace is categorized into 8 sectors called as the feature areas, empirically find out that number 8 is suitable for features extraction. To obtain best capturing of the Gaussian to suit the segmented hand and re-estimations are performed on the type to fit capturing the hand object, then the Gaussian shape are matched on the segmented hand to prepare the hand shape for finding out the features.

S. Shetty et al. built a virtual system for mouse using colors detection. They used webcam for detecting mouse cursor movement and click event using OpenCV built-in functions. Mouse driver which is written in java is required as well. This system fails to perform good in rough Environment.

P. C. Shindhe et al. extended a method for mouse cursor free control where mouse cursor movements are controlled by using hand fingers. They have collected different hand gestures through camera 8 using color detection principles. The built-in function of Image Processing Toolbox and a mouse driver, written in java, used in this approach. The pointer was not too efficient on the air as the cursor was very sensitive to the motion.

D. Gupta et al.G. Sahu et al. built a system for controlling mouse pointer using webcam which control volume of media player, powerpoint slides and can make or end a call. They used RGB color tapes to recognise user's finger.

Hand Gestures are used for communication and go with speech in many different forms. They extend from gestures that do not pass a specific meaning and simply follow the rhythm of the speech to those quality its meaning and symbolize specific topics. Hand gestures in certain, covering use of fingers and arms, are widely explored as a natural and intuitive interaction modality for a variety of applications. They used as a sole or one of the modes for interaction interface. It is trust that gesture based interfaces can reduces the complexity of interaction between humans and computers.

Motivations behind the decision to use gestures in an interface can be varied. Gesture dependent interfaces used for computer applications can be more initiate than established WIMP Windows Icon Mouse Pointer based interfaces, and inexperienced users to interact with computer applications, without undertaking extensively. In medical applications or industrial environments, they enable touchless operation guaranteeing sterility or safer interaction. Gestures interface for Virtual Reality and Augmented Reality environments proposes better immersion and do not need any conscious attention dedicated to the specific gestures being executed.

Interconnection with comfort functions in a vehicle can be achieved without taking the eyes off the road Gestures can be used to help older population achieve easier interaction with electronic appliance. These are just few of the examples, and new applications were constantly being developed. Use of gestures for these applications is performed in a variety of technologies. Development of Kinect sensor (Kinect, 2018) and LEAP sensor (LEAP MOTION INC., 2018), which are moveable and supported by Software Development Kits (SDKs) enabling simpler implementation, since 2013 it seems to have put up significantly to the elaborate of the field on gesture based interfaces. While the gesture-based models are being developed for various applications clear standards which could guide their further development are not apparent. Study of patterns of gestures use, and differences between different fields would be an starting step towards development of a standard framework for gesture elicitation for interaction interface development.

III. IMPLEMENTATION

We are making the system to recognize the gestures of human hand using the representation of hand landmarks. Step 1: We are representing the each finger as finger() and tips as fingertip(). And giving the indexes for fingers and tips as follows

1. Thumb finger as finger(0) and tip as fingertip(4).

2. Index finger as finger(1) and tip as fingertip(8)

3. Middle finger as finger(2) and tip as fingertip(12).

4. Ring finger as finger(3) and tip as fingertip(16).

5. Pinky finger as finger(4) and tip as fingertip(20).

Step 2: We are giving the indication whether the finger is up or down.

1. If the finger is up then it indicates it as 1.

2. If the finger is down then it indicates it as 0.

Step 3: We are deciding the gestures depending on user hand indications.

1. Firstly, user has to raise all fingers, then after the gesture denotes gets start.
2. If the only index finger is up, where finger(1) is 1 and remaining are 0 then the curser has to move from current position to next position.
3. If only the middle finger is up then the curser has to be hold at the current location or position.
4. If the thumb finger is up then the lift click operation has to take place.
5. If the both index finger and middle finger are up then the scroll up function has to take place.
6. If the both index finger and pinky finger are up then the scroll down function has to take place.
7. If the all fingers are down then the no function is going to happens. Now gesture is determined.

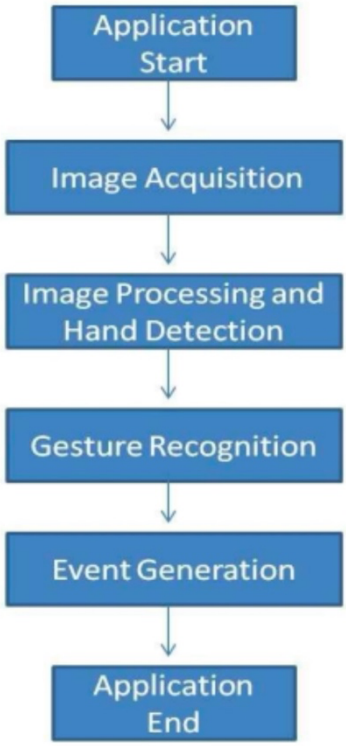
Image Acquisition:

Using the camera, the video is captured and making the each frame more clear. For accessing the system camera and capture video, we used cv.2VideoCapture().

Hand detection:

Step 1: From the video, we get to differ the hand from other objects by using the library source named OpenCV.
Step 2 : Human hand gets a landmarks after getting detected, by using the package called media pipe.

FLOW CHART



4. RESULT

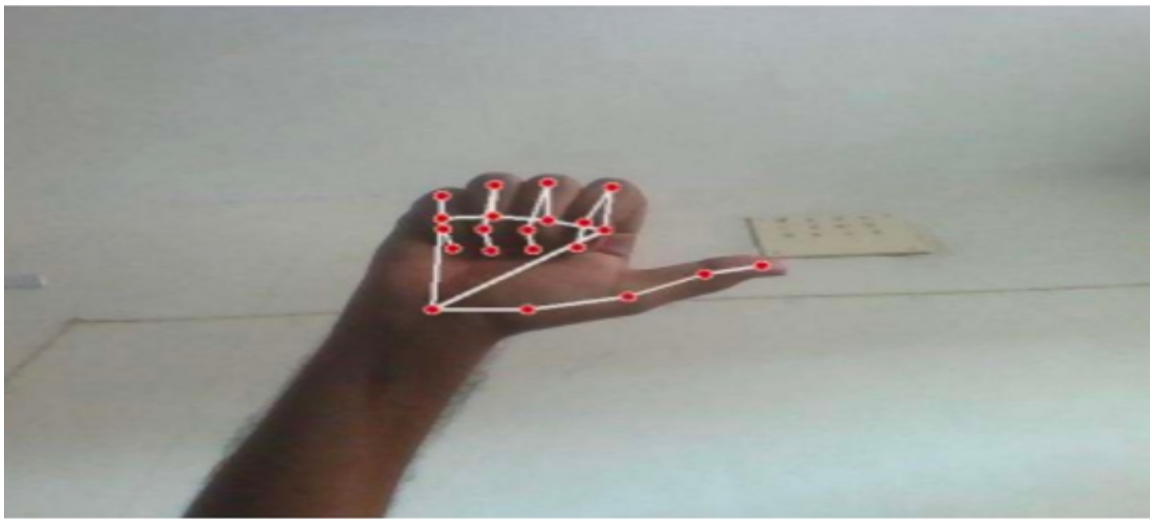


Figure 1.7: Thumb finger for Left Click.

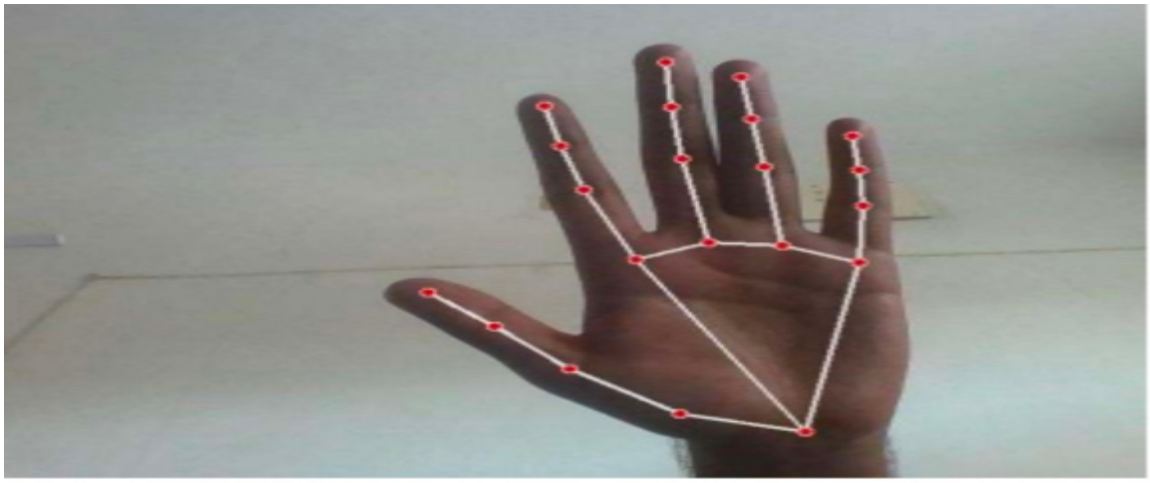


Figure 1.4: Right Hand.

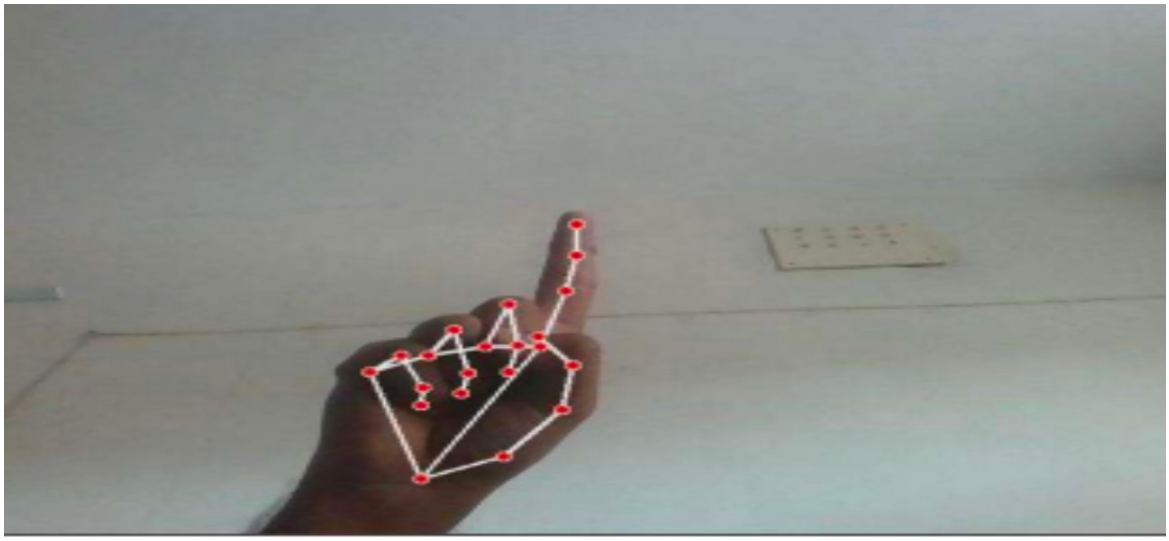


Figure 1.6: Index finger for moving.

CONCLUSION

In present digitized world, processing speeds have increased dramatically, with computers being modern and up to the levels where they can abet humans in complex tasks. Yet, code technologies seem to cause a major gridlock in performing few of the tasks, under-utilizing the available resources and restricting the expressiveness of application usage. Gesture recognition comes to assist here. Computer Vision methods for human gesture associate must surpass current performance in terms of robustness and speed to achieve interactivity and usability.

REFERENCES

[1] J. Katona, —A review of human–computer interaction and virtual reality research fields in cognitive InfoCommunica- tions,|| Applied Sciences, vol. 11, no. 6, P. 26462, 2021.

[2] D. L. Quam, —Gesture recognition with a DataGlove,|| IEEE Conference on Aerospace and Electronics, vol. 2, pp. 755–760, 1990.

[3] D.-H. Liou, D.Lee, and C.-C.Hsieh, —A real time gesture control virtual mouse using motion history image,|| in Proceedings of the 2010 2nd International Conference on Signal Processing System, July 2010.

[4] S.U.Dudhane, —Cursor control system using hand gesture recognition,|| IJARCCE, vol. 2, no. 5, 2013.

[5] K.P.Vinay, —Cursor control using gesture control virtual mouse,|| International Journal of Critical Accounting, vol. 0975–8887, 2016.

[6] L.Thomas, —Gesture control virtual mouse,|| International Research Journal of Engineering and Technology (IRJET, vol. 5, no. 4, 2018.

FOR ORPHANAGE. Authors: Pritom Kumer Rajvor, Md. Shafiqul Islam Shovon. Publisher:Department of Computer Science and Engineering, ShantoMariam University of Creative Technology, Dhaka, Bangladesh. Year:2021

[7] P. Nandhini, J. Jaya, and J. George, —Computer vision system for food quality evaluation—a review,|| in Proceedings of the 2013 International Conference on Current Trends in Engineering and Technology (ICCTET), PP. 85–87, C

[8] J. Jaya and K.Thanushkodi, —Implementation of certain system for medical image diagnosis,|| European Journal of Scientific Research, vol. 53, no. 4, pp. 561–567, 2011.

[9] P.Nandhini and J.Jaya, —Image segmentation for food quality evaluation using computer vision system,|| International Journal of Engineering Research and Applications, vol. 4, no. 2, pp. 1– 3, 2014.

[10] J.Jaya and K.Thanushkodi, —Implementation of classification system for medical images,|| European Journal of Scientific Research, vol. 53, no. 4, pp. 561–569, 2011.

[11] J. T. Camillo Lugaresi, —MediaPipe: A Framework for Building Perception Pipelines,|| 2019 https://arxiv.org/abs/1906.08172.

[12] Google, MP, https://ai.googleblog.com/2019/08/on-device real time hand tracking with html.

[13] V. Bazarevsky and G. R. Fan Zhang. On-Device, MediaPipe for Real-Time Hand Tracking.

[14] K.Pulli, A.Baksheev, K.Kornyakov, and V.Eruhimov, —Realtime computer vision with openCV,|| Queue, vol. 10, no. 4, pp. 40–56, 2012.

[15] D.-S. Tran, N.-H. Ho, H.-J. Yang, S.-H. Kim, and G. S. Lee, —Real-time virtual mouse system using RGB-D images and fingertip detection,|| Multimedia Tools and Applications Multimedia Tools and Applications, vol. 80, no. 7, pp. 10473–10490, 2021.

[16] A. Haria, A. Subramanian, N. Asokkumar, S. Poddar, and

[17] J. S.Nayak, —Hand gesture recognition for human computer interaction,|| Procedia Computer Science, vol. 115, pp. 367– 374, 2017.

[18] K. H. Shibly, S. Kumar Dey, M.A.Islam, and S.Iftekhar Showrav, —Design and development of hand gesture based virtual mouse,|| in Proceedings of the 2019 1st International Conference on Advances in Science, Engineering and Robotics Technology (ICASERT), pp. 1–5, Dhaka, Bangladesh, May 2019.