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Real-Time Hand Control for Interactive Presentations

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Abstract: ***In a world where we are constantly interacting with screens, the way we give presentations still feels stuck in the past. We are usually tethered to a laptop or fumbling with a plastic clicker. This paper explores a more natural alternative: using real-time hand gesture recognition to control PowerPoint slides. By combining computer vision with machine learning, we've developed a way to turn simple hand movements—like a swipe in the air—into commands. The goal isn't just to make presentations "hands-free"; it's about making them more fluid and engaging. When you can pause a video or jump to the next slide with a flick of the wrist, you stay connected to your audience instead of your equipment. We'll break down the technical side of how these systems track motion, the types of gestures that work best, and the balance between speed and accuracy. Ultimately, we look at how this technology is moving us toward a future where our digital tools finally understand our natural body language***

Keywords: Gesture recognition, Navigate Slides, Hand Gesture, Gesture dictionary

I. INTRODUCTION

The show is a way for a speaker to talk to a group of people. It gives people information starts a conversation shares ideas and shows what the speaker is thinking to a group of people. It helps students understand a topic, either in school or for work. PowerPoint is a program that makes presentations better by adding pictures to what you are saying. It lets you add text, pictures, sounds, videos, graphs and animations. You can move through the slides using a mouse, keyboard or special controller. These things can be annoying to use. A new way to control PowerPoint has been thought of it uses hand gestures so the speaker can move through the slides without any trouble during the presentation. This hand gesture system is an idea for PowerPoint presentations it makes things easier, for the speaker and the people watching the PowerPoint presentation.

II. GESTURE RECOGNITION

A motion is a way of communicating without using words. It is a way of sending a message to someone by using your body. You can move your hands. Face to show what you mean. You can even use parts of your body to get your point across. The thing, about motions is that they are really interesting. They are also pretty simple to learn. [21][22]

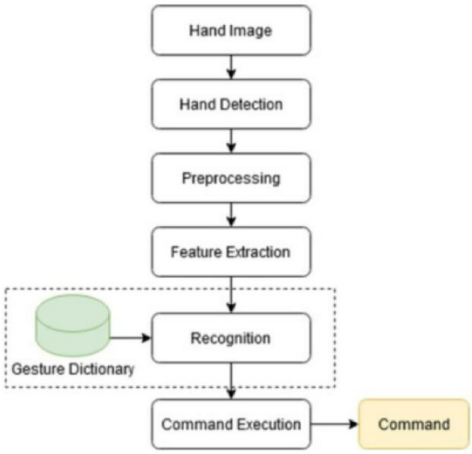

Fig. 1 - Hand Gesture Recognition (General Architecture)

The suggested algorithm for hand gesture recognition has the following steps.

1) A frame, which is a hand image is extracted from the recorded video stream.

2) The frame is converted from RGB color space to YCbCrcolor space model. Then using skin color detection techniques the hand is detected in the image. The hand is detected using skin color.

3) The machine converts the picture to black and white after hand recognition. Skin pixels are identified as non-skin pixels as black. Some preprocessing strategies are used to improve image clarity and remove noise. These include picture filling and morphological erosion with 15×15 structuring elements.

4) The equivalent diameter, area, perimeter and orientation of detected objects are calculated in the frame. These features are used for function extraction, the centroid. All the features are used to get a result.

5) The gesture is recognized by counting the number of items, in the picture and its direction. [24]

Finally an instruction is sent to the devices programs based on the recognized motion. The hand gesture is used to control the device.

The signal acknowledgment frameworks are used for things, including games helping deaf people talk, feeling recognition and robotics. We use hand signals, facial movements and other movements to control these things. There are two kinds of signals: static hand signals. Static hand signals are when you hold your hand in one position like making a shape with your hand. This is called a hand signal when your hand does not move for a while. On the hand dynamic hand signals are when you move your hand to show something like waving your hand.

For example static hand signals can be like the stop sign or the okay sign. One of the problems with static signals is that you can only do a few things with them. There are two ways to recognize hand signals: using vision and not using vision. The method that does not use vision uses gloves with wires to see how your fingers and hands are moving. The method that uses vision just needs a camera, which's something that every computer has these days. In the system we are talking about we use both dynamic hand signals to control PowerPoint.

This paper is divided into parts:

- Section II talks about what other people have written about this topic.
- Section III explains the work we are proposing.
- Section IV is about how we implemented our idea.
- Section V looks at the results we got.
- Section VI sums up what we did.

Talks about what we can do, in the future.

III. LITERATURE REVIEW

As hand gesture recognition is not new many people have experimented with it. There is a lot of work done in this field.[3] For example some researchers proposed a framework that used human-computer interaction methods to control displays like page up/down controls in a slideshow. Some studies analyzed pictures of hand gestures. [2] They found that each set had an average of 42 pictures marked using the YOLO labeling system. The dataset was labeled using an open-source tool to mark custom datasets. In general humans interact with computers using a mouse, keyboard, controller and touch screen. However natural communication is mainly done through intuitive non-contact ways, like sound and physical movements. These methods are considered flexible and effective.

The SIFT algorithm has a recognition rate.[5] Some researchers described that there has been an emphasis on human-computer interaction study to make easy-to-use interfaces by directly using normal communication and control abilities of humans. Recognizing hand motion is vital for human-computer interaction as hand is a part of the body. Some projects use VGGNet and neural networks, which makes the project complex. Some researchers focused on picture moments that're useful to describe objects after division. Basic properties of the picture found via picture moments include area, centroid and information about its direction.[6] The main point of building a hand motion recognition system is to make an interaction between humans and computers.

The recognized signals can be used for applications, including:

- Robot control
- Graphic editor control
- Number recognition
- Television control

Human interaction mostly happens through speech but some non-verbal methods are also used.[8] Edge detection algorithms, along with algorithms have been explained in research papers. However some false gestures are detected during experiments like when the gesture changes from palm to fist which're difficult to solve.

Hand gesture recognition is useful, for making human-computer interaction more natural. Hand gestures can be used to control devices. The use of hand gestures can make interaction more intuitive. [10] The research in [14] talked about a hand gesture recognition system where the web camera took time colored images. The pictures caught by the camera had a lot of things that were not needed to identify the hand so they used a method to remove these unnecessary items to detect the hand image. This research paper is really short. There is not much information available.

In [15] they used a kind of computer program called CNN to tell apart different hand movements. This process had steps like finding the part of the picture that showed the hand separating the fingers making the finger pictures look the same and using the CNN program to recognize the fingers. This research paper has a lot of information about covering up parts of images separating fingers taking pictures and what to do with the pictures after they are taken. They used a lot of computer programs in this research paper so the results are not very accurate.

The paper [18] discussed the kinds of sensors that can be used to recognize hand movements like special gloves that you wear and cameras. This paper explained a lot about how to track the movement of the hands and fingers. The special gloves can give exact measurements of how the hand is moving but they need to be set up carefully they can get in the way of normal hand movement and they are often very expensive.

The research in [19] noted that in years there have been a lot of new and clever devices and ways for people to interact with computers. These devices use the kinds of communication that people use when they talk to each other to make it easier and more natural for people to interact with computers. The algorithm used in this research is very good it gives results and is easy to understand.

The HOG algorithm is very hard to understand. It is not easy to use it in a program. Hand gesture recognition system like the one discussed in [14] and [15] is an area of research. Hand gesture recognition system and human-computer interaction, like the one discussed in [19] are related to each other.

After checking methods I made a table to compare them. The table shows factors such, as the techniques used and their good and bad points.

Table 1: Comparative Analysis of Existing Algorithms

S.No	Description	Advantages	Disadvantages	Algorithm Used
[1]	Hand signals are a part of non-verbal communication that can be passed on through the focal point of the palm.	Hand Gestures Based on Instrumented Glove Approach is given.	The amount of information provided in the research paper was inadequate.	Hand Recognition Algorithm, Skin segmentation algorithm
[2]	Our dataset comprised of 216 pictures. These pictures were additionally arranged into 5 unique sets.	This research paper gives information about Datasets which will be used for making of the Hand Tracking Model.	This research paper uses YOLOv3 which is little bit complex.	Neural algorithm, Recognition algorithm
[3]	Intelligent show frameworks utilize progressed Human Computer Interaction procedures.	This paper reduces external Interface the Advantage of System is to Reduce External Interface like Mouse and Keyboard.	The approach used here is very complex as well as conventional.	Point Pattern Matching
[4]	Human-PC cooperation is presently acknowledged fundamentally through a mouse	Gives information about two algorithms which I could use in my project and got information about how to implement those algorithms.	The SIFT algorithm has a higher recognition rate.	The hand-adaptive algorithm The SIFT algorithm.
[5]	There has been incredible accentuation on Human-Computer-Interaction examination	It gives info of Proposed gesture recognition system, Skin Color Detection, Preprocessing.	Use of VGG-Net and neural networks is there which basically makes the project very complex	Bayesian rule algorithm, Total variation algorithm
[6]	Picture minutes are valuable to depict objects after division.	The design, constraints used are explained very well with the help of steps.	Information in the research paper is not adequate.	Hand Recognition Algorithm, Skin segmentation algorithm
[7]	Successful correspondence, outstandingly instructing, is a focal utilization of mental brain research.	It gives a brief idea regarding different gestures and role of gestures in Neuroscience and Action.	Methods and algorithms used are very difficult to implement.	Poisson Regression, Hough algorithm.
[8]	The fundamental point of building hand motion acknowledgment framework is to make a characteristic cooperation among human and PC where the perceived signals can be utilized.	Information about the robot control method, Graphic editor control, Number recognition, Television, Television Control	This research paper does not have information related to datasets and its usage	Direction Analysis Algorithm, neural networks algorithm.
[9]	With the improvement of data innovation in our public, we can anticipate that PC frameworks a bigger degree should be implanted into our current circumstance.	Used different approaches. • Model based approach • View based Approach • Low Level Features based Approaches.	There are way too many approaches used here and the main algorithms have not been explained properly.	Vision Algorithms, Recognition Algorithms.
[11]	The Project presents an application involving PC vision for hand Gesture Recognition.	It gives info about the diagonal sum algorithm and the row vector algorithm	Many algorithms are used here which are not even required and are very complex.	Diagonal sum algorithm, Row vector Algorithm
[12]	OpenCV has a module containing essential picture handling and PC vision calculations.	This research paper contains useful data regarding Pattern Recognition and Classifiers.	Latency in this program is too much, which is there due to algorithms.	Adaboost Algorithm, Colour Segmentation
[13]	Motion acknowledgment is a field in software engineering and language innovation that deciphers human signals utilizing PC vision procedures.	Many different – different and useful approaches are there in this research paper	This research paper does not have enough data on the different approaches	Adaboost algorithm, Hand Recognition Algorithm

The Presentation Controller using Hand Gestures makes it really easy to change the slides of a presentation. This means the user does not have to stand in front of the device all the time. The Presentation Controller using Hand Gestures is very helpful because it makes changing the slides of a presentation hassle. The user can just use the Presentation Controller using Hand Gestures. Change the slides of the presentation from anywhere.

IV. HAND GESTURE RECOGNITION SYSTEM

In this analysis we use a set of information from 240 pictures of hands. These pictures were taken with a camera under the same conditions. The main thing we focus on is the background. The background of the picture should be very clean. We also look at the skin tone, which is figured out using the HSV color model. When we put two pictures together we get a result that helps us recognize hands. The overall plan of what we're proposing is shown in Fig 2. This plan works because we can correctly identify hand gestures.The details of each part are explained below:

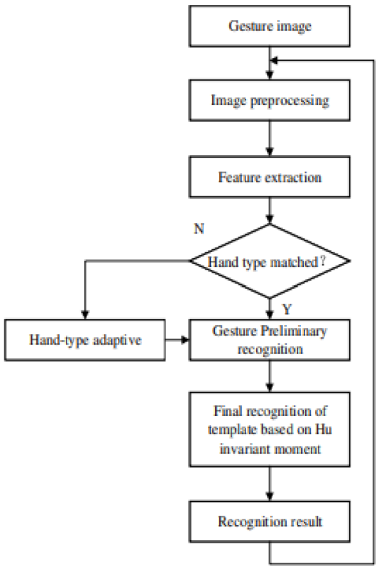

Fig. 2 ->

Gesture images are pictures that show a gesture or a body movement that means something. These pictures can be still a series of pictures or even moving. We use gesture images in areas like talking to people, technology and art.

When we talk to each other gesture images help us say things without using words. They can help when we cannot talk or when talking is not an idea. For example in sign language each gesture has a hand movement or way of standing and we show these gestures in pictures to help people learn and understand. In technology we use gesture images in things like touch screens or devices that can tell when we move. These pictures help us know how to use these devices and make it easy to do things.Now let us talk about getting images to use. This is called image pre-processing. It is a set of things we do to pictures before we look at them closely or use them for something else. We do this to make the pictures better easier to understand and to get information from them. There are things we do to get images ready as shown in Fig.3.

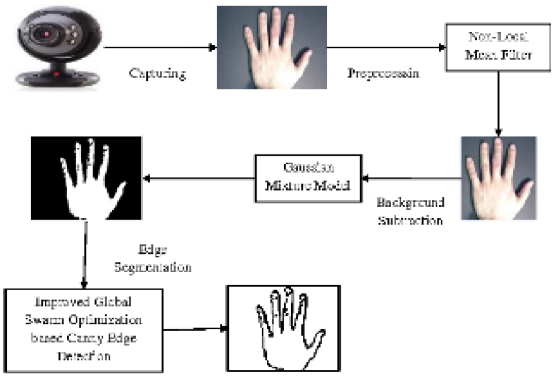

Fig 3 - Steps involved in Image Pre-Processing

We make the images bigger or smaller so they are all the size. This helps when we use them with things. We get rid of noise in the pictures. Noise is like dots, on the picture. We use tools to make the pictures clear. We do all these things to make the pictures good and easy to use.

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Feature Extraction is when we take chunks of raw data like pictures, words or sounds and turn them into smaller sets of important features. These features have the information that we need for a particular job or to figure out something like what we see in Figure 4. We do Feature Extraction to make the data smaller and easier to work with while still keeping the stuff that we need from the Feature Extraction process.

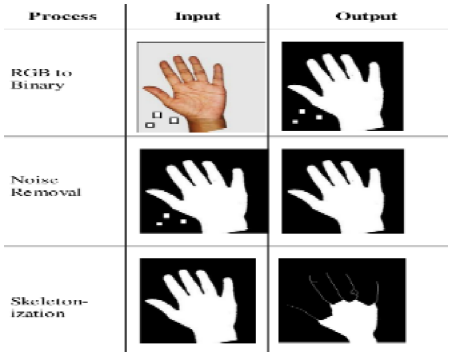

Fig. 4 Feature Extraction

Feature extraction is really important when it comes to making sense of data. It helps us look at the data in a way and makes it easier to analyze. The main idea of feature extraction is to take data that's very detailed and possibly repetitive and turn it into something smaller while still keeping the important parts. When we use feature extraction we can get to the stuff and make the data more manageable for the computer to look at. This makes the whole process faster and more efficient. In computer vision feature extraction is about finding special patterns or shapes in pictures. This can be things like edges or corners or textures. We use tools like gradient-based methods or something called scale-invariant feature transform or even convolutional neural networks to find these patterns in pictures.

Hand recognition is when we try to identify and understand hands in pictures or videos. We want to know where the hands are and what they are doing. This can help us make things, like gesture recognition or sign language translation or even virtual reality work better. To do hand recognition we need to do a things. We need to detect hands in the picture or video. We need to track the hands and understand what they are doing. The first step is called hand detection. We look at the picture or video. Try to find the parts that might be hands. We can use techniques like looking at skin color or subtracting the background to find the hands.. We can use machine learning to find the hands. We just want to find the parts of the picture that might be hands so we can look at them closely.[23]

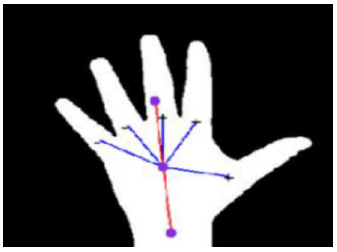

Fig. 5- Hand Recognition Process

Hand tracking is something that happens after the computer finds the hands. It uses tools to follow the hands as they move. These tools look at how things are moving or they follow special features or they use models to keep track of where the hands are going from one moment to the next.

Skin Segmentation is when the computer looks at a picture or a video and finds the parts that're human skin. It wants to find the skin and separate it from everything in the picture. The computer does this by looking at the colors. Human skin has colors that are different from other things.

The computer uses these colors to figure out what is skin and what is not. It uses math and statistics to do this. The computer knows that skin color is a range of colors like the colors you see on a TV or a computer screen.

The computer can then say what is skin and what is not, by using rules or by learning from examples.

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Fig. 6- Skin Segmentation

Edge Detection is about finding the borders or sharp changes between parts of a picture. The goal is to find and highlight areas where the pixel brightness changes a lot. These changes often show where objects start or end or their shapes or other important details. Edge detection algorithms look at how pixel values change to find these borders. They do this by checking the gradients or variations, in pixel values like it is shown in Fig. 7.

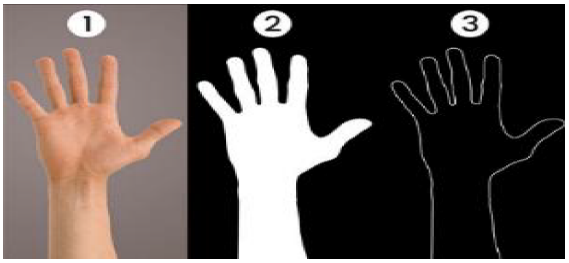


Fig 7: Edge Detection

This thing is supposed to tell the difference between areas that're pretty much the same and areas where things change a lot.

V. RESULT ANALYSIS

This model uses pictures from a webcam and Kaggle. First it turns these pictures into a list of numbers and saves them as RGB values for each pixel then it turns them into black and white. To find hand gestures it uses a computer vision algorithm. It gets a picture from the webcam. Looks for hands in it. Then it ignores everything in the picture and looks at the gestures it found. After that it uses a -trained model to figure out what the gesture means. This method is compared to methods in Table 2 and it is right 96.5 percent of the time.[23]

VI. FUTURE SCOPE AND CONCLUSION

This article looked at a different ways to do things. It looked at ways to find hands like using a webcam, a remote, KNN, HMM and Markov Model. The hand gesture recognition model the hand gesture recognition model is what this thing is about it is, about the hand gesture recognition model.

Table 2: Proposed System for Comparative Analysis

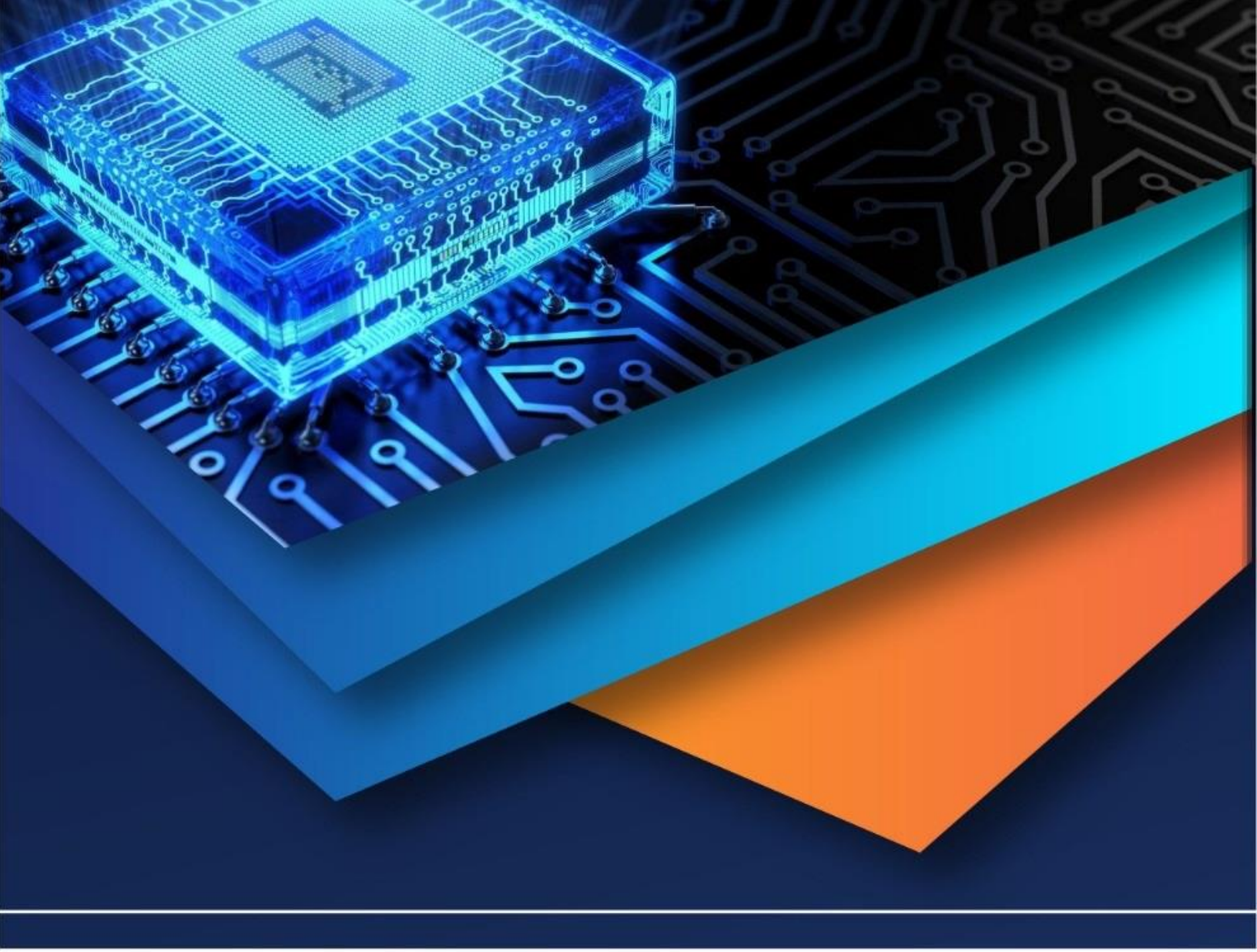
Ref	Technique	No. of Pictures for Testing	No. of features	Accuracy
[3]	Webcam Method	10	1	70%
[1]	Segmentation	10 images	1	95.5%
[9]	Static & Dynamic	7 gestures (6 static, 1 Dynamic)	2	88%
	Proposed Method	12 (Through Webcam)		96.5%

We read nine articles by writers about recognizing hand movements. The article that we liked the most was called "Hand Signal Recognition Using A Real Time Tracking Technique And Hidden Markov Models".

This article is about a system that can recognize hand movements. The writer of this article used a method to find out movements in front of a fixed background. This method uses Hidden Markov Models to figure out hand signals. The results are very good. The accuracy of our hand movement recognition system is high. We did tests using pictures of people both men and women. Each person made twenty hand movements. We got sixty pictures of each hand movement. We used a total of twenty hand movements and 1200 pictures to test our hand movement recognition system. Each picture is 256 by 256 pixels. We took thirty pictures per second. It took one second to make each picture. We think this method is very good for recognizing hand movements. It works well for hand movement recognition. So we are happy that our hand movement recognition system is complete. We did not use the SIFT algorithm or other algorithms in our hand movement recognition project because they are not as good for recognizing hand movements and do not give results. We only used the method that we thought was best for recognizing hand movements. Recognizing hand movements is what we were trying to do with our hand movement recognition system. We are happy, with our results. Our hand movement recognition system works well for recognizing hand movements.

REFERENCES

[1] Oudah, Munir, Ali Al-Naji, and Javaan Chahl. "Hand gesture recognition based on computer vision: a review of techniques." journal of Imaging 6, no. 8 (2020): 73.
[2] Sun, Jing-Hao, Ting-Ting Ji, Shu-Bin Zhang, Jia-Kui Yang, and Guang-Rong Ji. "Research on the hand gesture recognition based on deep learning." In 2018 12th International symposium on antennas, propagation and EM theory (ISAPE), pp. 1-4. IEEE, 2018.
[3] Shinde, Viraj, Tushar Bacchav, Jitendra Pawar, and Mangesh Sanap. "Hand gesture recognition system using camera." Int. J. Eng. Res. Technol.(IJERT) 3, no. 1 (2014).
[4] Zhang, Qiang, Shanlin Xiao, Zhiyi Yu, Huanliang Zheng, and Peng Wang. "Hand gesture recognition algorithm combining hand-type adaptive algorithm and effective-area ratio for efficient edge computing." Journal of Electronic Imaging 30, no. 6 (2021): 063026.
[5] Huang, Hanwen, Yanwen Chong, Congchong Nie, and Shaoming Pan. "Hand gesture recognition with skin detection and deep learning method." In Journal of Physics: Conference Series, vol. 1213, no. 2, p. 022001. IOP Publishing, 2019.
[6] Khan, Rafiqul Zaman, and Noor Adnan Ibraheem. "Hand gesture recognition: a literature review." International journal of artificial Intelligence & Applications 3, no. 4 (2012): 161.
[7] REYES, DR NAPOLEON H. "Real-Time Hand Gesture Detection and Recognition Using Simple Heuristic Rules", vol 05, Issue 06 p. 022034
[8] Dardas, Nasser H., and Emil M. Petriu. "Hand gesture detection and recognition using principal component analysis." In 2011 IEEE International conference on computational intelligence for measurement systems and applications (CIMSA) proceedings, pp. 1-6. IEEE, 2011.
[9] M. Panwar and P. Singh Mehra, "Hand gesture recognition for human computer interaction," 2011 International Conference on Image Information Processing, 2011, pp. 1-7, doi: 10.1109/ICIIP.2011.6108940
[10] C. Liao, S. Su and M. Chen, "Vision-Based Hand Gesture Recognition System for a Dynamic and Complicated Environment," 2015 IEEE International Conference on Systems, Man, and Cybernetics, 2015, pp. 2891-2895, doi: 10.1109/SMC.2015.503.
[11] Kang, Seokmin, and Barbara Tversky. "From hands to minds: Gestures promote understanding." Cognitive Research: Principles and Implications 1, no. 1 (2016): 1-15.
[12] Seong Min, “Online Hand Gesture Recognition Using OpenCV”, International Journl of Emerging Technologies and Innovative Research (www.jetir.org | UGC and issn Approved), ISSN:2349-5162, Vol.2, Issue 5, page no. pp1635-1637, May-2015
[13] Rao K, Srinivasa. 2022. Hand Gesture Recognition And Appliance Control Using Transfer Learning.Vol.1, Issue 7, page no. pp1611-1621, Aug-2015
[14] Susitha, A., N. Geetha, R. Suhirtha, and A. Swetha. "Static and Dynamic Hand Gesture Recognition for Indian Sign Language." In International Conference on Machine Learning and Big Data Analytics, pp. 48-66. Springer, Cham, 2021.
[15] Sharma, Surya. 2021. Hand Gesture Recognition Using OpencvAnd Python. , Issue 8, page no. pp1601-1681, Nov-2012
[16] Khan, Rafiqul Zaman, and Noor Adnan Ibraheem. "Hand gesture recognition: a literature review." International journal of artificial Intelligence & Applications 3, no. 4 (2012): 161.
[17] Rautaray, Siddharth S. "Real time hand gesture recognition system for dynamic applications." International Journal of ubicomp (IJU) 3, no. 1 (2012).
[18] Rastogi, Isha. 2018. Image Processing Hand Gesture Recognition. Issue 9, page no. pp1500-1587, Dec-2016
[19] Ohn-Bar, Eshed, and Mohan Manubhai Trivedi. "Hand gesture recognition in real time for automotive interfaces: A multimodal vision-based approach and evaluations." IEEE transactions on intelligent transportation systems 15, no. 6 (2014): 2368-2377.
[20] Patel, Nidhibahen. 2018. Hand Gesture Recognition Techniques, Methods And Tools. Issue 5, page no. pp1422-1456, Feb-2018.
[21] Gupta, Sumita, Sapna Gambhir, Mohit Gambhir, Rana Majumdar, Avinash K. Shrivastava, and Hoang Pham. "A deep learning approach to analyse stress by using voice and body posture." Soft Computing (2025): 1-27.
[22] Bansal, Mitashi, and Sumita Gupta. "Detection and recognition of hand gestures for Indian sign language recognition system." In 2021 6th International Conference on Signal Processing, Computing and Control (ISPCC), pp. 136-140. IEEE, 2021.
[23] S. Gupta, S. Gambhir, R. Majumdar, S. Sen, S. Chatterjee and S. Kangsabanik, "Real Time Hand Gesture Detection and Recognition to Control PowerPoint Slides," 2025 3rd International Conference on Communication, Security, and Artificial Intelligence (ICCSAI), Greater Noida, India, 2025, pp. 1808-1813, doi: 10.1109/ICCSAI64074.2025.11064135.
[24] E.D.G. Sanjeewa, K.K.L. Herath, B.G.D.A. Madhusanka, H.D.N.S. Priyankara, H.M.K.K.M.B. Herath, Chapter 14 - Understanding the hand gesture command to visual attention model for mobile robot navigation: service robots in domestic environment, Editor(s): Mamta Mittal, Rajiv Ratn Shah, Sudipta Roy, In Cognitive Data Science in Sustainable Computing, Cognitive Computing for Human-Robot Interaction, Academic Press, 2021, Pages 287-310, ISBN 9780323857697, https://doi.org/10.1016/B978-0-323-85769-7.00003-3.



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