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Virtual Graphic Creator by Sensing Hand Motion

Aditya Kumar Srivastava[1], Kartikey Gupta[2], Ankit Singh[3], Hariom Srivastava[4]
[1,2,3,4] Computer Science and Engineering, Institute of Technology and Management, Gorakhpur, India.

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Abstract: *At the 21st century we are moving toward new technology and upgrading the old technology. So, we decide to combine some old and new technology, then we put the topic of Virtual Graphic Creator by hand motion. In this topic we do some graphical representation with the help of hand motion. In upcoming years hand motion recognition is going to play some important role, with the help of hand motion recognition, we communicate between man and machine. In the future maximum work are done through guesser or speech recognition.*
Key Word: *Graphic; Hand motion Recognition; Human-machine interaction; Machine Vision; Media pipe; Open CV.*

I. INTRODUCTION

These days, non-contact methods of communication, such sound and physical gestures, are largely used to achieve communication between people and machines. Many researchers have attempted efforts to make the machine identify other intentions and information through the non-contact manner like people, such as sound, facial expressions, physical movements, and gestures. The communication by natural and intuitive non-contact manner is typically considered to be flexible and efficient. The most crucial component of human language among them is gesture, and gestures are also crucial for human communication. They are regarded as the most straightforward methods of human-computer interaction.
Numerous fields, such as robotics and sign language interpretation, use gesture recognition.[1]

The programme Virtual AI Painter, which uses Open CV and Media pipe, tracks the motion of an object. By moving the object—in our example, the human hand—in front of the webcam while it is in the air, the user can draw on the screen using this tracking feature. A painting app, but not just any painting software, is Virtual Painter.

When drawing virtually, the camera records your hand movements as you draw. Your fingertip's monochromatic item serves mostly as a marker. Systems that use robots can use Open CV. Pick up letters, recognize items on the conveyor belt, and back autonomous vehicles. Python is the language needed for this project; it has a more complete library, simple syntax, and a solid grasp of the fundamentals, and it can be implemented in any open-source language with CV support.[2]

Open CV, which turns 17 at the time of this book's publication, was introduced in August 1999 at the Computer Vision and Pattern Recognition conference. With the goal of advancing computer vision research and practical applications in society, Gary Brad ski established Open CV at Intel. With approximately 3,000 functions, 14 million downloads, and a download rate of well over 200,000 per month, Open CV is used daily in millions of mobile phones for tasks including scanning bar codes, stitching together panoramas, and enhancing photos using computational photography.[3]

II. LITERATURE REVIEW

Because of its numerous uses and capacity for effective human-computer interaction, hand gesture detection systems have drawn a lot of attention in recent years. This study presents a survey of current hand gesture recognition systems. Challenges of the gesture system are addressed together with key difficulties of the hand gesture recognition system. Additionally, review techniques for current posture and gesture recognition systems are described. A summary of the hand gesture research findings is also provided, along with a comparison of the key stages of gesture recognition. Finally, advantages and disadvantages of the systems under discussion are presented.[4]

Hasan used non-geometric features to identify hand motions using a multivariate Gaussian distribution. The input hand image is segmented using two separate techniques: clustering-based thresholding techniques and skin-color-based segmentation utilizing the HSV colour model. The hand's shape is captured using a few processes, and hand features are extracted using a modified version of the Direction Analysis Algorithm. This algorithm is used to determine the direction of the hand gesture in order to compute the object's slope and trend.[3]

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When you open your camera, a camera will pop out, and you'll need to reveal your hand with all five fingers spread out. Use one finger to paint, and use the other two to choose a brush and an eraser. Through our cutting-edge technology, specifically open cv and python, Virtual Arts on Air is made feasible. The primary use of Open CV is as an open-source computer vision and machine learning programme. The library contains more than 2400 of the greatest algorithms, including a wide range of both traditional and cutting-edge computer vision and machine learning techniques.[3]

The majority of these algorithms are employed in the detection and recognition of faces, the identification of objects, the classification of human activities in videos, the tracking of camera movements, the tracking of moving objects, the extraction of 3D models of objects, the production of 3D point clouds from stereo cameras, the stitching of images to create high-resolution images of entire scenes, the removal of red eyes from flash-taken photos, the following of eye movements, the recognition of scenery, and the establishment of markers to identify scenes.[6]

Graphic: Professionals who specialize in graphic design produce visual content to convey messages. Designers utilize typography and images to fulfill the individual demands of users and concentrate on the logic of showing pieces in interactive designs to maximize the user experience by utilizing visual hierarchy and page layout approaches.[4]

Hand motion Recognition: Understanding of Hand Gestures. A straightforward rule classifier may be used to identify the hand motion once the fingers have been observed and identified. The rule classifier predicts the hand motion based on the number and distribution of fingers found. What fingers are detected depends on the content of the fingers.[1]

Human-machine interaction: The term "human-machine interaction" (HMI) describes how a machine and a human communicate and engage with one another through a user interface. Natural user interfaces, like gestures, are gaining more and more attention today because they enable people to operate machines through instinctive and natural actions.[3]

Machine Vision: Machine vision (MV) is a field of computer science that focuses on providing imaging-based automatic inspection and analysis for a variety of industrial applications, including process control, robot guiding, and automatic inspection. The term "machine vision" covers a wide range of technologies, software and hardware items, integrated systems, procedures, and knowledge. Computer vision is a branch of computer science, whereas machine vision is a field of systems engineering. It makes an effort to employ already existing technologies in novel ways to address problems in the real world. The word is frequently used for these functions in situations involving industrial automation, but it is also used for similar functions in environments involving vehicle guiding.[1]

Media pipe: For live and streaming media, Media Pipe provides cross-platform, adaptable machine learning solutions. End-to-end acceleration: Even on standard hardware, built-in, quick ML inference and processing are accelerated. Create once, deploy everywhere IoT, desktop/cloud, web, Android, and iOS are all supported by a unified solution.[2]

Open CV: A computer vision and machine learning software library called Open CV is available for free use. A standard infrastructure for computer vision applications was created with Open CV in order to speed up the incorporation of artificial intelligence into products.[3]

In terms of the characteristics of the structure existing in the scene, computer vision can be defined as a discipline that describes how to reconstruct, disrupt, and comprehend a 3D scene from its 2D images. It focuses on simulating and reproducing human vision with computer hardware and software.

The following fields and computer vision greatly overlap each other:

Image alteration is the main focus of image processing.

Pattern Recognition: It describes several methods for categorizing patterns.

Photo grammetry is the study of taking precise measurements from photographs.[6]

Python: Python is a versatile programming language that is very popular right now. A crucial component of it is code, specifically how to comprehend lines of code more quickly. The language constructs make it possible for the user to develop understandable programmers on any size, no matter how big or tiny. Python's support for a variety of programming paradigms, including imperative, object-oriented, functional, and procedural programming, is its most significant characteristic. Python uses dynamic typing. The default setting for automatic memory management is on.[5]

PyCharm: Today's computer algebra systems (CASs) often operate not just on the basis of input via a console window in the REPL style, but also offer a mechanism for workbooks, worksheets, and documents where the commands to be executed and

their outputs are combined. Writing full articles or novels directly from a CAS is now made simple and effectively supports literate programming. Python has similarly revolutionized the field of numerical computation, challenging well-established programming languages like MATLAB or R. And with IPython Notebooks, the exact same method of interaction is supported in Python as well. It's simple to use I Python notebooks in PyCharm and you may take advantage of tools like code completion. This is the procedure. Note that only the evaluation of Python code necessitates an active IPython notebooks instance. PyCharm handles text rendering by itself. Make a file with the extension. ipynb first. This lets PyCharm know that the file is an IPython notebook.[6]

Anaconda: How come Python? Python is a mid-level, object-oriented programming language that is intuitive to learn and use and is adaptable enough to handle a wide range of jobs (Helmus & Collis, 2016). Since its debut in 1991 (Van Rossum & Drake Jr, 1995), its open-source nature has greatly increased its popularity, and it is today regarded as one of the best programming languages to learn (Saabith, Fareez, &Vinoth raj, 2019). Python is a programming language that anyone can learn to use because to its free availability, low system requirements, and cross-platform interoperability (Mac, Windows, and Linux). It already has a large community that includes both common people and top researchers who have created intriguing projects in a variety of fields, including data science, machine learning, artificial intelligence, game and app development, and more. Due to the open-source community's ongoing efforts to improve the language's capabilities, it is simple to locate these projects by just adding the keyword "Python" to any search. This community also offers a plethora of resources, including courses, source codes, answers to frequently asked questions, how-to videos, and much more. These resources are frequently free to use and address the most frequent issues that developers encounter at all degrees of difficulty.[7]

NumPy: An international group of volunteers began working on developing a data format for effective array computation in the middle of the 1990s. This structure developed into the N-dimensional NumPy array that is used today. With uses ranging from gaming to space exploration, the NumPy package, which includes the NumPy array and a number of supporting mathematical functions, has found widespread adoption in academia, government laboratories, and industry.

A multidimensional, uniform collection of elements is referred to as a NumPy array. The type of components that make up an array and its shape define it. For instance, a matrix could be represented as an array of form (MN) containing numbers, such as complex or floating-point integers. NumPy arrays can have any dimensionality, unlike matrices. Additionally, they may include different types of items (or even mixtures of elements), such as dates or Booleans.
A NumPy array is actually just a convenient way to describe one or more blocks of computer memory, allowing the numbers represented to be readily changed.[8]

Artificial Intelligence: Artificial intelligence is the branch of research that describes a machine's capacity to learn like humans do and its capacity to react to specific actions. It is also referred to as (A.I.). Artificial intelligence is becoming more and more necessary. Since artificial intelligence (AI) entered the market, it has been responsible for the swift changes in business and technology. By 2020, "85% of consumer interactions will be managed without a human," according to computer scientists. (Source: Gartner, n.d.). This means that, like when we use Siri or Galaxy to inquire about the weather's temperature, ordinary human requests will be dependent on computers and artificial intelligence. A representative model for comprehending thoughts and behaviors in terms of the physical connections between neurons is the artificial neural network (ANN). ANN has been used to tackle a number of problems by enabling the machine to create mathematical models that can mimic natural activities from the viewpoint of brains, as demonstrated in (figure A- 2). By employing this method, the machine will be able to locate the answer to any problem, much like the human brain does.

There are many applications of AI all around us, and in this essay, I'll talk about some of the most often used ones, namely virtual assistants like Siri, Cortana, and others. Smart assistants have become a very popular technology in most smart gadgets over the past several years, and most significantly, these assistants are becoming smarter than ever. Each of these apps has distinctive capabilities in addition to the fantastic assistance they give us. The phases of artificial intelligence are as follows: gathering data, cleaning, manipulating, and preparing it, training a model, testing the data, and improving it. In a different example, the virtual assistant's architecture shows that the system's flow begins with the user's input, and then it chooses the conversation strategy module to use in response to the dialogue management module, while a classification module responds to an NLP module. Finally, using the conversation history database is utilized to analyze the knowledge base building module which will response back to the domain knowledge based as mentioned in detail.[9]

III. CONCLUSION

An illustration of how Open CV may process images. The ultimate objective is to develop a computer vision machine learning application that fosters human-computer interaction. Human-computer interaction (HCI), also known as Man-Machine Interaction (MMI) refers to the relationship between the human and the computer or, more specifically, the machine. Since the machine is insignificant without appropriate human use, there are two main characteristics that should be taken into account when designing an HCI system as mentioned:

Efficacy and usability System functionality referred to the collection of features or services that the system offers to users, whereas system usability referred to the extent and range to which the system can operate and effectively carry out particular user purposes.

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