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Virtual Air Canvas Application using OpenCV and Numpy in Python

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***Abstract*-Writing is an integrated form of communication that can convey our thoughts. Typing and writing are standard ways to record information today. Letters or words are written in a relaxed space by marker or finger. These wearable devices can see and understand our actions.A computing process that attempts to recognize and interpret human gestures through the use of mathematical algorithms is known as gesture recognition. The project uses this gap in developing motion-to-text converter which can serve as software for smart wearable devices for writing in the air.The program will use a computer vision to track finger movement.The generated text can also be used for various purposes, such as texting, emails, etc. It will be a useful way for deaf to communicate.**

Keywords-Gesture recognition , Air writing, wearable devices.

I.INTRODUCTION

Writing has evolved majorly over the years. Writing was first invented in 2000 BC by neolithic people. They first started writing on walls then it was replaced by stones. Stones were replaced by cloth and presently we use paper for communication. With the help of QWERTY keyboards we are moving towards a more digitalized form of writing. These electronic devices are slowly taking the place of traditional forms of writing with pen and paper.

The need to develop human machine interactions is rapidly growing with the surge in the usage of augmented and virtual reality. Applications using hand gestures have gained popularity over the coming years.Automotive interfaces (Ohn-Bar and Trivedi, 2014),Economical Air Writing system(Pavithra and Prabhu,2016) and Handwriting recognition in Free Space(Shashidhar, Kim and Chai, 2015) have developed systems for hand gestures recognition. However hand gestures recognition is not enough for writing in air. It also involves fingertip detection, tracking and tracing of it. Fingertip detection or LED light detection system is developed by [pavithra], where they first detect LED light and then capture the movement and by using Optical Character Recognition(OCR) and display the alphabet on the screen. However these methods which have the usage of devices have some limitations.

The proposed system eliminates the usage of cell phones for taking notes. Fingertip detection and finger movement techniques are used to develop the system.Using Python, OpenCV and CNN techniques fingertip is first detected and then the trajectory of fingertip is traced and displayed on the screen.

II.PROBLEM STATEMENT

The existing system only works with your fingers and no highlighters, paints, or relatives.Identify and distinguish something like a finger from RGB image without depth sensor great challenge. Another problem is lack of top and movement under the pen. The system uses a one RGB camera that you can overwrite. From the depths discovery is impossible, jobs up and down of the pen cannot be traced. So, everything finger path is drawn, and the result the image will be abstract and unseen by model. Using real-time hand touch to change position the process from one region to another requires a lot of code care. In addition, the user should know many movement to control his plan adequately. The project focuses on solving some of the most important social issues Problems.

First of all, there are many hearing-impaired people problems in everyday life. While listening again listening is taken for granted, people don't have this communicating with a disability using sign language. Most countries in the world cannot understand yours feelings and emotions outside the middle translator. Second, overuse Smartphones: causes accidents, stress, distractions, and other illnesses that people can no longer tolerate find out. Although its portability and ease of use exist.very popular, its obstacles include life terrifying events. Waste paper is not uncommon. Many papers are wasted on writing,writing, drawing, etc. A4 paper production requires about 5 liters of water. 93% sources come from trees, 50% of commercial waste is paper, 25% of landfills are paper, and the list goes to. Waste paper harms the environment through use of water and trees and produce tons waste. On-air writing can solve these problems quickly. It will serve as a communication tool for the deaf.Your online text can be displayed in AR or translated into speech. One can write on the air quickly and continue to operate without much interruption.Also, writing in the air does not require paper. Everything is stored electronically electronically.

III.LITERATURE SURVEY

Automatic object tracking has many uses in computers, such as Computer vision and human machine interaction [1-2]. Various applications for tracking algorithms are suggested in the literature.One team of researchers used it to interpret the signals languages , some to see hand gestures , another text-tracking group as well recognition [4], and body monitoring the visible movement of objects as well character recognition based on finger tracking , etc. Bragatto et al. he built a way for that automatically translates Brazilian Sign Language from video input. Use NN multilayer (Neural Perceptron) a network with a line divided into sections a real-time video capture function processing. This activation function reduces means NN complex time. Moreover, they use NN in two stages: color recognition and steps to go check hand shape. Their results show that the method proposed well works with the acquisition rate of 99.2% . Cooper also introduced the method managing the most complex 3D cell bioprinting there is a standard set. Cooper developed a process that minimizes tracking by identifying errors in thesis division procedures and tracking. Cooper used two treatment modalities; One is for his movement, and the other is used for clarification hand shape. He used the screen for expand his vocabulary. Viseme is an important position word of mouth in pronouncing the word a Phoneme and visual representations of phonemes.Over time, you become less formal a way to identify the characters.

Araga et al. raised hand touch recognition A program that uses Jordan's Recurrent Neural Network (JRNN). Their program compared 5 and 9 different hand positions through representative sequence still images. He then took the recording as re-installation begins to separate the shape of the hands. JRNN gets input touch after a temporary behavior of sequence of positions has

been detected. In addition, they created a new way of training. the proposed method shows a 99.0% accuracy.five different positions, while reaching 94.3% accuracy of nine touches , Yanget al .; discussed another comparison solution sequence of images in the pattern, usually occurs with the touch of a hand touch. The proposed method is not supported by skin color patterns and can work even in the wrong divisions. They include both the classification and recognition process is used cross-cluster process. Their results show better 5% performance loss on both models. Neumann et al. he built a way to find out and see text in real photos. In their own article, they use a hypothesis framework that can manage multiple lines of text. They also use artifacts characters to train the algorithm, and, finally, they use the most stable (MSER), delivery firmness in geometric shapes and lamps .

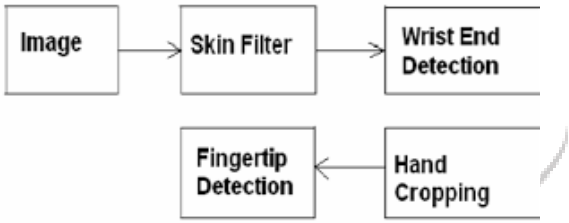
In addition, Wang et al. discussed colors internal and external motion detection system places. In the proposed way, use a webcam and t-shirt tracking item.The result of the proposed method shows that the method can be applied to the physical reality applications. Jari Hannuksela et al. Toshio Asano et al. and Sharad Vikram et al. babe finger recognition systems are finger-based to track. the author introduces the based movement a tracking algorithm that combines two Kalmans filtering techniques and expected expansion (EM) methods for measuring two different movements. Finger movement with the camera. Rate supported in moving buildings the place we count each image. Its idea is to control the cell phone devices by simply swiping a finger in front of a camera. the authors discuss visually seeing Japanese katakana characters in the wind. Following hand movements, they use LED pen and camera. They change the signal pencil in traffic codes. Codes are there usually up to 100 data items to complete the result of typing speed, in which there are 46 Japanese characters explained. With one camera, they get a 92.9% character recognition accuracy, too multiple cameras, action 9 ° directional accuracy.

IV.METHODOLOGY

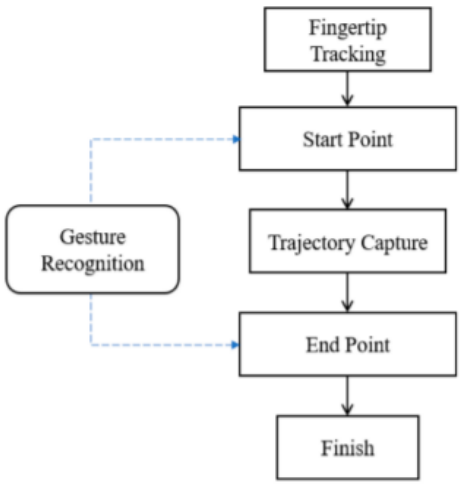
The objective is to create a free space where one can draw in air freely. The RGB camera detects the fingertip and tracks its motion through out the screen. Whenever the hand comes in front of the camera, the initial thing to do is detect the fingertip. There are various ways of fingertip detection.

Fingertip Detection

We are aiming to develop a system which can accurately detect the fingertips. First we will detect the whole hand and then the region segmentation is done. Region segmentation is a two step approach which includes skin segmentation and background subtraction. This system will work accurately in real time.For background subtraction we may use faster RCNN methods.



Determining the center of gravity is important as it is used to detect some particular hand gestures for operations to be done. The proposed system aims to use two algorithms for centroid calculation and then take the average value of both as the final result. Distance transformation is the algorithm used and the pixel with the highest intensity is the center of gravity.



Fingertip Tracking

After successive detection of hand region and center of gravity the next step is to track the fingertip movement on the screen. According to the previous work, faster R-CNN handheld detector is intensive and the frames produced are below real-time performance. Thus we are aiming to use KCF tracting algorithm. The algorithm converts the detected fingertip into HSV color space.

After the mask is detected in the air, the system will do some morphological operation to remove the impurities from the masked image. After detecting the contours drawing the line is the most important step. After this a python deque is created.The deque will memorize the position of the outline in each subsequent frame, and we will use these accumulated points to create a line using OpenCV's drawing capabilities.

V.PROJECT SCOPE

The scope of this system is mainly used as a powerful means of communication for the deaf, which means implementing this project can help in:

1. An effective communication method that reduces mobile and laptop usage by eliminating the need to write.
2. It helps people with hearing impairments to communicate well.
3. Various purposes, such as sending messages, e-mails, etc., as the generated text can also be used for that.

VI.CONCLUSION

This program has the potential to challenge traditional writing methods. Eliminates the need to carry a cell phone in hand to take notes, to give an easy way on the go to do the same. It will again work towards a greater purpose in helping especially those who know them to communicate easily. Even adults who find it difficult to use the keyboard can easily use the program. Expanding functionality, this program can also be used to control IoT devices soon. Air painting can also be made happen. This program will be very good smart clothing software using which people can work better with the digital world. The unpopular reality of taxpayers we see can make the text come alive. Wind-writing programs should listen only to their master's control touch and should not be misled by people all around. Such discovery algorithms are as follows as YOLO v3 can improve fingerprint recognition accuracy and speed. In the future, progress on Artificial Intelligence will improve the efficiency of writing in the air.

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