Gesture Based Digital Art - Drawing in The Air Using Open CV

Shaik Karimullah¹, T. Lakshmi Praveena², B. Lavanya³
Department of ECE, AITS, Rajampet, India
¹munnu483@gmail.com, ²pravenathippasani123@gmail.com, ³lavanya.b411@gmail.com

Abstract: The process of recognizing and interpreting a continuous sequential gesture stream from the given set of input data is gesture recognition. Gestures are non-verbal information used to improve computer language understanding. Human gestures are perceived by vision and computer vision used to analyze various gestures. To implement this we need less hardware and sensors are not required. A vision system records the hand and tracks the colored object in each fingertip and moves the screen cursor with different gestures. Raspberry Pi uses Python as the main programming language and is a Linux-based platform, and the development of software on Linux is easy because it is an open source environment. The system is made up of a raspbian camera that monitors and tracks gestures continuously for making digital art.

Keywords: ARMv8, ARM11, HUE, GNU

1. Introduction:

The framework includes the gadget, camera and projector ARM11 Raspberry Pi. Shading markers are set at the tip of the fingers of customers. The camera is encouraged to perceive the hand signals by denoting the client's fingers with red, yellow, green and blue shaded tape. The captured signal picture is exchanged for additional handling with the ARM11 Raspberry Pi gadget. The projector receives data on a specific surface or screen from the ARM11 Raspberry Pi gadget and undertakings. A framework is something that through the collaboration of its parts maintains its reality and capacities. For example. Body, humanity, access control, and so on A framework is a part of the world that a man or gathering of people in the middle of an interim period of time and for some reason generally considers, consisting of interrelated segments, each segment depicted by properties selected as applicable to the reason. The Implanted System is a combination of equipment and programming used to carry out a particular single error. Frameworks implanted are pc frameworks that screen, react or control an external situation.

2. Existing Methodology:

The digital pen, microcontroller and display unit are an existing system. With Sensor, a digital pen is built. It's like a regular ink pen. A computer invention that transmits writing to a digital pen with the exception of an optimal reader that records motion and images. The recorded data is then transmitted via wireless transmitter to the computer. For writing purposes, it requires a board. Speed is lower and less accurate.

3. Proposed Methodology:

We use a lightweight module here, i.e. Open CV with a high rate of edge. The following color is completed using HSV technique. High accuracy and speed. Here we create digital art entirely by executing algorithms that are coded into computer programs and can be regarded as the computer's native art form. It can't be computer-produced. The digital art can be made by tracking the colours on finger tips and art will appear on screen according to our hand movement.

4. Block Diagram:

This is Digital Art's block diagram. It has 1.2GHz 64-bit quad-core ARMv8 CPU, 802.11n Wireless LAN, Bluetooth 4.1, Bluetooth Low Energy (BLE). After that, we must connect the camera to capture the image. After capturing the image, we can display it on the projector or on any monitor screen.

5. FLOW CHART:

![Image of Flow Chart]

Fig 5.a:- Flow chart
Before the image is detected, we must first convert RGB to HSV. The image is captured in 8 bits after that. Then we have to decide on the specific color range. Hue values of basic colours:
Yellow has 22-38
Green has 38-75
Blue has 75-130
Red has 160-179
The exact range of HUE values must be found depending on the color of the object. Saturation and value depend on the environment's lighting condition and the object's surface. Then the upper and lower values of the particular color must be assigned. And so after morphological operations, our object would be detected.

6. Design Algorithm:

Images are been captured by OpenCV and videos in 8-bit, unsigned integer, BGR format. In other words, Captured images can be considered as 3 matrices: Blue, green and red (hence the name BGR) which has integer values from 0 to 255. The following image shows how a color image is represented using 3 matrices.

![Color matrices](image)

In the above image, a pixel is represented by each small boxes of the image. The pixels are so small in real images, these pixels are so small that it cannot be differentiated. Usually, one can think that BGR color space is more suitable for color based segmentation. HSV color space is the most suitable for image segmentation. So I converted the video's original color space from BGR to SV image in the above application. HSV color space is also made up of three matrices, HUE, SATURATION and VALUE. The range of values HUE, SATURATION and value in OpenCV is 0-179, 0-255 and 0-255 respectively. The color is the HUE, the amount to which the respective color is mixed with white is represented by SATURATION and the value to which the respective color is mixed with black.

7. Hardware Components:

a) Raspberry-pi

The Raspberry Pi 3 Model B is the Raspberry Pi third generation. This powerful single-board credit card computer can be used for many applications and replaces the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B. While maintaining the popular board format, the Raspberry Pi 3 Model B provides a more powerful processor, 10 times faster than the first Raspberry Pi generation. It also adds LAN & Bluetooth wireless connectivity, making it the ideal solution for powerful connected designs.

8. Software Tools:

a) Linux:

Linux appropriation is a collection Linux is a free open source framework and has a place in the Unix framework. In fact, Linux implies the part itself, which is at the heart of the working framework and manages the correspondence between the client and the equipment. Linux is regularly used to refer to the entire Linux programming dispersion in the light of the Linux kernel. It includes parts and applications of the GNU-task. Since Linux is an open source venture, it can be altered and distributed by anyone.

b) Raspbian Wheezy:

In view of Debian appropriation, Raspbian Wheezy is a free working framework. It's made by a small group of Raspberry Pi enthusiast. Raspbian is improved for the equipment of the Raspberry Pi and accompanies more than 35000 packages and programming pre-incorporated. Raspbian is still progressing dynamically and aims to improve the strength and execution of Debian bundles.

c) Python:

Python is a multi-worldview programming dialect: Protest programming arranged and organized computer writing programs are fully upheld, and various dialect highlights support practical programming and viewpoint programming (counting by meta programming and enchantment strategies). Using expansions, including contract configuration and rationale programming, many different standards are reinforced.
d) Open-cv:

OpenCV-Python is OpenCV's Python API. It combines the best OpenCV C+ API and Python dialect characteristics. OpenCV Python is a universally useful programming dialect started by Guido van Rossum, which has proven to be extremely popular in a short time due to its effortlessness and lucidity of the code. It empowers the software engineer to express his thoughts without diminishing clarity in less lines of code. Python is slower than various dialects such as C / C++. Another important component of Python in any case is that it tends to be reached effectively with C / C++. This component causes us to compose computer-concentrated C / C+ codes and make a Python wrapper so that we can use these wrappers as Python modules. This gives us two favorable circumstances: First, our code is as fast as the unique C / C+ code (because it is the real C+ code that works in Python), and secondly, code in Python is anything but difficult. That's how OpenCV-Python works, it's a Python wrapper for unique C++ execution. In addition, Numpy's help makes the errand less demanding. Numpy is an updated library for numerical tasks.

9. Result & Discussion:

a) Interfacing raspberry pi with monitor or screen:

Here we are interfacing raspbery pi and monitor or screen by using vnc server and viewer. By providing the IP address of the raspberry pi in vnc server, we can access raspberry pi directly from the monitor.

![vnc server and viewer](image)

b) Performing morphological operations:

By executing the code in python language, we perform morphological operations. We use python here because the code is more precise and less complex. Two windows will appear on the screen after the code has been successfully executed. After removing the background from the object, one window shows the live stream and another window shows the digital art.

Here we showed the exact Digital Art output. We must first contour the image. All points of our object are located in the contour. Once we have contoured the object, we can find an object's midpoint as we have all the object's point. Our object is detected in this way and we can therefore move the object with hand gestures and get the final output.

![Digital art](image)

10. Conclusion:

This paper showed the use of raspberry Pi. Using our hand signals here, we can execute our coveted image. We can distinguish human movements with the help of numerical calculations. Signal recognition first perceives the protest and then tracks it and also gives the question data. This is the easiest way to track a question. In cricket matches, another application would track a ball.

References:

i. B. Milner Voice Services Unit, BT Labs., Martlesham Heath, UK/ Handwriting recognition using acceleration-based motion detection.

ii. Mr. Kunal J. Patil, Mr. A. H. Karode, Mr. S. R. Suralkar3 Gesture Recognition Of Handwritten Digit Using Accelerometer Based Digital Pen.


vi. KeremAltun, BilbarBarshan, OrkunTuncel Department of Electrical and Electronics Engineering, Bilkent University, Bilkent,TR-06800Ankara, Turkey, presented “Comparative study on classifying human activities with miniature inertial and magnetic sensors “ in Elsevier.

vii. NimishAyachi, PiyushKejriwal, Lalit Kane, PritekKhanna Computer Science and Engineering Discipline PDPM Indian Institute of Information Technology Design and Manufacturing Jabalpur, Indiapkhanna@iiitdmj.ac.in, lalit.kane@iiitdmj.ac.in, presented “Analysis of the Hand Motion Trajectories for Recognition of Air-Drawn Symbols” in 2015 Fifth International Conference on Communication Systems and Network Technologies.

viii. ShaikKarimullah, Dr. D. Vishnuvardhan “A Review Paper On Optimization Of Placement And Routing Techniques atNC’e-TIMES # 1.0 IN2018, IJET ISSN: 2395-1303.

ix. Changxing Ding, Student Member, IEEE, Jonyhan Choi, Student Member, IEEE, Dacheng Tuo, Fellow, IEEE, and Larry S.
Davis, Fellow, IEEE. Citation information: DOI10.1109/TPAMI.2015.2462338, IEEE Transactions on Pattern Analysis and Machine Intelligence.

Shaik Karimullah, Abdul Rahim B. C.Ushasree "Design And Verification Of Online Bist For Different Word Sizes Of Memories" IJASTR, Issue 4 volume 4, July-August 2014, ISSN 2249-9954.

S. Shafiuddin, Y. Md. Riyazuddin, Shaik Karimullah, K. Riyazuddin "A Ranging Model Based Components For Localization In Sparse Networks" NC’e-TIDES -12 IJCAE, Vol.3 Issue 1, July 2012, 71-81 ISSN NO: 0988-0382E.

Lakshmi praveena thippasani currently pursuing her btech in ECE from annamacharya institute of technology and sciences (rajampet).

Lavanya Basanaboina currently pursuing her btech in ECE from annamacharya institute of technology and sciences (rajampet).

Shaik Karimullah received his B.Tech Degree in ECE from MeRITS and M.Tech Degree in VLSI System Design from Madina Engineering College. Currently he is working as Assistant Professor in Annamacharya Institute of Technology and Sciences, Rajampet. His Research areas include VLSI Systems, Embedded Systems etc.