MES COLLEGE OF ENGINEERING, KUTTIPPURAM
DEPARTMENT OF COMPUTER APPLICATIONS
20MCA246 – MAIN PROJECT_

PRO FORMA FOR THE APPROVAL OF THE FOURTH SEMESTER MAIN PROJECT

(Note: All entries of the pro forma for approval should be filled up with appropriate and complete information. Incomplete Pro forma of approval in any respect will be rejected.)

Main Project Proposal No :_____1_____ *(Filled by the Department)*	Academic Year : 2021- 22 Year of Admission : 2020

1. Title of the Project : Finger Recognition and Gesture Based Augmented Keyboard and Related Applications
2. Name of the Guide : Nowshad C V
3. Student Details (in BLOCK LETTERS)

Name	Register Number	Signature
Fathimath Suhara M A	MES20MCA2018	

Date:

Approval Status : Approved / Not Approved__

Signature of Committee Members

Comments of the Guide Dated Signature

Initial Submission :

First Review :

Second Review :

Comments of the Project Coordinator Dated Signature

Initial Submission:

First Review

Second Review

Final Comments :

Dated Signature of HOD

FINGER RECOGNITION AND GESTURE BASED AUGMENTED KEYBOARD AND RELATED APPLICATIONS

Fathimath Suhara M A

Introduction:

My project which utilizes finger recognition is a topic which comes under two major computer science fields like augmented reality and human-computer interaction and we have developed a virtual system with the goal of interpreting human gestures via mathematical algorithms. In this project, I tried to reduce the gap between the real world and the augmented environment to produce a mixed reality system. For that purpose, I created a virtually controllable keyboard system, pong game, virtual painter and calculator which is created and implemented using OpenCV libraries and python3.2.1. To provide an easy immersive augmented experience which is also gesture enabled, I employ a web camera which is integrated with OpenCV libraries through a compiler. Using the concept of gesture recognition, it is possible to point a finger at the computer screen or web camera so that the keypad will be pressed accordingly to form meaningful sentences or words.

Gesture recognition is an active research field in Human-Computer Interaction technology. It has many applications in virtual environment control and sign language translation, robot control, or music creation. In this machine learning project on Hand Gesture Recognition, we are going to make a real-time Hand Gesture Recognizer using the MediaPipe framework. OpenCV is a real-time Computer vision and image-processing framework built on C/C++. But I'll use it on python via the OpenCV-python package. Depending on the type of the input data or source, the approach for interpreting a fingertip could be done in different ways,most of the techniques rely on key pointers represented in a 3D coordinate system. Based on the relative motion of these, the gesture can be detected with a high accuracy, depending on the quality of the input and the algorithm's approach.

The webcam simply captures the consecutive frames and compares them to recognize it as a click if there is a difference in the contour.By using virtual Keyboard we are accessing AI virtual painter, Pong Game and Calculator virtually.

Objectives:

1.Virtual Keyboard Using OpenCV

I created a virtually controllable keyboard system which is created and implemented using OpenCV libraries and python3.2.1. To provide an easy immersive augmented experience which is also gesture enabled, I employ a web camera which is integrated with OpenCV libraries through a compiler. Using my system, users can control a virtual keyboard using their finger movements and finger tips. Further, users can communicate with people who are viewing the screen, the user selects an alphabet with their fingertip and can move the keyboard with the help of hand gesture. My model can be utilized by people who are specially-abled and people who cannot talk properly or communicate as they can communicate with others using our proposed system. This project describes the way of implementing a virtual keyboard without any additional hardware but by using the webcam available in the system. The webcam simply captures the consecutive frames and compares them to recognize it as a click if there is a difference in the contour.

2.Virtual Sketch Using OpenCV

Virtual Sketch is in where i can draw by just capturing the motion of a colored marker with a camera. One colored object at the tip of the finger is mainly used as the marker. Iam here now, using the techniques of computer vision in open cv to build this project. The required language for this project is python due to its more exhaustive libraries and easy to make use of the syntax and but understanding the basics as well as it can be implemented in any OpenCV supported languages. The colour tracking and detection processes are used to achieve the goal of this project.

3.Pong Game Using OpenCV

Pong is one of the earliest arcade video games. It is a table-tennis inspired game featuring simple two-dimensional graphics. In it, the player controls the paddle by moving it vertically across the left or the right side of the screen. The objective is to reach 21 points before the opponent; each player earns points when the opponent fails to return the ball. The aim of this project is to create a python-based application for Pong using the Pygame library. It also involves creating a few AI models which the user can play against.Here we can control the game by using the finger movements.

Problem Definition:

OpenCV is the most popular library for the task of computer vision, it is a cross-platform open-source library for machine learning, image processing, etc. using which real-time computer vision applications are developed. CVzone is a computer vision package, where it uses OpenCV and MediaPipe libraries as its core that makes us easy to run like hand tracking, face detection, facial landmark detection, pose estimation, etc., and also image processing and other computer vision-related applications.

Three common phases of Gesture Recognition System:

Phase 1: Image pre-processing

Phase 2: Tracking

Phase : Recognition

Gesture recognition is a topic pursued with the goal of interpreting human motions via mathematical algorithms. Gesture recognition can be seen as a way for a computer to begin to understand human body language, thus building a richer bridge between machines and humans than primitive text interfaces or even graphical user interfaces (GUI), which still limit the majority of input to keyboard and mouse. Hence, gesture recognition is a process by which the system will know, what is going to be performed by the gesturer. Gesture recognition can be conducted with techniques from computer vision and image processing. Gesture recognition enables humans to interface with the machine and interact naturally without any mechanical devices. Using the concept of gesture recognition, it is possible to point a finger at the computer screen so that the cursor will move accordingly. This could potentially make conventional input devices such as mouse, keyboards and even touch-screens redundant.

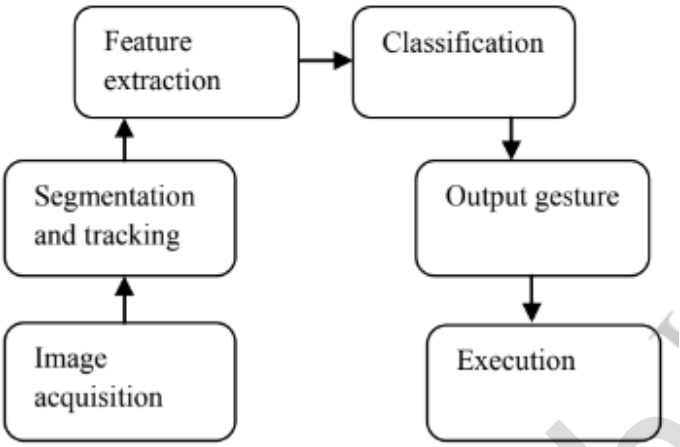
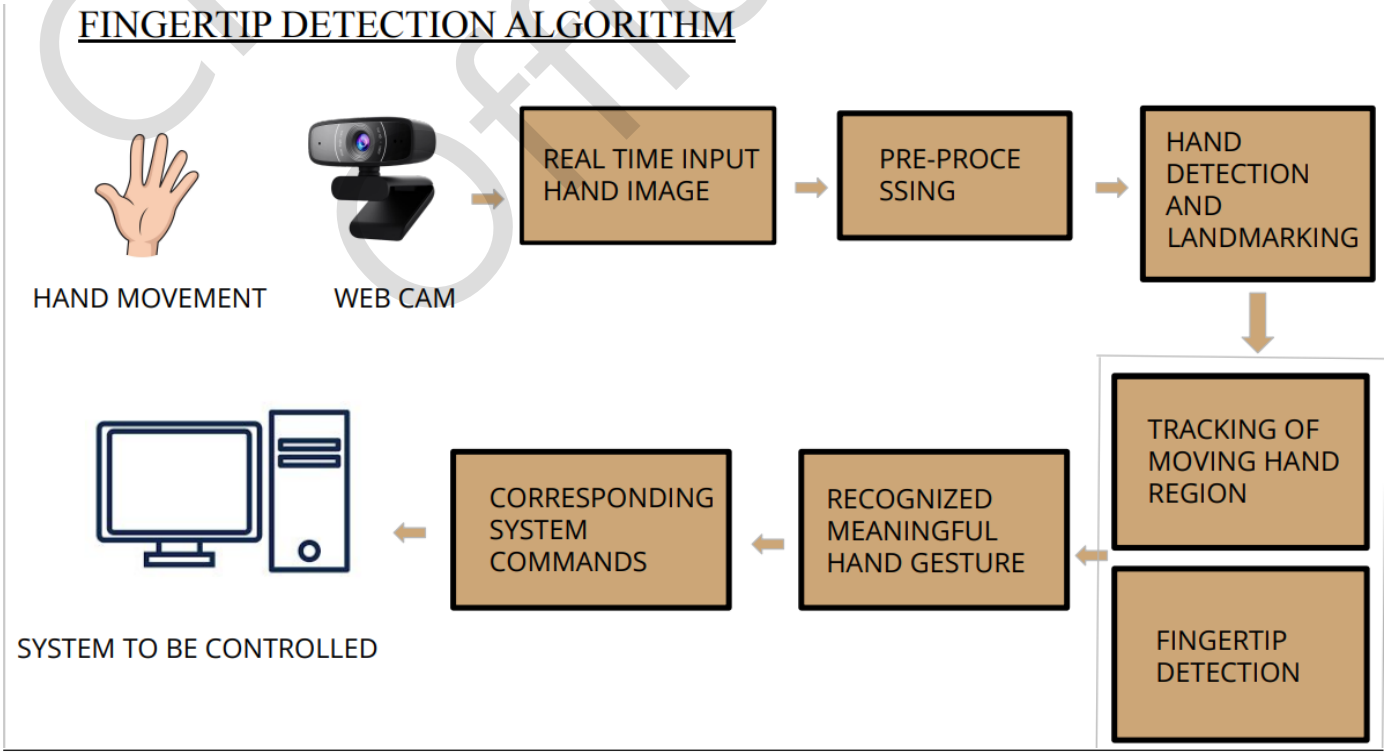


Figure: Block Diagram for Gesture Recognition System

Image acquisition is the first process in which a set of image frames are captured by using low cost web camera. This stage involves pre-processing such as scaling. Hand segmentation is necessary to track the movement of hand. Segmentation partitions the image into its constituent parts or objects. Once the hand is tracked there is a need to extract the most important feature points from the available data points. The next step is a feature extraction; it is a special form of dimensionality reduction. If the input data to an algorithm is too large to be processed and if it is redundant then it is transformed into reduced set of features. Transformed input data into set of features is called as feature extraction. Once the features are extracted, classifier plays a vital role in recognition process. Classifier takes feature set as input and gives a class labelled output, which are the required gestures. Each class is mapped to particular functions and executing actions related to gesture.

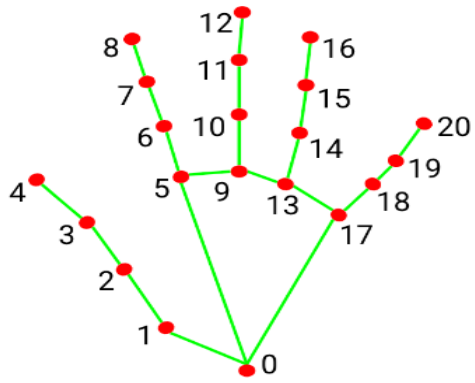


Concept of Hand Tracking

Hand tracking using MediaPipe involves two stages:

Palm detection - MediaPipe works on the complete input image and provides a cropped image of the hand.

Hand landmarks identification - MediaPipe finds the 21 hand landmarks on the cropped image of the hand.



0. WRIST
1. THUMB_CMC
2. THUMB_MCP
3. THUMB_IP
4. THUMB_TIP
5. INDEX_FINGER_MCP
6. INDEX_FINGER_PIP
7. INDEX_FINGER_DIP
8. INDEX_FINGER_TIP
9. MIDDLE_FINGER_MCP
10. MIDDLE_FINGER_PIP
11. MIDDLE_FINGER_DIP
12. MIDDLE_FINGER_TIP
13. RING_FINGER_MCP
14. RING_FINGER_PIP
15. RING_FINGER_DIP
16. RING_FINGER_TIP
17. PINKY_MCP
18. PINKY_PIP
19. PINKY_DIP
20. PINKY_TIP

Basic functionalities:

Tools / Platform, Hardware and Software Requirements:

Hardware specification:

The selection of hardware is very important in the existence and proper working of any software. Then selection hardware, the size and capacity requirements are also important.

• Processor : Intel Pentium Core i5 and above

• Primary Memory : 4 GB RAM and above

• Storage : 500 GB hard disk and above

• Display : VGA Colour Monitor

• Key Board : Windows compatible

• Mouse : Windows compatible

Software specification:

One of the most difficult tasks is selecting software for the system, once the system requirements is found out then we have to determine whether a particular software package fits for those system requirements.

The application requirements:

• Front end : Python

• Operating system : windows 7 and above

• IDE : PyCharm