

Project Phase IV Report

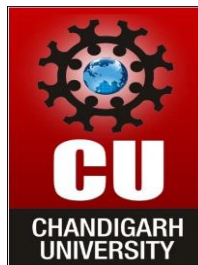
On

**Human Hand Tracking System(“H2TS=Hatuus”) Development Using
Python**

Submitted for the requirement of Project course

BACHELOR OF ENGINEERING

COMPUTER SCIENCE & ENGINEERING

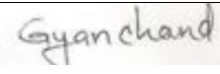
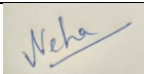


Submitted to: Gyan Chand Yadav
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Co - Supervisor
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

CHANDIGARH UNIVERSITY, GHARUAN

June 2022

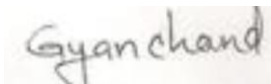
Certificate

This is to certify that Ananya Sharma(20BCS3049), Magan Jyot Kaur(20BCS3041) and Lokesh Choudhury(20BCS3033) B.E(COMPUTER SCIENCE & ENGINEERING) 2nd Year student of CHANDIGARH UNIVERSITY has done project work on

“Human Hand Tracking System- H2TS (Hatuus)”

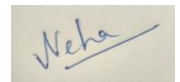
under the guidance of “Mr. Gyan Chand Yadav (Supervisor)

and Ms. Neha Sharma (Co-supervisor).



Mr. Gyan Chand Yadav

(Supervisor of project)



Ms. Neha Sharma

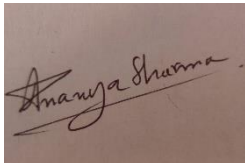
(Co-Supervisor of project)

CHANDIGARH UNIVERSITY, GHARUAN, MOHALI

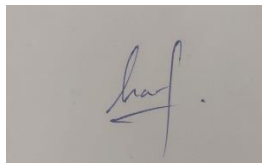
CANDIDATE’S DECLARATION

We hereby declare that the project entitled “**Human Hand Tracking System–H2TS (“Hatuus”)** submitted during a period from **February 2022** to **April 2022** by Ananya Sharma(20BCS3049), Magan Jyot Kaur(20BCS3041) and Lokesh Choudhury(20BCS3033) to the department of B.E(COMPUTER SCIENCE & ENGINEERING) at CHANDIGARH UNIVERSITY, GHARUAN, MOHALI is the record of project work carried out by us under the guidance of Mr. Gyan Chand Yadav(supervisor) and Ms. Neha Sharma (Co-supervisor).

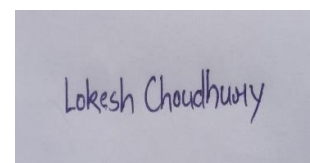
Signature of Candidates



Ananya Sharma



Magan Jyot Kaur



Lokesh Choudhry

Acknowledgement

We would like to express our special thanks of gratitude to all the people who have played a crucial role in the research for this project, without their active co-operation the preparation of this project could not have been completed within the specified time limit.

I am very thankful to our respected Co-Supervisor, **Ms. Neha Sharma** for motivating us to complete this project with complete focus and attention.

And special thanks to our project guide lecturer, **Mr. Gyan Chand Yadav** who supported us as a Supervisor throughout this project with utmost co-operation and patience and for helping us in doing this project completed successfully.

Finally, we would like to thanks “**CHANDIGARH UNIVERSITY**” for providing us an opportunity to showcase our talent through this project.

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Abstract

Hand tracking system allows user to interact without any physical input to the device by detecting the position and orientation of hands and the configuration of fingers. In this way user's hand act like an external device which inputs the data to execute a specific algorithm. In this work, we present a real-time method for performing different features using hand tracking incorporated into one program. H2TS system is based on a futuristic technological approach which will make human and software interaction much more virtual and convenient without using hardware. The advanced feature which can be incorporated are voice command, touchless operations { which can be done through web cam using hand landmarks' detection (total hand landmarks detection=21)} which will help- in cost saving (Keyboard), less maintenance cost of hardware, enough distance from hardware equipment ultimately better eye care and many more technological advantages.

Use of Modern tools in design and analysis

Hand tracking is the process in which a computer uses computer vision to detect a hand from an input image and keep focus on the hand's movement and orientation. In this project we have used python language for implementation of project. Python is often used as a support language for software developers, for build control and management, testing, and in many other ways. We made use of OpenCV to perform operations associated with computer vision and Media Pipe to perform the actual hand detection and tracking on our input image.

- **OpenCV:** is a tool for image processing and performing computer vision tasks. It is mainly used here to process input image to identify hands movement.
- **Media Pipe:** It is an open-sourced, cross-platform library that provides many ready-to-use machine learning solutions for solving computer vision problems. We use python for implementation of our project as it is the best fit for machine leaning and AI-based projects include simplicity and consistency, flexibility, access to powerful AI and ML libraries and frameworks and platform independence.

Discussion and report/results analysis

Human-computer interaction is research in the design and the use of computer technology, which focuses on the interfaces between user and systems. It can also be viewed as two processors trying to communicate with each other where one of the units(computer) depends on the data analysis which were input by the other unit I.e., humans. Plenty of research has already been done on this field and as the technology is advancing new researches and ideas are helping this field to flourish.

So, after doing all the research about it, we came to know that there are many systems of hand tracking related to human computer interaction, but because all of them are not available at one place, we have come up with a solution named SAHI (Software and Human Interaction) a virtual assistant. SAHI will help user for features' usages to do each task one by one through voice command. Currently it will assist five different tasks like -

- Virtual Volume Controller
- Virtual Mouse Controller
- Virtual Game Controller
- Virtual Calculator
- Virtual Painter

It is not constrained by the number of tasks we can add more tasks to it. As hand tracking system is a good option to eliminate interaction with hardware and with the use of virtual assistant the interaction with the software will be very smooth.

Project management and Professional communication

(Presentation)



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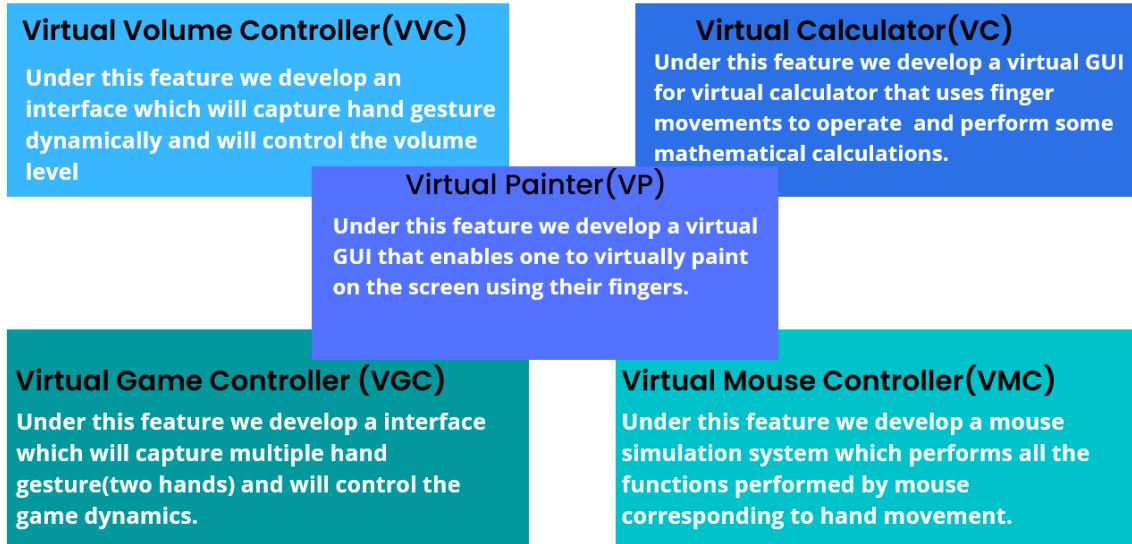
Human Hand Tracking System("H2TS=Hatuus") Development Using Python

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Introduction

- What is human computer interaction (HCI)?
 - It is the study of interaction between human(users) and computers.
 - The interaction between user(s) and computer(s) is achieved via an interface- user interface.
- What is SAHVI?
 - SAHVI is a virtual assistance which assists user to access different tasks.
 - SAHVI stands for Software and human virtual interaction.

- What are the tasks performed by this program?



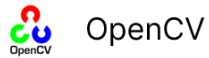
Objective

First objective of this project is to allow the communication between human and computer by the use of gestures and hand movements to be more intuitive.

Second objective of this project is to create a complete system to detect, recognize and interpret the hand gestures through computer vision.

Third objective of this project is to do more and more work on the computer with the help of hand gestures such as to control volume of the system, mouse control, game control and many more.

Technology Used

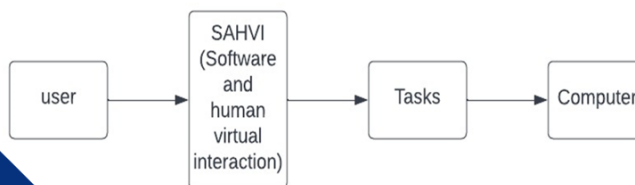


DFD Diagram

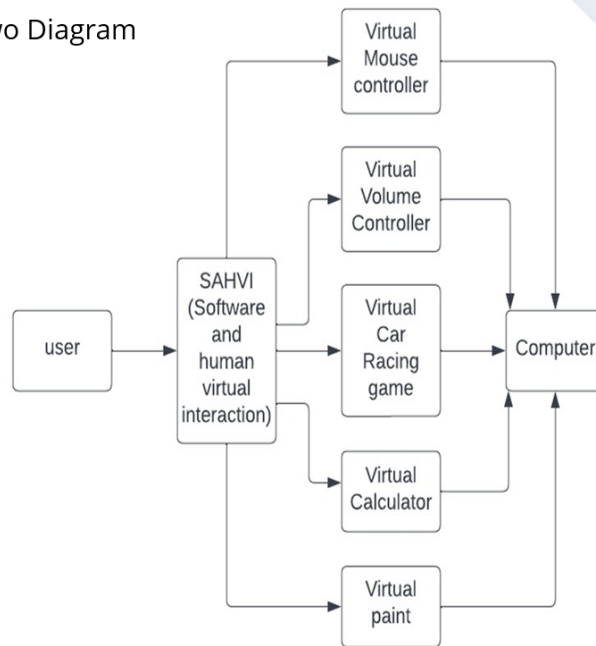
- Level Zero Diagram



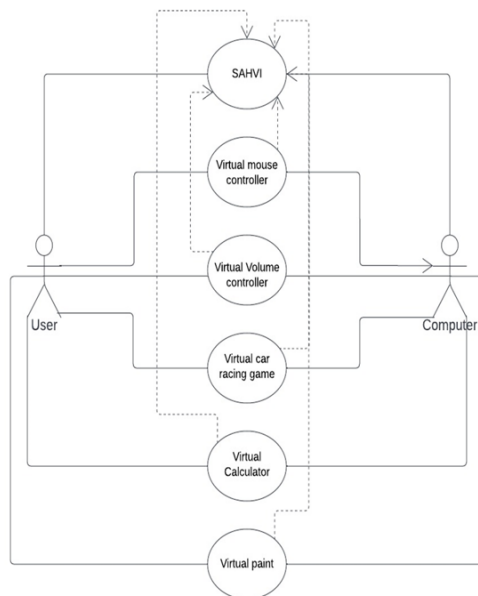
- Level One Diagram



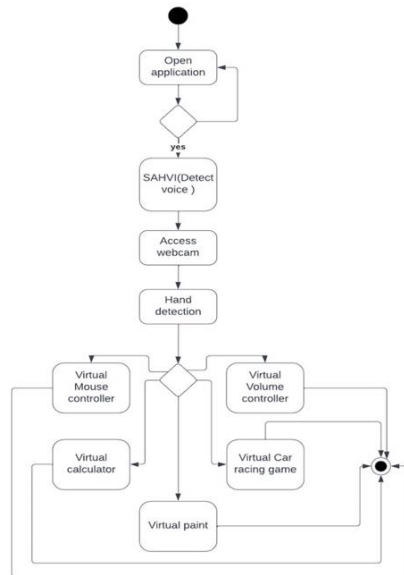
- Level Two Diagram



Use Case Diagram



Activity Diagram



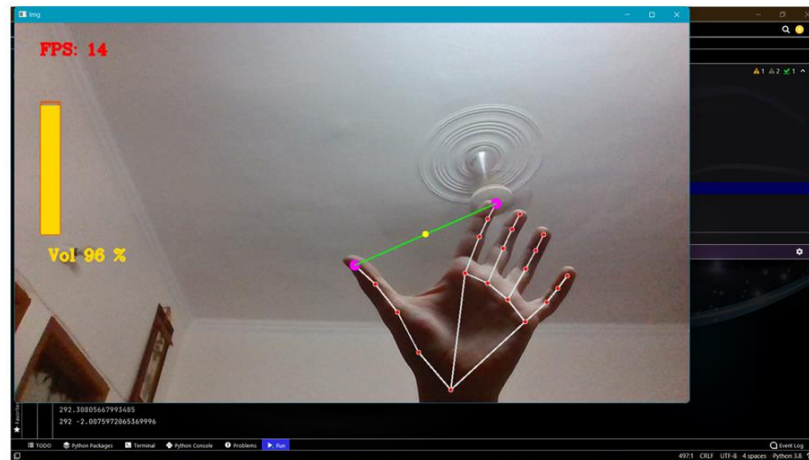
SAHVI Virtual Assistant

The screenshot shows a Python IDE (likely PyCharm) with a file named 'Nave.py'. The code is a simple text-based interface for the SAHVI Virtual Assistant. It uses a series of 'if' and 'elif' statements to respond to user commands. The interface includes a terminal window at the bottom showing the program's output, which includes a welcome message and a prompt for the user to enter a command. The code is as follows:

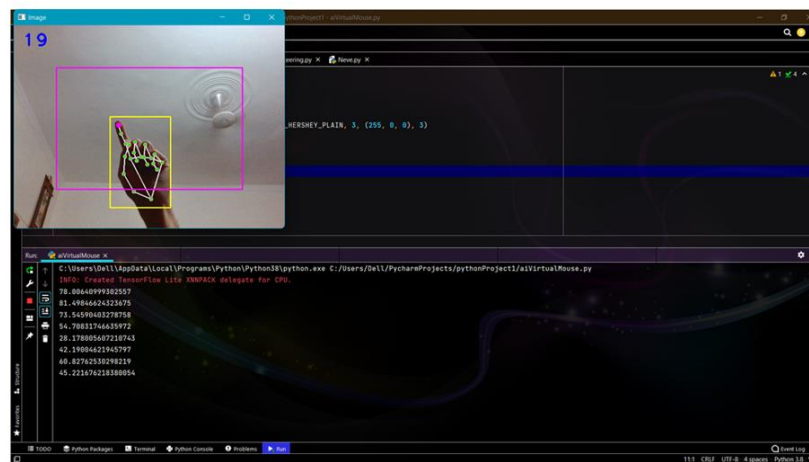
```
14 break
15
16 elif 'play the car game' in query or 'the car game' in query or 'car game' in query or 'game' in query:
17     os.system('python steering.py')
18     break
19
20 elif 'play the calculator' in query or 'the calculator' in query or 'calculator' in query:
21     os.system('python Handtracking_calc.py')
22     break
23
24 elif 'play the painter' in query or 'the painter' in query or 'painter' in query:
25     os.system('python gicfcpai-painter.py')
26     break
27
28 elif 'stop' in query or 'over' in query or 'bye' in query or 'quit' in query or 'see you' in query or 'go' in query:
29     f = "bye sir", "in see sir", "see you again sir", "As your wish sir", "Waiting for activation sir", "As you wish, but I don't want to go sir!!"
30     speak(random.choice(f))
31     break
```

The terminal output shows the program running and responding to the command 'play the painter'.

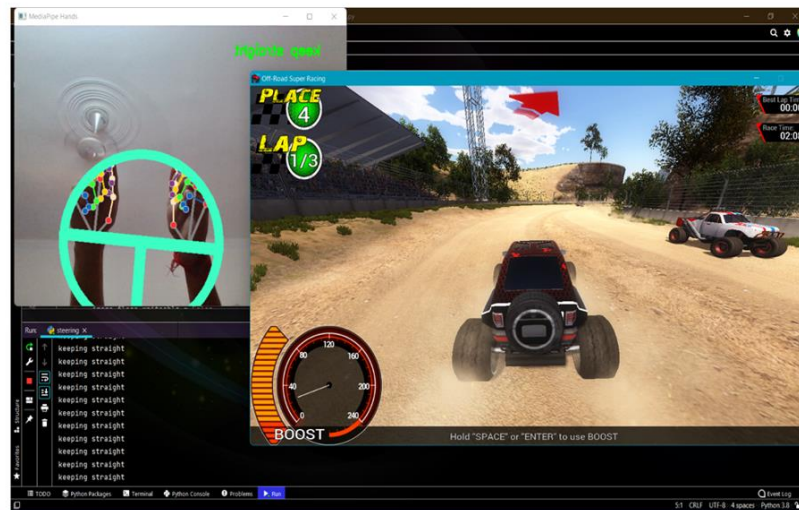
Virtual Volume Controller(VVC)



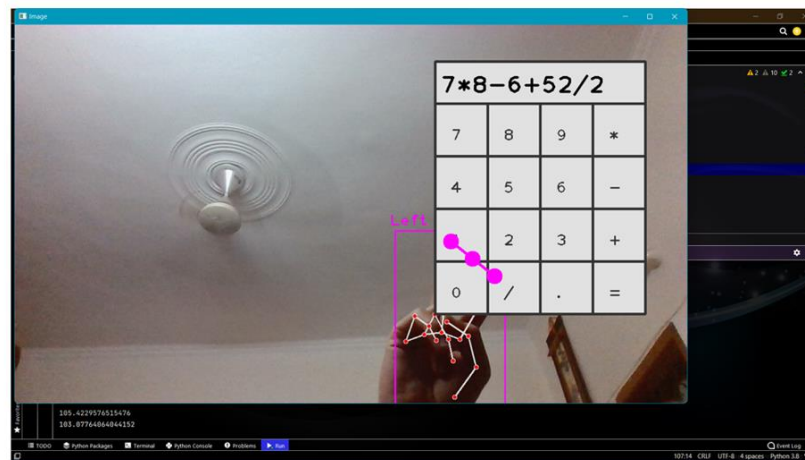
Virtual Mouse Controller(VMC)



Virtual Game Controller(VGC)



Virtual Calculator(VC)



Virtual Painter(VP)



Outcomes

Towards touchless system with multiple functions integrated, we present a python-based virtual system. The specific group of audience targeted is young generation and working people of middle class and above class who are familiar with systems.

Attainment of stated outcomes

- First outcome of this project is to allow the communication between human and computer by the use of gestures and hand movements to be more intuitive and to create a complete system to detect, recognize and interpret the hand gestures through computer vision.
- Second outcome of this project is to do more and more work on the computer with the help of hand gestures such as to control volume of the system, mouse control, car game control, calculations by virtual calculator and painting by virtual painter.
- The third project output is SAHVI (Software and Human Virtual Interaction), a virtual assistant that will aid users in using features and doing tasks one by one using voice commands. It currently assists with five different jobs, including:
 - ❖ Virtual Volume Controller
 - ❖ Virtual Mouse Controller
 - ❖ Virtual Game Controller
 - ❖ Virtual Calculator
 - ❖ Virtual Painter

We can add more tasks to it because it is not limited by the number of tasks. As a hand tracking system is a good alternative for eliminating hardware interaction, and with the usage of a virtual assistant, software interaction will be very fluid.