GAME AUTOMATION USING MACHINE LEARNING

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Abstract: This research paper's primary goal is to is to demonstrate how to play a computer game using human gestures. The system's secondary goal is to develop a system that allows a player to play a game without using a physical controller. This system seeks to create a gesture recognition application. The system's attached camera or webcam may be used to identify human hand gestures. The operations on the Game will be performed with the game's basic gaming controls based on the analysis performed by the program on identifying human Hand Gestures. The software includes instructions for recognizing human hand motions. Hand motions should be made using the palms of the hands. The system will be divided into three sections: user interface, gesture recognition, and analysis. The user interface module provides the user with all of the necessary graphical user interface to register the user's arm positions for performing gestures. Gesture recognition by the Media pipe is a cross-platform library developed by Google that provides amazing ready-to-use ML solutions for computer vision tasks. Open CV library in python is a computer vision library that is widely used for image analysis, image processing, detection, recognition etc. This research paper will be accomplished with the help of OPEN CV.

Keywords: Camera, hand gestures, motions, recognitions, Media pipe**.**

I.   INTRODUCTION

The majority of the time, hands are employed for daily physical activities involving manipulation, although communication is occasionally also done with them. Throughout the day, people communicate clearly by using hand gestures. Hand gestures are essential for sign language communication since mute and deaf persons rely on their hands and gestures to communicate. In this study, designers developed a hand-gesture-controlled Python game using OpenCV and Mediapipe. You can control your hill-climbing video game car using this system by moving your hands. You can take use of virtual discs with the help of this technology. To find hand landmarks, utilize the Mediapipe Python package. To find every face and hand landmark, I'll be using a Holistic model from Mediapipe Solutions. Showcase how various facial and skeletal elements may be accessed for computer vision applications including fatigue detection and sign language recognition. Hands are detected frame-by-frame; hands are not tracked across frames by the system. When it is necessary to follow a hand across a display, this kind of inter-frame tracking can help with user engagement.

II.   RELATED WORK

[1] Akshay Kumar, Sarath Kumar Purushothaman, Viral Singh, Abhishek Bharti, Nishant Kashyap stated that Automation in testing is crucial for bug discovery and enhancing the quality of the software product. Automation also saves time and helps delivering the product faster.

Automating a game play in a card-based game is challenging due to the indefinite cards which are served during game play and also due to the fact that the dynamic logic should be applied according to the type of card one receives during game play. A successful approach of building a test automation framework for automating the game play of a single instance of a card-based game was achieved previously.

Advantages

- Enhanced to successfully play multiple games simultaneously with multiple players
- It distinguishes the different game tables by the ID
- The actions to be performed on those tables are also determined by the action processor which is an element in the automation framework
- A remarkable performance is observed with a little scope for improvement.

Disadvantages

- A stable Internet connection is required for the game automation framework to perform actions and to receive the messages from the server.
- Performing a particular action on a single instance of the game takes an average time of 5 secs whereas performing the same action on multiple game tables takes about 10 secs.
- When performing the game play on android application, the devices with the app installed should always be connected to the computer in order to run the automation code.
- A separate automation build containing the hooks should be integrated along with the game engine build in order to serve the messages when requested by the hooks.

[2] Pieter Pauwels, Ronald De Meyer, Maarten Audenaert, Koen Samyn stated in the topic Role of game in architectural design environment that experimenting and observing are crucial actions in architectural design thinking. They rely heavily on the representation environment used (e.g., sketching, scale models, sketch tools, CAD tools, etc.) and the 'game rules' at play in these environments. In this succinct essay, Designers look at how this representational setting contributes to the whole process of architectural design ideation. Choosing a representation environment is thus one of the most important choices to be made by the designer.

Advantages

- Any representation environment for physical scale modelling follows different rules, mainly because of the nature of material substitutes.
- The rules in such representation environments have always had a crucial influence on the eventual outcome of the design process.
- Simply by switching the representation environment, architectural designers might come to remarkable new insights, thereby shaping the further design thinking process.

Disadvantages

- This not only includes gravity, but also more information-rich rules, such as weight-bearing capacities of a wooden beam, or the fact that you just cannot build a concrete shape in any imaginable freeform
- This model assumes that assumes that one is able to model all such rules exactly
- This approach is currently under research as a possible extension to our earlier work.

[3] Chang-Sik Cho, Kang-Min Sohn, Chang-Jun Park, Ji-Hoon Kang stated in the topic Online game testing using scenario-based control of massive virtual users. The stability and performance of game servers are major issues in online games because the online game servers must be able to handle and verify many connections. The massive virtual clients automatically generate packet loads to test the stability of game servers like the existing approaches. The main difference, however, is employed the game language and game map to construct the game logics rather than fictitious game client code. Therefore, while testing a new game, the test client code does not need to be rewritten.

[4] Jan Dornig, Changbai Li Tongji University, Changbai Li stated in the topic Exploring the Use of Machine Learning as Game Mechanic – Demonstrative Learning Multiplayer Game Prototype. These areas have seen strong interest in the past, but the use of ML as main game mechanic has been less explored so far. Most likely due to a lack of real-time learning capabilities and inaccessibility of algorithms to the gaming community in the past.

Advantages

- The system records the players actions and the input of their virtual sensors that track what the character sees around them.
- Part of the game mechanic is that players control when their movement is recorded and therefore used for training the zomboxes and when not.
- Train them to attack the enemy, or train them to collect boxes, up to the player.

Disadvantages

- The most important takeaway was that the Demonstrative Learning is not producing results fast enough for long term engagement.
- Player mechanic, but it overall can't be helped that players might look at their running boxes with the look and feeling of disappointed parents.

- Learning is not producing results fast enough for long term engagement. While it is possible to see the first results of the zomboxes seemingly starting to head in the right directions.

[5] Pravin Chopade, David Edwards, Saad M. Khan, Alejandro Andrade, and Scott Pu stated in the topic Using AI-Machine Learning for Mapping Human-Human Interaction and Measurement of CPS Teamwork Skills. The objective of this work is to present a machine learning (ML) -based framework to identify evidence about collaborative problem solving (CPS) cognitive (teamwork) and social-emotional learning (SEL) skills from the dyadic (humanhuman-HH) interactions. s. The ML based framework supports the development of evidence centered design for teamwork skills-mapping and aims to help teams operate effectively in a complex situation.

Advantages

- The ML based framework supports the development of evidence centered design for teamwork skills mapping and helps teams to operate in a complex situation.
- This work will require Subject Mater Experts (SMEs) to manually code various aspects of the collected data with relevant CPS subskill tags.

Disadvantages

- An approach which is used to identify and subsequently score CPS teamwork skills has been presented.
- These groups could either be reconstituted to mitigate individual conflicts, or remediation could be provided in the specific collaborative skills lacking in the group.
- Responses to the questions posed in this paper will aid us better understanding how cognitive and SEL skills can be measured via non-invasive methods.

[6] CHIH-HUNG WU stated in the topic a concept framework of using education game with artificial neural network techniques to identify learning styles. This is the study propose of a concept framework of using artificial neural networks to identify students' learning styles based on the learning portfolio data in our designed education balance game with the Felder-Silverman learning style model (FSLSM).

Advantages

- The learning portfolio data can be used to classify the student learning style through the results of the student's operation of the physical balance game, and then complete the development of the learning style recognition system.
- Future researchers can develop different learning style recognition systems through different forms of games, through the learning process of the game, and with different deep learning algorithms.
- The learning style scale used in this study has certain stability and accuracy. Which provides students with their own operations, is presented by the web version, integrating physical concepts such as torque, lever principle, torque, and rotation balance, and displaying physical calculation formulas to help students to create the linkage the application of mathematical principles in top of the screen.

Disadvantages

- The system records the times spend of finishing, button click count, and object drag times.
- This game design is in line with the principle of STEM education, and the relationship of STEM education. ILS questionnaire divides students' learning style into four major types, each of which is divided into two relative learning styles: perception, input processing and understanding.
- Future researchers can develop different learning style recognition systems through different forms of games, through the learning process of the game, and with different deep learning algorithms.

III. EXISTING SYSTEM

The interaction between social life and information technology has grown increasingly intimate in recent years as a result of advancements in computer hardware and software technologies. Future consumer electronics devices' interfaces, particularly those for smart phones, video games, and infotainment systems, will have an increasing number of features and be more complicated. It has become crucial to figure out how to create an easy-to-use human-machine interface (HMI) for every consumer electronics product.

The most popular form of interaction is still via a mouse, keyboard, or joystick, which are all classic examples of electronic input devices. It does not imply, however, that these gadgets are the most practical and natural input methods for the majority of users. Gestures have been an important form of human contact and communication since ancient times. Before the development of language, people could simply convey their ideas through gestures. Many individuals still use gestures in everyday life, and deaf people in particular find gestures to be the most natural and important form of communication.

Many human-based electronics items, including computers, TVs, and games, have adopted the gesture control technology in recent years. With the aid of the current system, this method enables users to operate the items in a more natural and intuitive manner.

IV.   PROPOSED SYSTEM

The proposed technique is divided into three phases:

1. Hand Pivot Position Region
2. Hand Tracking & Gesture Recognition
3. Hand Position Detection

1)   Hand pivot position region:

This is the area where the pivot points for both hands of the user will be defined in order to provide a central point for the movement region of the hands. This area, which has been demarcated for right hand, will be used throughout the game. following the hand movement motion in order to accomplish the ability to manipulate the gaming application.
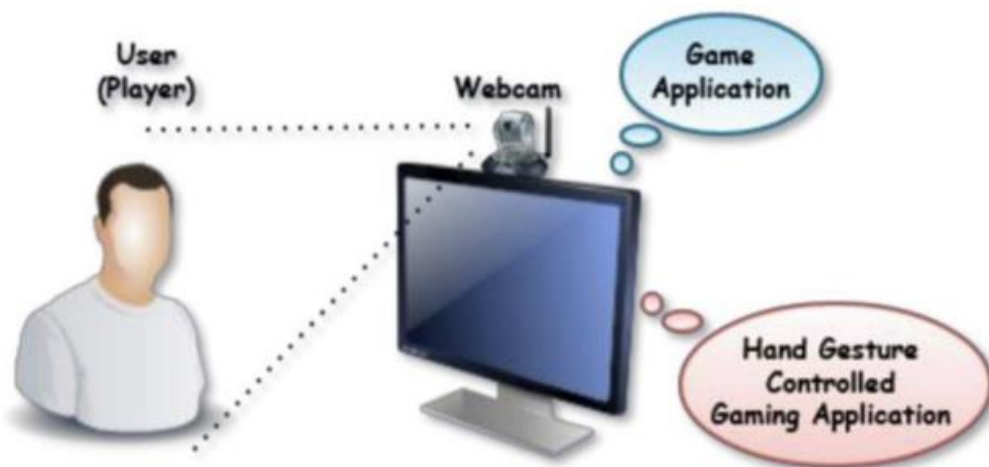

2)   Hand Tracking & Gesture Recognition:

In this case, open cv is being used to track the location of the hand and recognize gestures. This must be done appropriately throughout the entire system because it is a crucial task.

The process for finding the hand center has the advantage of being easy to follow. The hand's center is determined by the Hand Pivot Position Region. The center of the hand will be observed while the gesture is made. This action will make use of the pivoting of the center positions.

The distance between the hand's center and the center of the pivot region was used to compute the radius of the hand. The pivot region's center is found and used for hand tracking, and the hand center is determined for each following frame.
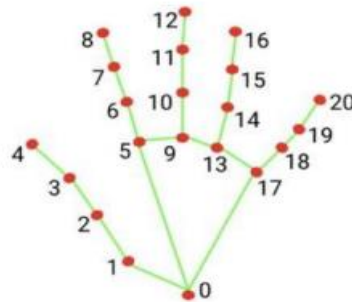
0. Wrist
1. Thumb carpometacarpal joint
2. Thumb metacarpophalangeal joint
3. Thumb interphalangeal joint
4. Thumb tip
5. Index finger metacarpophalangeal joint
6. Index finger proximal interphalangeal joint
7. Index finger distal interphalangeal joint
8. Index finger tip
9. Middle finger metacarpophalangeal joint
10. Middle finger proximal interphalangeal joint
11. Middle finger distal interphalangeal joint
12. Middle finger tip
13. Ring finger metacarpophalangeal joint
14. Ring finger proximal interphalangeal joint
15. Ring finger distal interphalangeal joint
16. Ring finger tip
17. Little finger metacarpophalangeal joint
18. Little finger proximal interphalangeal joint
19. Little finger distal interphalangeal joint
20. Little finger tip

Fig 4.2 Referral Hand marks in Mediapipe

3)   Hand position detection:

The hand's location is tracked by the pivot region's Centre. Which is used to calculate the location of the hand center by the position of the pivot region's center, i.e. determining whether the hand center lies to the top / bottom and left / right of the pivot region's center, will reveal the direction in which the hand is moved. The track of the hand movement gesture will be identified using this position detection. On using the position detection to manipulate the gaming application. This will only work fine with right hand opening hands denotes the gas i.e., Acceleration of car and closing hand denotes the break which stops the car.
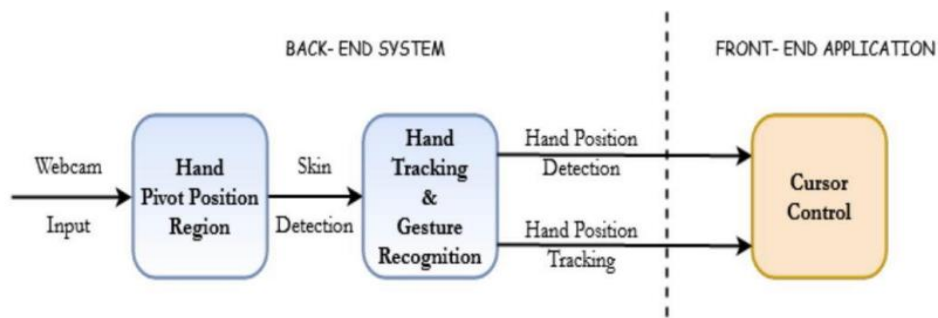

Fig 4.3 Block Diagram

Implementation of proposed system

1.   Detecting hands and image processing:

As soon as the user places his or her hands in front of the camera, the video begins to be recorded. As the video is being recorded, picture by image, the two hands are recognized Using Mediapipe module.

2.   Activating a Virtual Steering

When the hand is recognized, the virtual steering module is activated, and a virtual steering is displayed on the screen for the user to manage using hand movements.

3. Processing the actions performed by the user:

The user's activities are continually recorded, and they are processed to activate a module.

4. The gesture captured frame by frame:

Through various activation modules, the motions are translated to the controllers. Throughout the game, the user switches between different activities, hence the continuous actions need to be recorded and evaluated frame by frame.

5. The actions are performed in the game:

The user gets a virtual experience of operating the game without utilizing a hardware device since the adjustments he makes through gestures are displayed in the game.

V. CONCLUSION

This research paper outlines our plans for, designed and implemented the system for Hand gesture recognition for controlling Hill Climb racing using OpenCV and Mediapipe. One of the most frequent issues with computer vision is real-time hand gesture recognition. There are numerous methods for sketching face landmarks and detecting faces. Deep learning models assist in developing the most effective methods. However, attempting to create the models from scratch necessitates a significant amount of processing power, technical expertise, and a dataset. The majority of the time, it affects regular folks. The Mediapipe library is excellent at making challenging tasks simple for us. The library has a unique built-in reference model. Only the simple procedures for utilising Media Pipe to identify faces and construct face landmarks have been discussed in this article. In the next articles more easy and useful techniques will be shown with the help of Mediapipe.

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BIOGRAPHY

Prof. Sonia Maria D'Souza is currently working as a Senior Assistant Professor, Artificial Intelligence and Machine Learning, New Horizon College of Engineering, Bengaluru. She is an academician with more than 14 years of experience in teaching and academic management. She is an expert in disciplines of Computer Graphics and Visualization, Neural Networks, Fuzzy Logic Systems and Computer Architectures. She has received best paper presentation award from **"Smartcom-2020 Bangkok, Thailand"**. She has published National, International, Scopus and Springer journals. She has conducted SDP, FDP and CSR activities in various institutions. Sonia Maria D'Souza received the award for **"Highest Patent Publications in women's category"** for the academic year 2022 from Kumari Mangrove Foundation Research and Development, Kanyakumari. She has written text book on **"Full Stack Web Development", "Vehicular Ad Hoc Networks", and "Network Security and Cryptography"**. She has been recognized for her research work in Karnataka State Council for Science and Technology (KSCST), Indian Institute of Science, **"Design and Development of Efficient Cost-Saving Algorithms for Guiding Customer Purchasing Patterns in Modern Consumerism Scenario Using Feed Forward Back Propagation Neural Networks"**.

K S Dhruva Teja a third-year undergraduate student at New Horizon College of Engineering studying AI and machine learning. Won **second place globally for a NASA space settlement project**, enjoys programming, and also had two papers published. He is enthusiastic and interested in learning new things, both in academic and unrelated works. Numerous issue statements were investigated through participating in hackathons. Excellent leadership and teamwork abilities. A programmer who wants to know more about the robotics sector. He obtained various professional certifications, including those from Accenture's digital skills program and Microsoft's Certified Azure Fundamentals and also includes those earned through Accenture's digital skills: artificial intelligence program and Microsoft's Certified Azure Fundamentals. He has successfully completed Coincent's one-month Ecell Ambassador program and also, he has received bronze level certification from Lyriclious Company for a one-month campus ambassador internship. His accomplished projects include a hospital management system, enroll for a job, airline on time analysis using machine learning and big data

VR Geethika Reddy is a third-year undergraduate student in the AI & ML department at New Horizon College of Engineering. She is interested in exploring new things related to academics. She successfully completed her nptel course and passed the Microsoft Azure fundamentals test. She has completed a machine learning project about detecting credit card fraud in order to learn more. She has also finished her internship, which involved learning about machine learning and conducting hands-on experiments in order to interact with professionals in the field.

N Lohith Reddy is an engineering student at New Horizon College who is presently studying artificial intelligence and machine learning. He is interested in data analytics, skilled at handling issue statements, has competed in several hackathons. He has accomplished projects in several fields which includes Transportation management, Crime investigation using AI and Hospital management system.

Pavan Kumar T is third year engineering student at the New Horizon College of Engineering. He is good at programming and has taken a courses on artificial intelligence and machine learning to enhance his knowledge. His initiative towards project includes Criminal investigation, Can management system, and hospital management system. He is versatile in data analytics, and developing websites.