



Analysis of 2-D Game by Using Gesture Recognition.

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ABSTRACT

Imagine a world where communication goes beyond spoken words and written language, and instead, we rely on the natural, intuitive, and contemporary method of hand gestures.

This novel approach to non-verbal communication holds immense potential, not only in making our interaction with computers more seamless but also in bridging the communication gap for those who use sign language. In this paper, we explore an innovative system for hand gesture recognition that centers on detecting shape-based features.

The core of this system involves a single camera, which serves as the eyes to perceive the gestures made by the user. The camera captures the image of the hand and feeds it into our cutting-edge algorithm.

This work presents an application based on computer vision for recognising hand gesture and playing the hill climbing game. A live video feed is captured by a camera, and with the assistance of a Python library, a still image is extracted from the feed. The study involved the examination of various libraries capable of recognizing hand gestures.

In this, after identifying the image the game is totally operated by avoiding the use of input devices. The system implemented serves as a foundational and extendable platform for future endeavors aimed at creating a fully robust hand gesture recognition system, which remains a focal point of ongoing intensive research and development.

Keywords: computer vision, CVzone, hand gesture

1. INTRODUCTION

Human communication primarily revolves around speech, but it's worth noting that non-verbal communication methods also play a significant role [1]. One fascinating goal in the development of hand gesture recognition systems is to facilitate a more intuitive interaction between humans and computers.

These systems can be employed to monitor robots or convey meaningful information through recognized gestures [4]. Hand gestures serve as a unique channel for conveying information that might not be easily discernible through other means.

This research explores diverse approaches to detect and interpret the intricate language of hand gestures, enhancing the effectiveness of communication. In the course of daily life, body gestures serve as an effective mode of communication, and users have derived benefits from recent advances in computer software and associated hardware technology, which have introduced value-added services.

Computer vision encounters one of its fundamental challenges in hand gesture recognition, where computers equipped with this capability can detect hands, discern their identity, and track their movements.

In this work, with the help of python libraries such as

1. CVzone which helps in image analysis, image processing, image detection etc.
2. Mediapipe offers remarkable, readily available machine learning solutions for tasks in computer vision.
3. Pynput enables control and monitoring of input devices, with current support for both mouse and keyboard input and monitoring.

Using these libraries the speed of the car in Hill Climbing Race game is controlled by hand gestures.

2. LITERATURE REVIEW

Sr No.	Author	Year	Description	Result
1	Chetana D. Patil, Ajay Phirke, Amrita Sonare, Aniket Jha, Aliasgar Husain,	2022	The study employs Python's OpenCV to process hand gestures from webcams, enhancing human-computer interaction. It addresses challenges like background interference and camera quality, aiming to boost gesture recognition accuracy.	Checking the accuracy of gestures & Sharpness of Camera.
2	Nimmakayala Sai Krishna Swetha Kotavenuka, Dr. S P V Subba Rao, , Harshitha Kodakandla	2023	The paper creates a computer vision system for recognizing gestures in real-time video. It utilizes the Alexnet neural network, eliminating the need for gloves or markers, and propels natural human-computer interaction.	Recognizing gestures in real time video & also propels natural & human computer interactions.
3	Victor Chang Rahman Olamide Eniola, Lewis Golightly, and Qianwen Ariel Xu	2023	This paper enhances human-computer interaction with hand gesture recognition. Using a two-phase method—colour-based segmentation and CNN categorization—accuracy improves by 10%.	Rudimentary static gesture recognition system using ML Algorithms.
4	A.P. Ismail, Nazirah Mohammad Kasim, Kamarulazhar Daud	2023	This paper focuses on the intricate process of utilizing computer vision to detect, recognize, and interpret hand gestures, a task fraught with challenges due to the variability in factors such as pose, orientation, location, and scale. To address these challenges, the paper employs a Haar-cascaded Classifier to first detect hand gestures, which is a crucial preliminary step before delving into the subsequent image processing tasks.	Hand Gestures are recognized successfully by using Data Augmentation in Deep Learning
5	Siddharth Shukla.	2022	A simple and fast motion history image-based method is used to classify dynamic hand gestures.	Using low complexity algorithms.

3. ARCHITECTURE

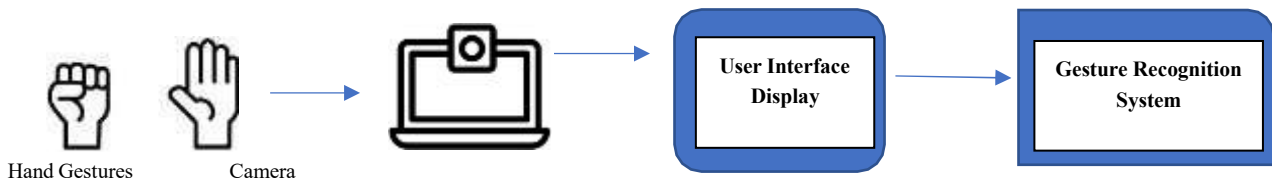


Fig. 1.1 : Hand Gesture Recognition System

Step 1 - Hand Gesture:

This is the initial step as shown in the fig.1.1 ,where a person performs a specific hand gesture in front of a device's camera or sensor. Hand gestures can vary and may include movements, positions, or signs made with the hands.

Step 2 - Image Captured by Device:

Once the hand gesture is performed, the device's camera captures an image or a series of images that represent the hand gesture. These images are then processed by the device's software.

Step 3 - Action to be Performed Based on Hand Gestures:

During this step, the software on the device analyzes the captured images to recognize and interpret the hand gesture. Based on the recognized gesture, the device is programmed to perform a specific action of moving car in forward direction or applying the brake to the car.

Overall, this process allows for hands-free interaction with a device by translating hand gestures into meaningful commands or actions, which can be particularly useful in applications like gesture-based control systems, virtual reality, or augmented reality interfaces.

4. WORKING

In this system, necessary libraries are imported first. Cvzone, this is the OpenCV library used for capturing and processing webcam frames. Hand Detector from CVzone. Hand Tracking Module is a custom module for hand tracking from the CVzone library.

Key and Controller from pynput module is used to simulate keyboard key presses and releases. Then webcam capture is been initialised. Initially it has set the video source to the default webcam (0). Then the width of the captured video frame is set to 720 pixels.

The height of the captured video frame is set to 420 pixels. Hand detector is created along with an instance of the HandDetector class with a detection confidence threshold is set to 0.7 and a maximum of 1 hand to be detected. While loop is used so that it continuously captures frames from the webcam and processes them.

Hand Detector object is used to detect hands in the captured frame. It returns a list of detected hands and the modified image with hand tracking annotations. If hands are detected then Depending on the finger positions, it simulates keyboard key presses and releases:

Gesture Detected	Action
All fingers closed [0 0 0 0]	Press the left arrow key and release the right arrow key.
All fingers open [1 1 1 1]	Press the right arrow key and release the left arrow key.
No specific gesture detected	Release both left and right arrow keys to avoid continuous input.



Fig.2.1

Fig 2.1 , Begin by launching the hill climbing game on your computer.



Fig.2.2

In this fig. 2.2 , Activate your camera to capture live video feed.



Fig.2.3



Fig.2.4

In fig 2.3 & 2.4 , As you initiate the game, extend your hand with open palms to start the car. All the fingers are open which presses the right key i.e. Gas and hence Car moves in Forward direction

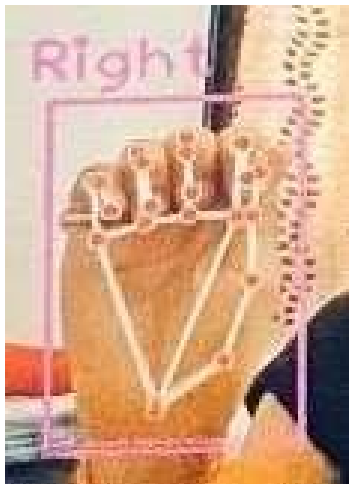


Fig.2.5



Fig.2.6

In fig 2.5 & 2.6, When you want to halt the car in the hill climbing game, close your hand. All the fingers are closed which presses left key i.e. Brake and hence Car stops

5. CONCLUSION

From the above project, it can be deduced that a person can employ their hand gestures as an input method to control the game. This project opens the door to exciting possibilities for hands-free computer control and human-computer interaction. Certainly, the project described above highlights the incredible potential of using hand gestures as an innovative input method for operating games and, more broadly, for various applications. The envisioned world where non-verbal communication through hand gestures becomes the contemporary norm offers immense promise for revolutionizing human-computer interaction and bridging communication gaps. The system described in this paper, which focuses on detecting shape-based features through a single camera, represents a significant step in realizing this vision. This technology not only offers a unique and engaging way to interact with computers but also opens the door to numerous exciting possibilities in the fields of human-computer interaction and accessibility.

As technology continues to evolve, gesture-based interfaces like this one may play a significant role in enhancing accessibility and user experiences in various domains such as Farming, Industries, etc.