Hand Detection

AI Model Development

Time: 60 mins

Introduction

In this class, the student/s will learn to open the camera on their computer and detect the hands and fingers.

New Commands Introduced

● cvzone.HandTrackingModule	Library for hand tracking module
● HandDetector(detectionCon=0.8)	Creates the hand detector object with 0.8 threshold
● cv2.flip()	Flips the camera
● findhands()	Finds the hands in the given frame
● fingersUp()	Returns an array of 5 elements that contains 0 for a finger that is down and 1 for a finger that is raised up. Eg: [0, 1, 0, 0, 0] for index finger up

Vocabulary

- Camera feed: A sequence of images processed electronically into an analog or digital format and displayed on a screen with sufficient rapidity as to create the illusion of motion and continuity.
- Detection : The act of noticing or sensing something.

Learning Objectives

Student/s should be able to:

- ***Recall*** how to process an image using the open cv library.
- ***Demonstrate*** how to detect the hands and fingers in the camera feed.
- ***Explain*** the concepts of identifying the hands and fingers in the camera feed.

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Activities

1. **Class Narrative:** *(2 mins)*
    - Brief the student/s about detecting hands and fingers from a camera feed. Identifying the hands and fingers and displaying their names on the screen.

2. **Concept Introduction Activity:** *(5 mins)*
    - Let the student/s play the explore-activity to detect and identify the hands and fingers.
    - Using the slides, explain that the student/s will learn:
        - to open the camera.
        - to detect the hand and display their names.
        - to identify fingers and display their names.

3. **Activity 1:Open Camera :** *(12 mins)*

    Teacher Activity: *(6 mins)*.
    - Explain the process of opening the camera on the device and reading the camera feed.
    - Demonstrate to the student/s how to open the camera and read the camera feed.

    Student Activity: *(6 mins)*
    - Guide the student/s to open the camera and read the camera feed.

4. **Activity 2: Detect hands:** *(12 mins)*

    Teacher Activity: *(6 mins)*
    - Explain to students how to detect the hands using the HandTrackingModule.
    - Explain how to use the findHands() function to detect the landmark points and connections.
    - Demonstrate how to detect the hands and display their names using the HandTrackingModule.

    Student Activity: *(6 mins)*
    - Guide the student/s to detect the hands and fingers using the handTrackingModule.

    Probing question: What is the use of the landmark points?
    Expected answer: Landmark points help to identify the points on the hands..

5. **Activity 3: Identify the Fingers:** *(12 mins)*

    Teacher Activity: *(6 mins)*
    - Explain the student/s to detect the fingers using the detect.fingersUp() function.

    Student Activity: *(6 mins)*

    - Guide the student/s to detect the fingers using the detect.fingersUp() function.

6. **Introduce the Post class project:** *(2 min)*
    - Apply the concepts learned in the class to add image filters to the camera feed based on the finger raised up.

7. **Test and Summarize the class learnings:** *(5 mins)*
    - Check for understanding through quizzes and summarize learning after respective missions.
    - Summarize the overall class learning towards the end of the class.

8. **Additional activities:**
    - Encourage the student/s to identify the fingers in both the hands simultaneously.
    - Encourage the student/s to add gray scale and oil painting filters to the camera feed based on the hand raised.

9. **State the Next Class Objective:** *(1 min)*
    - In the next class, student/s will learn to control the movement of the mouse pointer on the computer screen using hand gestures.

U.S. Standards:

CSTA: 2-AP-11, 2-AP-12, 2-AP-13, 2-AP-14, 2-AP-19

Links Table		
Activity	**Activity Name**	**Link**
Class Presentation	Hand Detection	https://s3-whjr-curriculum-uploads.whjr.online/ed057191-eca8-4e86-879c-64fca79a2b42.html
Explore Activity	Hand Detection	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-SAS-BP
Teacher Activity 1	Open the Camera	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-TAS-BP
Teacher Activity 1 Solution	Open the Camera: Solution	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-TAS
Student Activity 1	Open the Camera	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-SAS-BP
Teacher Reference: Student Activity 1 Solution	Open the Camera: Solution	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-TAS
Teacher Activity 2	Detect Hands	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-TAS-BP
Teacher Activity 2 Solution	Detect Hands: Solution	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-TAS
Student Activity 2	Detect Hands	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-SAS-BP
Teacher Reference: Student Activity 2 Solution	Detect Hands: Solution	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-SAS
Student Activity 3	Identify Fingers	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-SAS-BP
Teacher Reference: Student Activity 3 Solution	Identify Fingers: Solution	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-SAS
Student's Additional Activity 1	Identify Fingers of Both Hands	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-SAS-BP
Teacher Reference: Student's Additional Activity 1 Solution	Identify Fingers of Both Hands: Solution	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-SAS
Student's Additional Activity 2	Add Filters	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-SAS-BP

Teacher Reference: Student's Additional Activity 2 Solution	Add Filters: Solution	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-SAS
Post Class Project	Add Filters	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-PCP-BP
Teacher Reference: Post Class Project Solution	Add Filters: Solution	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C69-PCP