Image Filters

AI Model Development

Time: 60 mins

Introduction

In this class, the student/s will learn to create the image filters for the images. Student/s will learn image processing and display the processed image . They will also learn to save the processed image on their device. Student/s will learn to install Python virtual environment and download and install Visual Studio Code.

New Commands Introduced

- Python3 -m venv myvenv   Creates a virtual environment names 'myvenv'r

- <venv>\Scripts\activate.bat   Activates the virtual environment on Windows OS

- Source env/bin/activate   Activates the virtual environment on MAC OS

- Pip install requirements.txt   Installs the dependencies from the requirements file

- cv2.imread()   Reads the image passed to it

- cv2.imshow()   Displays the image

- cv2.cvtColor()   Convert an image from one color to another

- cv2.xphoto.oilPainting()   Converts an image into an oil painting

- cv2.GaussianBlur()   Blurs the image

- cv2.imwrite()   Write the image to the given path

Vocabulary

- Image Processing: Image processing is the process of transforming an image into a digital form and performing certain operations to get some useful information from it.

- Object Detection: Object detection is a computer vision technique for locating instances of objects in images or videos.

- Object Tracking : Object tracking is the ability to estimate or predict the position of a target object in each consecutive frame in a video once the initial position of the target object is defined.

- Face Detection: Also called facial detection, is an artificial intelligence (AI)-based computer technology used to find and identify human faces in digital images and video.

Learning Objectives

Student/s should be able to:
- **Recall** how to add voice chat in an app..
- **Demonstrate** how to process an image
- **Explain** the concepts of cv2 library.

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Activities

1. **Class Narrative:** *(2 mins)*
   - Brief the student/s about how adding the filters to the image changes its looks. Convert an normal image to oil painting and a sketch image. Save the processed image on the device.

2. **Concept Introduction Activity:** *(5 mins)*
   - Let the student/s play the explore-activity and explore how image processing is done.
   - Using the slides, explain that the student/s will learn:
     - to set up a virtual environment.
     - to process and display images.
     - to process and save images.

3. **Activity 1: Set up the Virtual Environment:** *(12 mins)*

   Teacher Activity: *(6 mins)*.
   - Explain the process of downloading the code from github and extracting the code from zip file.
   - Explain to the student/s how to create the virtual environment in the system.
   - Explain the concept of activating the virtual environment based on the users operating system.
   Note: To view the tutorials open the tutorial.md file and press ctrl+shift+v to open the preview, then close the tutorial.md file

   Student Activity: *(6 mins)*
   - Guide the student/s to download and extract the code, create virtual environment and activate it..

4. **Activity 2: Process and Display Images:** *(12 mins)*

   Teacher Activity: *(6 mins)*
   - Demonstrate how to download and install Visual Studio Code on your computer.

   Student Activity: *(6 mins)*
   - Guide students to download and install Visual Studio Code on their computer based on their Operating System.

   Teacher Activity: *(6 mins)*
   - Explain to students about he open cv library.
   - Explain how the different functions of the library can be used to process the image.

- Demonstrate how to convert the colored image to grey scale image and display on the screen.

    Student Activity: *(6 mins)*
- Guide the student/s to convert the image to an oil painting image.
  Probing question: What is the use of the cv2.cvtColor() function?
  Expected answer: Changes the color of the image to grey scale image.

5. **Activity 3: Style the Chat Messages:** *(8 mins)*

    Student Activity: *(8 mins)*
- Guide the student/s to follow the steps to crete a pencil sketch of an image:

    ○ creating an inverted image of the grayscale image,

    ○ adding blur on the image using GaussianBlur.

    ○ blending the grey scale image and blurred image using color dodge blend mode.Note that the cv2.divide() function is used to perform element-wise division between two arrays, dividing the grayscale image by the difference between 255 and the blurred image. The scale parameter is used to scale the result of the division.

- Guide the student/s to store the image on the computer using the cv2.imwrite() function.

6. **Introduce the Post class project:** *(2 min)*
- .Apply the image filters to the images given or your favorite pictures.

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 to rotate the image using image processing functions.
- Encourage the student to adjust the contrast of the image using image processing functions.
9. **State the Next Class Objective:** *(1 min)*
- In the next class, student/s will learn to detect objects in images.

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	Image Filters	https://s3-whjr-curriculum-uploads.whjr.online/cedfd73d-3104-44d3-a7ce-db12f63a1c04.html
Explore Activity	Image Filters	https://procodingclass.github.io/C65-Live-Website/index.html

Teacher Activity 1	Setup Virtual Environment	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C65-TAS-BP
Teacher Activity 1 Solution	Setup Virtual Environment - Solution	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C65-TAS
Student Activity 1	Setup Virtual Environment	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C65-SAS-BP
Teacher Reference: Student Activity 1 Solution	Setup Virtual Environment - Solution	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C65-SAS
Teacher Activity 2.1	Install Visual Studio Code	https://code.visualstudio.com/download
Teacher Activity 2.1 Solution	Install Visual Studio Code	https://code.visualstudio.com/download
Student Activity 2.1	Install Visual Studio Code	https://code.visualstudio.com/download
Teacher Reference: Student Activity 2.1 Solution	Install Visual Studio Code	https://code.visualstudio.com/download
Teacher Activity 2.2	Convert to Grayscale Image	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C65-TAS-BP
Teacher Activity 2.2 Solution	Convert to Grayscale Image - Solution	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C65-TAS
Student Activity 2.2	Convert to Oilpainting	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C65-SAS-BP
Teacher Reference: Student Activity 2.2 Solution	Convert to Oilpainting - Solution	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C65-SAS
Student Activity 3	Convert to Pencil Sketch	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C65-SAS-BP
Teacher Reference: Student Activity 3 Solution	Convert to Pencil Sketch - Solution	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C65-SAS
Student's Additional Activity 1	Rotate an Image	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C65-SAS-BP
Teacher Reference: Student's Additional Activity 1 Solution	Rotate an Image - Solution	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C65-SAS
Student's Additional Activity 2	Change the Contrast of an Image	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C65-SAS-BP
Teacher Reference: Student's Additional Activity 2 Solution	Change the Contrast of an Image - Solution	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C65-SAS
Post Class Project	Apply Filters to Your Favorite Images	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C65-PCP-BP
Teacher Reference: Post Class Project Solution	Apply Filters to Your Favorite Images - Solution	https://github.com/Tynker-Computer-Vision/TNK-M9-PRO-C65-PCP