VIDEO PROCESSING

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OUTLINE

01 **Introduction**

A Brief Intro to Video Processing

02 **Applications of Video Processing**

Purpose of Video Processing and Uses

03 **Reading from a Live Webcam Stream**

Processing a Live Video from a Webcam Stream

04 **Conversion of Color-Space of Image**

The Translation of the Representation of a Color From One Basis to Another.

OUTLINE (Cont.)

05 **Separation of Color Channels**

Necessary for component analysis of colors in an image

06 **Correlation**

Moving kernel over the image and computing the sum of products at each location

07 **Convolution**

Each element of the image is added to its local neighbors, and then it is weighted by the kernel

08 **Geometric Transformation**

Geometry of image is changed without altering its actual pixel values

OUTLINE (Cont.)

09 **Gaussian Filtering a Live Video Stream**

Applying Gaussian Filter to a Live Video Stream

11 **Grey Erosion**

Removing small objects, separating overlapping objects, and shrinking object boundaries

10 **Dilation**

Increasing the brightness of each pixel that is surrounded by neighbors with a higher intensity

12 **Conclusion**

A summary to all that we have discussed

INTRODUCTION

✅ Video processing refers to the manipulation, enhancement, and analysis of digital video content using various techniques and algorithms.

✅ It involves a series of steps to modify or analyze video footage, often with the goal of improving its quality, adding special effects, compressing it for storage or transmission, extracting information from the video, or making it compatible with different devices or platforms.
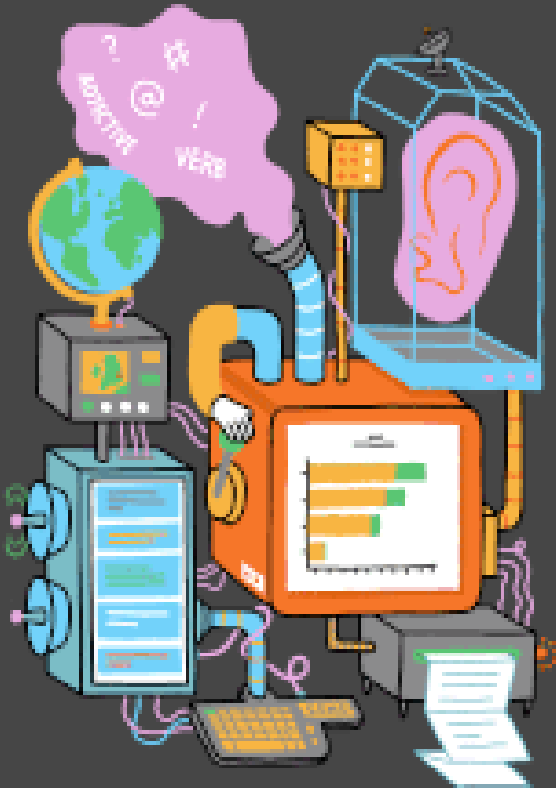
Applications Of Video Processing

✅ **Video Capture:** The process begins with capturing video using cameras or other recording devices. Analog signals from the camera's image sensor are converted into digital data.

✅ **Frame Extraction:** Videos are composed of a sequence of individual frames (images). Video processing involves extracting and manipulating these frames.

✅ **Frame Preprocessing:** This step includes various operations to prepare frames for further processing, such as noise reduction, color correction, and image stabilization.

Applications Of Video Processing (Cont.)

✅ **Spatial and Temporal Filtering:** Spatial filtering involves applying filters to individual pixels or small groups of pixels within a frame to enhance or alter certain characteristics. Temporal filtering considers the relationship between frames to achieve effects like motion blur reduction or de-interlacing.

✅ **Video Enhancement:** Techniques like contrast adjustment, brightness correction, and sharpness enhancement are used to improve the overall quality of the video.

Applications Of Video Processing (Cont.)

✅ **Video Compression:** Videos often contain a large amount of data, which can make them difficult to store and transmit efficiently. Video compression algorithms (like H.264, H.265, VP9, etc.) are used to reduce the file size while minimizing the loss of visual quality.

✅ **Video Editing and Special Effects:** Video processing tools enable editing, such as cutting, merging, and adding transitions. Special effects like chroma key (green screen), overlays, and animations can also be applied.

✅ **Object Detection and Tracking:** Video processing can involve identifying and tracking objects or people within the video using computer vision techniques. This is widely used in surveillance, autonomous vehicles, and sports analysis.

Applications Of Video Processing (Cont.)

- ✅ **Video Analysis:** Algorithms can analyze video content to extract valuable information, such as facial recognition, emotion detection, and gesture recognition.
- ✅ **Format Conversion:** Videos need to be converted into various formats to be compatible with different devices or platforms (e.g., converting a video for web streaming or mobile playback).
- ✅ **Rendering:** The final processed video is rendered, which involves assembling the processed frames back into a coherent video sequence.
- ✅ **Display and Playback:** The processed video can be displayed on various devices, such as computer screens, TVs, projectors, and mobile devices, for viewing by an audience.
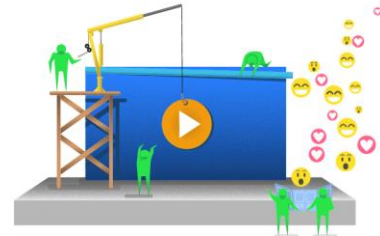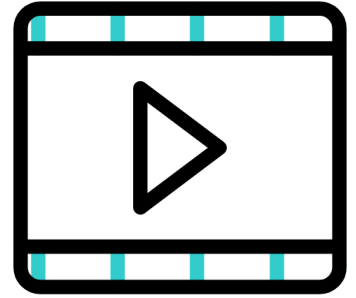
Reading a Live Webcam Stream

```python
import numpy as np
import cv2 as cv
cap = cv.VideoCapture(0)
cap.set(cv.CAP_PROP_FRAME_WIDTH, 256)
cap.set(cv.CAP_PROP_FRAME_HEIGHT, 144)
if not cap.isOpened():
        print("Cannot open Camera")
        exit()
    while True:
        ret, frame = cap.read()
        if not ret:
            print("Can't receive frame.....\nExiting ...")
            break
        cv.imshow('frame', frame)
        if cv.waitKey(1) == 27:
            break
    cap.release()
    cv.destroyAllWindows()
```

Python Code

Live Webcam Stream

Conversion of Color-space of image


```python
import numpy as np
import cv2 as cv
cap = cv.VideoCapture(0)
cap.set(cv.CAP_PROP_FRAME_WIDTH, 256)
cap.set(cv.CAP_PROP_FRAME_HEIGHT, 144)
if not cap.isOpened():
    print("Cannot open Camera")
    exit()
while True:
    ret, frame = cap.read()
    if not ret:
        print("Can't receive frame.....\nExiting ...")
        break
    gray = cv.cvtColor(frame,
            cv.COLOR_BGR2GRAY)
    cv.imshow('frame', gray)
    if cv.waitKey(1) == 27:
        break
cap.release()
cv.destroyAllWindows()
```

Python Code

Live Webcam Stream Color Space Image Conversion

Separation of Color channels


```python
b = frame[:, :, 0]
g = frame[:, :, 1]
r = frame[:, :, 2]

cv.imshow('Red', r)
cv.imshow('Green', g)
cv.imshow('Blue', b)

 if cv.waitKey(1) == 27:
    break

cap.release()
cv.destroyAllWindows()
```
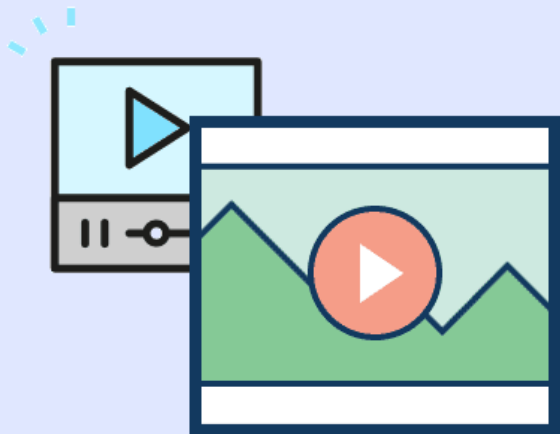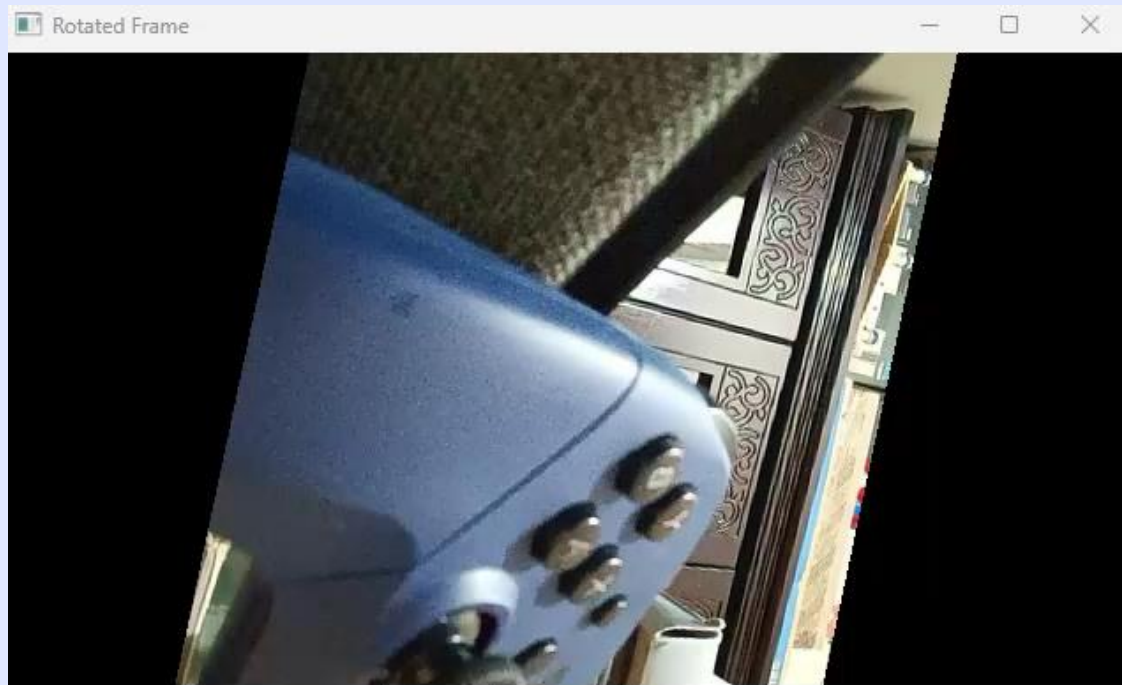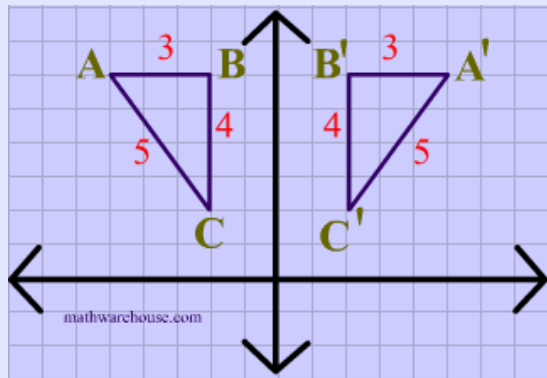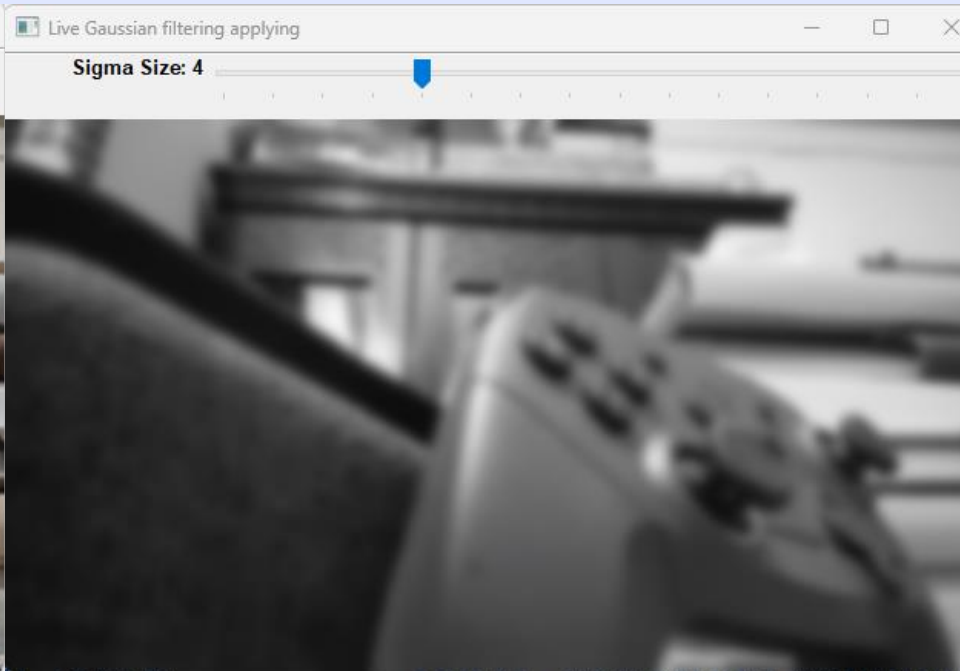
Python Code
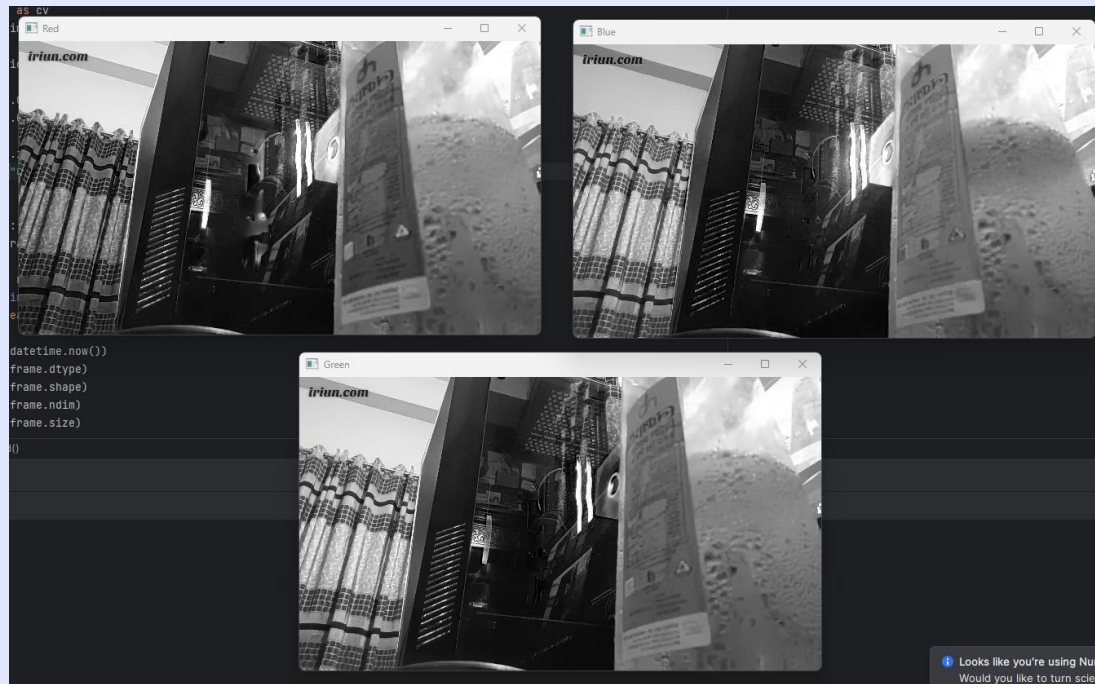
Color Channels Separation
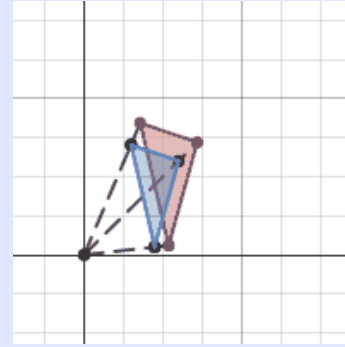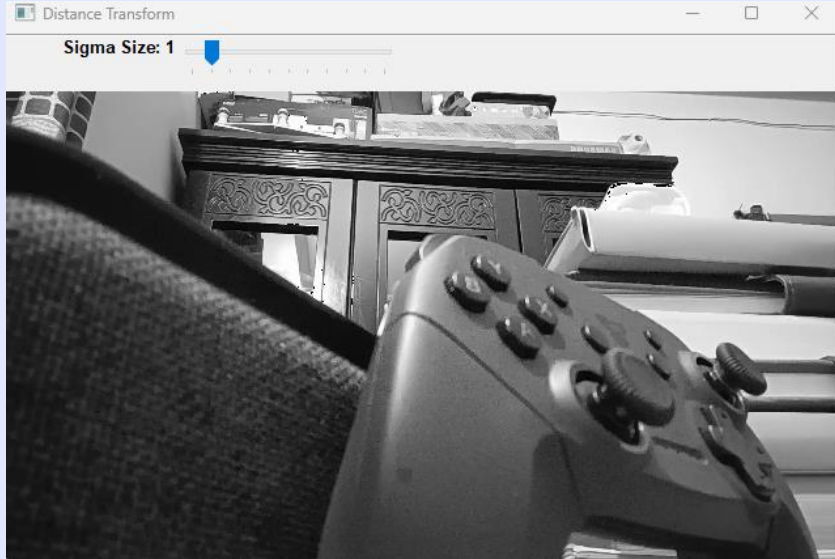
Correlation
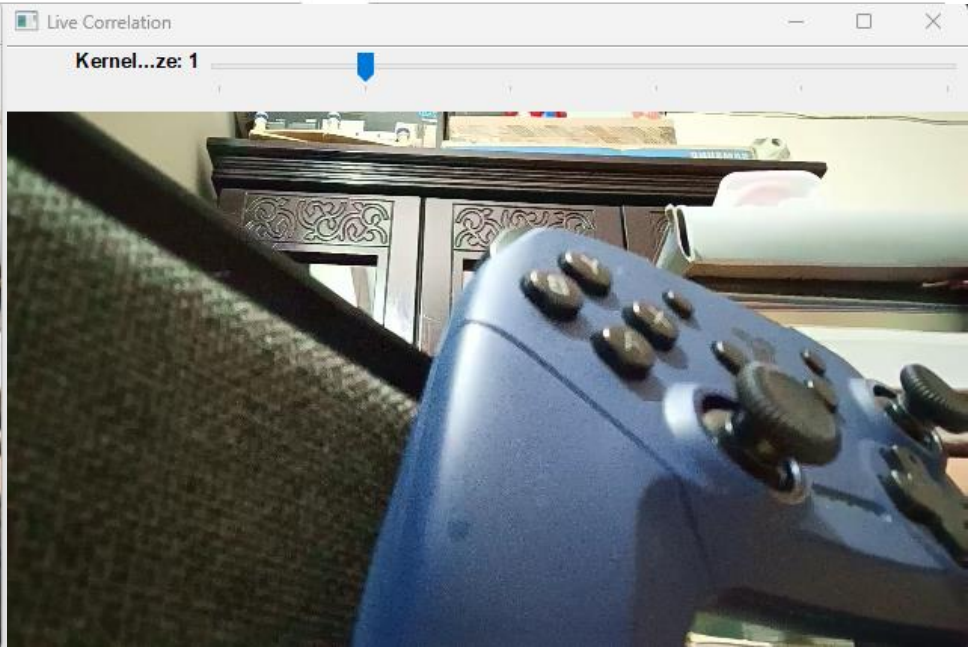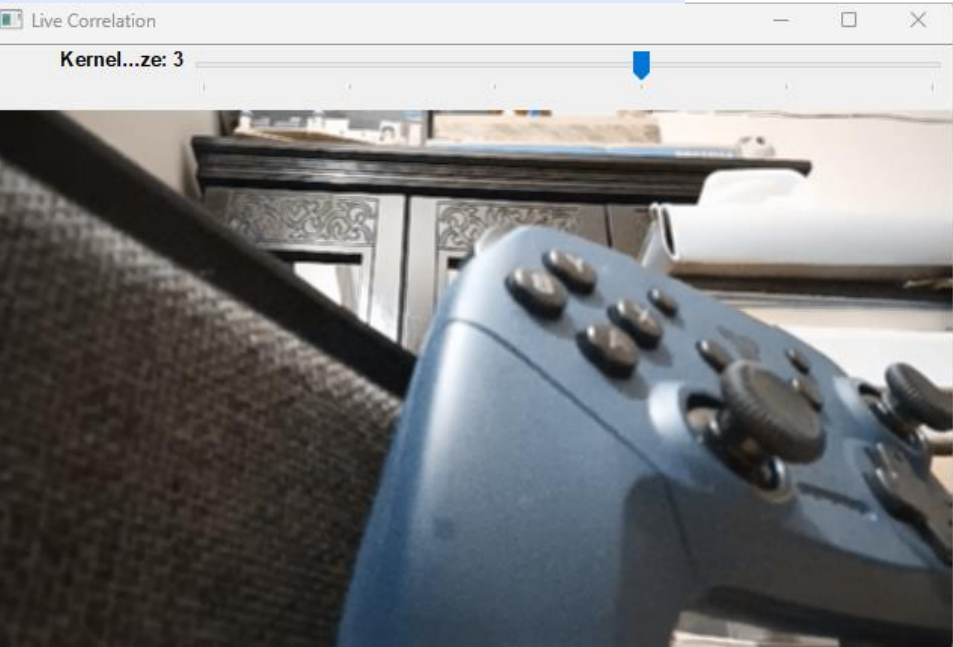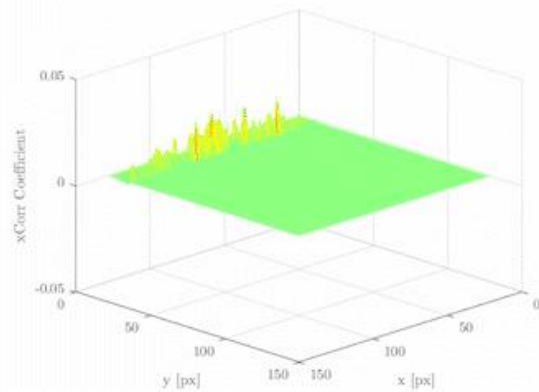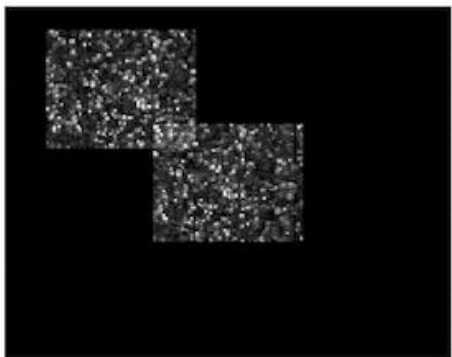
Convolution
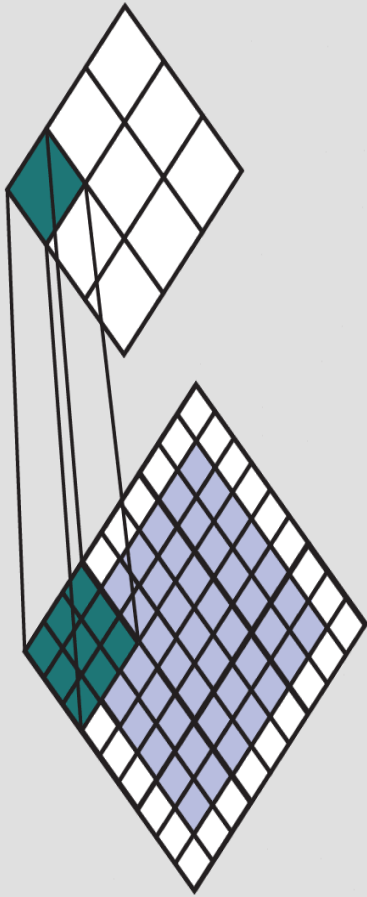
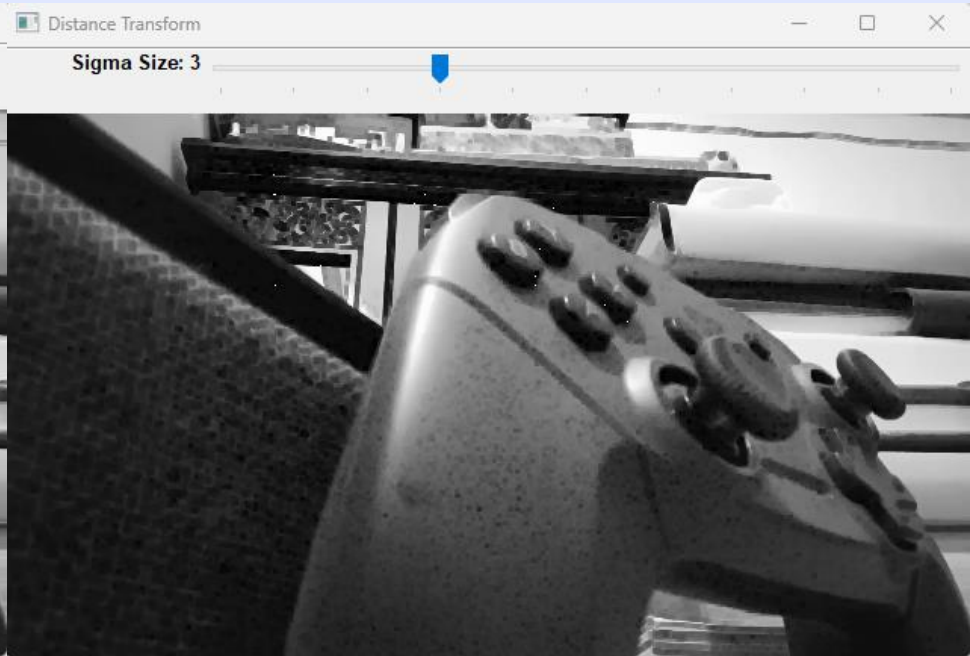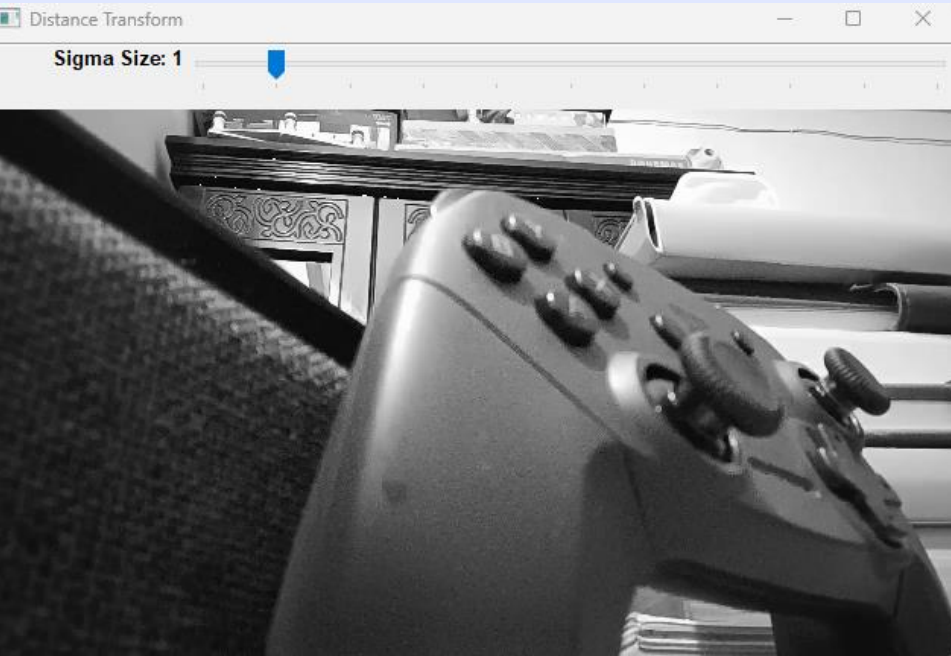Convolved frame

Geometric Transformation

Applying Gaussian Filter in Live Video Frame

Dilation
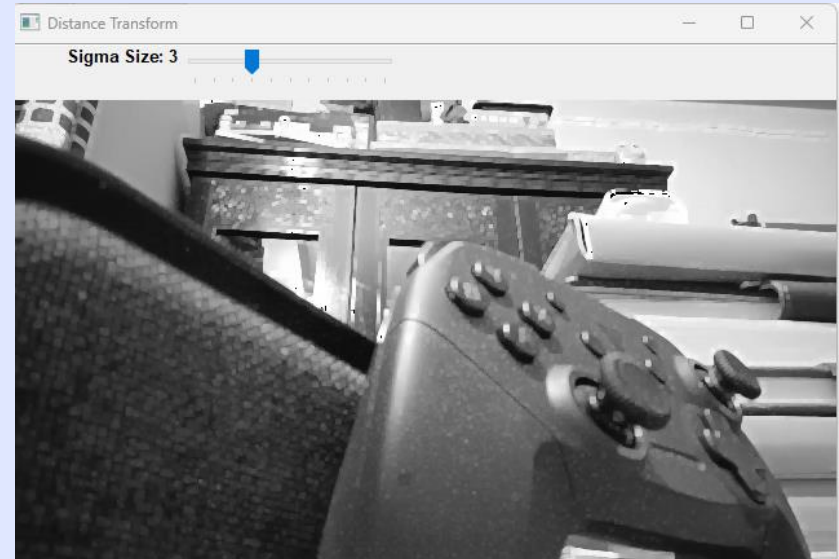
Grey Erosion

Conclusion

✅ In conclusion,
 Video processing is a dynamic and multifaceted field that plays a pivotal role in shaping the way we capture, manipulate, and interact with digital video content.

✅ Through a series of intricate steps and advanced algorithms, video processing empowers us to enhance video quality, apply captivating special effects, analyze visual data, and optimize storage and transmission efficiency.

Thanks!

Questions? Comments? Let us Know