

# Introduction to OpenCV

Abdelrahman El Sayed

Robotics Club

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# What is Computer Vision?

- Computer Vision is a field of study that enables machines to interpret and understand visual information from the world.
- It seeks to mimic the human visual system, allowing computers to make sense of images and videos.
- Computer Vision involves tasks such as image recognition, object detection, and scene understanding.

# What is OpenCV?

- OpenCV (Open Source Computer Vision) is an open-source computer vision and machine learning library.
- It provides a wide range of tools and functions for image and video analysis, as well as machine learning algorithms.

# Image Processing with OpenCV

- OpenCV allows you to perform various image processing tasks, such as:
  - Image filtering and smoothing
  - Edge detection
  - Image segmentation

Example code snippet

```
import cv2

#Read an image from file
image = cv2.imread('example.jpg')

# Apply a Gaussian blur
blurred_image = cv2.GaussianBlur(image, (5, 5), 0)
```

# Applications of OpenCV

- OpenCV is widely used in various computer vision applications, including:
  - Object detection and recognition
  - Facial recognition
  - Image stitching
  - Augmented reality

# HSV

- The HSV (Hue, Saturation, Value) color space is often used in image processing for better color representation.
- The `cv2.cvtColor` function is used to convert an image from one color space to another, such as converting from BGR to HSV.



# Creating Masks using `inRange`

- Masks are binary images that highlight specific regions of interest in an image.
- The `cv2.inRange` function is used to create a binary mask by specifying lower and upper bounds for pixel intensities.

# Moments in Image Analysis

- Moments are statistical measures that provide information about the distribution of pixel intensities in an image.
- The `cv2.moments` function is used to calculate moments, which can be used to find properties like the centroid of an object in an image.

# Drawing Arrowed Line in OpenCV

- The `cv2.arrowedLine` function is used to draw an arrowed line on an image.
- It is often used to visualize information such as the direction from a starting point to an ending point.

# Conclusion

- OpenCV is a powerful library for computer vision and image processing.
- It is widely used in both academia and industry for a variety of applications.
- The open-source nature of OpenCV makes it a valuable resource for researchers and developers.

# Workshop Agenda

Today's workshop will cover the following topics:

## ① Connecting web Camera Module:

- Demonstrating how to connect and set up the camera module.
- Writing Python scripts to capture images and videos.

## ② Building a Line-Follower Car with OpenCV:

- Introduction to the concept of a line-follower car.
- Using OpenCV for color detection and image processing.
- Writing Python code to control the car based on color information.

# Questions?

# Any Questions?