Roadmap

Week 1 — Absolute Foundations

Goal: Learn how images, video streams, and colors work in OpenCV, and confidently perform basic image manipulation.

Day 1: Understanding the basics

- Be able to capture video from a camera
- Understand what a frame is
- Know how pixels and arrays represent images
- Display frames in color and in grayscale

Day 2: Understanding Video Streams in OpenCV

- Understand how frames are read from a camera
- Know what ret and frame mean
- Understand how OpenCV creates live video using frames
- Clearly know why while True is mandatory

Day 3: Controlling Playback & Exiting Video

- Understand how keyboard input is captured in OpenCV
- Know what cv2.waitKey() does and what it returns
- Understand ASCII values and why keys are represented as numbers
- Understand bitwise AND (&) and why 0xFF is used
- Implement a keyboard-controlled exit from a video loop

Day 4: Images as NumPy Arrays

- Understand images as NumPy arrays in OpenCV
- Read and display images using OpenCV
- Understand image shape, channels, and pixel values
- Differentiate between grayscale and color images

Day 5: Drawing on Images with OpenCV

- Draw **lines, rectangles, circles, and text** on images
- Control **color, thickness, and position** of drawings
- Modify an image array directly

Day 6: Image Resizing, Cropping, and Copying

- Resize images using OpenCV
- Crop images using array slicing
- Copy and modify image regions
- Understand how image dimensions change after resizing and cropping

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Day 7: Image Color Spaces

- Understand what a color space is
- Know the difference between BGR, Grayscale, and HSV
- Convert images between color spaces using OpenCV
- Understand when and why different color spaces are used

◇ Week 2

Day 8: Color Detection using HSV

- Detect a specific color in an image
- Use HSV ranges to isolate colors
- Create and apply masks
- Understand how color-based segmentation works

Day 9: Trackbars for real-time HSV tuning

- Create trackbars in OpenCV
- Adjust HSV values in real time
- Tune color detection interactively
- Understand how real-time parameter control works

Day 10: Color Detection in Live Video

- Capture live video from a webcam
- Apply HSV-based color detection on video frames
- Combine trackbars + video feed
- Perform real-time color segmentation

Day 11: Noise Removal & Morphological Operations

- Understand what **noise** is in images and masks
- Clean binary masks using **morphological operations**
- Use **erosion, dilation, opening, and closing**
- Improve color detection results

Day 12: Contour Detection

- Understand what contours are
- Detect contours from a binary image
- Filter contours by area
- Draw bounding boxes around detected objects

Day 13: Object Tracking Basics

- Track a colored object across video frames
- Use contours to find object position
- Identify the **largest object** of a given color
- Draw tracking visuals (center point, path)

Day 14: Polishing the Color-Based Object Tracker

- Make the tracker **more stable**
- Reduce jitter and sudden jumps
- Visualize motion clearly
- Improve usability and presentation

◇ Week 3

Day 15: Polishing the Color-Based Object Tracker

- Make the tracker **more stable**
- Reduce jitter and sudden jumps
- Visualize motion clearly
- Improve usability and presentation

Day 16: Background Subtraction & Motion-Based Tracking

- Understand motion detection vs color-based detection
- Learn how background subtraction works conceptually
- Detect moving objects without HSV
- Know when background subtraction is the right tool

Day 17:

Day 18:

Day 19:

Day 20:

Day 21:

◇ Week 4

Day 22:

Day 23:

Day 24:

Day 25:

Day 26:

Day 27:

Day 28:

Day 29:

Day 30: