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# Main OpenCV Functions in Python

## Introduction

OpenCV (Open Source Computer Vision Library) is a powerful tool for image and video processing. It provides a wide range of functions for reading, manipulating, analyzing, and saving visual data.

## Key Functionalities

* 1. Image I/O: Load and save images using cv.imread() and cv.imwrite().
* 2. Color Conversion: Convert between color spaces (BGR, RGB, Grayscale).
* 3. Resizing and Rotation: Resize, translate, and rotate images.
* 4. Filtering: Apply blurring, Gaussian, median, and bilateral filters.
* 5. Thresholding: Binary, Otsu, and adaptive thresholding to segment images.
* 6. Edge Detection: Use Canny edge detector to find edges.
* 7. Morphological Operations: Perform erosion, dilation, opening, and closing.
* 8. Contour Detection: Find and draw object boundaries.
* 9. Drawing Shapes: Add rectangles, circles, lines, and text.
* 10. Histogram Equalization: Enhance image contrast.
* 11. Template Matching: Detect patterns or smaller images inside a larger one.
* 12. Hough Transform: Detect straight lines and circles.
* 13. Video Processing: Read and write video frames with cv.VideoCapture and cv.VideoWriter.

## Example Workflow

1. Load an image using cv.imread().  
2. Convert it to grayscale using cv.cvtColor().  
3. Apply Gaussian blur and detect edges using cv.Canny().  
4. Find contours and draw them on the original image.  
5. Save the final image using cv.imwrite().

## Conclusion

OpenCV simplifies many complex image processing tasks and is widely used in fields like computer vision, AI, robotics, and medical imaging. Its functions can be easily combined to perform powerful visual analyses.