Real-Time Object Detection with YOLOv3 and OpenCV

Features

- Real-time object detection with YOLOv3.
- Confidence threshold for filtering low-probability detections.
- Non-Maximum Suppression (NMS) to eliminate redundant bounding boxes.
- Dynamically displays detected object count.
- Highlights detected objects with bounding boxes and class labels.

Prerequisites

1. Python 3.x installed on your system.
2. Install the required Python libraries:
   pip install opencv-python numpy
3. Download the YOLOv3 model files:
- [YOLOv3 Weights](https://pjreddie.com/media/files/yolov3.weights)
- [YOLOv3 Config](https://github.com/pjreddie/darknet/blob/master/cfg/yolov3.cfg)
- [COCO Names](https://github.com/pjreddie/darknet/blob/master/data/coco.names)

Place these files in the same directory as the script or adjust the file paths accordingly.

Usage

1. Clone this repository to your local system:
   git clone https://github.com/<your-username>/YOLOv3-Object-Detection.git
2. Navigate to the project directory:
   cd YOLOv3-Object-Detection
3. Run the script:
   python yolov3_object_detection.py

4. The script will activate your webcam and display the video feed with detected objects.

Code Structure

- File Paths : Define paths to the YOLOv3 model files (`weights`, `cfg`, `names`).
- YOLO Initialization : Load the YOLO model using OpenCV's `cv2.dnn`.
- Webcam Feed : Capture video frames in real time.
- Preprocessing : Convert frames into YOLO-compatible blobs for detection.
- Detection Logic : Apply object detection using YOLO's forward pass and use confidence thresholds and NMS for accuracy.
- Visual Output : Draw bounding boxes and labels. Display object count dynamically.

Customization

- Adjust Confidence Threshold: Modify the confidence threshold to control detection sensitivity.
- Non-Maximum Suppression (NMS) : Fine-tune the NMS threshold for overlapping boxes.
- Use a Video File : Instead of a webcam, analyze a video file.

Example Output

Example frame showing real-time detections with bounding boxes and labels.

Troubleshooting

- Webcam Not Detected : Ensure the correct webcam index is used.
- File Paths : Verify that `yolov3.weights`, `yolov3.cfg`, and `coco.names` are in the correct locations.