Assignment Documentation

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Task Breakdown and Techniques Used to solve:-

1. **Track Objects in the Video**

   Technique: Centroid Tracker

   How: Uses Euclidean distance to match object centroids across frames.

   Alternatives:

   - Deep SORT (accurate, complex)
   - Byte Tracker (accurate, confidence-based)
   - Kalman Filter (predictive)
   - Optical Flow (pixel motion)

   Why Chosen: Simple, efficient, no DL dependency

2. **Object Detection**

   Technique: Thresholding + Contour Detection

   How: Converts to grayscale, thresholds, finds contours.

   Alternatives:

   - YOLOv5/YOLOv8 (accurate, needs pretrained weights)
   - Background Subtraction (needs static background)

   Why Chosen: Lightweight, fast, good for bright objects

3. **Drawing Bounding Boxes, Centroids & Trails**

   Technique: OpenCV drawing functions

   Why Chosen: Real-time, efficient

4. **Calculation of Metrics**

   Technique: Track entry frame of each object

   Alternatives: Storing to CSV, time-array mapping

   Why Chosen: Minimal and sufficient

5. **Export Video for Browser**

   Technique: OpenCV VideoWriter with H.264 ('avc1')

   Alternatives: ffmpeg, WebM encoding

   Why Chosen: Compatible with all major browsers