Motion Detection

Using Python and OpenCV

Problem Statement

- To detect the changes in a given video stream in order to estimate motion of any object including humans.

Assumption

1. The background of our video stream is largely static and unchanging over consecutive frames of a video.
2. Therefore, if we can model the background, we monitor it for substantial changes.
3. If there is a substantial change, we can detect it — this change normally corresponds to motion on our video.
4. The first frame of our video file will contain no motion and just background — therefore, we can model the background of our video stream using only the first frame of the video.

Approach

1. Resize the frames (keeping the aspect ratio) to width: 500px and convert to grayscale so that the processing is less memory intensive.
2. Apply Gaussian smoothing to remove tiny variations and smooth out high frequency noise due to the digital camera sensor errors.
3. Extract the 1st frame of the video for the reference frame for the motion detection algorithm.
4. Compute the difference (absolute subtraction) between the initial frame and subsequent new frames from the video stream. Regions having significant motion will have a higher value.
5. Put a Threshold and segment out the region of interest.

Approach: Continued

1. On the thresholded image, apply contour detection to find the outlines. Apply morphological opening and closing to discard very small contours and retain larger segments where the motion is actually happening.
2. Create a bounding box around the region to identify the action of motion in the image.