ASSIGNMENT 3 REPORT

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1. **Implemented Solutions**
   - The program is first applied background modelling and subtraction methods for detection of moving pixels.
   - Filtering of the detected moving pixels to remove noise by utilizing morphological operators and connected component analysis.
   - Label separate moving objects after filtering by applying connected component analysis.
   - Color code objects which is labelled.
2. **Observations and Findings**
   - I experimented both background modelling subtraction methods : mixture of Gaussians (MOG) and K-Nearest Neighbors (KNN) (with default parameters and no shadow detection). Compared to MOG, KNN gave better result with less noisy detection and object detection is more accurate.
   - Together with morphological operators (opening) in order to reduce noise, there is an additional step to analyse connected components if the area of the connected components is less than a threshold (25), it is considered noise and filled with background color. This step is a perfect way to reduce noise with almost noise in the video frame is removed. However, there are still some disadvantages, if an object is small, it will be removed by that step or if an area of noise is large, it will be detected as an object and not removed.
   - The moving objects are labelled using connectedComponents function in opencv. If pixels in the video frame has the same label they will give a distinct color to separate from others. However, the color of each object is changed if there are many objects in the video frame and two objects which are close or collide will have the same color.
3. **Conclusions**

   Background modelling and subtraction methods (KNN) has been applied in the program to detect the moving pixels in a video and it gives a good result with less noise and accurately detected objects. Connected component analysis is a good way for reducing noise, but it is not efficient if objects are small or areas of noise are large. The algorithm for connected component analysis and color code object need to be improved.