Project 3B

The Basics:

- To generate the submitted output videos: `python3 objectTracking.py -V rawVideo -O output_filename`
  - rawVideo is the path of the video input, either "Easy.mp4" or "Medium.mp4"
  - output_filename is the path of the output video that will be written to, do not add an extension
  - This code loads the pre-defined boxes that we used to generate the videos "Easy_output.avi" and "Medium_output.avi"
- To draw your own boxes: `python3 objectTracking.py -V rawVideo -O output_filename -b`
  - A window will pop up displaying the first frame of the video
  - Left-click and hold where you want the top left-corner of the box to be
  - Drag to where you want the bottom right corner of your box to be, and let go
  - Press q on your keyboard, and a window of the first frame will pop up showing the drawn boxes
  - Press q again, and the code will run

A Few Comments:

- The structure of the code was changed slightly from the assignment since it was mentioned on Piazza that this was permissible
  - There is no estimateFeatureTranslation – the code for that function was integrated into estimateAllTranslation
  - calculateError was added, which does a couple of things
    - Removes outliers based on a combination of thresholds, one of which is a scalar constant and the other which depends on the mean and standard deviation of all feature movements
    - Calculates the affine transformation between the starting features and the new features via least squares
    - Warps the image for the next iteration and calculates the error as the squared distance between pixel values of features
  - estimateAllTranslation calls calculateError at the end of each iteration for each bounding box, saves the new features if the error was decreased, and determines whether to continue iterating or to stop
  - applyGeometricTransformation applies the transformation from the bounding box last used to acquire features to that for the current frame via least squares, and it deletes a bounding box if its object has passed out of the image