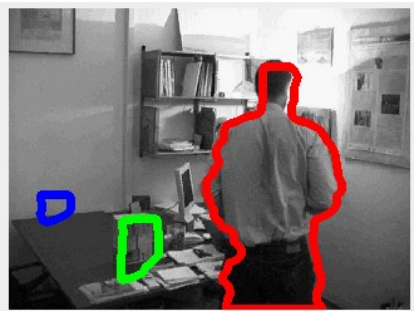
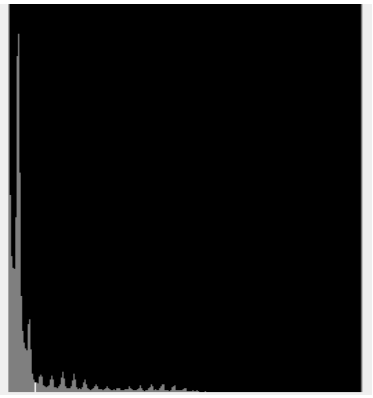
Intrusion Detection



In this task the goal was to detect movement from a video stream, and label the different objects.

Method
The general idea I implemented was to first take the average of several frames in order to get a ‘background’. This allowed me to subtract this background from each frame to get a image where everything identical to the background would be black and things not identical would have some shade of gray. After that, I would need to threshold the image so that I could exaggerate the areas of interest. Then I applied quite a lot of morphology to close the areas of interest. After that all I needed was to find the contours of the blobs and draw them in the original image. In addition to this, information about the blobs is written to a text file called change_detection.txt, with some basic information about the changes observed.



Thresholding
The most challenging and time consuming part of the project was to threshold the image in a good way. After looking at the histogram of the background-subtracted image I decided to set the threshold value at a drastic change in the histogram. In this snapshot of the histogram the threshold value is indicated by the white line. This proved to work quite well as the lighting conditions changes in the video.

Morphing
Applying morphology to the frame turned out to be somewhat of a trade-off between closing too much and blowing up the blobs, as well as morphing together different objects, and opening too much and splitting a blob into several blobs. This trade-off makes the blobs sometimes split up, and sometimes pretty weird looking.

Choices made
One choice I made was to update the background as the video goes. This made the thresholding more stable as it wasn’t so dependent of the lighting. This also makes the blobs of objects moved, like the boxes in the video, disappear when the background is updated.

Possible improvements
A possible improvement to reduce the number of false blobs detected could be to have a condition that the blobs must be detected for a certain number of frames. Another improvement could be done on the classification of the blobs, where it could be done on movement, and not just on size as I’m doing now. There is also,of course, tuning that could be done in order to improve the result, like on the thresholding value, morphology and on generating the background.