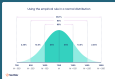


# Localization

## Derivation of Thresholds

Instead of manually selecting and testing HSI colour thresholds to mask Dutch number plates, we utilise statistics. Specifically, we calculate the mean and standard deviation for each dimension (Hue, Saturation, and intensity) based on the background colour (the orange part) of different number plates and from various angles, as the colour varies across frames in each provided video. This approach is motivated by the Law of Large Numbers.



## Applying a colour mask

In order to identify dutch license-plates, we use a colour mask, which only keeps the elements of the frame that have colours in the range specified by the estimated thresholds. Using the `inRange()` method from `opencv` was used in order for this mask to be applied. After applying the mask all the pixels in the image that have HSI values outside of the specified range are turned black, as seen in the picture.

## Identifying the plate

In order to identify and isolate the parts of the masked image that contain a plate, we first turn the masked image to a binary (black and white) image. Afterwards, we iterate through the image to find plates, using a threshold of 80 pixels in width to separate the actual plates from the noise. From this process, we derive the cropped plates and their bounding boxes, used for evaluation.



## Evaluation

For evaluation, we used intersection over union (IoU). We manually annotated the bounding boxes of the plates in all videos in the training set (One frame for each plate) and calculated the intersection over union. On average for each category(I, II, III), we get:

- Category I: 78.04%
- Category II: 89.75%
- Category III: 62.69%

