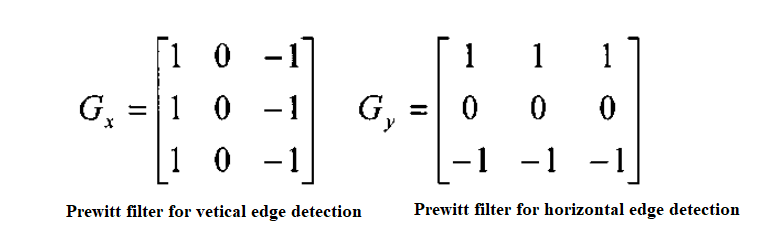
DATE HERE - info, figures, whatever afterwards, DATE EVERYTHING

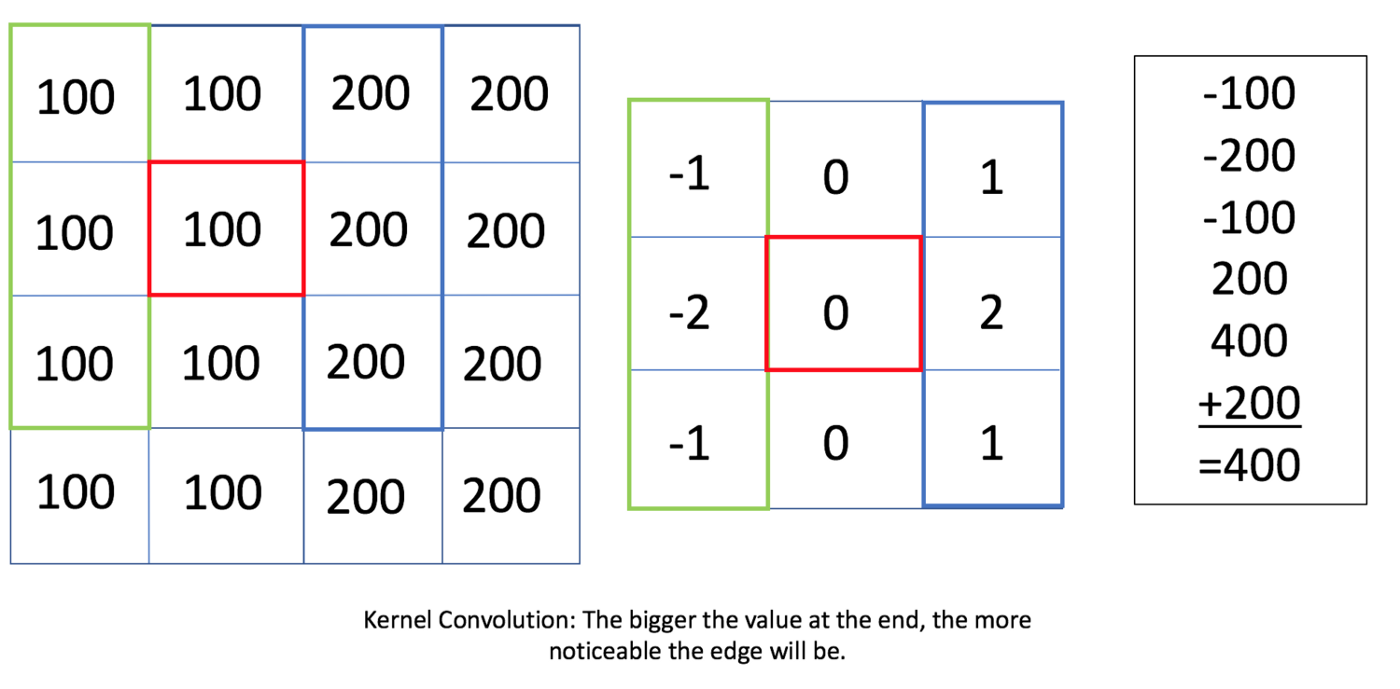
09/10/2022 – Image detection literature study

<https://www.mygreatlearning.com/blog/introduction-to-edge-detection/>

Edge detection described as: “a technique of image processing used to identify points in a digital image with discontinuities, simply to say, sharp changes in the image brightness”

There are several methods, all involving applying a filter matrix to the image at all possible points.

For all given pixels that the matrix will fit for, apply these coefficients for a given pixel, then sum the values and take this as the new value to be later normalized for the image:



This method results in the output being shrunk in dimensions, for an n\*n image and a r\*r filter the output image will be ( (n-r)+1)\*( (n-r)+1).

Canny edge detection is the most common. The process involves:

* Convert the image to grayscale
* Reduce noise – as the edge detection that using derivatives is sensitive to noise, we reduce it.
* Calculate the gradient – helps identify the edge intensity and direction.
* Non-maximum suppression – to thin the edges of the image.
* Double threshold –  to identify the strong, weak and irrelevant pixels in the images.
* Hysteresis edge tracking – helps convert the weak pixels into strong ones only if they have a strong pixel around them.

Attempt to implement a Sobel filter in MATLAB:

<https://www.geeksforgeeks.org/matlab-image-edge-detection-using-sobel-operator-from-scratch/>

**Advantages:**

1. Simple and time efficient computation *(for small images, cannot go above 720p at least for Arduino)*
2. Very easy at searching for smooth edges *(good for searching for edges of license plates)*

**Limitations:**

1. Diagonal direction points are not preserved always
2. Sensitive to noise
3. Not very accurate in edge detection
4. Detect with thick and rough edges does not give appropriate results

Overall quality detection if the threshold values are set correctly:



Main concern here is the potential overhead and memory requirements needed for this level of image processing, alongside all the extra processing surrounding finding the bounding box of the plate.