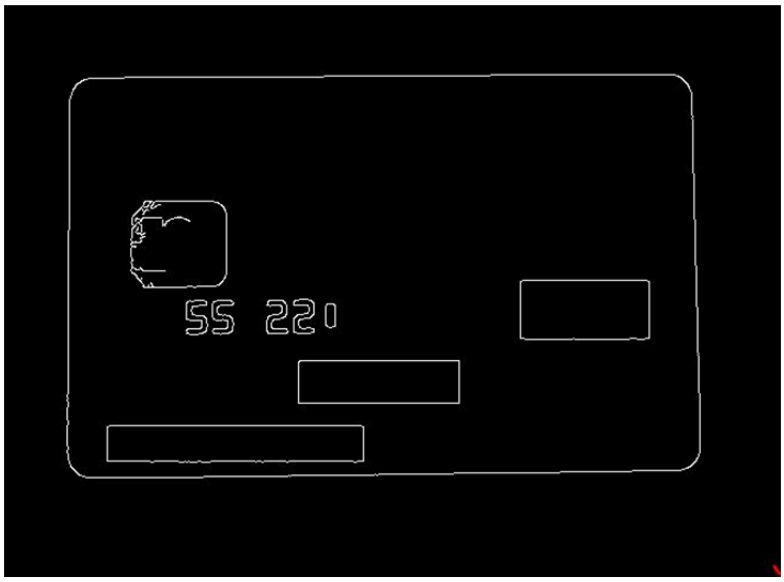
Extracting a Credit Card

NOTE: This example extracts only 12 of the 16 digits because, this is a working credit card :)

The code below does contains the functions we use to do the following:

1. It loads the image, image we're using our mobile phone camera to take this picture. (Note: ideally place the card on a contrasting background)

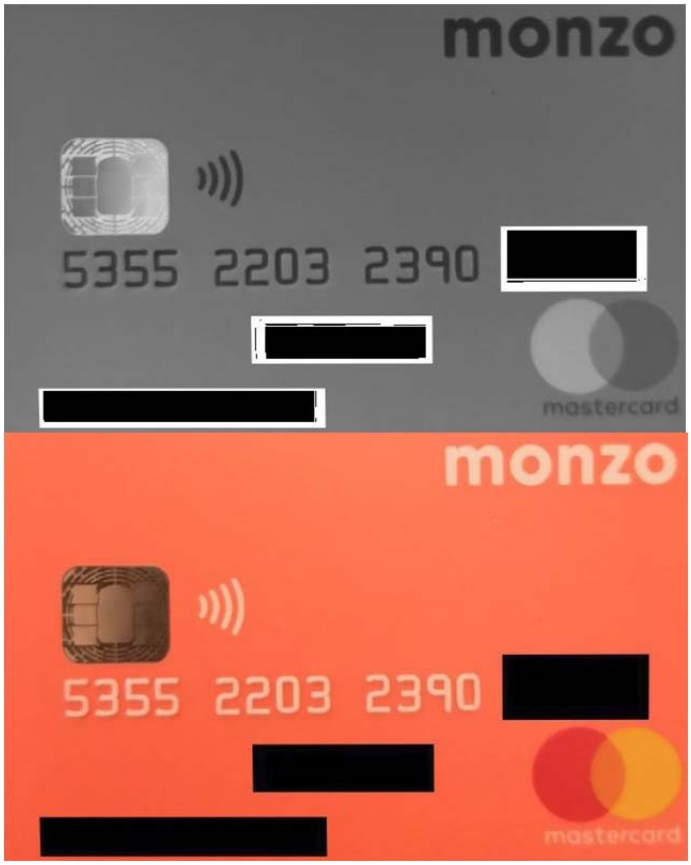
2. We use Canny Edge detection to identify the edges of card



3. We using cv2.findContours() to extract the largest contour (which we assume will be the credit card)

4. This is where we use the function **four_point_transform()** and **order_points()** to adjust the perspective of the card. It creates a top-down type view that is useful because:

- It standardizes the view of the card so that the credit card digits are always roughly in the same area.
- It removes/reduces skew and warped perspectives from the image when taken from a camera. All cameras unless taken exactly top down, will introduce some skew to text/digits. This is why scanners always produce more realistic looking images.



```python
import cv2
import numpy as np
import imutils
from skimage.filters import threshold_adaptive
import os

def order_points(pts):
    # initialize a list of coordinates that will be ordered
    # such that the first entry in the list is the top-left,
    # the second entry is the top-right, the third is the
    # bottom-right, and the fourth is the bottom-left
    rect = np.zeros((4, 2), dtype = "float32")

    # the top-left point will have the smallest sum, whereas
    # the bottom-right point will have the largest sum
    s = pts.sum(axis = 1)
    rect[0] = pts[np.argmin(s)]
    rect[2] = pts[np.argmax(s)]

    # now, compute the difference between the points, the
    # top-right point will have the smallest difference,
    # whereas the bottom-left will have the largest difference
    diff = np.diff(pts, axis = 1)
    rect[1] = pts[np.argmin(diff)]
    rect[3] = pts[np.argmax(diff)]

    # return the ordered coordinates
    return rect

def four_point_transform(image, pts):
    # obtain a consistent order of the points and unpack them
    # individually
    rect = order_points(pts)
    (tl, tr, br, bl) = rect

    # compute the width of the new image, which will be the
    # maximum distance between bottom-right and bottom-left
    # x-coordinates or the top-right and top-left x-coordinates
    widthA = np.sqrt(((br[0] - bl[0]) ** 2) + ((br[1] - bl[1]) ** 2))
    widthB = np.sqrt(((tr[0] - tl[0]) ** 2) + ((tr[1] - tl[1]) ** 2))
    maxWidth = max(int(widthA), int(widthB))

    # compute the height of the new image, which will be the
    # maximum distance between the top-right and bottom-right
    # y-coordinates or the top-left and bottom-left y-coordinates
    heightA = np.sqrt(((tr[0] - br[0]) ** 2) + ((tr[1] - br[1]) ** 2))
    heightB = np.sqrt(((tl[0] - bl[0]) ** 2) + ((tl[1] - bl[1]) ** 2))
    maxHeight = max(int(heightA), int(heightB))

    # now that we have the dimensions of the new image, construct
    # the set of destination points to obtain a "birds eye view",
    # (i.e. top-down view) of the image, again specifying points
    # in the top-left, top-right, bottom-right, and bottom-left
    # order
    dst = np.array([
        [0, 0],
        [maxWidth - 1, 0],
        [maxWidth - 1, maxHeight - 1],
        [0, maxHeight - 1]], dtype = "float32")

    # compute the perspective transform matrix and then apply it
```

```
    M = cv2.getPerspectiveTransform(rect, dst)
    warped = cv2.warpPerspective(image, M, (maxWidth, maxHeight))

    # return the warped image
    return warped

def doc_Scan(image):
    orig_height, orig_width = image.shape[:2]
    ratio = image.shape[0] / 500.0

    orig = image.copy()
    image = imutils.resize(image, height = 500)
    orig_height, orig_width = image.shape[:2]
    Original_Area = orig_height * orig_width

    # convert the image to grayscale, blur it, and find edges
    # in the image
    gray = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
    gray = cv2.GaussianBlur(gray, (5, 5), 0)
    edged = cv2.Canny(gray, 75, 200)

    cv2.imshow("Image", image)
    cv2.imshow("Edged", edged)
    cv2.waitKey(0)
    # show the original image and the edge detected image

    # find the contours in the edged image, keeping only the
    # largest ones, and initialize the screen contour
    _, contours, hierarchy  = cv2.findContours(edged.copy(), cv2.RETR_LIST, cv2.CHAIN_A
PPROX_SIMPLE)
    contours = sorted(contours, key = cv2.contourArea, reverse = True)[:5]

    # loop over the contours
    for c in contours:

        # approximate the contour
        area = cv2.contourArea(c)
        if area < (Original_Area/3):
            print("Error Image Invalid")
                    return("ERROR")
                peri = cv2.arcLength(c, True)
                approx = cv2.approxPolyDP(c, 0.02 * peri, True)

                # if our approximated contour has four points, then we
                # can assume that we have found our screen
                if len(approx) == 4:
                    screenCnt = approx
                    break

            # show the contour (outline) of the piece of paper
            cv2.drawContours(image, [screenCnt], -1, (0, 255, 0), 2)
            cv2.imshow("Outline", image)

            warped = four_point_transform(orig, screenCnt.reshape(4, 2) * ratio)
            # convert the warped image to grayscale, then threshold it
            # to give it that 'black and white' paper effect
            cv2.resize(warped, (640,403), interpolation = cv2.INTER_AREA)
            cv2.imwrite("credit_card_color.jpg", warped)
            warped = cv2.cvtColor(warped, cv2.COLOR_BGR2GRAY)
            warped = warped.astype("uint8") * 255
            cv2.imshow("Extracted Credit Card", warped)
```

```
            cv2.waitKey(0)
            cv2.destroyAllWindows()
            return warped
```

We now need to extract the credit card number region. If you looked at the code in the above example we are always re-sizing our extracted credit card image to a size of 640 x 403. The odd choice of 403 was chosen because 640:403 is the actual ratio of a credit card. We are trying to maintain as accurate as possible the length and width dimensions so that we don't necessarily warp the image too much.

NOTE: I know we're re-sizing all extracted digits to 32 x 32, but even still keeping the initial ratio correct will only help our classifier accuracy.

As such, because of the fixed size, we can now extract the region ([(55, 210), (640, 290)]) easily from our image.

```
image = cv2.imread('test_card.jpg')
image = doc_Scan(image)

region = [(55, 210), (640, 290)]

top_left_y = region[0][1]
bottom_right_y = region[1][1]
top_left_x = region[0][0]
bottom_right_x = region[1][0]

# Extracting the area were the credit numbers are located
roi = image[top_left_y:bottom_right_y, top_left_x:bottom_right_x]
cv2.imshow("Region", roi)
cv2.imwrite("credit_card_extracted_digits.jpg", roi)
cv2.waitKey(0)
cv2.destroyAllWindows()
```

This is what our extracted region looks like.

In the next section, we're going to using some OpenCV techniques to extract each digit and pass it to our classifier for identification.