Diego Alonso Martinez de Dios A01228042

Lab # 1 Camera Calibration
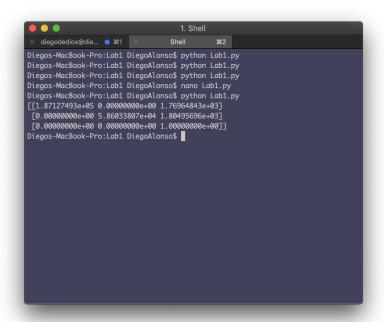
Important information and data:

The code used for the claibration was taken from

https://docs.opencv.org/master/dc/dbb/tutorial_py_calibration.html

Code:

```
import numpy as np
import cv2 as cv
import glob
# termination criteria
criteria = (cv.TERM_CRITERIA_EPS + cv.TERM_CRITERIA_MAX_ITER, 30, 0.001)
# prepare object points, like (0,0,0), (1,0,0), (2,0,0) ....,(6,5,0)
objp = np.zeros((6*9,3), np.float32)
objp[:,:2] = np.mgrid[0:9,0:6].T.reshape(-1,2)
# Arrays to store object points and image points from all the images.
objpoints = [] # 3d point in real world space
imgpoints = [] # 2d points in image plane.
images = glob.glob('*.jpg')
for fname in images:
    img = cv.imread(fname)
    gray = cv.cvtColor(img, cv.COLOR_BGR2GRAY)
    # Find the chess board corners
    ret, corners = cv.findChessboardCorners(gray, (6,9), None)
    # If found, add object points, image points (after refining them)
    if ret == True:
        objpoints.append(objp)
        corners2 = cv.cornerSubPix(gray,corners, (11,11), (-1,-1), criteria)
        imgpoints.append(corners)
        # Draw and display the corners
        cv.drawChessboardCorners(img, (6,9), corners2, ret)
        cv.imshow('img', img)
ret, mtx, dist, rvecs, tvecs = cv.calibrateCamera(objpoints, imgpoints, gray.shape[::-1], None, None)
print(mtx)
```

Camera specifications:

      Cellphone Samsung Galaxy S8 rear camera

      12 Megapixel f/1.7 with autofocus

      Image resolution: 4032x1960

With the camera 20 pictures were taken for the camera calibration and then by using the opencv function cv.calibrateCamera() I got the Camera matrix as the output:

Thus:

$$fx = 1.87127493e+05$$
$$fy = 5.86033807e+04$$
$$cx = 1.76964843e+03$$
$$cy = 1.80495696e+03$$