

ENPM673
PERCEPTION FOR AUTONOMOUS ROBOTS

PROJECT 1

SUBMITTED BY
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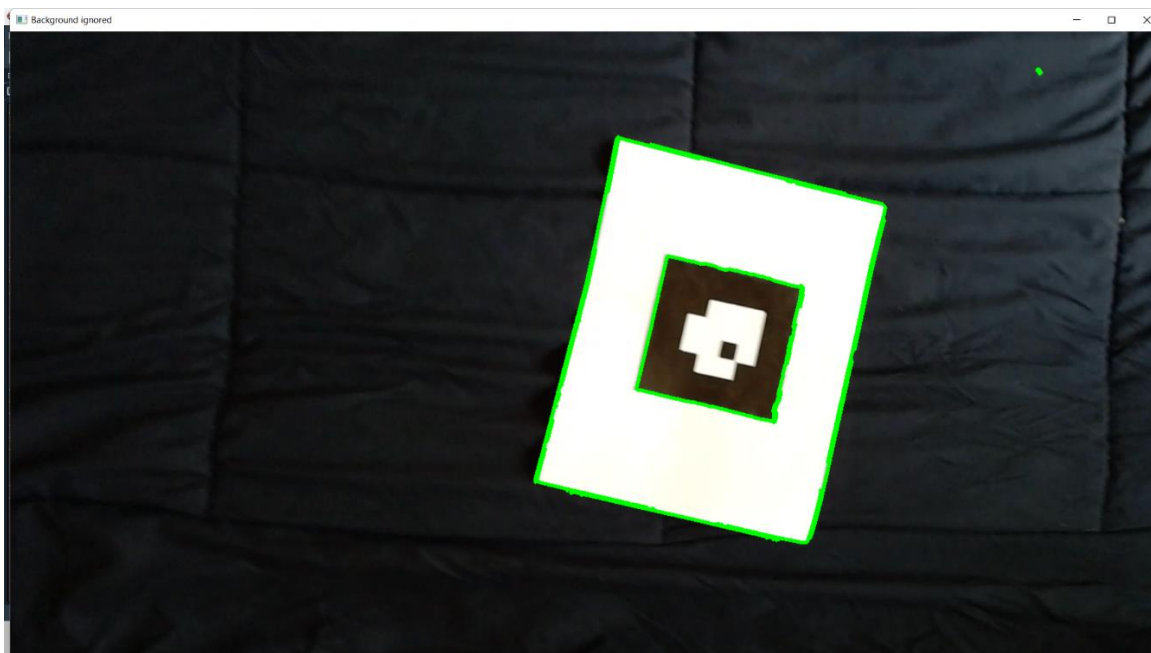
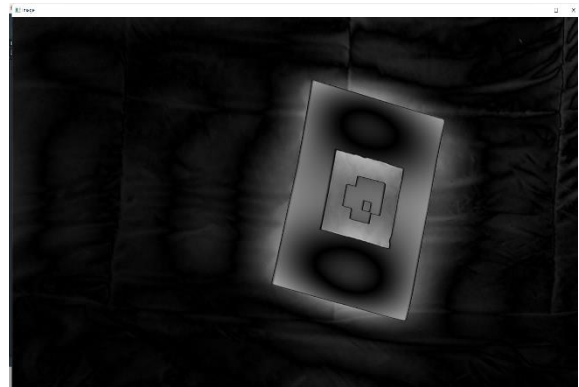
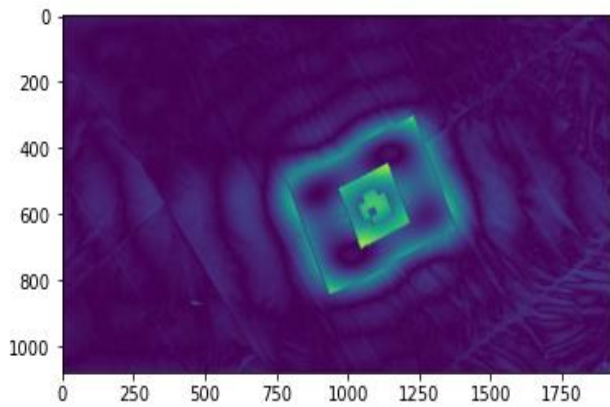
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1. DETECTION

a. AR Code detection

Fast Fourier Transformation is used to filter out high frequency pixels with high intensity gradient. Then, that image is ran with canny edge detection to detect the contour.



b. Decode custom AR tag

According the encoding scheme of AR tags, a reference image has been taken and its orientation and data bits are shown here.



2. TRACKING

a. Superimposing image onto Tag

By putting limits on the contour area after canny edge detection, the corners of the AR tag are found. The AR tags in each frame of the video are re-oriented to a standard tag dimension. Homography between these two corner points lead to superimposed image of testudo on the AR tag.

https://youtu.be/kEFWRcrKp_g

b. Placing a virtual cube onto Tag

Similarly, a 3D cube is developed then projected with the given intrinsic values and placed on the AR tag.

<https://youtu.be/S08xDbqvlZ0>

3. DexiNed AND CANNY COMPARISON

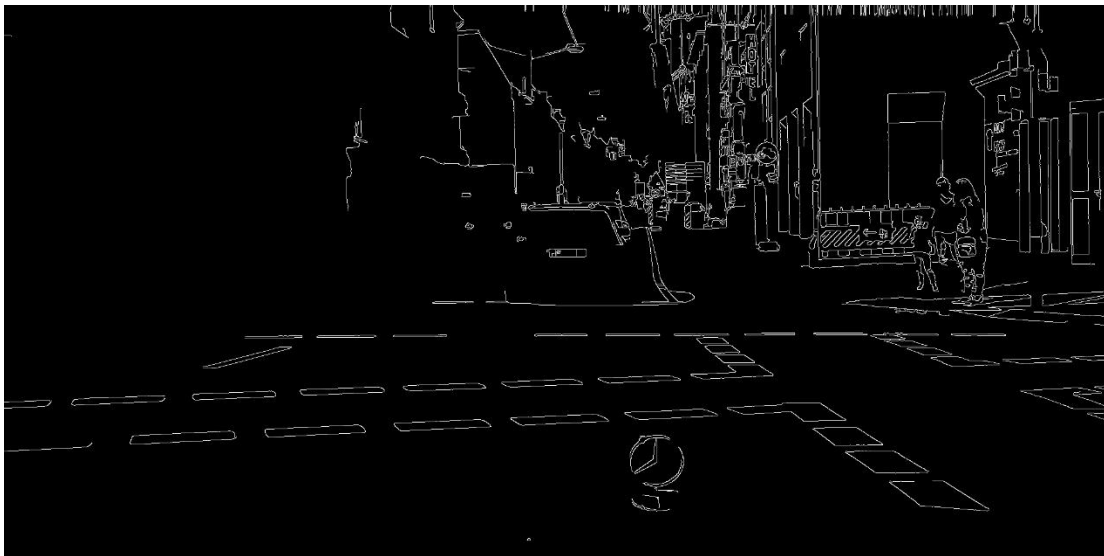
Canny Edge Detection:

Canny Edge Detection is a traditional method which blurs the given image to avoid weak edges and then use kernel window with lower and upper threshold limits to detect edges. It does not have any semantics while detecting.

Canny with zero threshold limits



Canny with threshold limits (50,300)



DexiNed Edge Detection:

DexiNed Edge Detection is a holistic and semantic method that has been trained with multiple datasets and use the information and weights to compute multiple layers of edge detected image. Later, it can all be fused or averaged.

Dataset used : BIPED (Barcelona Images for Perpetual Edge Detection)

The mean image of the outputs from different layers is shown below:



The fused image from different layers of DexiNed network is shown below:



Comparison between Canny Edge Detection and DexiNed Edge Detection:

The output images from Canny Edge Detection makes it difficult to figure out the edges and it gives equal importance to everything on the image. Whereas DexiNed gives importance to the certain aspects of the image by deep learning techniques.