ME6406 HW2 Report

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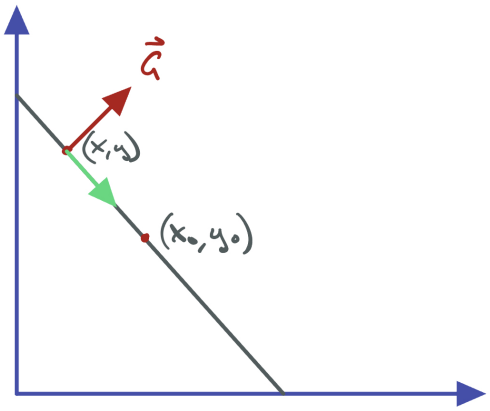
1 Hough Transform

1.a



$eq1: \ y = ax + b;$
$eq2: \ y_0 = ax_0 + b$

$eq1 - eq2 \rightarrow y - y_0 = a(x - x_0) = a = \frac{y-y_0}{x-x_0} = \frac{-g_x}{g_y} = \frac{-x_0}{y_0}$

$\frac{y-y_0}{x-x_0} = \frac{-x_0}{y_0} \rightarrow x_0(x - x_0) + y_0(y - y_0) = 0$

For $y_0 = \frac{g_y x_0}{g_x}$; $x_0(x - x_0) + \frac{g_y x_0}{g_x}(y - \frac{g_y x_0}{g_x}) = 0$

Multiply by gx^2,

$x_0 g_x^2(x - x_0) + g_y x_0(yg_x - g_y x_0) = 0 \rightarrow x_0 x g_x^2 - g_x^2 x_0 + x_0 y g_y g_x - x_0^2 g_y^2 = 0 \rightarrow x_0 g_x(xg_x + yg_y) = x_o^2(g_x^2 + g_y^2)$

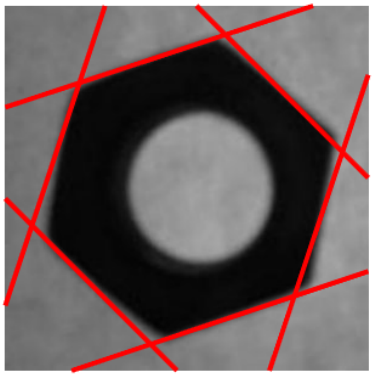
$\frac{x_0^2}{x_0 g_x} = \frac{xg_x + yg_y}{g_x^2 + g_y^2} \rightarrow x_0 = g_x \frac{xg_x + yg_y}{g_x^2 + g_y^2}$

Since $x_0 = \frac{y_0 g_x}{g_y}$, $y_0 = g_y \frac{xg_x + yg_y}{g_x^2 + g_y^2}$

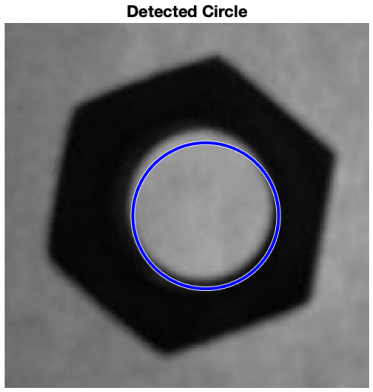
Set $v = \frac{xg_x + yg_y}{g_x^2 + g_y^2}$

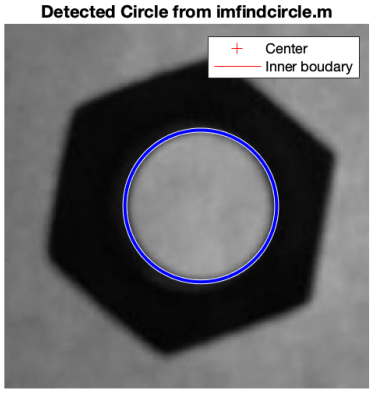
$\therefore \begin{bmatrix} x_0 \\ y_0 \end{bmatrix} = v \begin{bmatrix} g_x \\ g_y \end{bmatrix}$

1.b



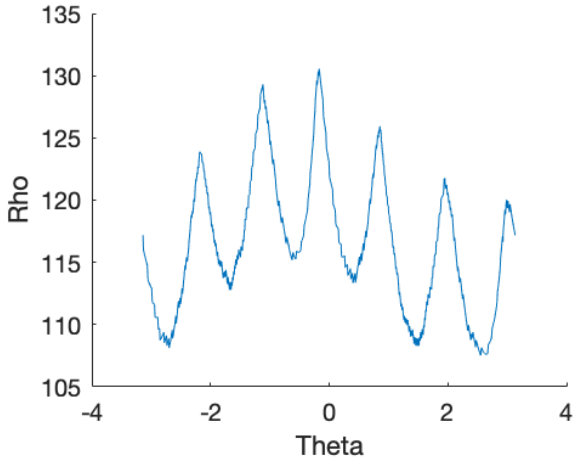
1.c

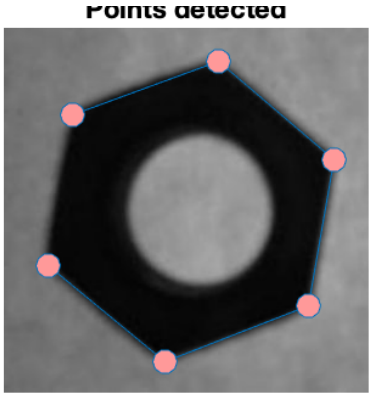

Detected Circle


Detected Circle from imfindcircle.m
Center
Inner boudary

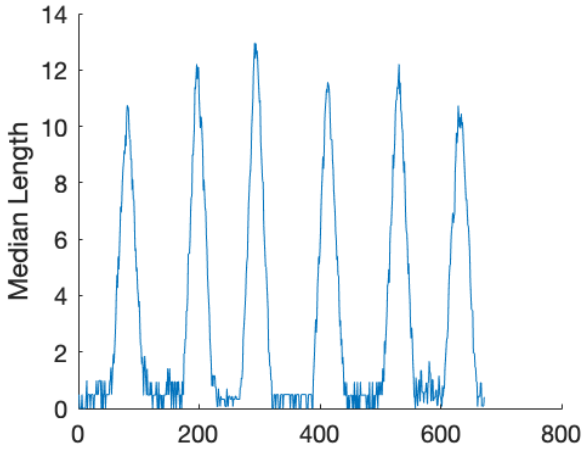
2 Feature Points Detection

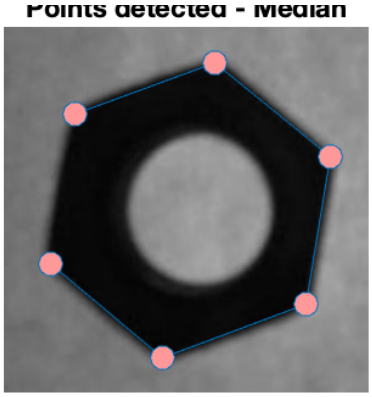
2.a



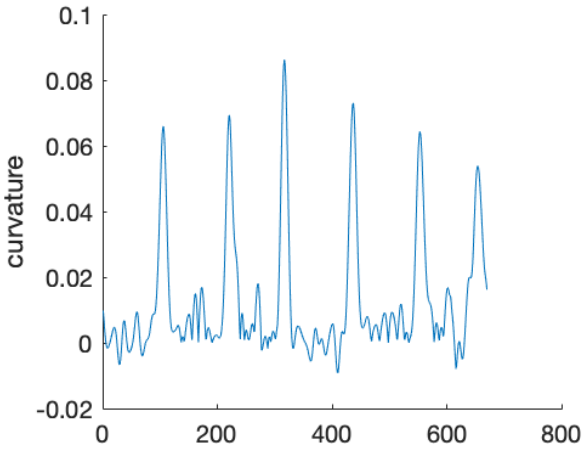


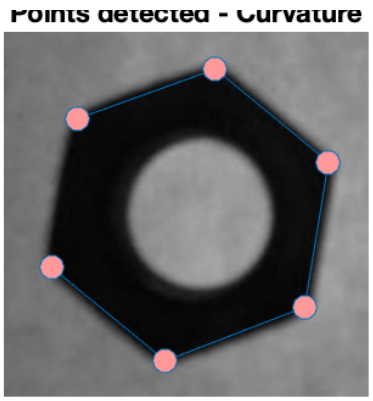
2.b





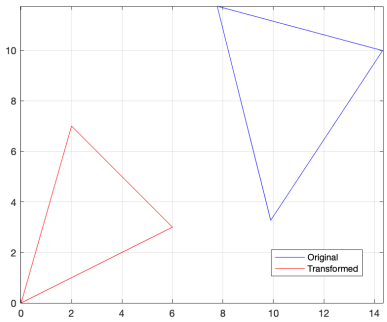
2.c





3. Tempate Matching

3.a



3.b

kd = 1.2

theta = 0.5236 rad = 30^o

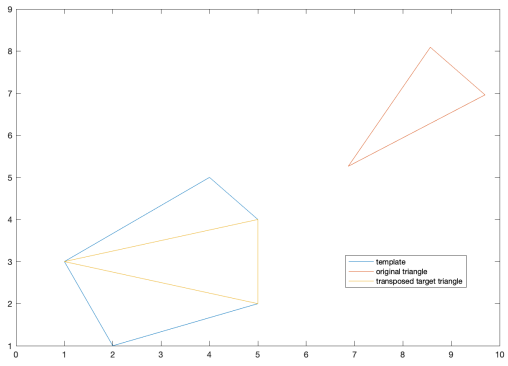
xd = 8

yd = 5

These parameters match Table 1.

3.c

The match points are 2,3,5.


template
original triangle
transposed target triangle