CSE 5525 HW6

Problem 1

Shape, square

Description automatically generated

The distance image is all white because each value for each box is very similar (around 22 – 23).

The upper left index of the best match box is (120,131) and here is the tracking part.

A picture containing graphical user interface

Description automatically generated

%% Problem 1

modelCovMatrix = [47.917 0 -146.636 -141.572 -123.269;

0 408.250 68.487 69.828 53.479;

-146.636 68.487 2654.285 2621.672 2440.381;

-141.572 69.828 2621.672 2597.818 2435.368;

-123.269 53.479 2440.381 2435.368 2404.923];

target = im2double(imread('target.jpg'));

%%

% construct the candandidate covariance matrix

[r,c,co] = size(target);

mu = zeros(5,1);

% compute the mean

for y = 1:r

for x = 1:c

fk = [x,y,target(y,x,1),target(y,x,2),target(y,x,3)]';

mu = mu + fk;

end

end

mu = mu/(r\*c);

%%

M = zeros(r,c,5); % each entry in M is fk-mu

for y = 1:r

for x = 1:c

fk = [x,y,target(y,x,1),target(y,x,2),target(y,x,3)]';

M(y,x,:) = fk-mu;

end

end

candidate = zeros(171,297,5,5);

for i = 1:171

for j = 1:297

C2 = zeros(5,5);

for x = i:i+69

for y = j:j+23

C2 = C2+ reshape(M(x,y,:),[5,1])\*reshape(M(x,y,:),[1,5]);

end

end

C2 = C2/(70\*24);

candidate(i,j,:,:) = C2;

end

end

ros = zeros(171,297);

for i = 1:171

for j = 1:297

C2 = reshape(candidate(i,j,:,:),[5,5]);

ros(i,j) = rol(modelCovMatrix,C2);

end

end

min = min(min(ros));

[x,y] = find(ros == min);

%%

imagesc(target(120:120+23,131:131+69,:));

%% helper functions

% compute the rol value for each box

% C1 is the model; C2 is the candidate

function result = rol(C1,C2)

result = 0;

lambda = eig(C1,C2);

for i = 1:size(lambda)

result = result + (log(lambda(i)))^2;

end

result = sqrt(result);

end

Problem 2

function [X] = circularNeighbors(img, x, y, radius)

K = (floor(y+radius)-ceil(y-radius))\*(floor(y+radius)-ceil(x-radius));

for i = 1:K

for r = ceil(y-radius):floor(y+radius)

for c = ceil(x-radius):floor(y+radius)

X(i,:) = [c,r,img(c,r,1),img(c,r,2),img(c,r,3)];

end

end

end

end