Imperial College London

COMP70058 Computer Vision

Tutorial 4 - Image Sequence Processing

Sample Answers

Getting Started with Corner Detection in MATLAB

```
% YOUR TASK: implement the Harris corner detector

I = imread('cameraman.tif');
I = im2single(I);

%Create a gaussian filter
filterSize=5;
sigma = filterSize / 3;
filter2D = fspecial('gaussian', filterSize, sigma);

% Estimate the image gradients
I_x = imfilter(I,[-1 0 1] ,'replicate','same','conv');
I_y = imfilter(I,[-1 0 1]','replicate','same','conv');

% Crop the valid gradients
I_x = I_x(2:end-1,2:end-1);
I_y = I_y(2:end-1,2:end-1);

% Compute the derivatives which will be used to compute the corner metric
and filter them
I_xy = I_x .* I_y;
I_x2 = I_x .* I_x;
I_y2 = I_y .* I_y;
I_x2 = imfilter(I_x2,filter2D,'replicate','full','conv');
I_y2 = imfilter(I_y2,filter2D,'replicate','full','conv');
I_xy = imfilter(I_xy,filter2D,'replicate','full','conv');

% Estimate the corner metric
k = 0.04;
metric = (I_x2 .* I_y2) - (I_xy .^ 2) - k * ( I_x2 + I_y2 ) .^ 2;

% Find the corner locations
quality=0.01;
maxMetric = max(metric(:));
bw = imregionalmax(metric, 8);
threshold = quality * maxMetric;
bw(metric < threshold) = 0;
[loc_r loc_c]=find(bw);
loc=[loc_c loc_r];
% Plot the corner points on the image
figure; imshow(I)
hold on
plot(loc(:, 1),loc(:, 2),'*')
```

Extract feature descriptors in MATLAB

```
%Extract feature descriptors for the detected corner points:
[features, valid_points] = extractFeatures(I, loc);
```

Extract interest point descriptors and match features in MATLAB

```
%Read a pair of images captured with a stereo camera:
I1 = imread('viprectification_deskLeft.png');
I2 = imread('viprectification_deskRight.png');

%Extract corner points from the above images:
[features1, valid_points1] = extractFeatures(I1, points1);
[features2, valid_points2] = extractFeatures(I2, points2);

%Match the detected features:
indexPairs = matchFeatures(features1, features2);
matchedPoints1 = valid_points1(indexPairs(:, 1), :);
matchedPoints2 = valid_points2(indexPairs(:, 2), :);


%Visualize corresponding points:
figure; showMatchedFeatures(I1, I2, matchedPoints1, matchedPoints2);
```