

MATLAB Coding Exercise 6

Local feature detection

There are several ways detecting local interest points, for instance, Harris, Surf, and SIFT. Here we investigate two types: Harris and Surf. They are implemented by the MATLAB command Local interest point detection is implemented by the MATLAB command `detectHarrisFeatures` and `detectSURFFeatures`. Each of these functions requires the input of a gray image. If your image is a color image, you should first convert it using the `rgb2gray` function.

Given the cameraman image, we could detect its Harris and Surf interest points as follows:

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

```
harrisFeatures = detectHarrisFeatures(I);
```

```
surfFeatures = detectSURFFeatures(I);
```

The outputs `harrisFeatures` and `surfFeatures` give the location of the interest points. Next, we extract feature descriptor at each interest point using the MATLAB command `extractFeatures` which takes the input of both the image `I` and the interest point `harrisFeatures` / `surfFeatures`:

```
[features1, valid_points1] = extractFeatures(I,harrisFeatures);
```

```
[features2, valid_points2] = extractFeatures(I,surfFeatures);
```

It outputs both the feature descriptors and valid point locations. The `valid_points` may contain fewer points than input points as some interest points (e.g. lying on the boundary of the image) may not be considered. Let's generate an image with 2 subplots showing the results of Harris and SURF features:

```
subplot(1,2,1)
```

```
imshow(I); hold on
```

```
plot(valid_points1);
```

```
subplot(1,2,2)
```

```
imshow(I); hold on
```

```
plot(valid_points2.selectStrongest(100),'showOrientation',true);
```

The SURF interest point detector normally finds more interest points than the Harris detector, we therefore choose to show the top 100 strongest points in the SURF image, `valid_points2.selectStrongest(100)`. You may also control the number of interest

points detected via the threshold set within the `detectSURFFeatures` function. Notice the `extractFeatures` function provides different ways to extract feature descriptors in its instructions; for instance you may choose to extract the SIFT features on top of the Harris points, etc. You may investigate these combinations yourselves to find the best choices in practice.

For the above cameraman image example, you should end-up with an image like this:



where the left image shows the Harris detection and the right the SURF detection. The circle in the SURF detection represents the feature scale which has an area proportional to MSER ellipse area. The orientation of the feature is also showed within each circle.

EXERCISE:

Repeat the above using the indoor.jpg image from the module's KEATS webpage.