

## Ubung: SIFT detector

This document explains the classes and script developed in order to complete/achive the SIFT keypoint detection algorithm successfully. The submission consists of four scripts

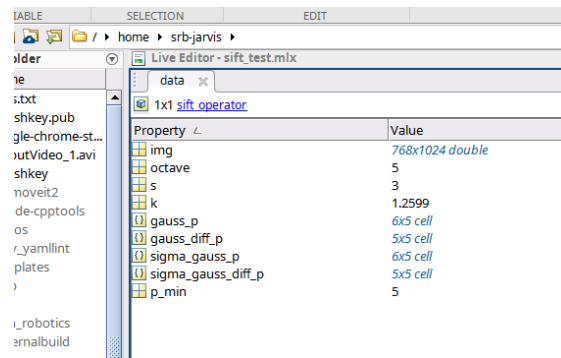
1. Sift\_test
2. Sift\_operaoat
3. Sift\_keypoints
4. Sift\_Orientation

It consists of following matlab scripts, brief description of these function as follow

Sift\_test:

### 1. Step1:

- read the input image and generate the raw data using sift\_operator – a user defied function for the next step.
- A variable named 'data' is being generated, contacting the pyramid of Gaussian, Difference of Gaussian and corresponding sigma values.
- Data structure of variable as follow:

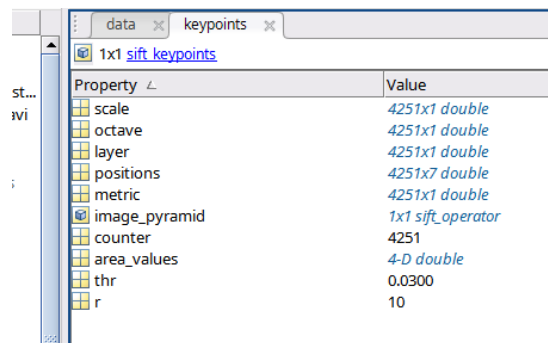


The screenshot shows the MATLAB Live Editor interface. On the left, a file explorer lists various files. The main window displays the 'data' variable structure, which is a 1x1 cell array containing the output of the 'sift\_operator' function. The structure is as follows:

Property	Value
img	768x1024 double
octave	5
s	3
k	1.2599
gauss_p	6x5 cell
gauss_diff_p	5x5 cell
sigma_gauss_p	6x5 cell
sigma_gauss_diff_p	5x5 cell
p_min	5

### 2. Step2:

- Keypoint detection- A user defined function sift\_keypoint is used to detect the keypoints by processing the data generated in the previous step.
- Data structure of keypoints as follow:



The screenshot shows the MATLAB Live Editor interface with two tabs: 'data' and 'keypoints'. The 'keypoints' tab is active, displaying the output of the 'sift\_keypoint' function. The structure is as follows:

Property	Value
scale	4251x1 double
octave	4251x1 double
layer	4251x1 double
positions	4251x7 double
metric	4251x7 double
image_pyramid	1x1 sift_operator
counter	4251
area_values	4-D double
thr	0.0300
r	10

3. Step2:

- Orientation histogram- In this step, the gradient and orientation is computed by using as kernel of size 16x16 around the point of interest and orientation data is being plotted as orientation histogram
- Based on the maxima of histogram the keypoint orientation is determined.

Live Editor - sift\_test.mlx

data x keypoints x test\_qualifier x

1x1 sift\_orientation

Property	Value
grad_magnitude	4251x1 cell
grad_direction	4251x1 cell
counter	0
keypoints	1x1 sift_keypoints
orientation	4251x3 double
orientation_hist	4251x1 cell
scale	4251x2 double

4. Step 4:

- Plot the keypoints and keypoint orientation with original image.





Keypoints with their orientation