

# READ ME

**Please feel free to contact me** if you find any problem or have any question.

**TEL: (+86)18682277972**

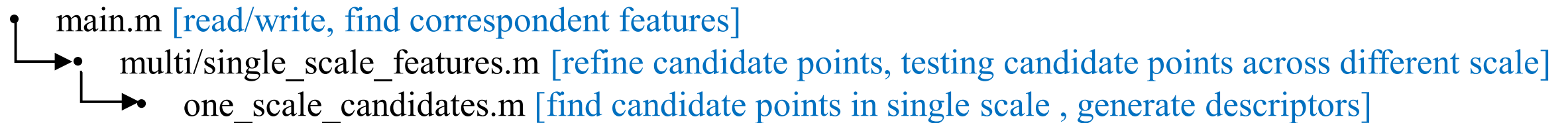
# Requirements:

- Windows system [tested on Win10]
- MATLAB [tested on R2018a]

## Run:

- Change workspace to this folder in MATLAB
- Open & Run file [main.m]

## Architecture & Functions:

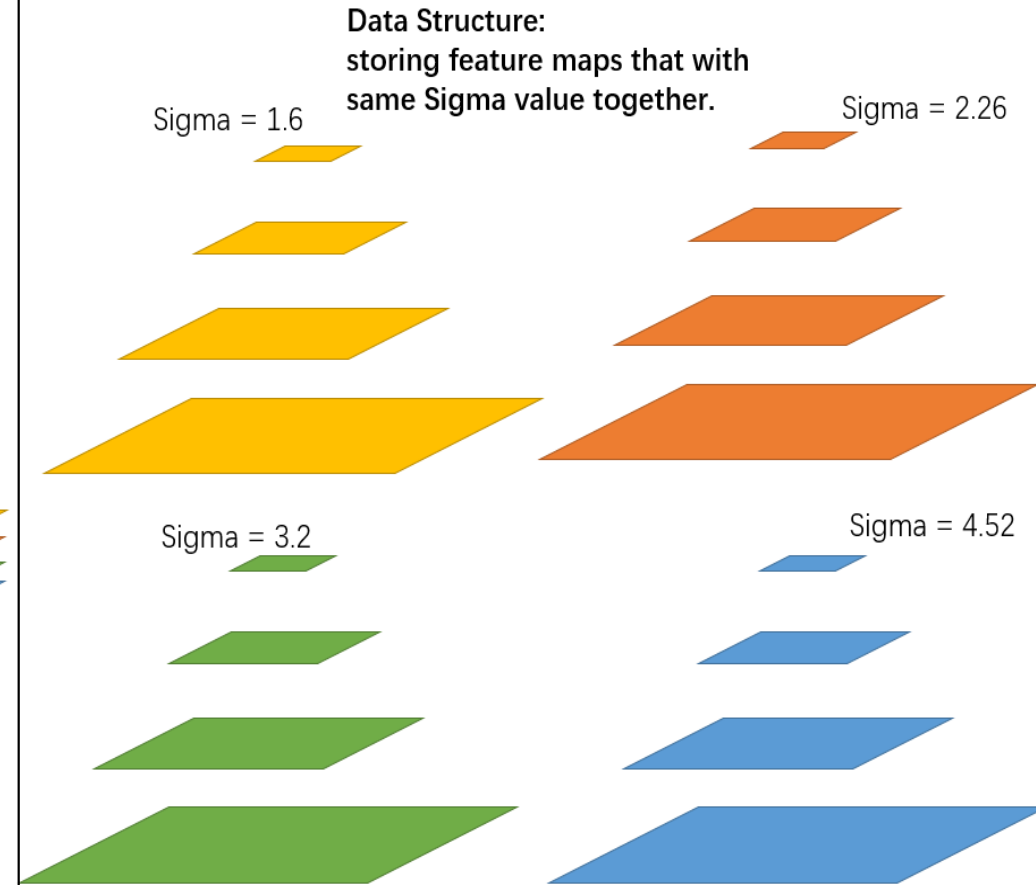
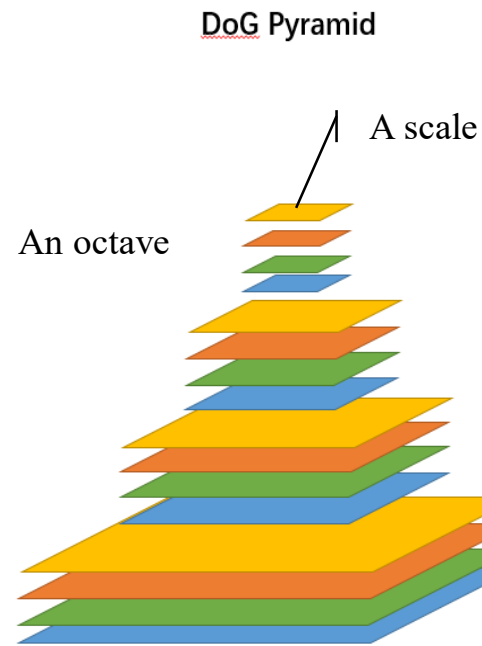


# Speed-up Solution:

- **Steps:**

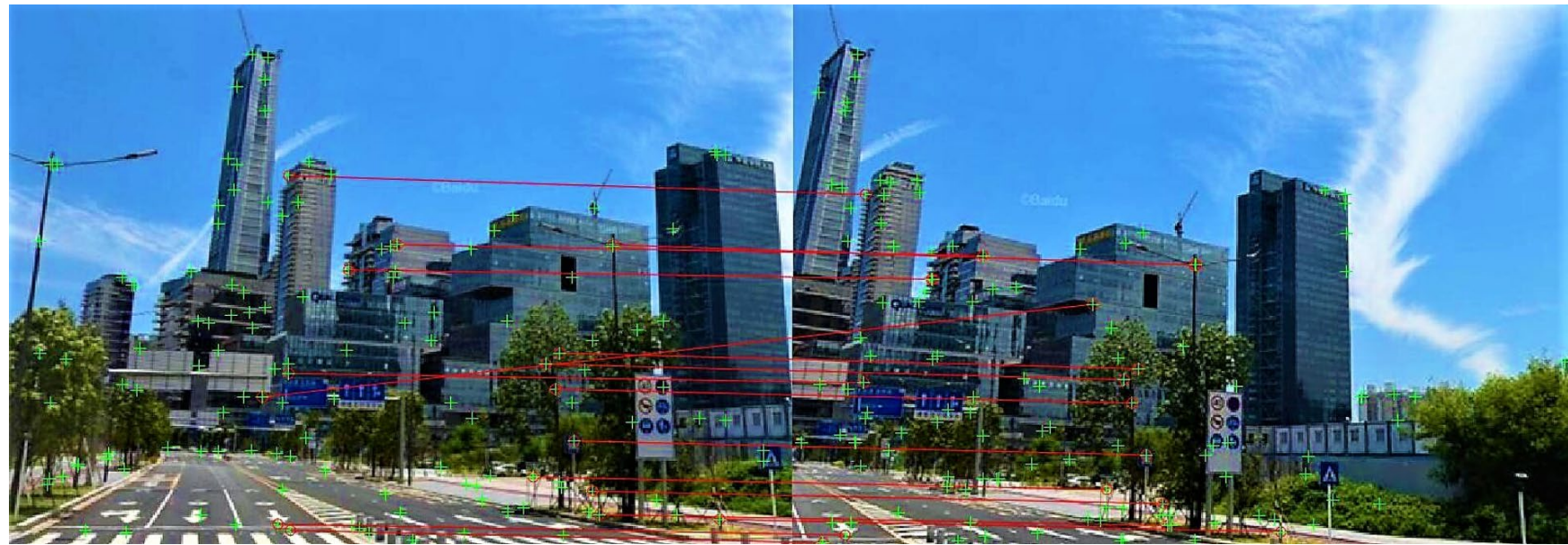
- 1 Store feature maps that **share same sigma value** but **from different octave** together.
- 2 Locate **potential feature points** in every single scale, I call them candidates.
- 3 **Test** these candidates across different scale.

**[NOTICE:]** In step 3, only the candidates of step 2 will be tested, therefore the time spend on this time-consuming step decreases drastically.



# Results :

- **Images** are cropped from Google Street View.
- **Feature points** are labeled with green crosses[+]
- **Homonymy points** are connected by red lines[—]
- **Fig 1** shows results of:  
**Standard SIFT**  
It has 5 octaves in the feature pyramid and each octave has 6 scales.
- **Fig 2** shows results of:  
**A twisted version of SIFT.**  
It has an auto-adaptive number of octaves and each octave has single scale.  
It is faster but less robust.



**Fig 1. Multi-scale version (the standard one)**



**Fig 2. Single-scale version (the twisted one)**

# Important Features of this Program

- **[矢量化提速]** 对单层产生候选点时，采用了矢量化的方案，使得速度大幅提升。具体做法是 `one_scale_candidates.m` 中的第61-76行，会产生一个掩模来批量处理所有点的[与相邻点比较]这一步骤。
- **[提高稳定性]** 产生128维描述向量时，会对最高峰和次高峰分别产生一组描述向量，它们会平等地参与后续的匹配，以此增加稳定性。
- **[数据结构优化]** 通过前述的Speed-up方案，大大提高了速度，并测试了单层的SIFT的可行性。



# Warnings & A Problem

- **Warnings:** There are three subjective thresholds that will influence the results.
  - First threshold locates in [\[one\\_scale\\_candidates.m\]](#), line 55. Choosing a larger threshold will eliminate background points, for instance, the candidate points from clouds. This makes SIFT more stable but produce less points.
  - Second threshold locates in [\[one\\_scale\\_candidates.m\]](#), line 87. This one is used to eliminate the line feature points. I set it to 10 according to the experiment results from paper of SIFT.
  - Second threshold locates in [\[main.m\]](#), line 52 & 79. They determine what is “homonymy points”. With larger thresholds, we get less homonymy points yet they are more stable.
- **A Problem:**
  - There are some errors in the output homonymy point pair, and we can use RANSAC to eliminate them.