TLD 在 MATLAB 上的调试

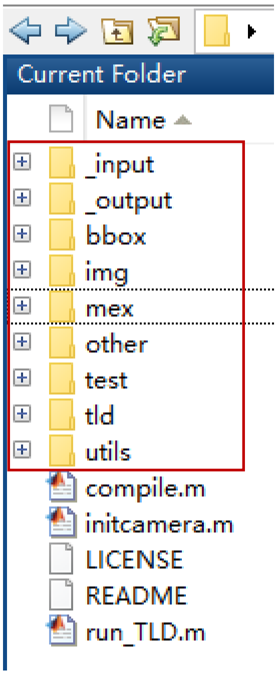
By Xian2207, 13689903575, wszhangxian@126.com

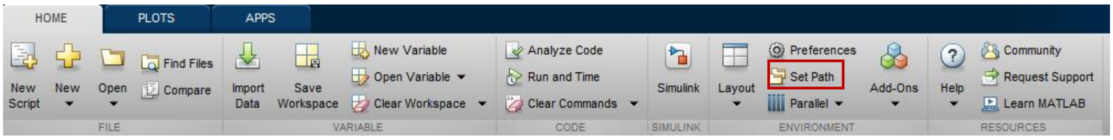
第一步：

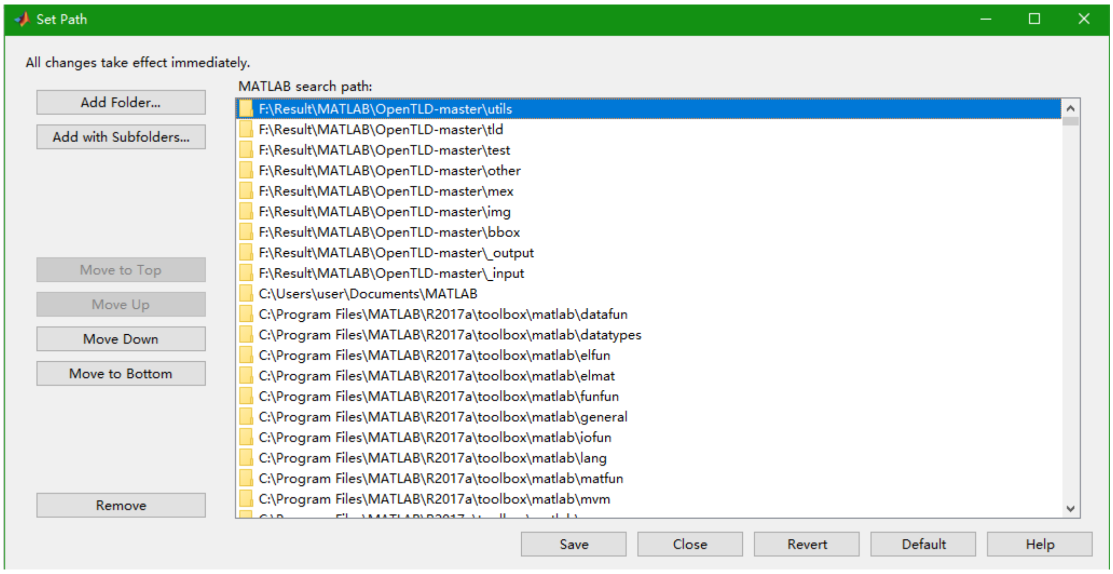
确保 opencv2.4.10 和 vs2015 已经安装在 PC 机里的 Windows 系统上。Opencv 最好选择 2.4.9 或以上，vs 最好选择 2013 或以上，我的电脑是 win10 64+vs2015+opencv2.4.10+MATLAB2017；

第二步：

网上下载 Matlab 版 TLD 算 https://github.com/zk00006/OpenTLD；加压后，放在 F:\Result\MATLAB\OpenTLD-master。完了，点击 Set Path（红框圈出），将红框中的 folder 一个个添加进去，







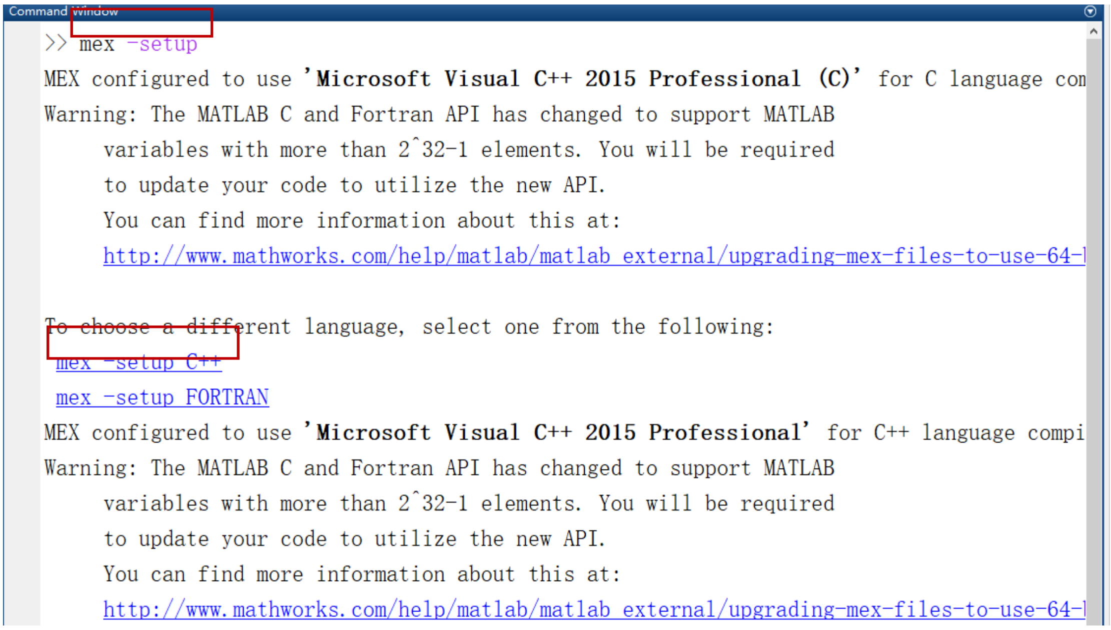
All changes take effect immediately.

MATLAB search path:

```
F:\Result\MATLAB\OpenTLD-master\utils
F:\Result\MATLAB\OpenTLD-master\tld
F:\Result\MATLAB\OpenTLD-master\test
F:\Result\MATLAB\OpenTLD-master\other
F:\Result\MATLAB\OpenTLD-master\mex
F:\Result\MATLAB\OpenTLD-master\img
F:\Result\MATLAB\OpenTLD-master\bbox
F:\Result\MATLAB\OpenTLD-master\_output
F:\Result\MATLAB\OpenTLD-master\_input
C:\Users\user\Documents\MATLAB
C:\Program Files\MATLAB\R2017a\toolbox\matlab\datafun
C:\Program Files\MATLAB\R2017a\toolbox\matlab\datatypes
C:\Program Files\MATLAB\R2017a\toolbox\matlab\elfun
C:\Program Files\MATLAB\R2017a\toolbox\matlab\elmat
C:\Program Files\MATLAB\R2017a\toolbox\matlab\funfun
C:\Program Files\MATLAB\R2017a\toolbox\matlab\general
C:\Program Files\MATLAB\R2017a\toolbox\matlab\iofun
C:\Program Files\MATLAB\R2017a\toolbox\matlab\lang
C:\Program Files\MATLAB\R2017a\toolbox\matlab\matfun
C:\Program Files\MATLAB\R2017a\toolbox\matlab\mvm
```

第三步：

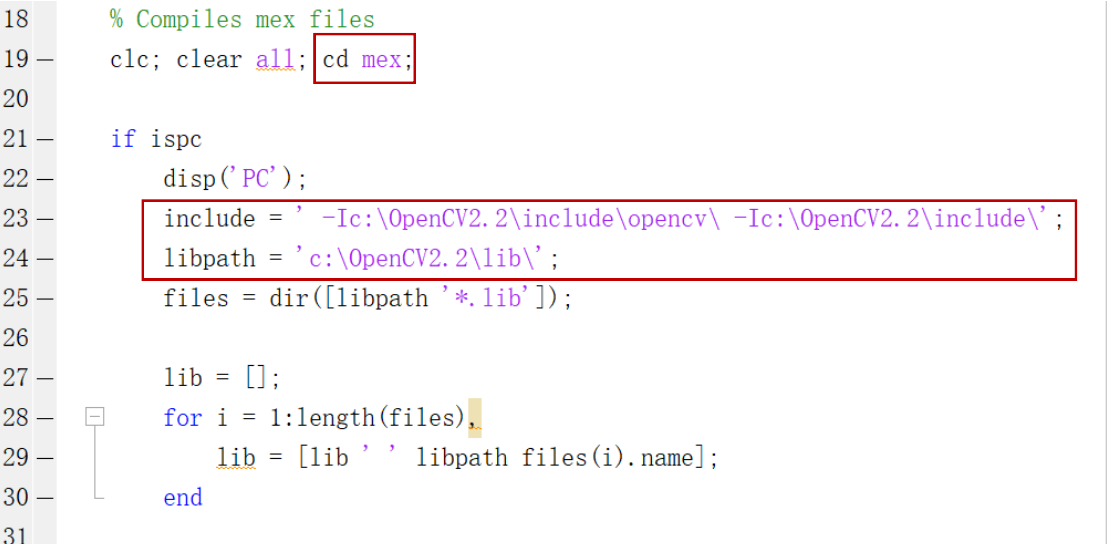
在 MATLAB 命令行中输入 mex -setup，点击 mex -setup C++，MATLAB 自动 configure；



```
>> mex -setup
MEX configured to use 'Microsoft Visual C++ 2015 Professional (C)' for C language con
Warning: The MATLAB C and Fortran API has changed to support MATLAB
     variables with more than 2^32-1 elements. You will be required
     to update your code to utilize the new API.
     You can find more information about this at:
     http://www.mathworks.com/help/matlab/matlab_external/upgrading-mex-files-to-use-64-l

To choose a different language, select one from the following:
 mex -setup C++
 mex -setup FORTRAN
MEX configured to use 'Microsoft Visual C++ 2015 Professional' for C++ language compi
Warning: The MATLAB C and Fortran API has changed to support MATLAB
     variables with more than 2^32-1 elements. You will be required
     to update your code to utilize the new API.
     You can find more information about this at:
     http://www.mathworks.com/help/matlab/matlab_external/upgrading-mex-files-to-use-64-l
```

第四步：

打开 compile.m 文件，修改两处红框代码

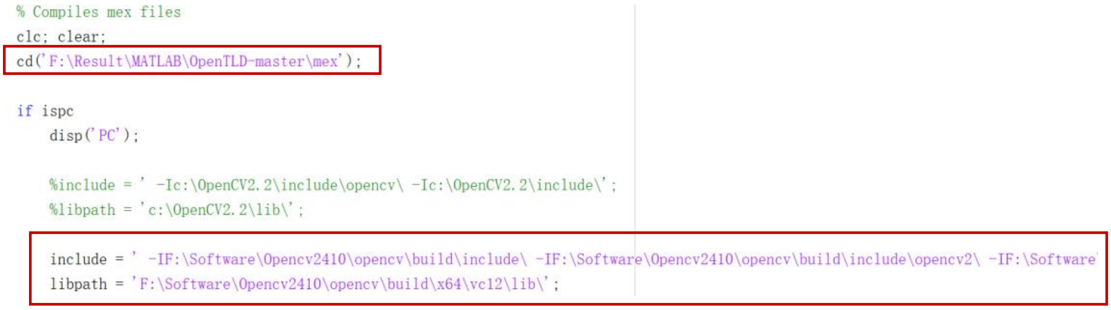


```
% Compiles mex files
clc; clear all; cd mex;

if ispc
    disp('PC');
    include = ' -Ic:\OpenCV2.2\include\opencv\ -Ic:\OpenCV2.2\include\';
    libpath = 'c:\OpenCV2.2\lib\';
    files = dir([libpath '*.lib']);

    lib = [];
    for i = 1:length(files),
        lib = [lib ' ' libpath files(i).name];
    end

```

修改结果如下：

```
(1) cd('F:\Result\MATLAB\OpenTLD-master\mex');

(2) include = ' -IF:\Software\Opencv2410\opencv\build\include\
-IF:\Software\Opencv2410\opencv\build\include\opencv2\
-IF:\Software\Opencv2410\opencv\build\include\opencv\';

    libpath = 'F:\Software\Opencv2410\opencv\build\x64\vc12\lib\';
```

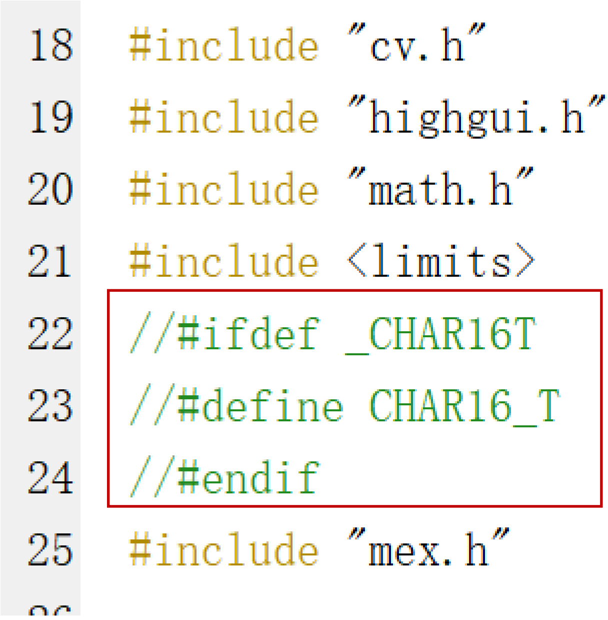
注意：首先 ‘🟥-IF:\Software...\include\🟥-IF:\....opencv2\🟥-IF:\...opencv\’; 红色部分一定要有空格，否则编译不通过；其次，-I 过来是 F（大小写无所谓），就是我们安装 opencv 的地方；最后，cd mex 代码要替换掉，改为 cd(‘F:\Result\....mex’);



```
% Compiles mex files
clc; clear;
cd('F:\Result\MATLAB\OpenTLD-master\mex');

if ispc
    disp('PC');

    %include = ' -Ic:\OpenCV2.2\include\opencv\ -Ic:\OpenCV2.2\include\';
    %libpath = 'c:\OpenCV2.2\lib\';

    include = ' -IF:\Software\Opencv2410\opencv\build\include\ -IF:\Software\Opencv2410\opencv\build\include\opencv2\ -IF:\Software
    libpath = 'F:\Software\Opencv2410\opencv\build\x64\vc12\lib\';
```

第五步：

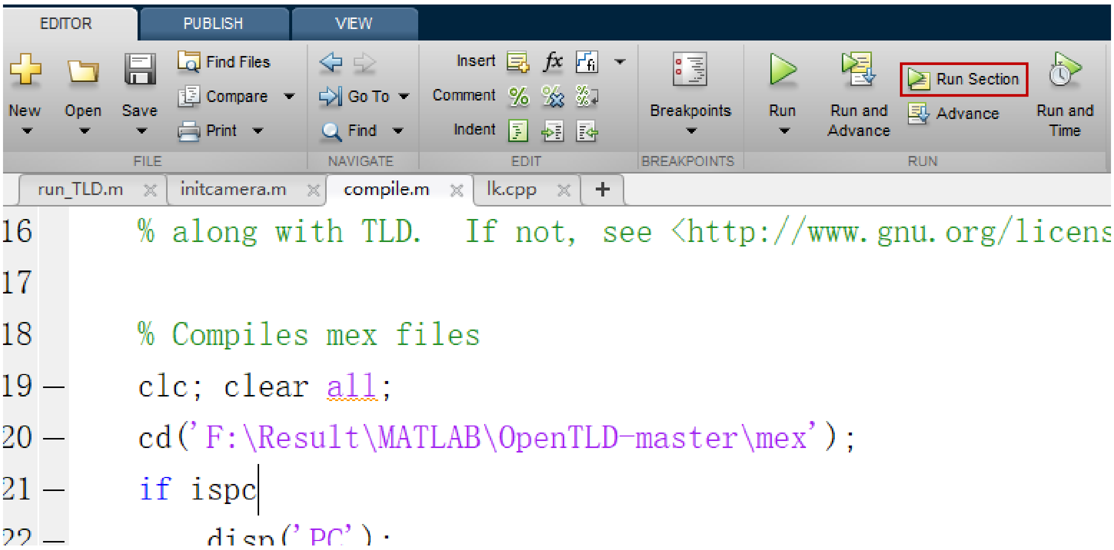
进入 mex 文件夹下的 lk.cpp, fern.cpp, bb_overlap.cpp 里，将#indef _CHAR16T， #define CHAR16_T, #endif 全部注释掉



```
#include "cv.h"
#include "highgui.h"
#include "math.h"
#include <limits>
//#ifdef _CHAR16T
//#define CHAR16_T
//#endif
#include "mex.h"
```

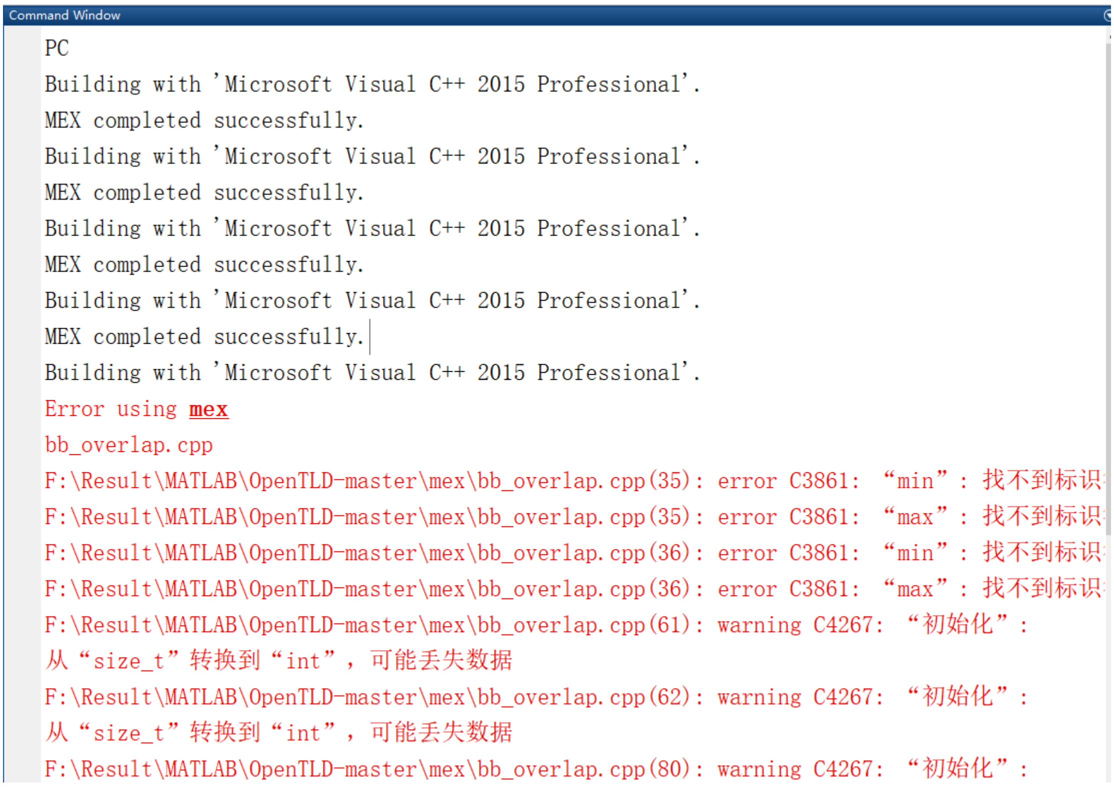
第六步：

运行 compile.m 文件，点击 Run Section 按钮



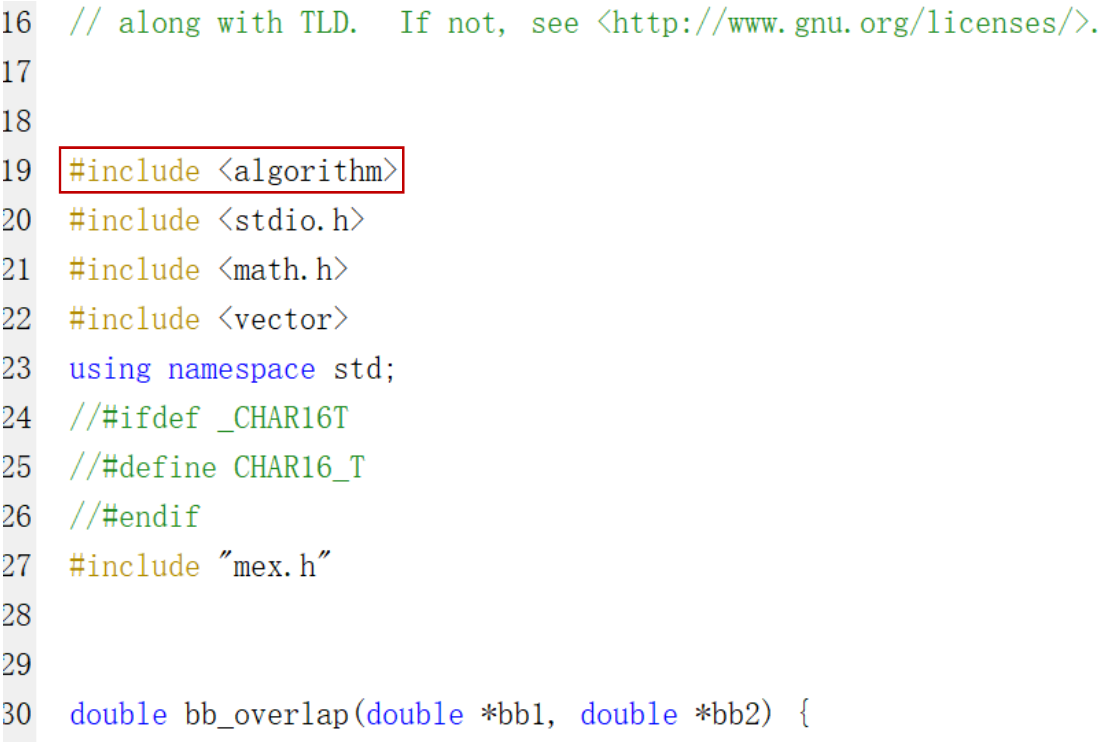
```
% along with TLD.  If not, see <http://www.gnu.org/licens

% Compiles mex files
clc; clear all;
cd('F:\Result\MATLAB\OpenTLD-master\mex');
if ispc
    disp('PC');
```

出现结果如下：



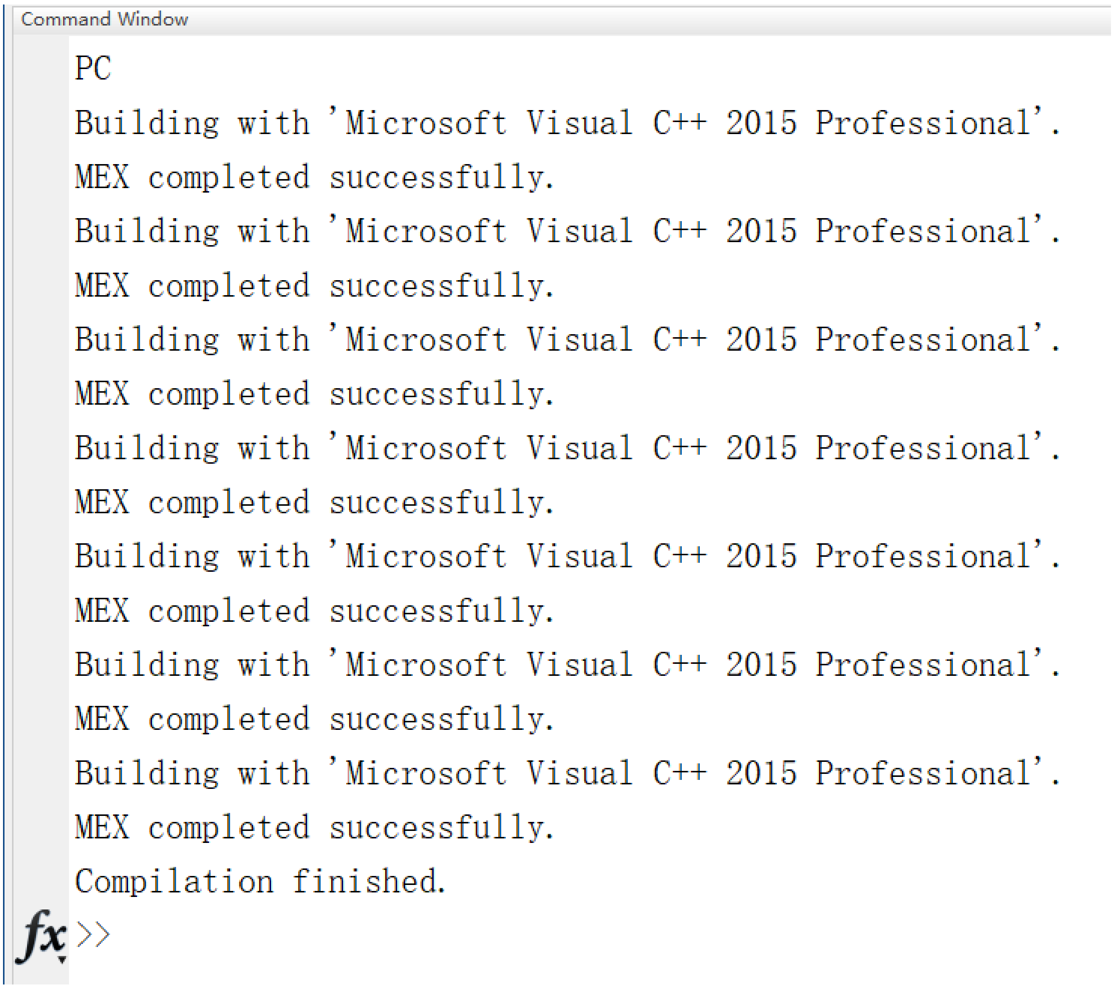
```
PC
Building with 'Microsoft Visual C++ 2015 Professional'.
MEX completed successfully.
Building with 'Microsoft Visual C++ 2015 Professional'.
MEX completed successfully.
Building with 'Microsoft Visual C++ 2015 Professional'.
MEX completed successfully.
Building with 'Microsoft Visual C++ 2015 Professional'.
MEX completed successfully.
Building with 'Microsoft Visual C++ 2015 Professional'.
Error using mex
bb_overlap.cpp
F:\Result\MATLAB\OpenTLD-master\mex\bb_overlap.cpp(35): error C3861: “min”: 找不到标识
F:\Result\MATLAB\OpenTLD-master\mex\bb_overlap.cpp(35): error C3861: “max”: 找不到标识
F:\Result\MATLAB\OpenTLD-master\mex\bb_overlap.cpp(36): error C3861: “min”: 找不到标识
F:\Result\MATLAB\OpenTLD-master\mex\bb_overlap.cpp(36): error C3861: “max”: 找不到标识
F:\Result\MATLAB\OpenTLD-master\mex\bb_overlap.cpp(61): warning C4267: “初始化”:
从“size_t”转换到“int”，可能丢失数据
F:\Result\MATLAB\OpenTLD-master\mex\bb_overlap.cpp(62): warning C4267: “初始化”:
从“size_t”转换到“int”，可能丢失数据
F:\Result\MATLAB\OpenTLD-master\mex\bb_overlap.cpp(80): warning C4267: “初始化”:
```

此时，定位到 bb_overlap.cpp 文件，添加头文件即可



```cpp
// along with TLD.  If not, see <http://www.gnu.org/licenses/>.


#include <algorithm>
#include <stdio.h>
#include <math.h>
#include <vector>
using namespace std;
//#ifdef _CHAR16T
//#define CHAR16_T
//#endif
#include "mex.h"


double bb_overlap(double *bb1, double *bb2) {
```

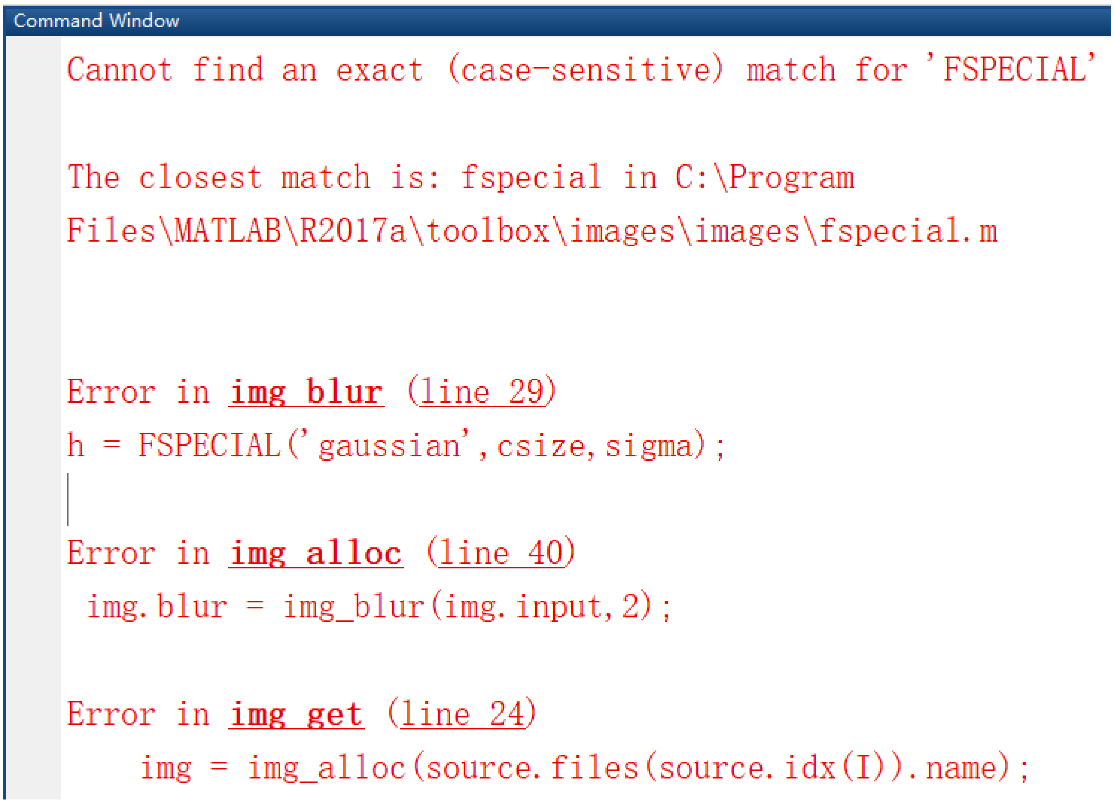
再次运行，结果如下：



```
PC
Building with 'Microsoft Visual C++ 2015 Professional'.
MEX completed successfully.
Building with 'Microsoft Visual C++ 2015 Professional'.
MEX completed successfully.
Building with 'Microsoft Visual C++ 2015 Professional'.
MEX completed successfully.
Building with 'Microsoft Visual C++ 2015 Professional'.
MEX completed successfully.
Building with 'Microsoft Visual C++ 2015 Professional'.
MEX completed successfully.
Building with 'Microsoft Visual C++ 2015 Professional'.
MEX completed successfully.
Building with 'Microsoft Visual C++ 2015 Professional'.
MEX completed successfully.
Compilation finished.
fx >>
```

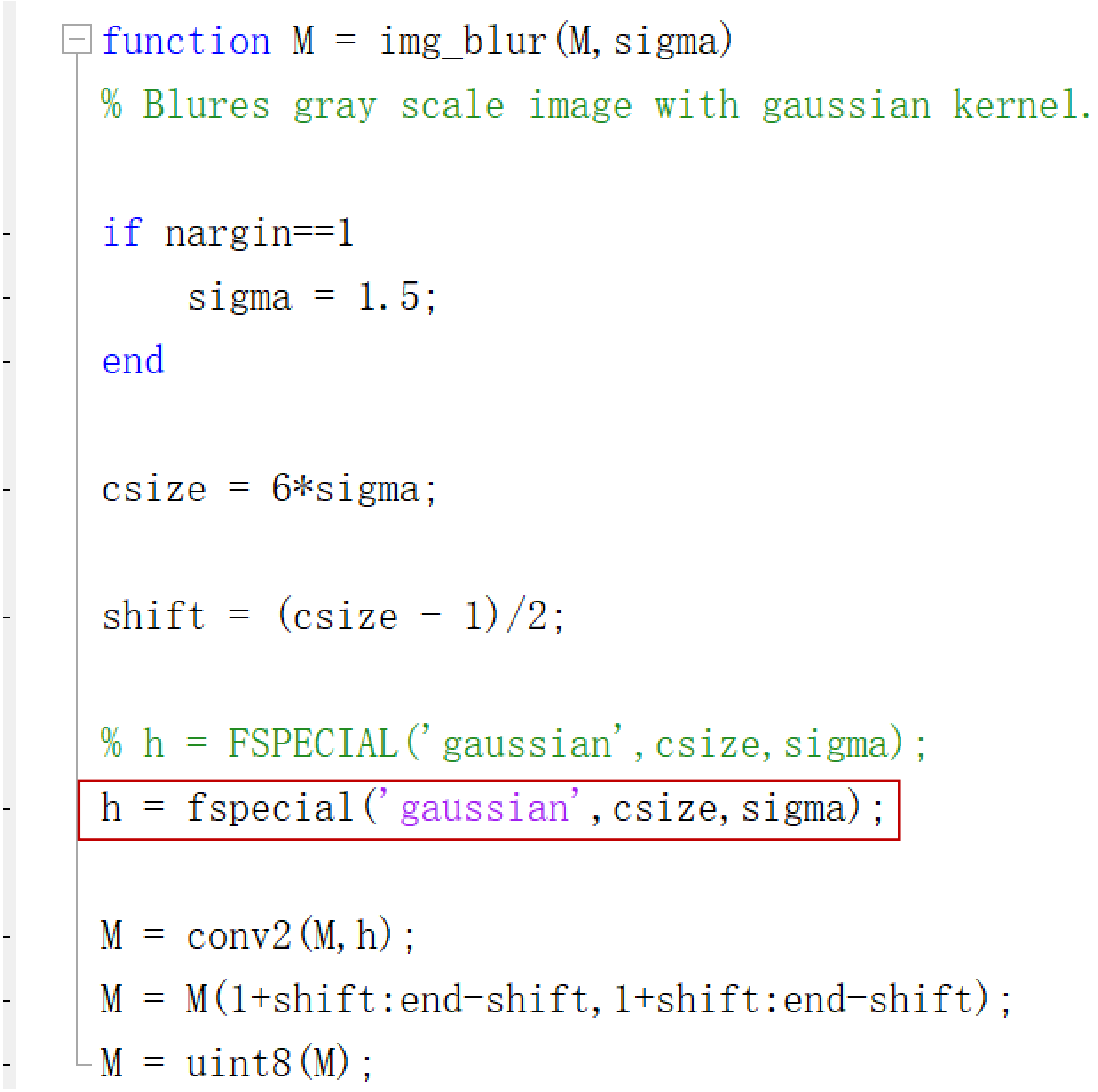
第七步：

将 compile.m 文件关闭，打开 run_tld.m，运行它：



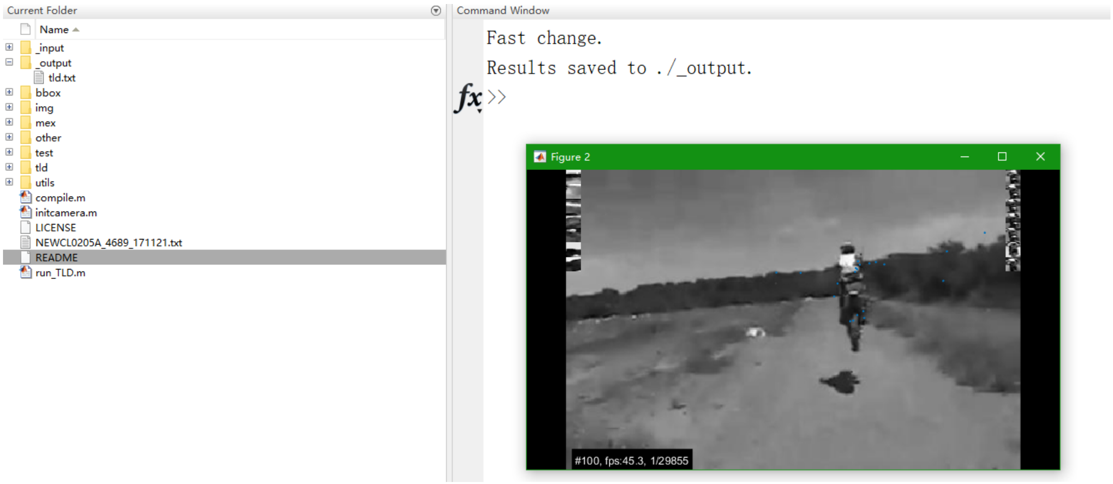
```
Cannot find an exact (case-sensitive) match for 'FSPECIAL'

The closest match is: fspecial in C:\Program
Files\MATLAB\R2017a\toolbox\images\images\fspecial.m



Error in img_blur (line 29)
h = FSPECIAL('gaussian',csize,sigma);

Error in img_alloc (line 40)
 img.blur = img_blur(img.input,2);

Error in img_get (line 24)
    img = img_alloc(source.files(source.idx(I)).name);
```

此时，打开 img_blur.m 这个文件夹，找到 FSPECIAL 函数，修改它成小写的



```
function M = img_blur(M,sigma)
% Blures gray scale image with gaussian kernel.

if nargin==1
    sigma = 1.5;
end

csize = 6*sigma;

shift = (csize - 1)/2;

% h = FSPECIAL('gaussian',csize,sigma);
h = fspecial('gaussian',csize,sigma);

M = conv2(M,h);
M = M(1+shift:end-shift,1+shift:end-shift);
M = uint8(M);
```

结果：



Current Folder

Name

_input
_output
tld.txt
bbox
img
mex
other
test
tld
utils
compile.m
initcamera.m
LICENSE
NEWCL0205A_4689_171121.txt
README
run_TLD.m

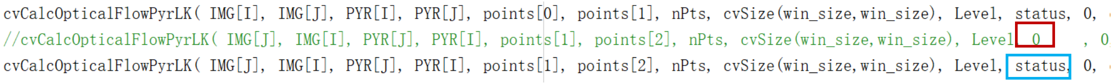
Command Window

```
Fast change.
Results saved to ./_output.
fx >>
```

备注

网上说做下列步骤：

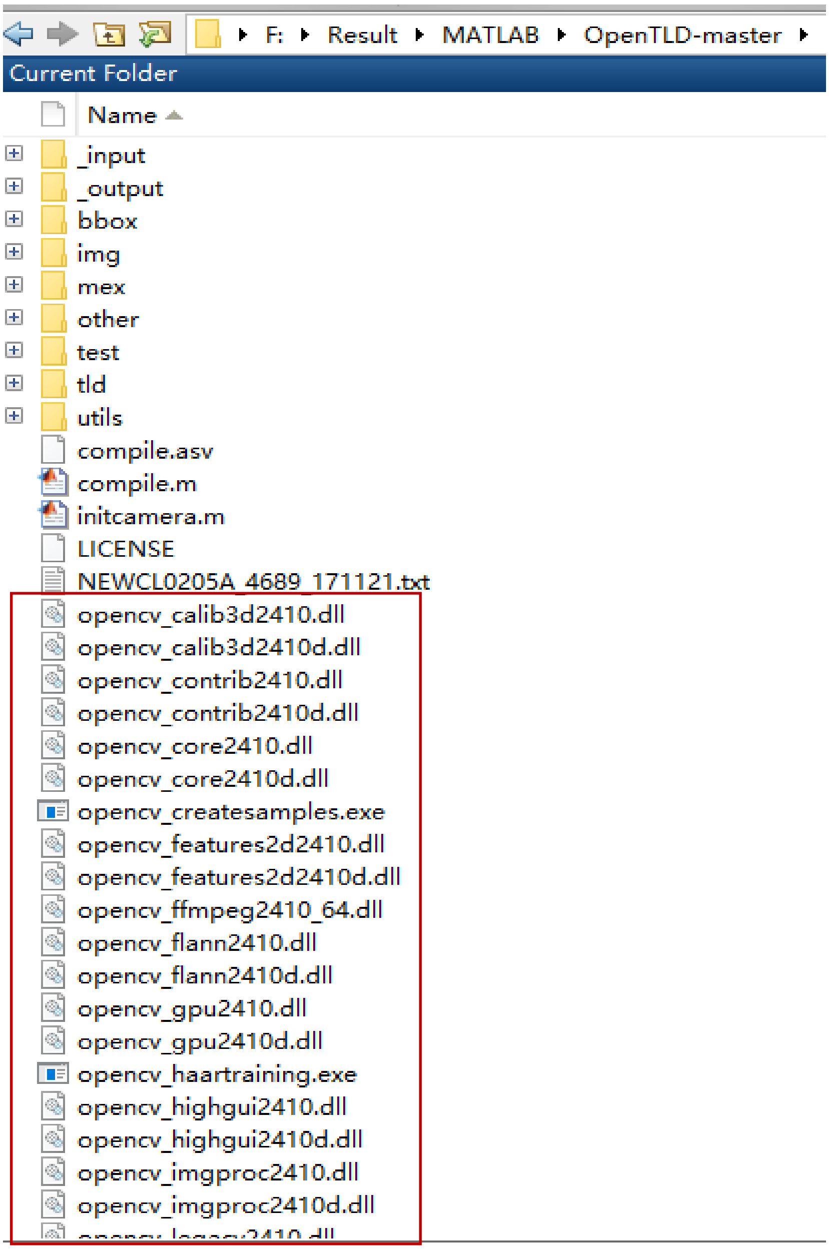
第一，到 lk.cpp 中，找到 cvCalcOpticalFlowPyrLK(....)，这个代码在 lk.cpp 中最长，找到 0



```
cvCalcOpticalFlowPyrLK( IMG[I], IMG[J], PYR[I], PYR[J], points[0], points[1], nPts, cvSize(win_size,win_size), Level, status, 0,
//cvCalcOpticalFlowPyrLK( IMG[J], IMG[I], PYR[J], PYR[I], points[1], points[2], nPts, cvSize(win_size,win_size), Level 0    , 0
cvCalcOpticalFlowPyrLK( IMG[J], IMG[I], PYR[J], PYR[I], points[1], points[2], nPts, cvSize(win_size,win_size), Level, status, 0,
```

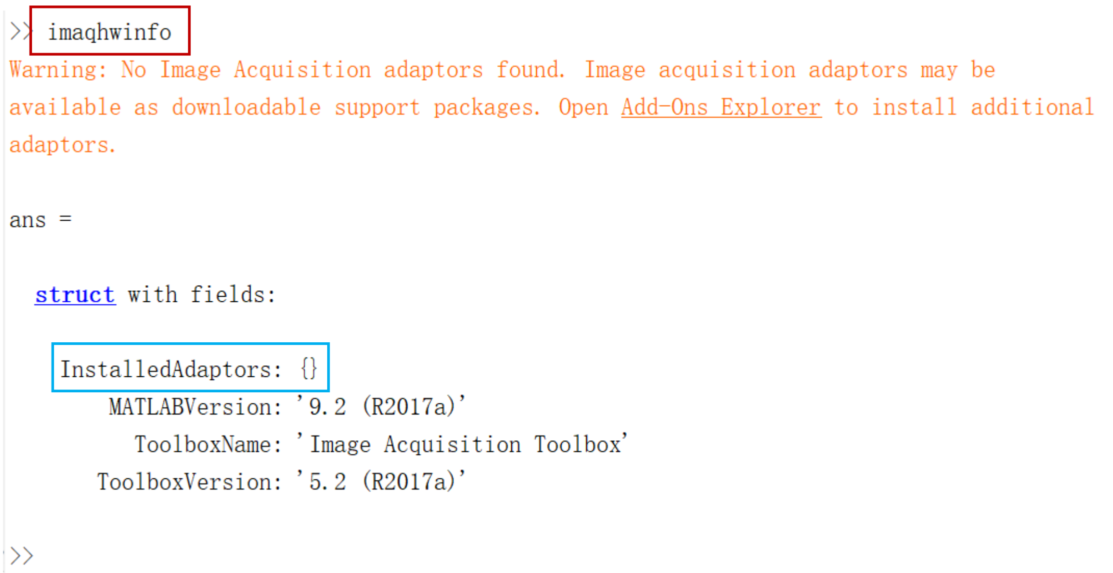
将 0 改为 status(蓝框)。经测试，即使不修改，也不影响结果；

第二，将 F:\Software\Opencv2410\opencv\build\x64\vc12\bin 中所有文件（就是 opencv 的 dll 文件），拷贝到 Matlab 版 TLD 的文件夹下。经测试，运行结果和上面的步骤没有差别。



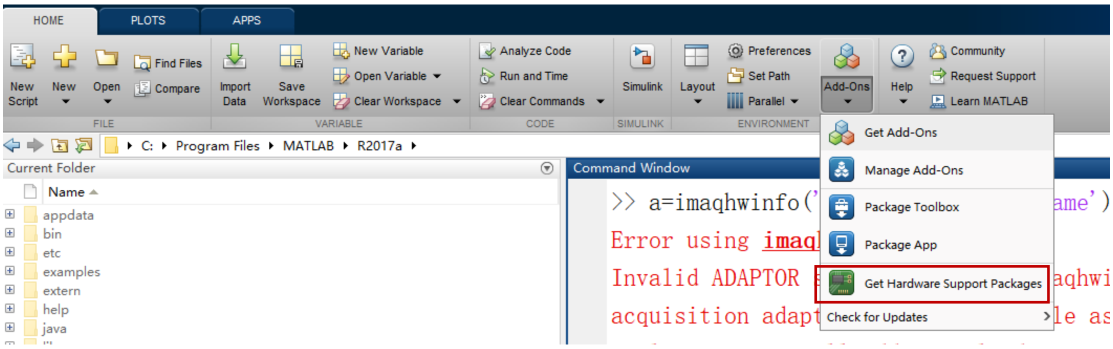
_input
_output
bbox
img
mex
other
test
tld
utils
compile.asv
compile.m
initcamera.m
LICENSE
NEWCL0205A_4689_171121.txt
opencv_calib3d2410.dll
opencv_calib3d2410d.dll
opencv_contrib2410.dll
opencv_contrib2410d.dll
opencv_core2410.dll
opencv_core2410d.dll
opencv_createsamples.exe
opencv_features2d2410.dll
opencv_features2d2410d.dll
opencv_ffmpeg2410_64.dll
opencv_flann2410.dll
opencv_flann2410d.dll
opencv_gpu2410.dll
opencv_gpu2410d.dll
opencv_haartraining.exe
opencv_highgui2410.dll
opencv_highgui2410d.dll
opencv_imgproc2410.dll
opencv_imgproc2410d.dll
opencv_legacy2410.dll

第三，MATLAB 读取摄像头数据，进而 TLD 跟踪：



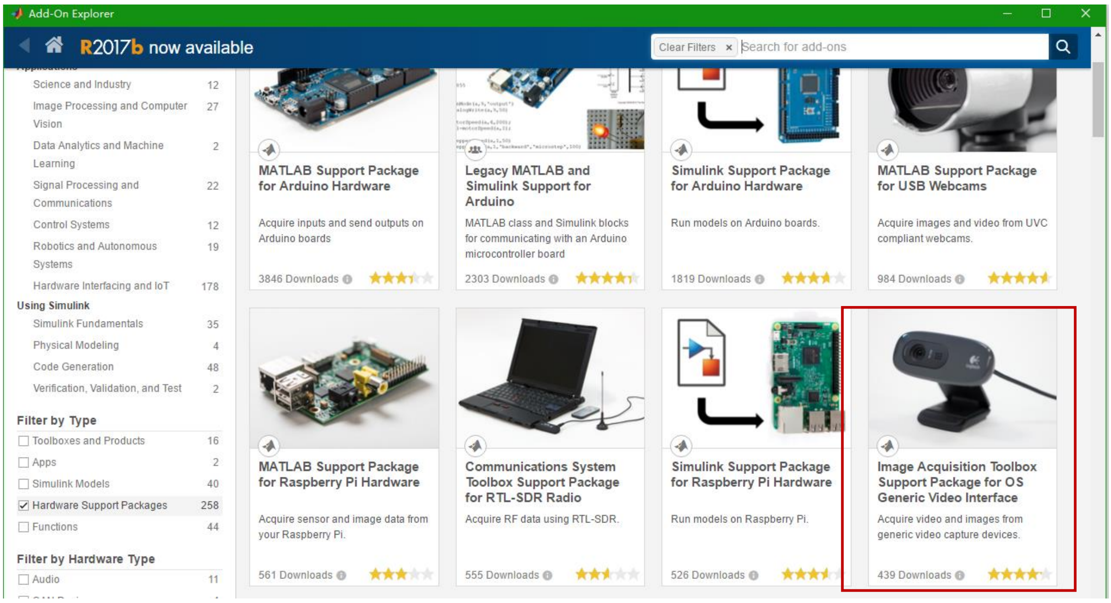
```
>> imaqhwinfo
Warning: No Image Acquisition adaptors found. Image acquisition adaptors may be
available as downloadable support packages. Open Add-Ons Explorer to install additional
adaptors.

ans =

  struct with fields:

    InstalledAdaptors: {}
         MATLABVersion: '9.2 (R2017a)'
           ToolboxName: 'Image Acquisition Toolbox'
        ToolboxVersion: '5.2 (R2017a)'

>>
```

首先，命令框输入 imaqhwinfo 查看蓝框中的 installedAdaptors={};说明没有 matlab 和图像处理的适配器，因此 matlab 无法调用摄像头。此时，需要点击 HOME->Add-Ons->下拉菜单选择 Get Hardwares Support Packages.



```
>> a=imaqhwinfo('                    ame')
Error using imaq
Invalid ADAPTOR                      aqhwi
acquisition adapt                    le as
```

得到


Add-On Explorer
R2017b now available
Clear Filters ×
Search for add-ons
Science and Industry 12
Image Processing and Computer Vision 27
Data Analytics and Machine Learning 2
Signal Processing and Communications 22
Control Systems 12
Robotics and Autonomous Systems 19
Hardware Interfacing and IoT 178
Using Simulink
Simulink Fundamentals 35
Physical Modeling 4
Code Generation 48
Verification, Validation, and Test 2
Filter by Type
☐ Toolboxes and Products 16
☐ Apps 2
☐ Simulink Models 40
☑ Hardware Support Packages 258
☐ Functions 44
Filter by Hardware Type
☐ Audio 11

MATLAB Support Package for Arduino Hardware
Acquire inputs and send outputs on Arduino boards
3846 Downloads

Legacy MATLAB and Simulink Support for Arduino
MATLAB class and Simulink blocks for communicating with an Arduino microcontroller board
2303 Downloads

Simulink Support Package for Arduino Hardware
Run models on Arduino boards.
1819 Downloads

MATLAB Support Package for USB Webcams
Acquire images and video from UVC compliant webcams.
984 Downloads

MATLAB Support Package for Raspberry Pi Hardware
Acquire sensor and image data from your Raspberry Pi.
561 Downloads

Communications System Toolbox Support Package for RTL-SDR Radio
Acquire RF data using RTL-SDR.
555 Downloads

Simulink Support Package for Raspberry Pi Hardware
Run models on Raspberry Pi.
526 Downloads

Image Acquisition Toolbox Support Package for OS Generic Video Interface
Acquire video and images from generic video capture devices.
439 Downloads

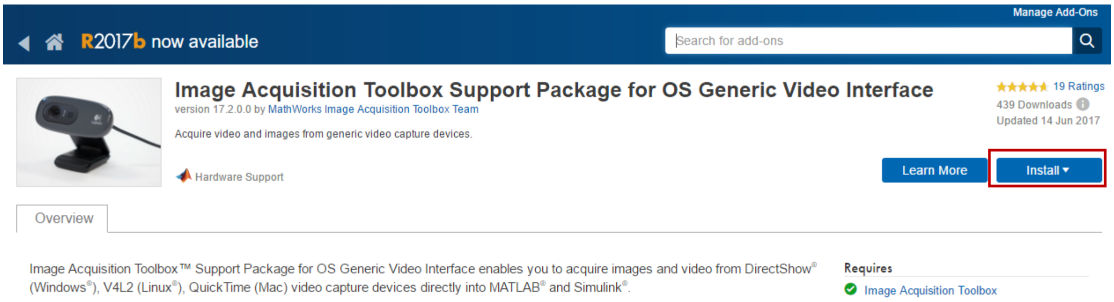


Image Acquisition Toolbox Support Package for OS Generic Video Interface

version 17.2.0.0 by MathWorks Image Acquisition Toolbox Team

Acquire video and images from generic video capture devices.

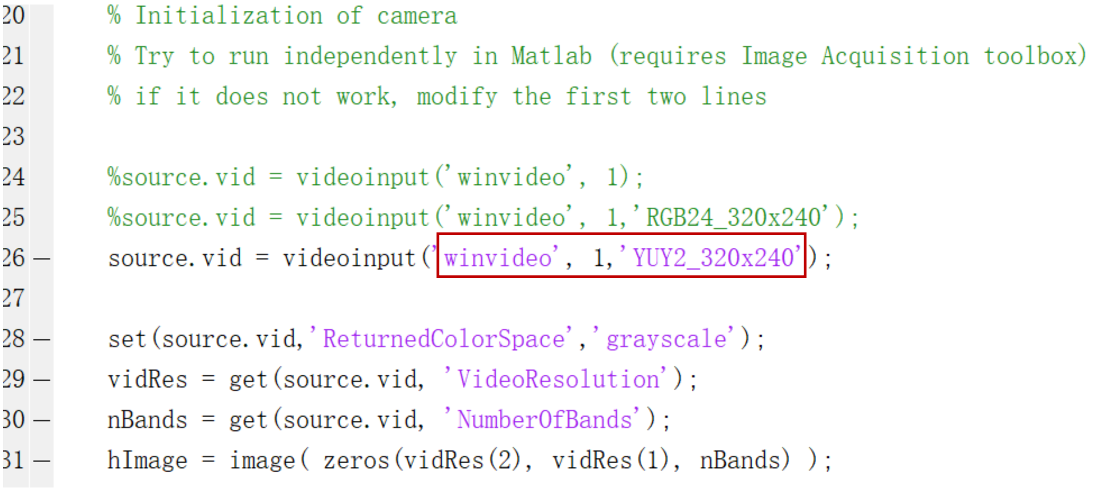
Hardware Support

★★★★★ 19 Ratings
439 Downloads
Updated 14 Jun 2017

Image Acquisition Toolbox™ Support Package for OS Generic Video Interface enables you to acquire images and video from DirectShow® (Windows®), V4L2 (Linux®), QuickTime (Mac) video capture devices directly into MATLAB® and Simulink®.

Requires
✓ Image Acquisition Toolbox

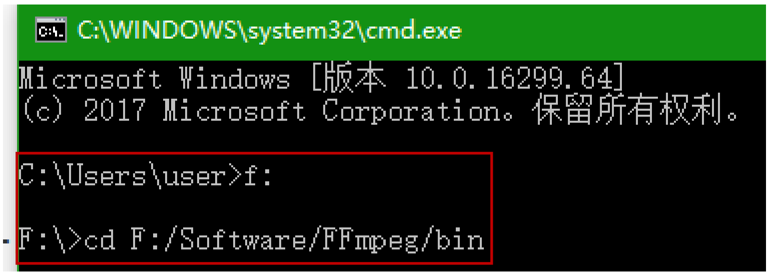
点击红框中的图标，安装即可。但如果没有 MathWork Account，必须先注册一个才能下载安装。完了在命令框中重新输入 imaqhwinfo，找到 InstalledAdaptors 的名字，然后在 matlab 目录中找到 initcamera.m 这个文件，将’winvideo’和’YUY2_320x240’改成自己的 Adaptor 名字。



```
    % Initialization of camera
    % Try to run independently in Matlab (requires Image Acquisition toolbox)
    % if it does not work, modify the first two lines

    %source.vid = videoinput('winvideo', 1);
    %source.vid = videoinput('winvideo', 1,'RGB24_320x240');
    source.vid = videoinput('winvideo', 1,'YUY2_320x240');

    set(source.vid,'ReturnedColorSpace','grayscale');
    vidRes = get(source.vid, 'VideoResolution');
    nBands = get(source.vid, 'NumberOfBands');
    hImage = image( zeros(vidRes(2), vidRes(1), nBands) );
```

参考链接：http://blog.csdn.net/linxue968/article/details/6047376

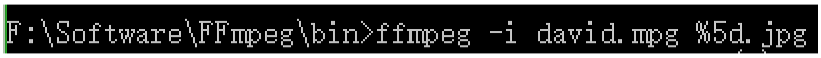
第四，如何使用自己的视频，然后运行 TLD？需要下载 FFmpeg 把自己的视频转换成一帧帧图像。FFmpeg 下载链接：https://ffmpeg.zeranoe.com/builds/，安装它，路径自己定义。教程见：http://javapyer.iteye.com/blog/1989274。安装好后，打开 win+R 键，输入 cmd，选择确定，打开 dos 命令窗口



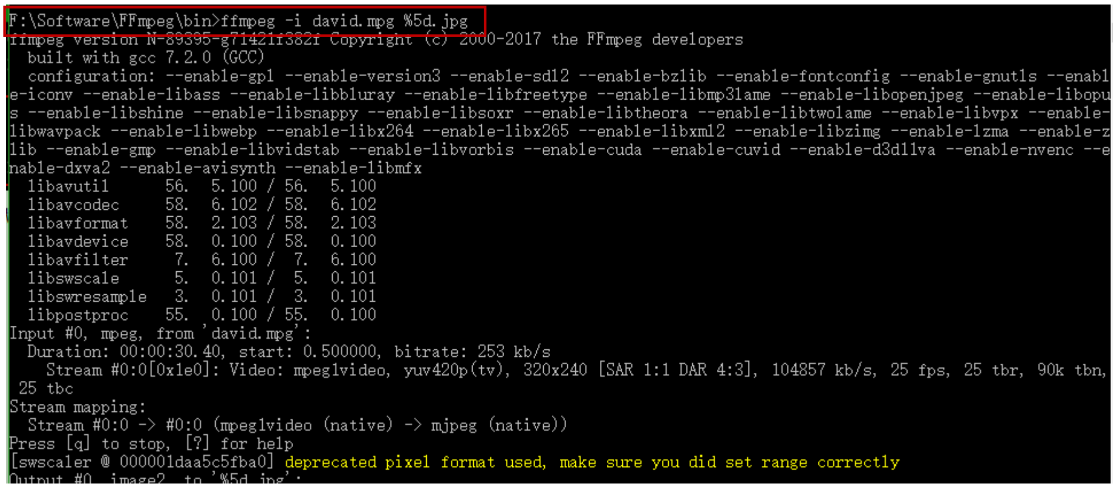
```
Microsoft Windows [版本 10.0.16299.64]
(c) 2017 Microsoft Corporation。保留所有权利。

C:\Users\user>f:

F:\>cd F:/Software/FFmpeg/bin
```

注意自己的盘符，以及‘/’输入方式。接着做

ffmpeg -i 视频名字和格式(i.e. david.mpg) %5d.jpg

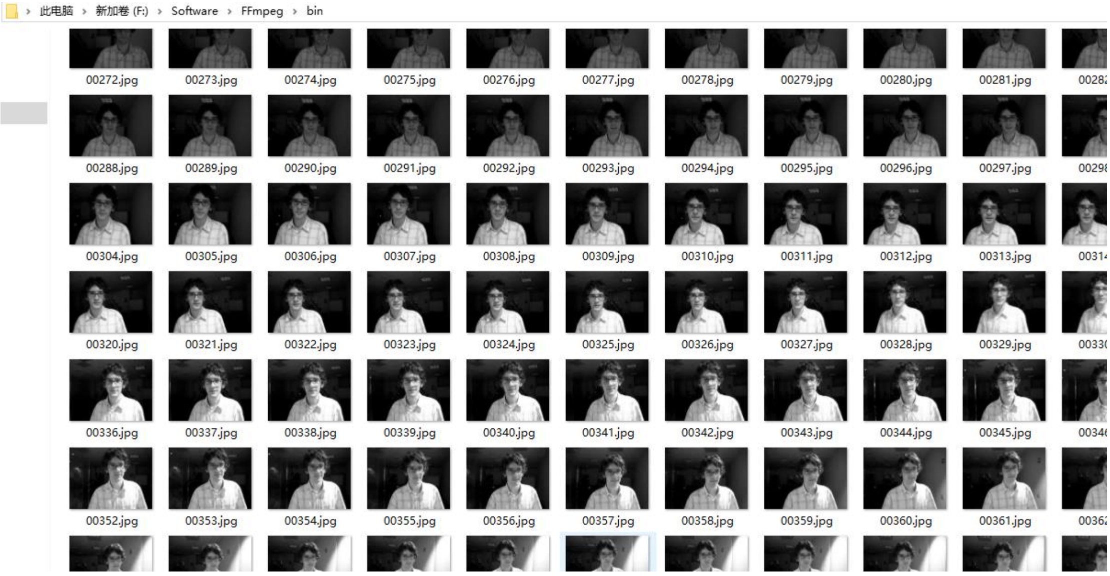


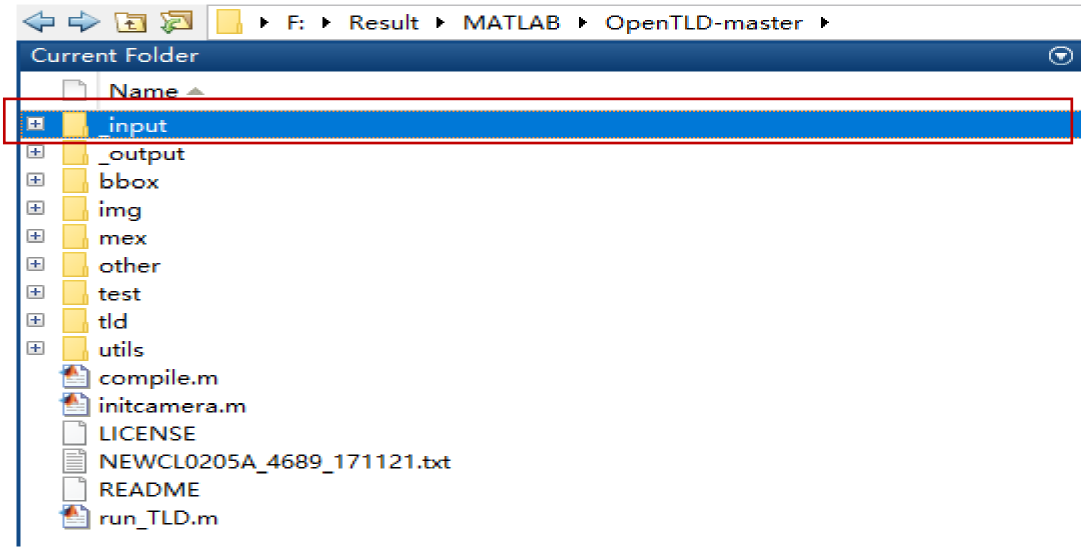
```
F:\Software\FFmpeg\bin>ffmpeg -i david.mpg %5d.jpg
```



```
F:\Software\FFmpeg\bin>ffmpeg -i david.mpg %5d.jpg
ffmpeg version N-89395-g71421f382f Copyright (c) 2000-2017 the FFmpeg developers
  built with gcc 7.2.0 (GCC)
  configuration: --enable-gpl --enable-version3 --enable-sdl2 --enable-bzlib --enable-fontconfig --enable-gnutls --enabl
e-iconv --enable-libass --enable-libbluray --enable-libfreetype --enable-libmp3lame --enable-libopenjpeg --enable-libopu
s --enable-libshine --enable-libsnappy --enable-libsoxr --enable-libtheora --enable-libtwolame --enable-libvpx --enable-
libwavpack --enable-libwebp --enable-libx264 --enable-libx265 --enable-libxml2 --enable-libzimg --enable-lzma --enable-z
lib --enable-gmp --enable-libvidstab --enable-libvorbis --enable-cuda --enable-cuvid --enable-d3d11va --enable-nvenc --e
nable-dxva2 --enable-avisynth --enable-libmfx
  libavutil      56.  5.100 / 56.  5.100
  libavcodec     58.  6.102 / 58.  6.102
  libavformat    58.  2.103 / 58.  2.103
  libavdevice    58.  0.100 / 58.  0.100
  libavfilter     7.  6.100 /  7.  6.100
  libswscale      5.  0.101 /  5.  0.101
  libswresample   3.  0.101 /  3.  0.101
  libpostproc    55.  0.100 / 55.  0.100
Input #0, mpeg, from 'david.mpg':
  Duration: 00:00:30.40, start: 0.500000, bitrate: 253 kb/s
    Stream #0:0[0x1e0]: Video: mpeg1video, yuv420p(tv), 320x240 [SAR 1:1 DAR 4:3], 104857 kb/s, 25 fps, 25 tbr, 90k tbn,
 25 tbc
Stream mapping:
  Stream #0:0 -> #0:0 (mpeg1video (native) -> mjpeg (native))
Press [q] to stop, [?] for help
[swscaler @ 000001daa5c5fba0] deprecated pixel format used, make sure you did set range correctly
Output #0, image2, to '%5d.jpg':
```

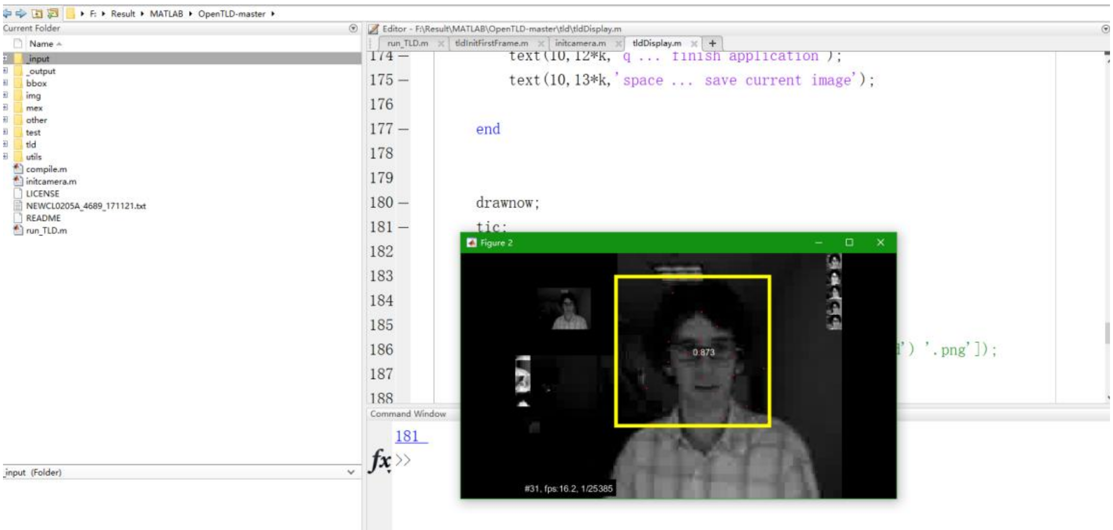
运行结束后，没有报错，直接找到安装 ffmpeg 的文件夹，F:\Software\FFmpeg\bin，此时结果如下，视频被转换成了图片。然后 copy 这些图片到 matlab TLD 程序的_input 文件夹了。





_input
_output
bbox
img
mex
other
test
tld
utils
compile.m
initcamera.m
LICENSE
NEWCL0205A_4689_171121.txt
README
run_TLD.m

完了再运行 run_tld.m 文件，结果如下，运行的很好。



_input
_output
bbox
img
mex
other
test
tld
utils
compile.m
initcamera.m
LICENSE
NEWCL0205A_4689_171121.txt
README
run_TLD.m

```
        text(10,12*k, 'q ... finish application');
        text(10,13*k,'space ... save current image');

    end


    drawnow;
    tic;
```