

00A0 2203∃ 2200∀ 2286⊆ 2713x 27FA⇔ 221A√ 221B³/ 2295⊕ 2297⊗ UTF8gbsn

MYNT® EYE S SDK Documentation

发布 2.5.0

MYNTAI

2020 年 01 月 02 日

1	产品	1
1.1	简介	1
1.2	外观	2
1.3	规格	3
1.4	IMU 坐标系统	9
1.5	附件	10
2	SDK	13
2.1	SDK 说明	13
2.2	SDK 安装	14
2.3	SDK 数据样例	24
2.4	SDK 控制样例	41
2.5	SDK 工程引用	53
2.6	更新日志	63
3	固件	65
3.1	固件说明	65
3.2	固件升级	66
3.3	更新日志	71
4	使用工具支持	73
4.1	标定工具的使用	73
5	开源项目支持	79
5.1	VINS-Mono 如何整合	79
5.2	VINS-Fusion 如何整合	80
5.3	ORB_SLAM2 如何整合	82
5.4	OKVIS 如何整合	83
5.5	VIORB 如何整合	84
5.6	Maplab 如何整合	85
6	API DOCS	87
6.1	API	87
6.2	Device	92
6.3	Enums	96
6.4	Types	101
6.5	Utils	105

7 技术支持	107
7.1 常见问题	107
7.2 联系我们	107
索引	109

1.1 简介

小觅双目摄像头标准版系列包括小觅双目摄像头标准版 (MYNT EYE S)，小觅双目摄像头标准入门版 (MYNT EYE SE)，小觅双目摄像头标准彩色版 (MYNT EYE SC)，小觅双目摄像头 (MYNT® EYE) 标准版系列采用的“双目 +IMU”的惯性导航方案，可为 vSLAM 的应用提供精准的六轴互补数据，并且相较其他单一方案拥有更高精度和鲁棒性。

结合自研的帧同步、自动曝光及白平衡控制等摄像头技术，小觅双目摄像头 (MYNT® EYE) 标准版系列提供基于 CUDA 的 GPU 实时加速方案，可以输出高精度同步的图像源，帮助降低算法研发难度，加快算法研发效率。同时，小觅双目摄像头标准版配备六轴传感器 (IMU) 和红外主动光探测器 (IR)。其中，六轴传感器 (IMU) 可为视觉定位算法的研究提供数据的互补和校正，适用于视觉惯性里程计 (VIO) 的算法研究，帮助提升定位精度；红外主动光探测器 (IR) 可以帮助解决室内白墙和无纹理物体的识别难题，提升图像源的识别精度。小觅双目摄像头标准入门版和标准版的区别仅在于入门版不带 IR，为客户提供更低成本的硬件。小觅双目摄像头标准彩色版 (MYNT EYE SC) 提供 8cm/12cm 可选基线方案，超广角 146°FOV，提供更广阔的深度识别范围和精度水平，产品配备彩色镜头、全新升级 BMI088 六轴 IMU、IR 主动光、I2C 时间同步芯片、全局快门等领先的硬件方案，分辨率最高可高达 2560x800@30fps，精度可达厘米级。此外，小觅双目摄像头标准版系列产品还提供丰富的 SDK 接口和 VSLAM 开源项目支持，可以帮助客户迅速进行方案集成，加速实现产品研发进程，实现方案的快速产品化和落地。

小觅双目摄像头标准版系列可广泛应用于视觉定位导航 (vSLAM) 领域，包括：无人车和机器人的视觉实时定位导航系统、无人机视觉定位系统、无人驾驶避障导航系统、增强现实 (AR)、虚拟现实 (VR) 等；双目也可应用于视觉识别领域，包括：立体人脸识别、三维物体识别、空间运动追踪、三维手势与体感识别等；应用于测量领域，包括：辅助驾驶系统 (ADAS)、双目体积计算、工业视觉筛检等。目前，小觅智能已与国内外 500 余家企业客户开展了服务与合作。

为保证摄像头产品输出数据质量，产品出厂时，我们已对双目进行标定。同时，产品通过富士康实验室的高温高湿持续工作、高温高湿持续操作、低温动态老化、高温工作、低温存储、整机冷热冲击、正弦振动、随机振动等多项产品质量测试，保证品质的稳定和可靠。除了产品和技术的研发，亦可直接应用于产品量产，加速从研发到产品化的过程。

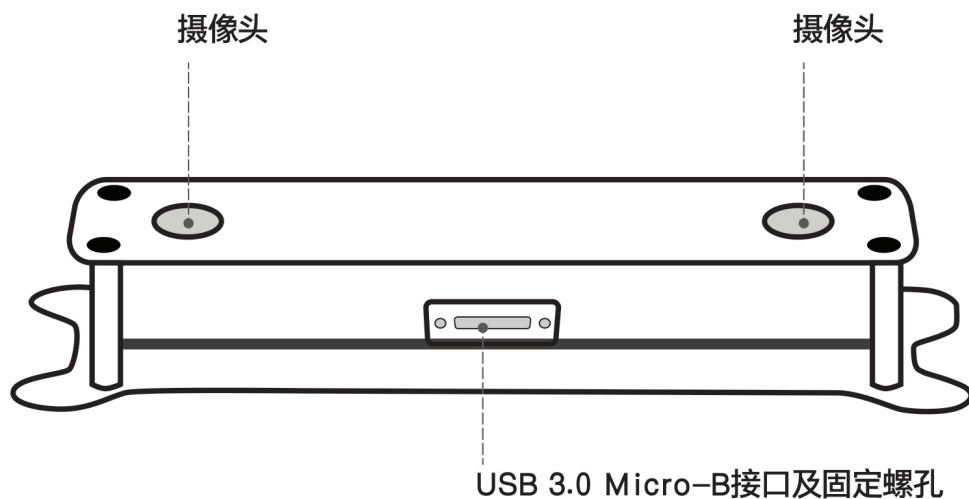
1.2 外观

1.2.1 S1030 尺寸与结构

外壳 (mm)	PCBA 板 (mm)
165x31.5x29.6	149x24

1.2.3 S2110 尺寸与结构

外壳 (mm)	PCBA 板 (mm)
125x47x40	100x15



- A. 摄像头：摄像头传感器镜头，在使用中请注意保护，以避免成像质量下降。
- B. USB Micro-B 接口及固定孔：使用中，插上 USB Micro-B 数据线后，请使用接口端的螺丝紧固接口，以避免使用中损坏接口，也保证数据连接的稳定性。

1.3 规格

1.3.1 S1030-120/Mono

产品规格

型号	S1030-120/Mono
尺寸	165x31.5x31.23mm
帧率	10/15/20/25/30/35/40/45/50/55/60FPS
分辨率	752*480; 376*240
深度分辨率	Based on CPU/GPU Up to 752*480@60FPS
像素尺寸	6.0*6.0μm
基线	120.0mm
视角	D:146° H:122° V:76°
焦距	2.1mm
滤镜	Dual Pass Filter
支持 IR	No
IR 可探测距离	-
色彩模式	Monochrome
深度工作距离	0.8-5m+
曝光方式	Global Shutter
功耗	1W@5V DC from USB
同步精度	<1ms (up to 0.05ms)
IMU 频率	100/200/250/333/500Hz
输出数据格式	Raw data
接口	USB3.0
重量	160g
UVC MODE	Yes

软件

支持操作系统	Windows 10、Ubuntu 14.04/16.04/18.04、ROS indigo/kinetic/melodic、Android 7.0+
SDK 地址	http://www.myntai.com/dev/mynteye
开发者支持	SDK
开源项目支持	ORB_SLAM2、OKVIS、Vins-Mono、Vins-Fusion、VIO RB

环境

运行温度	10°C~50°C
存储温度	-20°C~60°C
湿度	10% to 90% non-condensing

包装

包装内容	MYNT EYE x1 USB Micro-B Cable x1
------	----------------------------------

保修

产品保修	12 Months Limited Manufacturer' s Warranty
------	--------------------------------------------

精度

深度测量精度	误差不超过 4%
--------	----------

1.3.2 S1030-IR-120/Mono**产品规格**

型号	S1030-IR-120/Mono
尺寸	165x31.5x31.23mm
帧率	10/15/20/25/30/35/40/45/50/55/60FPS
分辨率	752*480; 376*240
深度分辨率	Based on CPU/GPU Up to 752*480@60FPS
像素尺寸	6.0*6.0μm
基线	120.0mm
视角	D:146° H:122° V:76°
焦距	2.1mm
滤镜	Dual Pass Filter
支持 IR	Yes
IR 可探测距离	Up to 3m
色彩模式	Monochrome
深度工作距离	0.8-5m+
曝光方式	Global Shutter
功耗	1~2.7W@5V DC from USB
同步精度	<1ms (up to 0.05ms)
IMU 频率	100/200/250/333/500Hz
输出数据格式	Raw data
接口	USB3.0
重量	184g
UVC MODE	Yes

软件

支持操作系统	Windows 10、Ubuntu 14.04/16.04/18.04、ROS indigo/kinetic/melodic、Android 7.0+
SDK 地址	http://www.myntai.com/dev/mynteye
开发者支持	SDK
开源项目支持	ORB_SLAM2、OKVIS、Vins-Mono、Vins-Fusion、VIO RB

环境

运行温度	10°C~50°C
存储温度	-20°C~60°C
湿度	10% to 90% non-condensing

包装

包装内容	MYNT EYE x1 USB Micro-B Cable x1
------	----------------------------------

保修

产品保修	12 Months Limited Manufacturer' s Warranty
------	--------------------------------------------

精度

深度测量精度	误差不超过 4%
--------	----------

1.3.3 S2100-146/Color

产品规格

型号	S2100-146/Color
尺寸	125x47x26.6mm
帧率	1280x400@10/20/30/60fps 2560x800@10/20/30fps
分辨率	1280x400; 2560x800;
深度分辨率	Based on CPU/GPU Up to 1280*400@60FPS
像素尺寸	3.0*3.0μm
基线	80.0mm
视角	D:141° H:124° V:87°
焦距	0.95mm
支持 IR	NO
色彩模式	Color
深度工作距离	0.26-3m+
快门类型	Global Shutter
功耗	1.1W@5V DC from USB
同步精度	<1ms (up to 0.02ms)
IMU 频率	200Hz
输出数据格式	YUYV
接口	USB3.0
时间同步接口	DF50A
重量	62g
UVC MODE	Yes

软件

支持操作系统	Windows 10、Ubuntu 14.04/16.04/18.04、ROS indigo/kinetic/melodic
SDK 地址	http://www.myntai.com/dev/mynteye
开发者支持	SDK
开源项目支持	ORB_SLAM2、OKVIS、Vins-Mono、Vins-Fusion、VIORB

环境

运行温度	-15°C~55°C
存储温度	-20°C~75°C
湿度	0% to 95% non-condensing

包装

包装内容	MYNT EYE x1 USB Micro-B Cable x1
------	----------------------------------

保修

产品保修	12 Months Limited Manufacturer' s Warranty
------	--------------------------------------------

精度

深度测量精度	误差不超过 4%
--------	----------

1.3.4 S2110-95/Color

产品规格

型号	S2100-95/Color
尺寸	125x47x26.6mm
帧率	1280x400@10/20/30/60fps 2560x800@10/20/30fps
分辨率	1280x400; 2560x800;
深度分辨率	Based on CPU/GPU Up to 1280*400@60FPS
像素尺寸	3.0*3.0μm
基线	80.0mm
视角	D:112° H:95° V:50°
焦距	2.63mm
支持 IR	NO
色彩模式	Color
深度工作距离	0.60-7m
快门类型	Global Shutter
功耗	1.1W@5V DC from USB
同步精度	<1ms (up to 0.02ms)
IMU 频率	200Hz
输出数据格式	YUYV
接口	USB3.0
时间同步接口	DF50A
重量	100.8g
UVC MODE	Yes

软件

支持操作系统	Windows 10、Ubuntu 14.04/16.04/18.04、ROS indigo/kinetic/melodic
SDK 地址	http://www.myntai.com/dev/mynteye
开发者支持	SDK
开源项目支持	ORB_SLAM2、OKVIS、Vins-Mono、Vins-Fusion、VIO RB

环境

运行温度	-15°C~55°C
存储温度	-20°C~65°C
湿度	0% to 95% non-condensing

包装

包装内容	MYNT EYE x1 USB Micro-B Cable x1
------	----------------------------------

保修

产品保修	12 Months Limited Manufacturer' s Warranty
------	--------------------------------------------

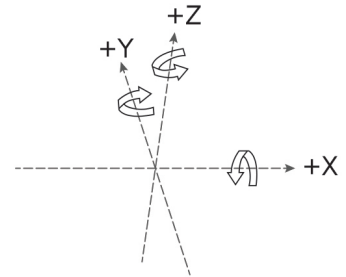
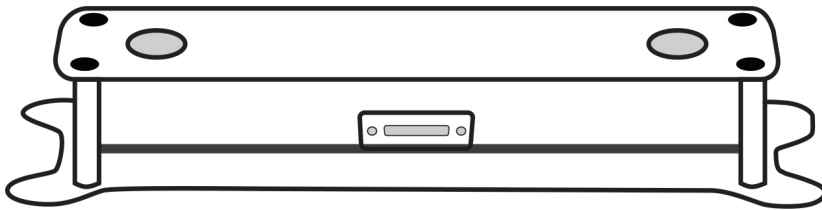
精度

深度测量精度	误差不超过 4%
--------	----------

1.4 IMU 坐标系统

1.4.1 S1030 IMU 坐标系统

IMU 坐标系统为右手系，坐标轴方向如下：



1.4.3 S2110 IMU 坐标系统

IMU 坐标系统为右手系，坐标轴方向如下：



2.1 SDK 说明

2.1.1 支持平台

SDK 是基于 CMake 构建的，用以跨 Linux, Windows 等多个平台。SDK 提供两种安装方式：下载安装以及源码编译安装。

已测试可用的平台有：

- Windows 10
- Ubuntu 18.04.1 / 16.04.6 / 14.04.5
- Jetson TX1/TX2 / Xavier
- firefly RK3399 测试固件 (提取码: y6qs)

警告： 由于硬件传输速率要求，务必使用 USB 3.0 接口。另外，虚拟机因其大多存在 USB 驱动兼容性问题，不建议使用。

2.1.2 OpenCV 说明

SDK 提供了三层接口，其 OpenCV 依赖情况如下：

- api，上层接口，依赖 OpenCV。
- device，中间层接口，不依赖 OpenCV。
- uvc，底层接口，不依赖 OpenCV。

如果不想使用 OpenCV，你可编辑 `<sdk>/cmake/Option.cmake` 里的 `WITH_API` 选项，设为 `OFF` 就能关闭 api 层代码编译：

```
option(WITH_API "Build with API layer, need OpenCV" ON)
```

device 层接口使用样例，请见 `samples/camera_with_junior_device_api.cc`。

2.2 SDK 安装

2.2.1 Ubuntu PPA 安装

Ubuntu 14.04	Ubuntu 16.04	Ubuntu 18.04
✓	✓	✓

x64 PPA 安装

```
$ sudo add-apt-repository ppa:slightech/mynt-eye-s-sdk
$ sudo apt-get update
$ sudo apt-get install mynt-eye-s-sdk
```

armv8 PPA 安装 (16.04)

```
$ sudo add-apt-repository ppa:slightech/mynt-eye-s-sdk-arm
$ sudo apt-get update
$ sudo apt-get install mynt-eye-s-sdk
```

运行样例

小技巧： samples 路径: `/opt/mynt-eye-s-sdk/samples`

```
$ cd /opt/mynt-eye-s-sdk/samples
$ ./camera_with_junior_device_api
```

2.2.2 Ubuntu 源码安装

Ubuntu 14.04	Ubuntu 16.04	Ubuntu 18.04
✓	✓	✓

小技巧： 安装 SDK 前尽量保证系统纯净，其他第三方软件可能会造成库的冲突。如果是其他 Linux 发行版，不是用的 apt-get 包管理工具，那你准备依赖时不能 make init 自动安装，得自己手动安装了。必要安装项如下：

Linux	How to install required packages
Debian based	<code>sudo apt-get install build-essential cmake git libv4l-dev</code>
Red Hat based	<code>sudo yum install make gcc gcc-c++ kernel-devel cmake git libv4l-devel</code>
Arch Linux	<code>sudo pacman -S base-devel cmake git v4l-utils</code>

获取代码

```
sudo apt-get install git
git clone https://github.com/slightech/MYNT-EYE-S-SDK.git
```

准备依赖

```
cd <sdk> # <sdk> 是指 sdk 路径
make init
```

- OpenCV

小技巧：如果需要安装 ROS(不支持 4.0+), 可以不用安装 OpenCV/PCL, 以防兼容性问题。OpenCV 如何编译安装, 请见官方文档 [Installation in Linux](#) 。或参考如下命令：

```
[compiler] sudo apt-get install build-essential
[required] sudo apt-get install cmake git libgtk2.0-dev pkg-config libavcodec-dev \
↳ libavformat-dev libswscale-dev
[optional] sudo apt-get install python-dev python-numpy libtbb2 libtbb-dev libjpeg-
↳ dev libpng-dev libtiff-dev libjasper-dev libdc1394-22-dev

$ git clone https://github.com/opencv/opencv.git
$ cd opencv/
$ git checkout tags/3.4.1

$ mkdir _build
$ cd _build/

$ cmake \
-DMAKE_BUILD_TYPE=RELEASE \
-DMAKE_INSTALL_PREFIX=/usr/local \
\
-DWITH_CUDA=OFF \
\
-DBUILD_DOCS=OFF \
-DBUILD_EXAMPLES=OFF \
-DBUILD_TESTS=OFF \
-DBUILD_PERF_TESTS=OFF \
..

$ make -j4
$ sudo make install
```

编译代码

小技巧：如果 OpenCV 安装到了自定义目录或想指定某一版本，编译前可如下设置路径：

```
# OpenCV_DIR is the directory where your OpenCVConfig.cmake exists
export OpenCV_DIR=~/.opencv
```

不然，CMake 会提示找不到 OpenCV。如果不想依赖 OpenCV，请阅读[OpenCV 说明](#)。

编译并安装：

```
cd <sdk>
make install
```

最终，默认会安装在 /usr/local 目录。

编译样例

```
cd <sdk>
make samples
```

运行样例：

```
./samples/_output/bin/camera_with_junior_device_api
```

教程样例，请阅读[SDK 工程引用](#)和[SDK 控制样例](#)。

结语

工程要引入 SDK 的话，CMake 可参考 samples/CMakeLists.txt 里的配置。不然，就是直接引入安装目录里的头文件和动态库。

2.2.3 Windows EXE 安装

Windows 10
✓

下载并安装 SDK

小技巧：下载地址：[mynteye-s-x.x.x-win-x64-opencv-3.4.3.exe](#) [Google Drive](#) [百度网盘](#) (提取码:rj4k)。

安装完 SDK 的 exe 安装包后，桌面会生成 SDK 根目录的快捷方式。

小技巧：<SDK_ROOT_DIR> 是指 exe 包安装路径

进入 <SDK_ROOT_DIR>\bin\samples 目录，双击 get_stereo_rectified.exe 运行，即可看到双目实时画面。

如果样例没有运行成功，请先检查一下系统变量 `PATH` 中是否成功添加了 `<SDK_ROOT_DIR>\3rdparty\opencv\build,<SDK_ROOT_DIR>\bin` 路径，如果没有需要手动添加一下。

生成样例工程

首先，安装好 [Visual Studio 2017](#) 和 [CMake](#) 。

接着，进入 `<SDK_ROOT_DIR>\samples` 目录，双击 `generate.bat` 即可生成样例工程。

小技巧： 运行样例需要先右键样例，设为启动项目，然后使用 `Release x64` 运行

p.s. 样例教程，可见 [SDK](#) 主页给出的 `Guide` 文档。

如何于 Visual Studio 2017 下使用 SDK

进入 `<SDK_ROOT_DIR>\\samples\\simple_demo\\project_vs2017`，见 `README.md` 说明。

2.2.4 Windows 源码安装

Windows 10
✓

小技巧： Windows 不直接提供 `Visual Studio *.sln` 工程文件，需要用 `CMake` 来构建生成。一是 `CMake` 跨平台、易配置、可持续维护，二是第三方代码（`glog`, `OpenCV`）也都是用的 `CMake` 构建。

前提条件

CMake（提供构建）

- [CMake](#)，用于构建编译（必要）。
- [Git](#)，用于获取代码（可选）。
- [Doxygen](#)，用于生成文档（可选）。

安装好上述工具后，在命令提示符（`Command Prompt`）里确认可运行此些命令：

```
>cmake --version
cmake version 3.10.1

>git --version
git version 2.11.1.windows.1

>doxygen --version
1.8.13
```

Visual Studio (提供编译)

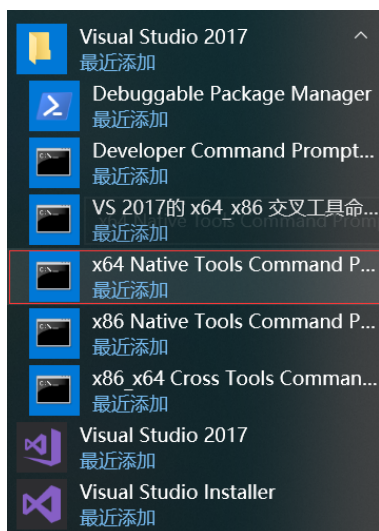
- Visual Studio
 - Visual Studio 2017
 - Visual Studio 2015
- Windows 10 SDK

安装好 Visual Studio 后, 在其 Visual Studio Command Prompt 里确认可运行如下命令:

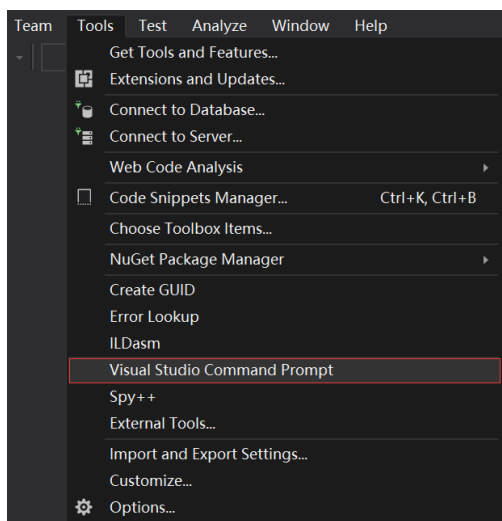
```
>cl
Microsoft (R) C/C++ Optimizing Compiler Version 19.14.26429.4 for x86

>msbuild
Microsoft (R) 生成引擎版本 15.7.179.6572
```

小技巧: Visual Studio Command Prompt 可以从开始菜单打开,



也可以从 Visual Studio 的工具菜单里打开,

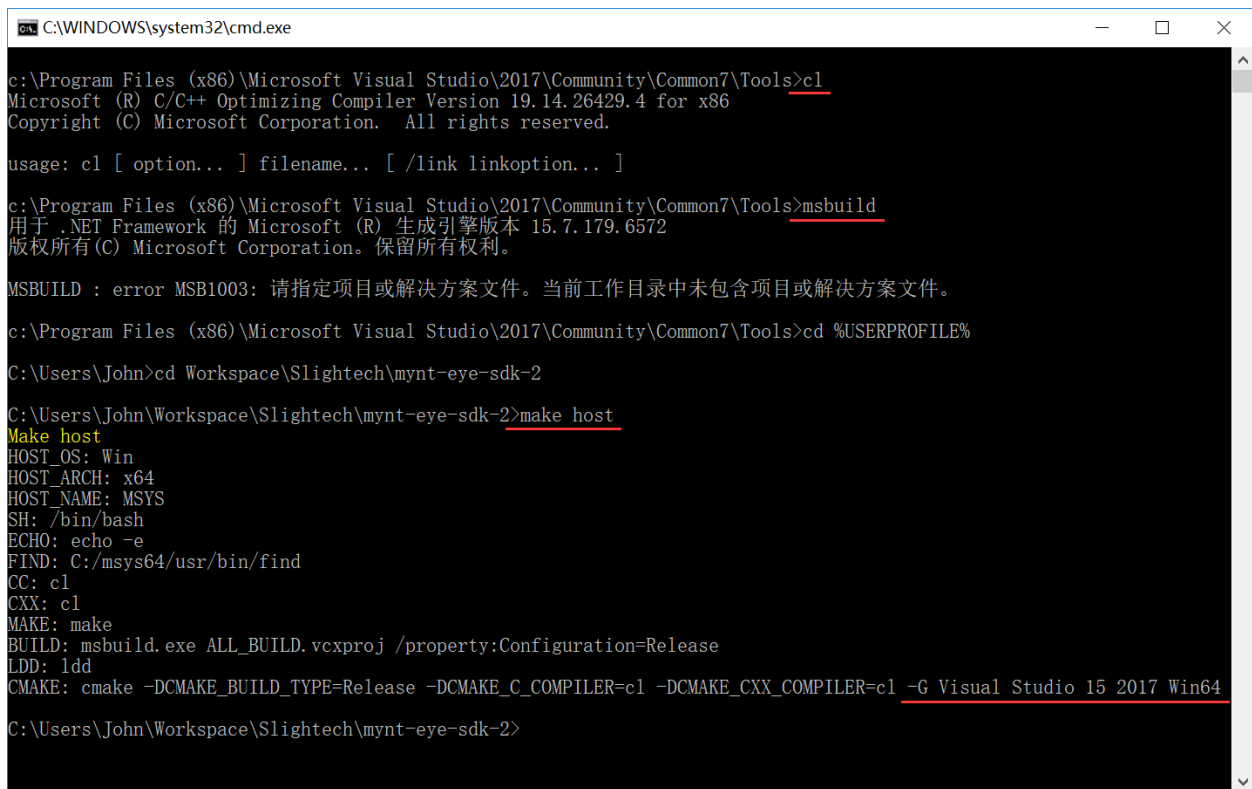


但如 Visual Studio 2015 工具菜单里可能没有，可以自己添加个。

打开 Tools 的 External Tools…，然后 Add 如下内容：

Field	Value
Title	Visual Studio Command Prompt
Command	C:\Windows\System32\cmd.exe
Arguments	/k "C:\Program Files (x86)\Microsoft Visual Studio 14.0\Common7\Tools\VsDevCmd.bat"
Initial Directory	\$(SolutionDir)

Visual Studio Command Prompt 里就可以用编译命令 `cl link lib msbuild` 等 (需要先完成“MSYS2”和“获取代码”步骤)，



```

C:\WINDOWS\system32\cmd.exe

c:\Program Files (x86)\Microsoft Visual Studio\2017\Community\Common7\Tools>cl
Microsoft (R) C/C++ Optimizing Compiler Version 19.14.26429.4 for x86
Copyright (C) Microsoft Corporation. All rights reserved.

usage: cl [ option... ] filename... [ /link linkoption... ]

c:\Program Files (x86)\Microsoft Visual Studio\2017\Community\Common7\Tools>msbuild
用于 .NET Framework 的 Microsoft (R) 生成引擎版本 15.7.179.6572
版权所有 (C) Microsoft Corporation。保留所有权利。

MSBUILD : error MSB1003: 请指定项目或解决方案文件。当前工作目录中未包含项目或解决方案文件。

c:\Program Files (x86)\Microsoft Visual Studio\2017\Community\Common7\Tools>cd %USERPROFILE%
C:\Users\John>cd Workspace\Slightech\mynt-eye-sdk-2
C:\Users\John\Workspace\Slightech\mynt-eye-sdk-2>make host
Make host
HOST_OS: Win
HOST_ARCH: x64
HOST_NAME: MSYS
SH: /bin/bash
ECHO: echo -e
FIND: C:/msys64/usr/bin/find
CC: cl
CXX: cl
MAKE: make
BUILD: msbuild.exe ALL_BUILD.vcxproj /property:Configuration=Release
LDD: ldd
CMAKE: cmake -DCMAKE_BUILD_TYPE=Release -DCMAKE_C_COMPILER=cl -DCMAKE_CXX_COMPILER=cl -G Visual Studio 15 2017 Win64
C:\Users\John\Workspace\Slightech\mynt-eye-sdk-2>

```

MSYS2 (提供 Linux 命令)

- MSYS2
 - 国内镜像
 - pacman

安装后，确认系统环境变量 PATH 里添加了如下路径：

```
C:\msys64\usr\bin
```

然后，打开 MSYS2 MSYS，执行更新并安装 make：


```
$ pacman -Syu
$ pacman -S make
```

最终，命令提示符（Command Prompt）里可以运行如下命令：

```
>make --version
GNU Make 4.2.1
```

获取代码

```
git clone https://github.com/slightech/MYNT-EYE-S-SDK.git
```

准备依赖

```
>cd <sdk> # <sdk> 是指 sdk 路径
>make init
Make init
Init deps
Install cmd: pacman -S
Install deps: git clang-format
pacman -S clang-format (not exists)
error: target not found: clang-format
pip install --upgrade autopep8 cpplint pylint requests
...
Init git hooks
ERROR: clang-format-diff is not installed!
Expect cmake version >= 3.0
cmake version 3.10.1
```

- [OpenCV](#)

小技巧：OpenCV 官方提供了 exe 进行安装 (不支持 4.0+)。如果想从源码编译，请见官方文档 [Installation in Windows](#) 。或参考如下命令：

```
>git clone https://github.com/opencv/opencv.git
>cd opencv
>git checkout tags/3.4.1

>cd opencv
>mkdir _build
>cd _build

>cmake ^
-D CMAKE_BUILD_TYPE=RELEASE ^
-D CMAKE_INSTALL_PREFIX=C:/opencv ^
-D WITH_CUDA=OFF ^
-D BUILD_DOCS=OFF ^
-D BUILD_EXAMPLES=OFF ^
-D BUILD_TESTS=OFF ^
-D BUILD_PERF_TESTS=OFF ^
-G "Visual Studio 15 2017 Win64" ^
..
```

(下页继续)

(续上页)

```
>msbuild ALL_BUILD.vcxproj /property:Configuration=Release
>msbuild INSTALL.vcxproj /property:Configuration=Release

msbuild 路径可参考 ``C:\Program Files (x86)\Microsoft Visual Studio\2017\Community\
↳MSBuild\15.0\Bin\MSBuild.exe``
```

编译代码

小技巧: 如果 OpenCV 安装到了自定义目录或想指定某一版本, 编译前可如下设置路径:

```
# OpenCV_DIR 为 OpenCVConfig.cmake 所在目录
set OpenCV_DIR=C:\opencv\_build
```

不然, CMake 会提示找不到 OpenCV。如果不想依赖 OpenCV, 请阅读[OpenCV 说明](#)。

编译并安装:

```
cd <sdk>
make install
```

最终, 默认会安装在 <sdk>/_install 目录。

编译样例

```
cd <sdk>
make samples
```

运行样例:

```
.\samples\_output\bin\camera_with_senior_api.bat
```

教程样例, 请阅读[SDK 工程引用](#) 和 [SDK 控制样例](#)。

小技巧: 所有编译出的样例程序 exe 都会有个相应的 bat。bat 会临时设定下系统环境变量, 然后再运行 exe。所以建议执行 bat 运行程序。

如果直接运行 exe 的话, 可能会报 dll 找不到。说明你需要将 <sdk>_install\bin %OPENCV_DIR%\bin 加入到系统环境变量 PATH 里。

OpenCV 如何设定环境变量, 可见官方文档 [Set the OpenCV environment variable and add it to the systems path](#)。

结语

工程要引入 SDK 的话，CMake 可参考 samples/CMakeLists.txt 里的配置。不然，就是直接引入安装目录里的头文件和动态库。

2.2.5 ROS Wrapper 安装

ROS Melodic	ROS Kinetic	ROS Indigo
✓	✓	✓

环境准备

- ROS
- ROS 官方安装说明

ROS Melodic (Ubuntu 18.04)

```
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc) main" > /
↳etc/apt/sources.list.d/ros-latest.list'
sudo apt-key adv --keyserver 'hkp://keyserver.ubuntu.com:80' --recv-key_
↳C1CF6E31E6BADE8868B172B4F42ED6FBAB17C654
sudo apt update
sudo apt install ros-melodic-desktop-full
sudo rosdep init
rosdep update
echo "source /opt/ros/melodic/setup.bash" >> ~/.bashrc
source ~/.bashrc
```

ROS Kinetic (Ubuntu 16.04)

```
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc) main" > /
↳etc/apt/sources.list.d/ros-latest.list'
sudo apt-key adv --keyserver 'hkp://keyserver.ubuntu.com:80' --recv-key_
↳C1CF6E31E6BADE8868B172B4F42ED6FBAB17C654
sudo apt-get update
sudo apt-get install ros-kinetic-desktop-full
sudo rosdep init
rosdep update
echo "source /opt/ros/kinetic/setup.bash" >> ~/.bashrc
source ~/.bashrc
```

ROS Indigo (Ubuntu 14.04)

```
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc) main" > /
↳etc/apt/sources.list.d/ros-latest.list'
sudo apt-key adv --keyserver 'hkp://keyserver.ubuntu.com:80' --recv-key_
↳C1CF6E31E6BADE8868B172B4F42ED6FBAB17C654
sudo apt-get update && sudo apt-get install dpkg
sudo apt-get install ros-indigo-desktop-full
sudo rosdep init
rosdep update
echo "source /opt/ros/indigo/setup.bash" >> ~/.bashrc
source ~/.bashrc
```

编译代码

```
cd <sdk>
make ros
```

运行节点

```
source wrappers/ros/devel/setup.bash
roslaunch mynt_eye_ros_wrapper mynteye.launch # 这个节点没有图像显示
```

运行节点，同时打开 RViz 预览：

```
source wrappers/ros/devel/setup.bash
roslaunch mynt_eye_ros_wrapper display.launch
```

测试服务

运行节点，有提供获取设备信息服务，如下测试：

```
$ source wrappers/ros/devel/setup.bash
$ rosrunc mynt_eye_ros_wrapper get_device_info.py
LENS_TYPE: 0000
SPEC_VERSION: 1.0
NOMINAL_BASELINE: 120
HARDWARE_VERSION: 2.0
IMU_TYPE: 0000
SERIAL_NUMBER: 0610243700090720
FIRMWARE_VERSION: 2.0
DEVICE_NAME: MYNT-EYE-S1000
```

常见问题 - ROS Indigo

make ros 时 libopencv 找不到

```
make[3]: *** No rule to make target `/usr/lib/x86_64-linux-gnu/libopencv_videostab.so.
↳2.4.8', needed by `/home/john/Workspace/MYNT-EYE-S-SDK/wrappers/ros/devel/lib/
↳libmynteye_wrapper.so'. Stop.
```

Solution 1) 安装 OpenCV 2:

```
sudo apt-get update
sudo apt-get install libcv-dev
```

Solution 2) 安装 OpenCV 3 并重编 cv_bridge:

```
sudo apt-get install ros-indigo-opencv3

git clone https://github.com/ros-perception/vision_opencv.git
mv vision_opencv/cv_bridge/ MYNT-EYE-S-SDK/wrappers/ros/src/
```

然后, 重新 make ros。

结语

关于如何使用, 请阅读 wrapper_ros。

2.3 SDK 数据样例

2.3.1 获取设备信息

通过 API 的 GetInfo() 函数, 就可以获取当前打开设备的各类信息值。

参考代码片段:

```
auto &&api = API::Create(argc, argv);

LOG(INFO) << "Device name: " << api->GetInfo(Info::DEVICE_NAME);
LOG(INFO) << "Serial number: " << api->GetInfo(Info::SERIAL_NUMBER);
LOG(INFO) << "Firmware version: " << api->GetInfo(Info::FIRMWARE_VERSION);
LOG(INFO) << "Hardware version: " << api->GetInfo(Info::HARDWARE_VERSION);
LOG(INFO) << "Spec version: " << api->GetInfo(Info::SPEC_VERSION);
LOG(INFO) << "Lens type: " << api->GetInfo(Info::LENS_TYPE);
LOG(INFO) << "IMU type: " << api->GetInfo(Info::IMU_TYPE);
LOG(INFO) << "Nominal baseline: " << api->GetInfo(Info::NOMINAL_BASELINE);
```

参考运行结果, 于 Linux 上:

```
$ ./samples/_output/bin/get_device_info
I0503 16:40:21.109391 32106 utils.cc:13] Detecting MYNT EYE devices
I0503 16:40:21.604116 32106 utils.cc:20] MYNT EYE devices:
I0503 16:40:21.604127 32106 utils.cc:24] index: 0, name: MYNT-EYE-S1000
I0503 16:40:21.604142 32106 utils.cc:30] Only one MYNT EYE device, select index: 0
I0503 16:40:21.615054 32106 get_device_info.cc:10] Device name: MYNT-EYE-S1000
```

(下页继续)

(续上页)

```

I0503 16:40:21.615113 32106 get_device_info.cc:11] Serial number: 0610243700090720
I0503 16:40:21.615129 32106 get_device_info.cc:12] Firmware version: 2.0
I0503 16:40:21.615139 32106 get_device_info.cc:13] Hardware version: 2.0
I0503 16:40:21.615146 32106 get_device_info.cc:14] Spec version: 1.0
I0503 16:40:21.615155 32106 get_device_info.cc:15] Lens type: 0000
I0503 16:40:21.615164 32106 get_device_info.cc:16] IMU type: 0000
I0503 16:40:21.615171 32106 get_device_info.cc:17] Nominal baseline: 120

```

完整代码样例，请见 `get_device_info.cc`。

2.3.2 获取图像标定参数

通过 API 的 `GetIntrinsics()` `GetExtrinsics()` 函数，就可以获取当前打开设备的图像标定参数和相机使用的模型。

小技巧： 参数模版可以参考 `tools/writer/config` 下的参数文件，其中 S21XX 对应的相机参数在 `tools/writer/config/S21XX` S1030 对应的相机参数在 `tools/writer/config/S1030 equidistant` 表示等距模型，`pinhole` 表示针孔模型

注解： 相机内参 `Intrinsics`: `k` 表示等距畸变系数，`mu`, `mv` 对应焦距，`v`, `u` 对应主点坐标。相机外参 `Extrinsics` (从右目往左目): `rotation` 表示旋转矩阵，`translation` 表示平移矩阵。`D`、`K`、`R`、`P` 分别为畸变参数，内参矩阵，矫正矩阵，投影矩阵。参考链接: [ros CameraInfo](#)

参考代码片段：

```

auto &&api = API::Create(argc, argv);

LOG(INFO) << "Intrinsics left: {" << *api->GetIntrinsicsBase(Stream::LEFT)
<< "}";
LOG(INFO) << "Intrinsics right: {" << *api->GetIntrinsicsBase(Stream::RIGHT)
<< "}";
LOG(INFO) << "Extrinsics right to left: {"
<< api->GetExtrinsics(Stream::RIGHT, Stream::LEFT) << "}";

```

参考运行结果，于 Linux 上：

```

$ ./samples/_output/bin/get_img_params
I/utils.cc:48 MYNT EYE devices:
I/utils.cc:51 index: 0, name: MYNT-EYE-S1030, sn: 4B4C192400090712, firmware: 2.4
I/utils.cc:60 Only one MYNT EYE device, select index: 0
I/synthetic.cc:59 camera calib model: kannala_brandt
I/utils.cc:93 MYNT EYE requests:
I/utils.cc:96 index: 0, request: width: 752, height: 480, format: Format::YUYV,
↪fps: 60
I/utils.cc:96 index: 1, request: width: 376, height: 240, format: Format::YUYV,
↪fps: 60
I/utils.cc:107 There are 2 stream requests, select index:
0
I/get_img_params.cc:44 Intrinsics left: {equidistant, width: 752, height: 480, k2: 0.
↪00986113697985857, k3: -0.11937208025856659, k4: 0.19092250072175385, k5: -0.
↪10168315832257743, mu: 356.41566867259672335, mv: 356.31078130432149464, u0: 375.
↪76739787805968263, v0: 246.20025492033516912}

```

(下页继续)

(续上页)

```

I/get_img_params.cc:45 Intrinsics right: {equidistant, width: 752, height: 480, k2: -
→0.02246312175999786, k3: 0.01303393297719630, k4: -0.01735983686524734, k5: 0.
→00675132874903371, mu: 357.96820061652590539, mv: 357.76889287108474491, u0: 397.
→09281703352422710, v0: 258.93978588846073308}
I/get_img_params.cc:46 Extrinsics right to left: {rotation: [0.99997489222742053, 0.
→00041828202737396, -0.00707389248605010, -0.00042920419615213, 0.99999871813992847,
→-0.00154256353448567, 0.00707323819170721, 0.00154556094848940, 0.
→99997378992793495], translation: [-120.01607586757218371, 0.34488126401045993, 0.
→64552185106557303]}
ROSMsgInfoPair:
left:
width: 752, height: 480
distortion_model: KANNALA_BRANDT
D: 0.00986114,-0.119372,0.190923,-0.101683,0,
K: 356.416,0,375.767,0,356.311,246.2,0,0,1,
R: 0.999919,-0.00246361,-0.0124477,0.00245407,0.999997,-0.000781093,0.0124496,0.
→000750482,0.999922,
P: 357.04,0,511.114,0,0,357.04,311.965,0,0,0,1,0,

right:
width: 752, height: 480
distortion_model: KANNALA_BRANDT
D: -0.0224631,0.0130339,-0.0173598,0.00675133,0,
K: 357.968,0,397.093,0,357.769,258.94,0,0,1,
R: 0.999981,-0.00287357,-0.00537853,0.00287782,0.999996,0.000781842,0.00537626,-0.
→000797306,0.999985,
P: 357.04,0,511.114,-42851.3,0,357.04,311.965,0,0,0,1,0,

```

完整代码样例，请见 `get_img_params.cc`。

2.3.3 获取 IMU 标定参数

通过 API 的 `GetMotionIntrinsics()` `GetMotionExtrinsics()` 函数，就可以获取当前打开设备的 IMU 标定参数。

参考代码片段：

```

auto &api = API::Create(argc, argv);

LOG(INFO) << "Motion intrinsics: {" << api->GetMotionIntrinsics() << "}";
LOG(INFO) << "Motion extrinsics left to imu: {"
    << api->GetMotionExtrinsics(Stream::LEFT) << "}";

```

完整代码样例，请见 `get_imu_params.cc`。

2.3.4 获取双目原始图像

API 提供了 `Start()` `Stop()` 函数，用于开始或停止捕获数据。如果只捕获图像数据的话，参数用 `Source::VIDEO_STREAMING` 即可。

开始捕获数据后，首先调用 `WaitForStreams()` 函数，等待捕获到数据。接着，通过 `GetStreamData()` 函数，就能获取想要的數據了。

参考代码片段：

```
auto &&api = API::Create(argc, argv);

api->Start(Source::VIDEO_STREAMING);

cv::namedWindow("frame");

while (true) {
    api->WaitForStreams();

    auto &&left_data = api->GetStreamData(Stream::LEFT);
    auto &&right_data = api->GetStreamData(Stream::RIGHT);

    cv::Mat img;
    cv::hconcat(left_data.frame, right_data.frame, img);
    cv::imshow("frame", img);

    char key = static_cast<char>(cv::waitKey(1));
    if (key == 27 || key == 'q' || key == 'Q') { // ESC/Q
        break;
    }
}

api->Stop(Source::VIDEO_STREAMING);
```

上述代码，用了 OpenCV 来显示图像。选中显示窗口时，按 ESC/Q 就会结束程序。

完整代码样例，请见 [get_stereo.cc](#)。

2.3.5 获取双目纠正图像

API 提供的 `GetStreamData()` 默认仅能获取到硬件的原始数据，例如双目原始图像。

而双目纠正图像，属于上层合成数据。此类数据，需要事先 `EnableStreamData()` 启用，然后 `GetStreamData()` 才能获取到。

另外，`WaitForStreams()` 等待的是关键原始数据。刚开始时，合成数据可能还在处理，取出的是空值，所以需要判断下不为空。

小技巧： 如果想要合成数据一生成就立即获取到，请参阅[从回调接口获取数据](#)。

参考代码片段：

```
auto &&api = API::Create(argc, argv);

api->EnableStreamData(Stream::LEFT_RECTIFIED);
api->EnableStreamData(Stream::RIGHT_RECTIFIED);
```

(下页继续)

(续上页)

```

api->Start(Source::VIDEO_STREAMING);

cv::namedWindow("frame");

while (true) {
    api->WaitForStreams();

    auto &left_data = api->GetStreamData(Stream::LEFT_RECTIFIED);
    auto &right_data = api->GetStreamData(Stream::RIGHT_RECTIFIED);

    if (!left_data.frame.empty() && !right_data.frame.empty()) {
        cv::Mat img;
        cv::hconcat(left_data.frame, right_data.frame, img);
        cv::imshow("frame", img);
    }

    char key = static_cast<char>(cv::waitKey(1));
    if (key == 27 || key == 'q' || key == 'Q') { // ESC/Q
        break;
    }
}

api->Stop(Source::VIDEO_STREAMING);

```

上述代码，用了 OpenCV 来显示图像。选中显示窗口时，按 ESC/Q 就会结束程序。

完整代码样例，请见 [get_stereo_rectified.cc](#)。

2.3.6 获取视差图像

视差图像，属于上层合成数据。需要事先 `EnableStreamData()` 启用，然后 `GetStreamData()` 获取。另外，判断不为空后再使用。

详细流程说明，请参阅[获取双目原始图像](#) [获取双目纠正图像](#)。

另外，推荐使用插件计算深度：深度图效果会更好，并且运算速度更快。具体请参阅[使用插件获取数据](#)。

小技巧： 其中 `SetDisparityComputingMethodType` 方法用于改变视差计算方式，目前有 BM/SGBM 两种方式可供选择。

参考代码片段：

```

auto &&api = API::Create(argc, argv);

// api->EnableStreamData(Stream::DISPARITY);
api->EnableStreamData(Stream::DISPARITY_NORMALIZED);

api->SetDisparityComputingMethodType(DisparityComputingMethod::BM);

api->Start(Source::VIDEO_STREAMING);

cv::namedWindow("frame");
// cv::namedWindow("disparity");

```

(下页继续)

(续上页)

```

cv::namedWindow("disparity_normalized");

while (true) {
    api->WaitForStreams();

    auto &&left_data = api->GetStreamData(Stream::LEFT);
    auto &&right_data = api->GetStreamData(Stream::RIGHT);

    cv::Mat img;
    cv::hconcat(left_data.frame, right_data.frame, img);
    cv::imshow("frame", img);

    // auto &&disp_data = api->GetStreamData(Stream::DISPARITY);
    // if (!disp_data.frame.empty()) {
    //     cv::imshow("disparity", disp_data.frame);
    // }

    auto &&disp_norm_data = api->GetStreamData(Stream::DISPARITY_NORMALIZED);
    if (!disp_norm_data.frame.empty()) {
        cv::imshow("disparity_normalized", disp_norm_data.frame); // CV_8UC1
    }

    char key = static_cast<char>(cv::waitKey(1));
    if (key == 27 || key == 'q' || key == 'Q') { // ESC/Q
        break;
    }
}

api->Stop(Source::VIDEO_STREAMING);

```

上述代码，用了 OpenCV 来显示图像。选中显示窗口时，按 ESC/Q 就会结束程序。

完整代码样例，请见 [get_disparity.cc](#)。

2.3.7 获取深度图像

深度图像，属于上层合成数据。需要事先 `EnableStreamData()` 启用，然后 `GetStreamData()` 获取。深度数据的格式为 `CV_16UC1`。另外，判断不为空后再使用。

详细流程说明，请参阅[获取双目原始图像](#) [获取双目纠正图像](#)。

另外，推荐使用插件计算深度：深度图效果会更好，并且运算速度更快。具体请参阅[使用插件获取数据](#)。

参考代码片段：

```

auto &&api = API::Create(argc, argv);

api->EnableStreamData(Stream::DEPTH);

api->Start(Source::VIDEO_STREAMING);

cv::namedWindow("frame");
cv::namedWindow("depth");

while (true) {
    api->WaitForStreams();

```

(下页继续)

(续上页)

```

auto &&left_data = api->GetStreamData(Stream::LEFT);
auto &&right_data = api->GetStreamData(Stream::RIGHT);

cv::Mat img;
cv::hconcat(left_data.frame, right_data.frame, img);
cv::imshow("frame", img);

auto &&depth_data = api->GetStreamData(Stream::DEPTH);
if (!depth_data.frame.empty()) {
    cv::imshow("depth", depth_data.frame); // CV_16UC1
}

char key = static_cast<char>(cv::waitKey(1));
if (key == 27 || key == 'q' || key == 'Q') { // ESC/Q
    break;
}
}

api->Stop(Source::VIDEO_STREAMING);

```

上述代码，用了 OpenCV 来显示图像。选中显示窗口时，按 ESC/Q 就会结束程序。

完整代码样例，请见 [get_depth.cc](#)。

小技巧：预览深度图某区域的值，请见 [get_depth_with_region.cc](#)。

2.3.8 获取点云图像

点云图像，属于上层合成数据。需要事先 `EnableStreamData()` 启用，然后 `GetStreamData()` 获取。另外，判断不为空后再使用。

详细流程说明，请参阅[获取双目原始图像](#) [获取双目纠正图像](#)。

参考代码片段：

```

auto &&api = API::Create(argc, argv);

api->EnableStreamData(Stream::POINTS);

api->Start(Source::VIDEO_STREAMING);

cv::namedWindow("frame");
PCViewer pcviewer;

while (true) {
    api->WaitForStreams();

    auto &&left_data = api->GetStreamData(Stream::LEFT);
    auto &&right_data = api->GetStreamData(Stream::RIGHT);

    cv::Mat img;
    cv::hconcat(left_data.frame, right_data.frame, img);
    cv::imshow("frame", img);
}

```

(下页继续)

(续上页)

```

auto &&points_data = api->GetStreamData(Stream::POINTS);
if (!points_data.frame.empty()) {
    pcviewer.Update(points_data.frame);
}

char key = static_cast<char>(cv::waitKey(1));
if (key == 27 || key == 'q' || key == 'Q') { // ESC/Q
    break;
}
if (pcviewer.WasStopped()) {
    break;
}
}

api->Stop(Source::VIDEO_STREAMING);

```

上述代码，用了 PCL 来显示点云。关闭点云窗口时，也会结束程序。

完整代码样例，请见 [get_depth_and_points.cc](#)。

注意： 准备好了 PCL 库，编译教程样例时才会有此例子。如果 PCL 库安装到了自定义目录，那么请打开 CMakeLists.txt，找到 find_package(PCL)，把 PCLConfig.cmake 所在目录添加进 CMAKE_PREFIX_PATH。

2.3.9 获取 IMU 数据

API 提供了 Start() Stop() 函数，用于开始或停止捕获数据。要捕获 IMU 数据的话，参数用 Source::MOTION_TRACKING。或者 Source::ALL 同时捕获图像和 IMU 数据。

开始捕获数据后，需要 EnableMotionDatas() 启用缓存，才能通过 GetMotionDatas() 函数获取到 IMU 数据。否则，只能通过回调接口得到 IMU 数据，请参阅[从回调接口获取数据](#)。

参考代码片段：

```

auto &&api = API::Create(argc, argv);

// Enable this will cache the motion datas until you get them.
api->EnableMotionDatas();

api->Start(Source::ALL);

CVPainter painter;

cv::namedWindow("frame");

while (true) {
    api->WaitForStreams();

    auto &&left_data = api->GetStreamData(Stream::LEFT);
    auto &&right_data = api->GetStreamData(Stream::RIGHT);

    cv::Mat img;
    cv::hconcat(left_data.frame, right_data.frame, img);
}

```

(下页继续)

(续上页)

```

auto &&motion_datas = api->GetMotionDatas();
/*
for (auto &&data : motion_datas) {
    LOG(INFO) << "Imu frame_id: " << data.imu->frame_id
        << ", timestamp: " << data.imu->timestamp
        << ", accel_x: " << data.imu->accel[0]
        << ", accel_y: " << data.imu->accel[1]
        << ", accel_z: " << data.imu->accel[2]
        << ", gyro_x: " << data.imu->gyro[0]
        << ", gyro_y: " << data.imu->gyro[1]
        << ", gyro_z: " << data.imu->gyro[2]
        << ", temperature: " << data.imu->temperature;
}
*/

painter.DrawImgData(img, *left_data.img);
static std::vector<api::MotionData> motion_datas_s = motion_datas;

if (!motion_datas.empty() && motion_datas.size() > 0) {
    motion_datas_s = motion_datas;
}
if (!motion_datas_s.empty() && motion_datas_s.size() > 0) {
    painter.DrawImuData(img, *motion_datas_s[0].imu);
}

cv::imshow("frame", img);

char key = static_cast<char>(cv::waitKey(1));
if (key == 27 || key == 'q' || key == 'Q') { // ESC/Q
    break;
}
}

api->Stop(Source::ALL);

```

上述代码，用了 OpenCV 来显示图像和数据。选中显示窗口时，按 ESC/Q 就会结束程序。

完整代码样例，请见 `get_imu.cc`。

2.3.10 获取时间戳对应的 IMU 数据

如果想让获取到的图像的时间戳，在获取到的 IMU 数据的时间戳中间，保持对应关系，可以通过 API 提供的 `EnableTimestampCorrespondence()` 函数，启用此功能。

参考代码片段：

```

auto &&api = API::Create(argc, argv);

// Enable motion datas with timestamp correspondence of some stream
api->EnableTimestampCorrespondence(Stream::LEFT);

api->Start(Source::ALL);

cv::namedWindow("frame");

```

(下页继续)

(续上页)

```

while (true) {
    api->WaitForStreams();

    auto &left_data = api->GetStreamData(Stream::LEFT);
    auto &right_data = api->GetStreamData(Stream::RIGHT);

    auto img_stamp = left_data.img->timestamp;
    LOG(INFO) << "Img timestamp: " << img_stamp
        << ", diff_prev=" << (img_stamp - prev_img_stamp);
    prev_img_stamp = img_stamp;

    cv::Mat img;
    cv::hconcat(left_data.frame, right_data.frame, img);

    auto &motion_datas = api->GetMotionDatas();
    LOG(INFO) << "Imu count: " << motion_datas.size();
    for (auto &data : motion_datas) {
        auto imu_stamp = data.imu->timestamp;
        LOG(INFO) << "Imu timestamp: " << imu_stamp
            << ", diff_prev=" << (imu_stamp - prev_imu_stamp)
            << ", diff_img=" << (1.f + imu_stamp - img_stamp);
        prev_imu_stamp = imu_stamp;
    }
    LOG(INFO);

    cv::imshow("frame", img);

    char key = static_cast<char>(cv::waitKey(1));
    if (key == 27 || key == 'q' || key == 'Q') { // ESC/Q
        break;
    }
}

api->Stop(Source::ALL);

```

参考运行结果，于 Linux 上：

```

$ ./samples/_output/bin/get_imu_correspondence
I/utils.cc:30 Detecting MYNT EYE devices
I/utils.cc:40 MYNT EYE devices:
I/utils.cc:43   index: 0, name: MYNT-EYE-S1030, sn: 0281351000090807
I/utils.cc:51 Only one MYNT EYE device, select index: 0
I/synthetic.cc:126 camera calib model: kannala_brandt
I/utils.cc:79 MYNT EYE devices:
I/utils.cc:82   index: 0, request: width: 752, height: 480, format: Format::YUYV,
↪fps: 60
I/utils.cc:87 Only one stream request, select index: 0
I/get_imu_correspondence.cc:50 Img timestamp: 171323050, diff_prev=39990
I/get_imu_correspondence.cc:58 Imu count: 13
I/get_imu_correspondence.cc:61 Imu timestamp: 171318710, diff_prev=171318710, diff_
↪img=-4352
I/get_imu_correspondence.cc:61 Imu timestamp: 171320730, diff_prev=2020, diff_img=-
↪2320
I/get_imu_correspondence.cc:61 Imu timestamp: 171322750, diff_prev=2020, diff_img=-304
I/get_imu_correspondence.cc:61 Imu timestamp: 171324770, diff_prev=2020, diff_img=1712
I/get_imu_correspondence.cc:61 Imu timestamp: 171326790, diff_prev=2020, diff_img=3728

```

(下页继续)

(续上页)

```

I/get_imu_correspondence.cc:61 Imu timestamp: 171328800, diff_prev=2010, diff_img=5744
I/get_imu_correspondence.cc:61 Imu timestamp: 171330810, diff_prev=2010, diff_img=7760
I/get_imu_correspondence.cc:61 Imu timestamp: 171332840, diff_prev=2030, diff_img=9776
I/get_imu_correspondence.cc:61 Imu timestamp: 171334860, diff_prev=2020, diff_
↪img=11808
I/get_imu_correspondence.cc:61 Imu timestamp: 171336880, diff_prev=2020, diff_
↪img=13824
I/get_imu_correspondence.cc:61 Imu timestamp: 171338900, diff_prev=2020, diff_
↪img=15840
I/get_imu_correspondence.cc:61 Imu timestamp: 171340920, diff_prev=2020, diff_
↪img=17872
I/get_imu_correspondence.cc:61 Imu timestamp: 171342930, diff_prev=2010, diff_
↪img=19872
I/get_imu_correspondence.cc:66
I/get_imu_correspondence.cc:50 Img timestamp: 171403040, diff_prev=79990
I/get_imu_correspondence.cc:58 Imu count: 20
I/get_imu_correspondence.cc:61 Imu timestamp: 171383310, diff_prev=40380, diff_img=-
↪19728
I/get_imu_correspondence.cc:61 Imu timestamp: 171385330, diff_prev=2020, diff_img=-
↪17712
I/get_imu_correspondence.cc:61 Imu timestamp: 171387350, diff_prev=2020, diff_img=-
↪15696
I/get_imu_correspondence.cc:61 Imu timestamp: 171389370, diff_prev=2020, diff_img=-
↪13664
I/get_imu_correspondence.cc:61 Imu timestamp: 171391380, diff_prev=2010, diff_img=-
↪11664
I/get_imu_correspondence.cc:61 Imu timestamp: 171393390, diff_prev=2010, diff_img=-
↪9648
I/get_imu_correspondence.cc:61 Imu timestamp: 171395420, diff_prev=2030, diff_img=-
↪7616
I/get_imu_correspondence.cc:61 Imu timestamp: 171397440, diff_prev=2020, diff_img=-
↪5600
I/get_imu_correspondence.cc:61 Imu timestamp: 171399460, diff_prev=2020, diff_img=-
↪3584
I/get_imu_correspondence.cc:61 Imu timestamp: 171401480, diff_prev=2020, diff_img=-
↪1568
I/get_imu_correspondence.cc:61 Imu timestamp: 171403500, diff_prev=2020, diff_img=464
I/get_imu_correspondence.cc:61 Imu timestamp: 171405510, diff_prev=2010, diff_img=2464
I/get_imu_correspondence.cc:61 Imu timestamp: 171407520, diff_prev=2010, diff_img=4480
I/get_imu_correspondence.cc:61 Imu timestamp: 171409540, diff_prev=2020, diff_img=6496
I/get_imu_correspondence.cc:61 Imu timestamp: 171411570, diff_prev=2030, diff_img=8528
I/get_imu_correspondence.cc:61 Imu timestamp: 171413590, diff_prev=2020, diff_
↪img=10544
I/get_imu_correspondence.cc:61 Imu timestamp: 171415610, diff_prev=2020, diff_
↪img=12576
I/get_imu_correspondence.cc:61 Imu timestamp: 171417630, diff_prev=2020, diff_
↪img=14592
I/get_imu_correspondence.cc:61 Imu timestamp: 171419650, diff_prev=2020, diff_
↪img=16608
I/get_imu_correspondence.cc:61 Imu timestamp: 171421660, diff_prev=2010, diff_
↪img=18624

```

完整代码样例，请见 `get_imu_correspondence.cc`。

2.3.11 从回调接口获取数据

API 提供了 `SetStreamCallback()` `SetMotionCallback()` 函数，来设定各类数据的回调。

注意： 一定不要阻塞回调。如果需要长时间处理数据，请将回调作为数据生产者。

参考代码片段：

```
auto &&api = API::Create(argc, argv);

// Attention: must not block the callbacks.

// Get left image from callback
std::atomic_uint left_count(0);
api->SetStreamCallback(
    Stream::LEFT, [&left_count](const api::StreamData &data) {
        CHECK_NOTNULL(data.img);
        ++left_count;
    });

// Get depth image from callback
api->EnableStreamData(Stream::DEPTH);
std::atomic_uint depth_count(0);
cv::Mat depth;
std::mutex depth_mtx;
api->SetStreamCallback(
    Stream::DEPTH,
    [&depth_count, &depth, &depth_mtx](const api::StreamData &data) {
        UNUSED(data);
        ++depth_count;
        {
            std::lock_guard<std::mutex> _(depth_mtx);
            depth = data.frame;
        }
    });

// Get motion data from callback
std::atomic_uint imu_count(0);
std::shared_ptr<mynteye::ImuData> imu;
std::mutex imu_mtx;
api->SetMotionCallback(
    [&imu_count, &imu, &imu_mtx](const api::MotionData &data) {
        CHECK_NOTNULL(data.imu);
        ++imu_count;
        {
            std::lock_guard<std::mutex> _(imu_mtx);
            imu = data.imu;
        }
    });

api->Start(Source::ALL);

CVPainter painter;

cv::namedWindow("frame");
cv::namedWindow("depth");
```

(下页继续)

(续上页)

```

unsigned int depth_num = 0;
while (true) {
    api->WaitForStreams();

    auto &left_data = api->GetStreamData(Stream::LEFT);
    auto &right_data = api->GetStreamData(Stream::RIGHT);

    // Concat left and right as img
    cv::Mat img;
    cv::hconcat(left_data.frame, right_data.frame, img);

    // Draw img data and size
    painter.DrawImgData(img, *left_data.img);

    // Draw imu data
    if (imu) {
        std::lock_guard<std::mutex> _(imu_mtx);
        painter.DrawImuData(img, *imu);
    }

    // Draw counts
    std::ostringstream ss;
    ss << "left: " << left_count << ", depth: " << depth_count
        << ", imu: " << imu_count;
    painter.DrawText(img, ss.str(), CVPainter::BOTTOM_RIGHT);

    // Show img
    cv::imshow("frame", img);

    // Show depth
    if (!depth.empty()) {
        // Is the depth a new one?
        if (depth_num != depth_count || depth_num == 0) {
            std::lock_guard<std::mutex> _(depth_mtx);
            depth_num = depth_count;
            // LOG(INFO) << "depth_num: " << depth_num;
            ss.str("");
            ss.clear();
            ss << "depth: " << depth_count;
            painter.DrawText(depth, ss.str());
            cv::imshow("depth", depth); // CV_16UC1
        }
    }

    char key = static_cast<char>(cv::waitKey(1));
    if (key == 27 || key == 'q' || key == 'Q') { // ESC/Q
        break;
    }
}

api->Stop(Source::ALL);

```

上述代码，用了 OpenCV 来显示图像和数据。选中显示窗口时，按 ESC/Q 就会结束程序。

完整代码样例，请见 [get_from_callbacks.cc](#)。

2.3.12 使用插件获取数据

API 提供了 `EnablePlugin()` 函数，以启用某路径下的插件。

官方目前提供了些计算双目视差的插件，在 `MYNTEYE_BOX` 的 `Plugins` 目录内。

```
Plugins/
├─linux-x86_64/
│   ├──libplugin_b_ocl1.2_opencv3.4.0.so
│   ├──libplugin_g_cuda9.1_opencv2.4.13.5.so
│   ├──libplugin_g_cuda9.1_opencv3.3.1.so
│   └─libplugin_g_cuda9.1_opencv3.4.0.so
├─tegra-armv8/
└─win-x86_64/
```

- 目录 `linux-x86_64` 表明了系统和架构。
 - 可从系统信息或 `uname -a` 得知你的 CPU 架构。
- 库名 `libplugin_*` 表明了插件标识和第三方依赖。
 - `b g` 是插件标识，说明用了不同算法。
 - `ocl1.2` 表明依赖了 OpenCL 1.2，如果存在。
 - `cuda9.1` 表明依赖了 CUDA 9.1，如果存在。
 - `opencv3.4.0` 表明依赖了 OpenCV 3.4.0，如果存在。
 - `mynteye2.0.0` 表明依赖了 MYNT EYE SDK 2.0.0，如果存在。

首先，根据具体情况，选择你想测试使用的插件。如果依赖了第三方，那么请安装一致的版本。

然后，参考如下代码启用插件：

```
auto &&api = API::Create(argc, argv);

api->EnablePlugin("plugins/linux-x86_64/libplugin_g_cuda10.1_opencv3.4.1.so");
```

路径可以是绝对路径，也可以是相对路径（相对于当前工作目录）。

最终，和之前一样调用 API 获取数据就行了。

小技巧： 如果没有启用插件的话，`api->Start(Source::VIDEO_STREAMING)`；时会自动在 `<sdk>/plugins/<platform>` 目录里找合适的插件去加载。

换句话说，可以把当前平台的插件目录整个搬进 `<sdk>/plugins` 目录内。安装好对应的 CUDA OpenCV 等插件依赖后重编译，此后运行 API 层接口程序，就会自动加载官方插件了。

运行前，请执行如下命令，以确保能搜索到插件的依赖库：

```
# Linux
export LD_LIBRARY_PATH=/usr/local/lib:$LD_LIBRARY_PATH
# /usr/local/lib 指依赖库所在路径

# macOS
export DYLD_LIBRARY_PATH=/usr/local/lib:$DYLD_LIBRARY_PATH
# /usr/local/lib 指依赖库所在路径

# Windows
```

(下页继续)

(续上页)

```
set PATH=C:\opencv\x64\vc14\bin;%PATH%
# 或者, 添加进系统环境变量 Path 里。
```

此外, 可执行如下命令, 检查是否能搜索到插件的依赖库:

```
# Linux
ldd *.so
# *.so 指具体插件路径

# macOS
otool -L *.dylib
# *.dylib 指具体插件路径

# Windows
# 请下载如 Dependency Walker, 打开 DLL。
```

如果找不到插件的依赖库, 加载时将会报错 “Open plugin failed”。

完整代码样例, 请见 `get_with_plugin.cc`。

小技巧: Linux 上也可以把依赖库路径加入系统环境, 编译出的程序就可以直接运行了 (不需要于终端里 `export LD_LIBRARY_PATH` 再运行)。

- 新建 `/etc/ld.so.conf.d/libmynteye.conf` 文件, 写入依赖库路径。
- 终端里执行 `sudo /sbin/ldconfig` 命令, 刷新缓存。

2.3.13 保存设备信息和参数

SDK 提供了保存信息和参数的工具 `save_all_infos`。

参考运行命令:

```
./samples/_output/bin/save_all_infos

# Windows
.\samples\_output\bin\save_all_infos.bat
```

参考运行结果, 于 Linux 上:

```
$ ./samples/_output/bin/save_all_infos
I0512 21:40:08.687088 4092 utils.cc:26] Detecting MYNT EYE devices
I0512 21:40:09.366693 4092 utils.cc:33] MYNT EYE devices:
I0512 21:40:09.366734 4092 utils.cc:37] index: 0, name: MYNT-EYE-S1000
I0512 21:40:09.366757 4092 utils.cc:43] Only one MYNT EYE device, select index: 0
I0512 21:40:09.367609 4092 save_all_infos.cc:38] Save all infos to "config/
↪SN0610243700090720"
```

默认会保存进 `<workdir>/config` 目录。你也可以加参数, 指定保存到其他目录。

保存内容如下:

```
<workdir>/
└─config/
    └─SN0610243700090720/
```

(下页继续)

(续上页)

```

├─device.info
├─img.params
└─imu.params

```

2.3.14 保存单张图片

按 “Space” “s” “S” 键来保存图片。

参考代码片段：

```

api->Start(Source::VIDEO_STREAMING);

cv::namedWindow("frame");

std::int32_t count = 0;
std::cout << "Press 'Space' 's' 'S' to save image." << std::endl;
while (true) {
    api->WaitForStreams();

    auto &left_data = api->GetStreamData(Stream::LEFT);
    auto &right_data = api->GetStreamData(Stream::RIGHT);
    if (!left_data.frame.empty() && !right_data.frame.empty()) {
        cv::Mat img;
        cv::hconcat(left_data.frame, right_data.frame, img);
        cv::imshow("frame", img);
    }

    char key = static_cast<char>(cv::waitKey(1));
    if (key == 27 || key == 'q' || key == 'Q') { // ESC/Q
        break;
    } else if (key == 32 || key == 's' || key == 'S') {
        if (!left_data.frame.empty() && !right_data.frame.empty()) {
            char l_name[20];
            char r_name[20];
            ++count;
            snprintf(l_name, sizeof(l_name), "left_%d.jpg", count);
            snprintf(r_name, sizeof(r_name), "right_%d.jpg", count);

            cv::imwrite(l_name, left_data.frame);
            cv::imwrite(r_name, right_data.frame);

            std::cout << "Saved " << l_name << " " << r_name << " to current directory" << "\n";
        }
    }
}

api->Stop(Source::VIDEO_STREAMING);

```

上述代码，用了 OpenCV 来显示图像。选中显示窗口时，按 ESC/Q 就会结束程序。

完整代码样例，请见 `save_single_image.cc`。

2.3.15 写入图像标定参数

SDK 提供了写入图像标定参数的工具 `img_params_writer`。

有关如何获取，请阅读[获取图像标定参数](#)。此参数会用于计算纠正、视差等。

参考运行命令：

```
./samples/_output/bin/write_img_params samples/config/img.params  
  
# Windows  
.\samples\_output\bin\write_img_params.bat samples\config\img.params
```

警告： 请不要随意覆写参数。另外 `save_all_infos` 工具可帮你备份参数。

其中，`samples/config/S1030/img.params.pinhole` 是 s1030 针孔模型参数文件路径。如果你自己标定了参数，可以编辑此文件，然后执行上述命令写入设备。

小技巧： S21XX 对应的相机参数在 `tools/writer/config/S21XX` S1030 对应的相机参数在 `tools/writer/config/S1030` 其中 `equidistant` 表示等距模型，`pinhole` 表示针孔模型

小技巧： 旧 SDK 提供的标定参数文件 `SN*.conf` 也可用此工具写入设备。

2.3.16 写入 IMU 标定参数

SDK 提供了写入 IMU 标定参数的工具 `imu_params_writer`。

有关如何获取，请阅读[获取 IMU 标定参数](#)。

参考运行命令：

```
./samples/_output/bin/write_imu_params samples/config/imu.params  
  
# Windows  
.\samples\_output\bin\write_imu_params.bat samples\config\imu.params
```

其中，`samples/config/imu.params` 是参数文件夹路径。如果你自己标定了参数，可以编辑此文件，然后执行上述命令写入设备。

警告： 请不要随意覆写参数。另外 `save_all_infos` 工具可帮你备份参数。

2.4 SDK 控制样例

2.4.1 设定图像帧率和 IMU 频率

通过 API 的 `SetOptionValue()` 函数，就可以设定当前打开设备的各类控制值。

以 s1030 为例，设定图像帧率和 IMU 频率，就是设定 `Option::FRAME_RATE` 和 `Option::IMU_FREQUENCY`。

注意：

- 图像帧率有效值：10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60。
- IMU 频率有效值：100, 200, 250, 333, 500。

以 s21XX 为例，图像帧率需要在运行样例时选择，帧率和分辨率选择如下：

```
index: 0, request: width: 1280, height: 400, format: Format::BGR888, fps: 10
index: 1, request: width: 1280, height: 400, format: Format::BGR888, fps: 20
index: 2, request: width: 1280, height: 400, format: Format::BGR888, fps: 30
index: 3, request: width: 1280, height: 400, format: Format::BGR888, fps: 60
index: 4, request: width: 2560, height: 800, format: Format::BGR888, fps: 10
index: 5, request: width: 2560, height: 800, format: Format::BGR888, fps: 20
index: 6, request: width: 2560, height: 800, format: Format::BGR888, fps: 30
```

参考代码片段：

s1030:

```
auto &&api = API::Create(argc, argv);

// Attention: must set FRAME_RATE and IMU_FREQUENCY together, otherwise won't
// succeed.

// FRAME_RATE values: 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60
api->SetOptionValue(Option::FRAME_RATE, 25);
// IMU_FREQUENCY values: 100, 200, 250, 333, 500
api->SetOptionValue(Option::IMU_FREQUENCY, 500);

LOG(INFO) << "Set FRAME_RATE to " << api->GetOptionValue(Option::FRAME_RATE);
LOG(INFO) << "Set IMU_FREQUENCY to "
    << api->GetOptionValue(Option::IMU_FREQUENCY);
```

s21XX:

```
auto &&api = API::Create(argc, argv);
if (!api) return 1;

bool ok;
auto &&request = api->SelectStreamRequest(&ok);
if (!ok) return 1;
api->ConfigStreamRequest(request);

LOG(INFO) << "Please set frame rate by 'SelectStreamRequest()';
```

参考运行结果，于 Linux 上：

s1030:

```
$ ./samples/_output/bin/ctrl_framerate
I0513 14:05:57.218222 31813 utils.cc:26] Detecting MYNT EYE devices
I0513 14:05:57.899404 31813 utils.cc:33] MYNT EYE devices:
I0513 14:05:57.899430 31813 utils.cc:37] index: 0, name: MYNT-EYE-S1000
I0513 14:05:57.899435 31813 utils.cc:43] Only one MYNT EYE device, select index: 0
I0513 14:05:58.076257 31813 framerate.cc:36] Set FRAME_RATE to 25
I0513 14:05:58.076836 31813 framerate.cc:37] Set IMU_FREQUENCY to 500
I0513 14:06:21.702361 31813 framerate.cc:82] Time beg: 2018-05-13 14:05:58.384967, ↵
↵end: 2018-05-13 14:06:21.666115, cost: 23281.1ms
I0513 14:06:21.702388 31813 framerate.cc:85] Img count: 573, fps: 24.6122
I0513 14:06:21.702404 31813 framerate.cc:87] Imu count: 11509, hz: 494.348
```

s21XX:

```
$ ./samples/_output/bin/ctrl_framerate
I/utils.cc:30 Detecting MYNT EYE devices
I/utils.cc:40 MYNT EYE devices:
I/utils.cc:43 index: 0, name: MYNT-EYE-S210A, sn: 07C41A190009071F
I/utils.cc:51 Only one MYNT EYE device, select index: 0
I/utils.cc:79 MYNT EYE devices:
I/utils.cc:82 index: 0, request: width: 1280, height: 400, format: Format::BGR888, ↵
↵fps: 10
I/utils.cc:82 index: 1, request: width: 1280, height: 400, format: Format::BGR888, ↵
↵fps: 20
I/utils.cc:82 index: 2, request: width: 1280, height: 400, format: Format::BGR888, ↵
↵fps: 30
I/utils.cc:82 index: 3, request: width: 1280, height: 400, format: Format::BGR888, ↵
↵fps: 60
I/utils.cc:82 index: 4, request: width: 2560, height: 800, format: Format::BGR888, ↵
↵fps: 10
I/utils.cc:82 index: 5, request: width: 2560, height: 800, format: Format::BGR888, ↵
↵fps: 20
I/utils.cc:82 index: 6, request: width: 2560, height: 800, format: Format::BGR888, ↵
↵fps: 30
I/utils.cc:93 There are 7 stream requests, select index:
2
I/framerate.cc:54 Please set frame rate by 'SelectStreamRequest()'
I/framerate.cc:99 Time beg: 2018-12-29 10:05:08.203095, end: 2018-12-29 10:08:20.
↵074969, cost: 191872ms
I/framerate.cc:102 Img count: 5759, fps: 30.0148
I/framerate.cc:104 Imu count: 77163, hz: 402.159
```

样例程序按 ESC/Q 结束运行后，会输出计算得的图像帧率和 IMU 频率。

完整代码样例，请见 `ctrl_framerate.cc`。

2.4.2 设定加速度计及陀螺仪的量程

通过 API 的 SetOptionValue() 函数，就可以设定当前打开设备的各类控制值。

设定加速度计及陀螺仪的量程，就是设定 Option::ACCELEROMETER_RANGE 和 Option::GYROSCOPE_RANGE。

注意： s1030 有效值：

- 加速度计量程有效值（单位：g）：4, 8, 16, 32。
- 陀螺仪量程有效值（单位：deg/s）：500, 1000, 2000, 4000。

s21XX 有效值：

- 加速度计量程有效值（单位：g）：6, 12, 24, 48。
- 陀螺仪量程有效值（单位：deg/s）：250, 500, 1000, 2000, 4000。

参考代码片段：

s1030:

```
auto &&api = API::Create(argc, argv);
if (!api)
    return 1;

// ACCELEROMETER_RANGE values: 4, 8, 16, 32
api->SetOptionValue(Option::ACCELEROMETER_RANGE, 8);
// GYROSCOPE_RANGE values: 500, 1000, 2000, 4000
api->SetOptionValue(Option::GYROSCOPE_RANGE, 1000);

LOG(INFO) << "Set ACCELEROMETER_RANGE to "
            << api->GetOptionValue(Option::ACCELEROMETER_RANGE);
LOG(INFO) << "Set GYROSCOPE_RANGE to "
            << api->GetOptionValue(Option::GYROSCOPE_RANGE);
```

s21XX:

```
auto &&api = API::Create(argc, argv);
if (!api) return 1;

bool ok;
auto &&request = api->SelectStreamRequest(&ok);
if (!ok) return 1;
api->ConfigStreamRequest(request);

// ACCELEROMETER_RANGE values: 6, 12, 24, 48
api->SetOptionValue(Option::ACCELEROMETER_RANGE, 6);
// GYROSCOPE_RANGE values: 250, 500, 1000, 2000, 4000
api->SetOptionValue(Option::GYROSCOPE_RANGE, 1000);

LOG(INFO) << "Set ACCELEROMETER_RANGE to "
            << api->GetOptionValue(Option::ACCELEROMETER_RANGE);
LOG(INFO) << "Set GYROSCOPE_RANGE to "
            << api->GetOptionValue(Option::GYROSCOPE_RANGE);
```

参考运行结果，于 Linux 上：

s1030:

```
$ ./samples/_output/bin/ctrl_imu_range
I/utils.cc:28 Detecting MYNT EYE devices
I/utils.cc:38 MYNT EYE devices:
I/utils.cc:41   index: 0, name: MYNT-EYE-S1030, sn: 4B4C1F1100090712
I/utils.cc:49 Only one MYNT EYE device, select index: 0
I/imu_range.cc:34 Set ACCELEROMETER_RANGE to 8
I/imu_range.cc:36 Set GYROSCOPE_RANGE to 1000
I/imu_range.cc:81 Time beg: 2018-11-21 15:34:57.726428, end: 2018-11-21 15:35:12.
↪190478, cost: 14464ms
I/imu_range.cc:84 Img count: 363, fps: 25.0967
I/imu_range.cc:86 Imu count: 2825, hz: 195.312
```

s21XX:

```
$ ./samples/_output/bin/ctrl_imu_range
I/utils.cc:30 Detecting MYNT EYE devices
I/utils.cc:40 MYNT EYE devices:
I/utils.cc:43   index: 0, name: MYNT-EYE-S210A, sn: 07C41A190009071F
I/utils.cc:51 Only one MYNT EYE device, select index: 0
I/utils.cc:79 MYNT EYE devices:
I/utils.cc:82   index: 0, request: width: 1280, height: 400, format: Format::BGR888,↵
↪fps: 10
I/utils.cc:82   index: 1, request: width: 1280, height: 400, format: Format::BGR888,↵
↪fps: 20
I/utils.cc:82   index: 2, request: width: 1280, height: 400, format: Format::BGR888,↵
↪fps: 30
I/utils.cc:82   index: 3, request: width: 1280, height: 400, format: Format::BGR888,↵
↪fps: 60
I/utils.cc:82   index: 4, request: width: 2560, height: 800, format: Format::BGR888,↵
↪fps: 10
I/utils.cc:82   index: 5, request: width: 2560, height: 800, format: Format::BGR888,↵
↪fps: 20
I/utils.cc:82   index: 6, request: width: 2560, height: 800, format: Format::BGR888,↵
↪fps: 30
I/utils.cc:93 There are 7 stream requests, select index:
3
I/imu_range.cc:51 Set ACCELEROMETER_RANGE to 6
I/imu_range.cc:53 Set GYROSCOPE_RANGE to 1000
I/imu_range.cc:98 Time beg: 2018-12-29 10:03:10.706211, end: 2018-12-29 10:04:12.
↪497427, cost: 61791.2ms
I/imu_range.cc:101 Img count: 3706, fps: 59.9762
I/imu_range.cc:103 Imu count: 24873, hz: 402.533
```

样例程序按 ESC/Q 结束运行后，imu 量程设置完成。该结果将固化在硬件内部，不受掉电影响。

完整代码样例，请见 `ctrl_imu_range.cc`。

2.4.3 启用自动曝光及其调节

通过 API 的 SetOptionValue() 函数，就可以设定当前打开设备的各类控制值。

启用自动曝光，就是设定 Option::EXPOSURE_MODE 为 0。

以 s1030 为例，自动曝光时，可调节的设定有：

- Option::MAX_GAIN 最大增益。
- Option::MAX_EXPOSURE_TIME 最大曝光时间。
- Option::DESIRED_BRIGHTNESS 期望亮度。

以 s21XX 为例，自动曝光可调节的设定有：

- Option::MAX_GAIN 最大增益。
- Option::MAX_EXPOSURE_TIME 最大曝光时间。
- Option::DESIRED_BRIGHTNESS 期望亮度。
- Option::MIN_EXPOSURE_TIME 最小曝光时间。

参考代码片段：

s1030:

```
auto &&api = API::Create(argc, argv);

// auto-exposure: 0
api->SetOptionValue(Option::EXPOSURE_MODE, 0);

// max_gain: range [0,48], default 48
api->SetOptionValue(Option::MAX_GAIN, 48);
// max_exposure_time: range [0,240], default 240
api->SetOptionValue(Option::MAX_EXPOSURE_TIME, 240);
// desired_brightness: range [0,255], default 192
api->SetOptionValue(Option::DESIRED_BRIGHTNESS, 192);

LOG(INFO) << "Enable auto-exposure";
LOG(INFO) << "Set MAX_GAIN to " << api->GetOptionValue(Option::MAX_GAIN);
LOG(INFO) << "Set MAX_EXPOSURE_TIME to "
<< api->GetOptionValue(Option::MAX_EXPOSURE_TIME);
LOG(INFO) << "Set DESIRED_BRIGHTNESS to "
<< api->GetOptionValue(Option::DESIRED_BRIGHTNESS);
```

s21XX:

```
auto &&api = API::Create(argc, argv);

bool ok;
auto &&request = api->SelectStreamRequest(&ok);
if (!ok) return 1;
api->ConfigStreamRequest(request);

// auto-exposure: 0
api->SetOptionValue(Option::EXPOSURE_MODE, 0);

// max_gain: range [0,255], default 8
api->SetOptionValue(Option::MAX_GAIN, 8);
// max_exposure_time: range [0,655], default 333
```

(下页继续)

(续上页)

```

api->SetOptionValue (Option::MAX_EXPOSURE_TIME, 333);
// desired_brightness: range [1,255], default 122
api->SetOptionValue (Option::DESIRED_BRIGHTNESS, 122);
// min_exposure_time: range [0,655], default 0
api->SetOptionValue (Option::MIN_EXPOSURE_TIME, 0);

LOG(INFO) << "Enable auto-exposure";
LOG(INFO) << "Set EXPOSURE_MODE to "
    << api->GetOptionValue (Option::EXPOSURE_MODE);
LOG(INFO) << "Set MAX_GAIN to " << api->GetOptionValue (Option::MAX_GAIN);
LOG(INFO) << "Set MAX_EXPOSURE_TIME to "
    << api->GetOptionValue (Option::MAX_EXPOSURE_TIME);
LOG(INFO) << "Set DESIRED_BRIGHTNESS to "
    << api->GetOptionValue (Option::DESIRED_BRIGHTNESS);
LOG(INFO) << "Set MIN_EXPOSURE_TIME to "
    << api->GetOptionValue (Option::MIN_EXPOSURE_TIME);

```

参考运行结果，于 Linux 上：

s1030:

```

$ ./samples/_output/bin/ctrl_auto_exposure
I0513 14:07:57.963943 31845 utils.cc:26] Detecting MYNT EYE devices
I0513 14:07:58.457536 31845 utils.cc:33] MYNT EYE devices:
I0513 14:07:58.457563 31845 utils.cc:37]   index: 0, name: MYNT-EYE-S1000
I0513 14:07:58.457567 31845 utils.cc:43] Only one MYNT EYE device, select index: 0
I0513 14:07:58.474916 31845 auto_exposure.cc:37] Enable auto-exposure
I0513 14:07:58.491058 31845 auto_exposure.cc:38] Set MAX_GAIN to 48
I0513 14:07:58.505131 31845 auto_exposure.cc:39] Set MAX_EXPOSURE_TIME to 240
I0513 14:07:58.521375 31845 auto_exposure.cc:41] Set DESIRED_BRIGHTNESS to 192

```

s21XX:

```

$ ./samples/_output/bin/ctrl_auto_exposure
I/utils.cc:30 Detecting MYNT EYE devices
I/utils.cc:40 MYNT EYE devices:
I/utils.cc:43   index: 0, name: MYNT-EYE-S210A, sn: 07C41A190009071F
I/utils.cc:51 Only one MYNT EYE device, select index: 0
I/utils.cc:79 MYNT EYE devices:
I/utils.cc:82   index: 0, request: width: 1280, height: 400, format: Format::BGR888, ↵
↪fps: 10
I/utils.cc:82   index: 1, request: width: 1280, height: 400, format: Format::BGR888, ↵
↪fps: 20
I/utils.cc:82   index: 2, request: width: 1280, height: 400, format: Format::BGR888, ↵
↪fps: 30
I/utils.cc:82   index: 3, request: width: 1280, height: 400, format: Format::BGR888, ↵
↪fps: 60
I/utils.cc:82   index: 4, request: width: 2560, height: 800, format: Format::BGR888, ↵
↪fps: 10
I/utils.cc:82   index: 5, request: width: 2560, height: 800, format: Format::BGR888, ↵
↪fps: 20
I/utils.cc:82   index: 6, request: width: 2560, height: 800, format: Format::BGR888, ↵
↪fps: 30
I/utils.cc:93 There are 7 stream requests, select index:
3
I/auto_exposure.cc:72 Enable auto-exposure
I/auto_exposure.cc:73 Set EXPOSURE_MODE to 0

```

(下页继续)

(续上页)

```
I/auto_exposure.cc:75 Set MAX_GAIN to 8
I/auto_exposure.cc:76 Set MAX_EXPOSURE_TIME to 333
I/auto_exposure.cc:78 Set DESIRED_BRIGHTNESS to 122
I/auto_exposure.cc:80 Set MIN_EXPOSURE_TIME to 0
```

样例程序会显示图像，左上角有真实曝光时间，单位毫秒。

完整代码样例，请见 `ctrl_auto_exposure.cc`。

2.4.4 启用手动曝光及其调节

通过 API 的 `SetOptionValue()` 函数，就可以设定当前打开设备的各类控制值。

启用手动曝光，就是设定 `Option::EXPOSURE_MODE` 为 1。

以 s1030 为例，手动曝光时，可调节的设定有：

- `Option::GAIN` 增益。
- `Option::BRIGHTNESS` 亮度，或者说曝光时间。
- `Option::CONTRAST` 对比度，或者说黑电平校准。

以 s21XX 为例，手动曝光时，可调节的设定有：

- `Option::BRIGHTNESS` 亮度，或者说曝光时间。

参考代码片段：

s1030:

```
auto &&api = API::Create(argc, argv);

// manual-exposure: 1
api->SetOptionValue(Option::EXPOSURE_MODE, 1);

// gain: range [0,48], default 24
api->SetOptionValue(Option::GAIN, 24);
// brightness/exposure_time: range [0,240], default 120
api->SetOptionValue(Option::BRIGHTNESS, 120);
// contrast/black_level_calibration: range [0,254], default 116
api->SetOptionValue(Option::CONTRAST, 116);

LOG(INFO) << "Enable manual-exposure";
LOG(INFO) << "Set GAIN to " << api->GetOptionValue(Option::GAIN);
LOG(INFO) << "Set BRIGHTNESS to " << api->GetOptionValue(Option::BRIGHTNESS);
LOG(INFO) << "Set CONTRAST to " << api->GetOptionValue(Option::CONTRAST);
```

s21XX:

```
auto &&api = API::Create(argc, argv);

bool ok;
auto &&request = api->SelectStreamRequest(&ok);
if (!ok) return 1;
api->ConfigStreamRequest(request);

// manual-exposure: 1
api->SetOptionValue(Option::EXPOSURE_MODE, 1);
```

(下页继续)

(续上页)

```
// brightness/exposure_time: range [1,255], default 120
api->SetOptionValue (Option::BRIGHTNESS, 120);

LOG(INFO) << "Enable manual-exposure";
LOG(INFO) << "Set EXPOSURE_MODE to "
    << api->GetOptionValue (Option::EXPOSURE_MODE);
LOG(INFO) << "Set BRIGHTNESS to "
    << api->GetOptionValue (Option::BRIGHTNESS);
```

参考运行结果，于 Linux 上：

s1030:

```
$ ./samples/_output/bin/ctrl_manual_exposure
I0513 14:09:17.104431 31908 utils.cc:26] Detecting MYNT EYE devices
I0513 14:09:17.501519 31908 utils.cc:33] MYNT EYE devices:
I0513 14:09:17.501551 31908 utils.cc:37] index: 0, name: MYNT-EYE-S1000
I0513 14:09:17.501562 31908 utils.cc:43] Only one MYNT EYE device, select index: 0
I0513 14:09:17.552918 31908 manual_exposure.cc:37] Enable manual-exposure
I0513 14:09:17.552953 31908 manual_exposure.cc:38] Set GAIN to 24
I0513 14:09:17.552958 31908 manual_exposure.cc:39] Set BRIGHTNESS to 120
I0513 14:09:17.552963 31908 manual_exposure.cc:40] Set CONTRAST to 116
```

s21XX:

```
$ ./samples/_output/bin/ctrl_manual_exposure
I/utils.cc:30 Detecting MYNT EYE devices
I/utils.cc:40 MYNT EYE devices:
I/utils.cc:43 index: 0, name: MYNT-EYE-S210A, sn: 07C41A190009071F
I/utils.cc:51 Only one MYNT EYE device, select index: 0
I/utils.cc:79 MYNT EYE devices:
I/utils.cc:82 index: 0, request: width: 1280, height: 400, format: Format::BGR888, ↵
↪fps: 10
I/utils.cc:82 index: 1, request: width: 1280, height: 400, format: Format::BGR888, ↵
↪fps: 20
I/utils.cc:82 index: 2, request: width: 1280, height: 400, format: Format::BGR888, ↵
↪fps: 30
I/utils.cc:82 index: 3, request: width: 1280, height: 400, format: Format::BGR888, ↵
↪fps: 60
I/utils.cc:82 index: 4, request: width: 2560, height: 800, format: Format::BGR888, ↵
↪fps: 10
I/utils.cc:82 index: 5, request: width: 2560, height: 800, format: Format::BGR888, ↵
↪fps: 20
I/utils.cc:82 index: 6, request: width: 2560, height: 800, format: Format::BGR888, ↵
↪fps: 30
I/utils.cc:93 There are 7 stream requests, select index:
3
I/manual_exposure.cc:62 Enable manual-exposure
I/manual_exposure.cc:63 Set EXPOSURE_MODE to 1
I/manual_exposure.cc:65 Set BRIGHTNESS to 120
```

样例程序会显示图像，左上角有真实曝光时间，单位毫秒。

完整代码样例，请见 `ctrl_manual_exposure.cc`。

2.4.5 启用 IR 及其调节

通过 API 的 `SetOptionValue()` 函数，就可以设定当前打开设备的各类控制值。

启用 IR，就是设定 `Option::IR_CONTROL` 大于 0 的值。值越大，强度越高。

注意：

- s21XX 不支持此功能

参考代码片段：

```
auto &&api = API::Create(argc, argv);

// Detect infrared add-ons
LOG(INFO) << "Support infrared: " << std::boolalpha
    << api->Supports(AddOns::INFRARED);
LOG(INFO) << "Support infrared2: " << std::boolalpha
    << api->Supports(AddOns::INFRARED2);

// Get infrared intensity range
auto &&info = api->GetOptionInfo(Option::IR_CONTROL);
LOG(INFO) << Option::IR_CONTROL << ": {" << info << "}";

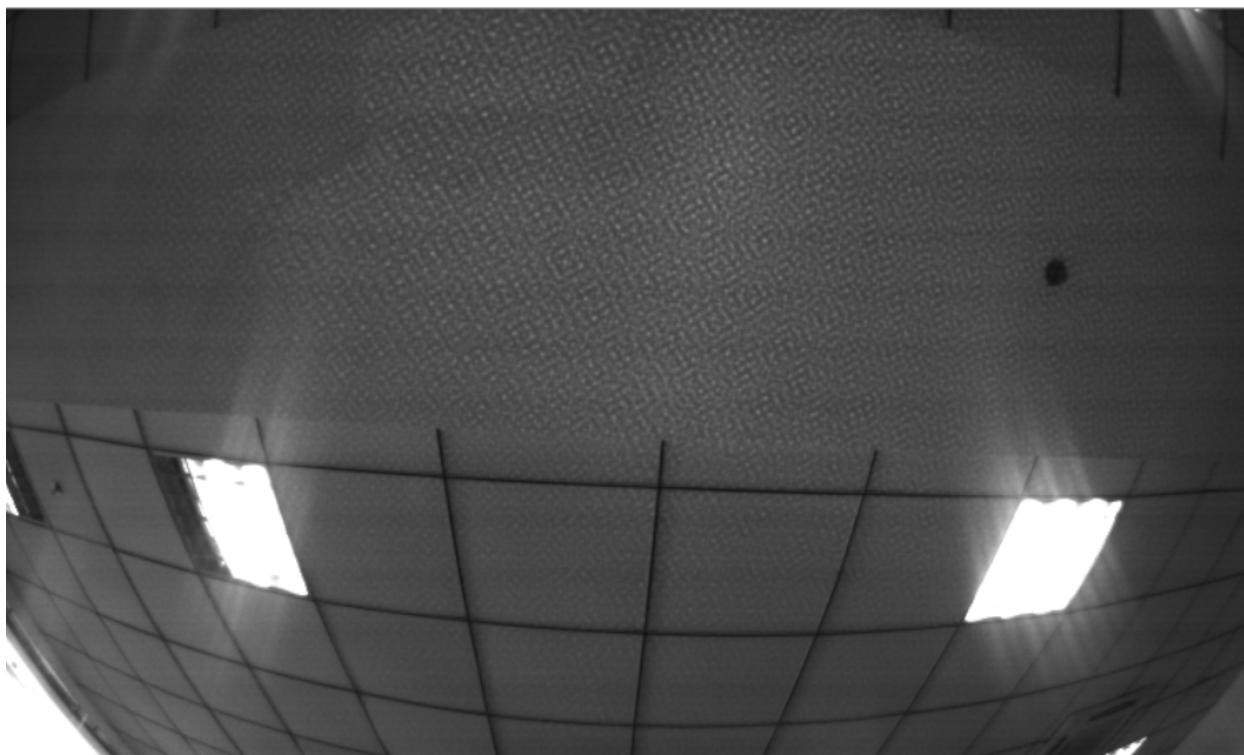
// Set infrared intensity value
api->SetOptionValue(Option::IR_CONTROL, 80);
```

参考运行结果，于 Linux 上：

```
$ ./samples/_output/bin/ctrl_infrared
I0504 16:16:28.016624 25848 utils.cc:13] Detecting MYNT EYE devices
I0504 16:16:28.512462 25848 utils.cc:20] MYNT EYE devices:
I0504 16:16:28.512473 25848 utils.cc:24]   index: 0, name: MYNT-EYE-S1000
I0504 16:16:28.512477 25848 utils.cc:30] Only one MYNT EYE device, select index: 0
I0504 16:16:28.520848 25848 infrared.cc:13] Support infrared: true
I0504 16:16:28.520869 25848 infrared.cc:15] Support infrared2: true
I0504 16:16:28.520889 25848 infrared.cc:20] Option::IR_CONTROL: {min: 0, max: 160, ↵
↵def: 0}
```

此时，如果显示了图像，就能够看到图像上会有 IR 光斑，如下图：

frame



注意：硬件不记录 IR 设定值，断电后恢复为默认设置 0。如果需保持启用 IR 的话，程序在打开设备后，一定要设定下 IR 值。

完整代码样例，请见 [ctrl_infrared.cc](#)。

2.4.6 低通滤波

通过 API 的 `SetOptionValue()` 函数，就可以设定当前打开设备的各类控制值。

设定加速度计低通滤波寄存器值及陀螺仪低通滤波寄存器值，就是设定 `Option::ACCELEROMETER_LOW_PASS_FILTER` 和 `Option::GYROSCOPE_LOW_PASS_FILTER`。

注意：

- s1030 不支持此功能

参考代码片段：

```
auto &&api = API::Create(argc, argv);
if (!api) return 1;

bool ok;
auto &&request = api->SelectStreamRequest(&ok);
if (!ok) return 1;
api->ConfigStreamRequest(request);
```

(下页继续)

(续上页)

```
// ACCELEROMETER_RANGE values: 0, 1, 2
api->SetOptionValue (Option::ACCELEROMETER_LOW_PASS_FILTER, 2);
// GYROSCOPE_RANGE values: 23, 64
api->SetOptionValue (Option::GYROSCOPE_LOW_PASS_FILTER, 64);

LOG(INFO) << "Set ACCELEROMETER_LOW_PASS_FILTER to "
    << api->GetOptionValue (Option::ACCELEROMETER_LOW_PASS_FILTER);
LOG(INFO) << "Set GYROSCOPE_LOW_PASS_FILTER to "
    << api->GetOptionValue (Option::GYROSCOPE_LOW_PASS_FILTER);
```

参考运行结果，于 Linux 上：

```
$ ./samples/_output/bin/ctrl_imu_low_pass_filter
I/utils.cc:30 Detecting MYNT EYE devices
I/utils.cc:40 MYNT EYE devices:
I/utils.cc:43   index: 0, name: MYNT-EYE-S210A, sn: 07C41A190009071F
I/utils.cc:51 Only one MYNT EYE device, select index: 0
I/utils.cc:79 MYNT EYE devices:
I/utils.cc:82   index: 0, request: width: 1280, height: 400, format: Format::BGR888, ↵
↵fps: 10
I/utils.cc:82   index: 1, request: width: 1280, height: 400, format: Format::BGR888, ↵
↵fps: 20
I/utils.cc:82   index: 2, request: width: 1280, height: 400, format: Format::BGR888, ↵
↵fps: 30
I/utils.cc:82   index: 3, request: width: 1280, height: 400, format: Format::BGR888, ↵
↵fps: 60
I/utils.cc:82   index: 4, request: width: 2560, height: 800, format: Format::BGR888, ↵
↵fps: 10
I/utils.cc:82   index: 5, request: width: 2560, height: 800, format: Format::BGR888, ↵
↵fps: 20
I/utils.cc:82   index: 6, request: width: 2560, height: 800, format: Format::BGR888, ↵
↵fps: 30
I/utils.cc:93 There are 7 stream requests, select index:
1
I/imu_low_pass_filter.cc:48 Set ACCELEROMETER_LOW_PASS_FILTER to 2
I/imu_low_pass_filter.cc:50 Set GYROSCOPE_LOW_PASS_FILTER to 64
I/imu_low_pass_filter.cc:96 Time beg: 2018-12-29 13:53:42.296299, end: 2018-12-29 ↵
↵14:06:33.295960, cost: 771000ms
I/imu_low_pass_filter.cc:99 Img count: 15412, fps: 19.9896
I/imu_low_pass_filter.cc:101 Imu count: 309891, hz: 401.934
```

样例程序按 ESC/Q 结束运行后，imu 低通滤波设置完成。该结果将固化在硬件内部，不受掉电影响。

完整代码样例，请见 `ctrl_imu_low_pass_filter.cc`。

2.4.7 设定 IIC 地址

通过 API 的 `SetOptionValue()` 函数，就可以设定当前打开设备的各类控制值。

设定 IIC 地址，就是设定 `Option::IIC_ADDRESS_SETTING`。

注意： 仅支持 S21XX

参考代码片段：

s2XX:

```
auto &&api = API::Create(argc, argv);
if (!api) return 1;
bool ok;
auto &&request = api->SelectStreamRequest(&ok);
if (!ok) return 1;
api->ConfigStreamRequest(request);
Model model = api->GetModel();
if (model == Model::STANDARD210A || model == Model::STANDARD2) {
    api->SetOptionValue(Option::IIC_ADDRESS_SETTING, 0x31);
    LOG(INFO) << "Set iic address to " << std::hex << "0x"
        << api->GetOptionValue(Option::IIC_ADDRESS_SETTING);
}
```

参考运行结果，于 Linux 上：

s21XX:

```
$ ./samples/_output/bin/ctrl_iic_address
I/utils.cc:30 Detecting MYNT EYE devices
I/utils.cc:40 MYNT EYE devices:
I/utils.cc:43   index: 0, name: MYNT-EYE-S210A, sn: 07C41A190009071F
I/utils.cc:51 Only one MYNT EYE device, select index: 0
I/utils.cc:79 MYNT EYE devices:
I/utils.cc:82   index: 0, request: width: 1280, height: 400, format: Format::BGR888, ↵
↵fps: 10
I/utils.cc:82   index: 1, request: width: 1280, height: 400, format: Format::BGR888, ↵
↵fps: 20
I/utils.cc:82   index: 2, request: width: 1280, height: 400, format: Format::BGR888, ↵
↵fps: 30
I/utils.cc:82   index: 3, request: width: 1280, height: 400, format: Format::BGR888, ↵
↵fps: 60
I/utils.cc:82   index: 4, request: width: 2560, height: 800, format: Format::BGR888, ↵
↵fps: 10
I/utils.cc:82   index: 5, request: width: 2560, height: 800, format: Format::BGR888, ↵
↵fps: 20
I/utils.cc:82   index: 6, request: width: 2560, height: 800, format: Format::BGR888, ↵
↵fps: 30
I/utils.cc:93 There are 7 stream requests, select index:
3
I/imu_range.cc:51 Set iic address to 0x31
```

样例程序按 ESC/Q 结束。

完整代码样例，请见 `ctrl_iic_address.cc`。

2.5 SDK 工程引用

2.5.1 CMake 如何使用 SDK

本教程将使用 CMake 创建一个项目来使用 SDK。

你可以在 `<sdk>/samples/simple_demo/project_cmake` directory 目录下找到工程样例。

准备

- Windows: 安装 SDK 的 exe 包
- Linux: 使用源代码编译和 `make install`

创建项目

添加 `CMakeLists.txt` 和 `mynteye_demo.cc` 文件,

```
cmake_minimum_required(VERSION 3.0)

project(mynteyed_demo VERSION 1.0.0 LANGUAGES C CXX)

# flags

set(CMAKE_C_FLAGS "${CMAKE_C_FLAGS} -Wall -O3")
set(CMAKE_CXX_FLAGS "${CMAKE_CXX_FLAGS} -Wall -O3")

set(CMAKE_C_FLAGS "${CMAKE_C_FLAGS} -std=c++11 -march=native")
set(CMAKE_CXX_FLAGS "${CMAKE_CXX_FLAGS} -std=c++11 -march=native")

## mynteye_demo

add_executable(mynteye_demo mynteye_demo.cc)
target_link_libraries(mynteye_demo mynteye ${OpenCV_LIBS})
```

配置项目

增加 `mynteye` 和 `OpenCV` 到 `CMakeLists.txt` ,

```
# packages

if(MSVC)
  set(SDK_ROOT "$ENV{MYNTEYES_SDK_ROOT}")
  if(SDK_ROOT)
    message(STATUS "MYNTEYES_SDK_ROOT: ${SDK_ROOT}")
    list(APPEND CMAKE_PREFIX_PATH
      "${SDK_ROOT}/lib/cmake"
      "${SDK_ROOT}/3rdparty/opencv/build"
    )
  else()
    message(FATAL_ERROR "MYNTEYES_SDK_ROOT not found, please install SDK firstly")
  endif()
endif()
```

(下页继续)

(续上页)

```

endif()

## mynteye

find_package(mynteye REQUIRED)
message(STATUS "Found mynteye: ${mynteye_VERSION}")

# When SDK build with OpenCV, we can add WITH_OPENCV macro to enable some
# features depending on OpenCV, such as ToMat().
if(mynteye_WITH_OPENCV)
    add_definitions(-DWITH_OPENCV)
endif()

## OpenCV

# Set where to find OpenCV
#set(OPENCV_DIR "/usr/share/OpenCV")

# When SDK build with OpenCV, we must find the same version here.
find_package(OpenCV REQUIRED)
message(STATUS "Found OpenCV: ${OpenCV_VERSION}")

```

将 `include_directories` 和 `target_link_libraries` 添加到 `mynteye_demo` 目标,

```

# targets

include_directories(
    ${OPENCV_INCLUDE_DIRS}
)

## mynteye_demo

add_executable(mynteye_demo mynteye_demo.cc)
target_link_libraries(mynteye_demo mynteye ${OPENCV_LIBS})

```

使用 SDK

可以参考工程样例添加头文件和使用 API。

Windows

可以参考 *Windows EXE 安装*, 安装编译工具。

然后打开 “x64 Native Tools Command Prompt for VS 2017” 命令行来编译和运行,

```

mkdir _build
cd _build

cmake -G "Visual Studio 15 2017 Win64" ..

msbuild.exe ALL_BUILD.vcxproj /property:Configuration=Release

.\Release\mynteye_demo.exe

```

Linux

打开命令行来编译和运行，

```
mkdir _build
cd _build/

cmake ..

make

./mynteye_demo
```

2.5.2 Visual Studio 2017 如何使用 SDK

本教程将使用 Visual Studio 2017 创建一个项目来使用 SDK 。

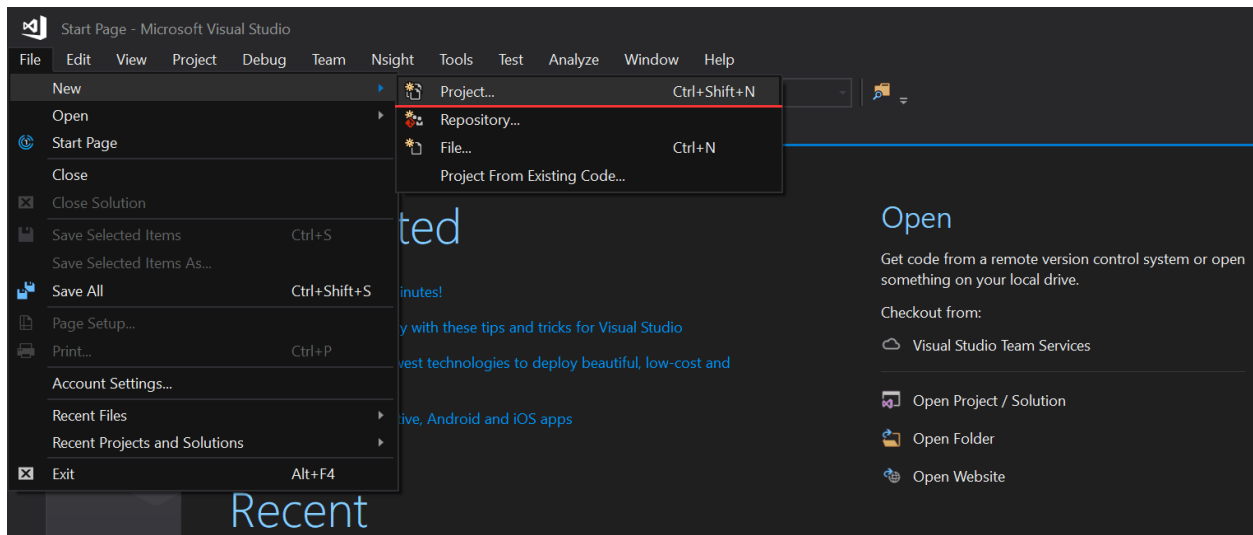
你可以在 <sdk>/samples/simple_demo/project_vs2017 目录下找到工程样例。

准备

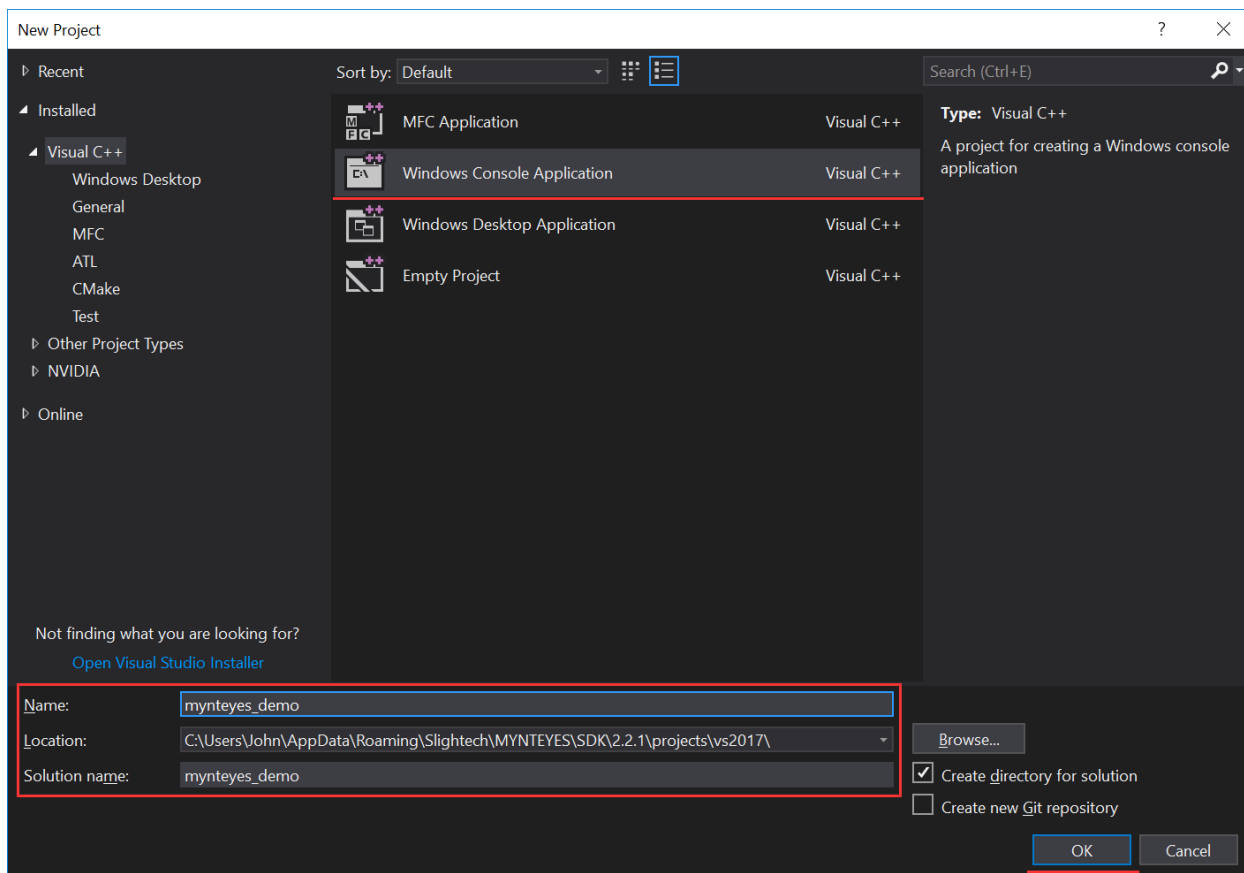
- Windows: 安装 SDK 的 exe 包

创建项目

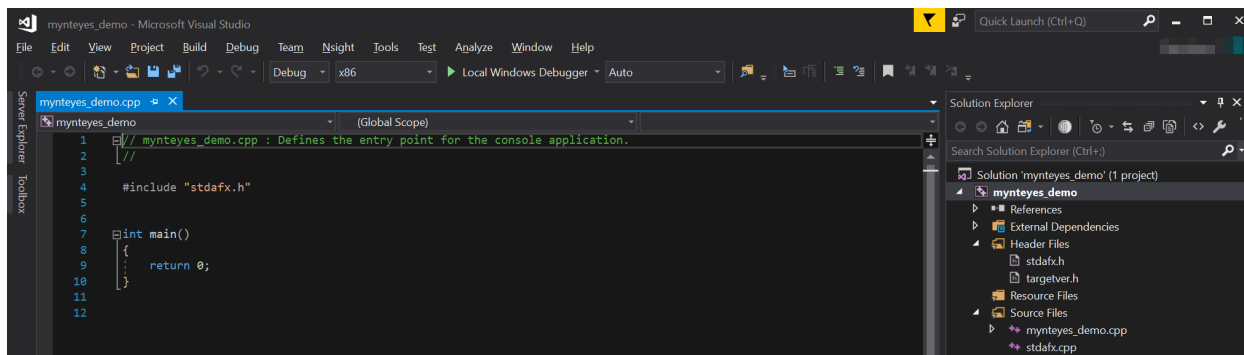
打开 Visual Studio 2017，然后 File > New > Project，



选择 “Windows Console Application”，设置项目位置和名字，点击 “OK”，

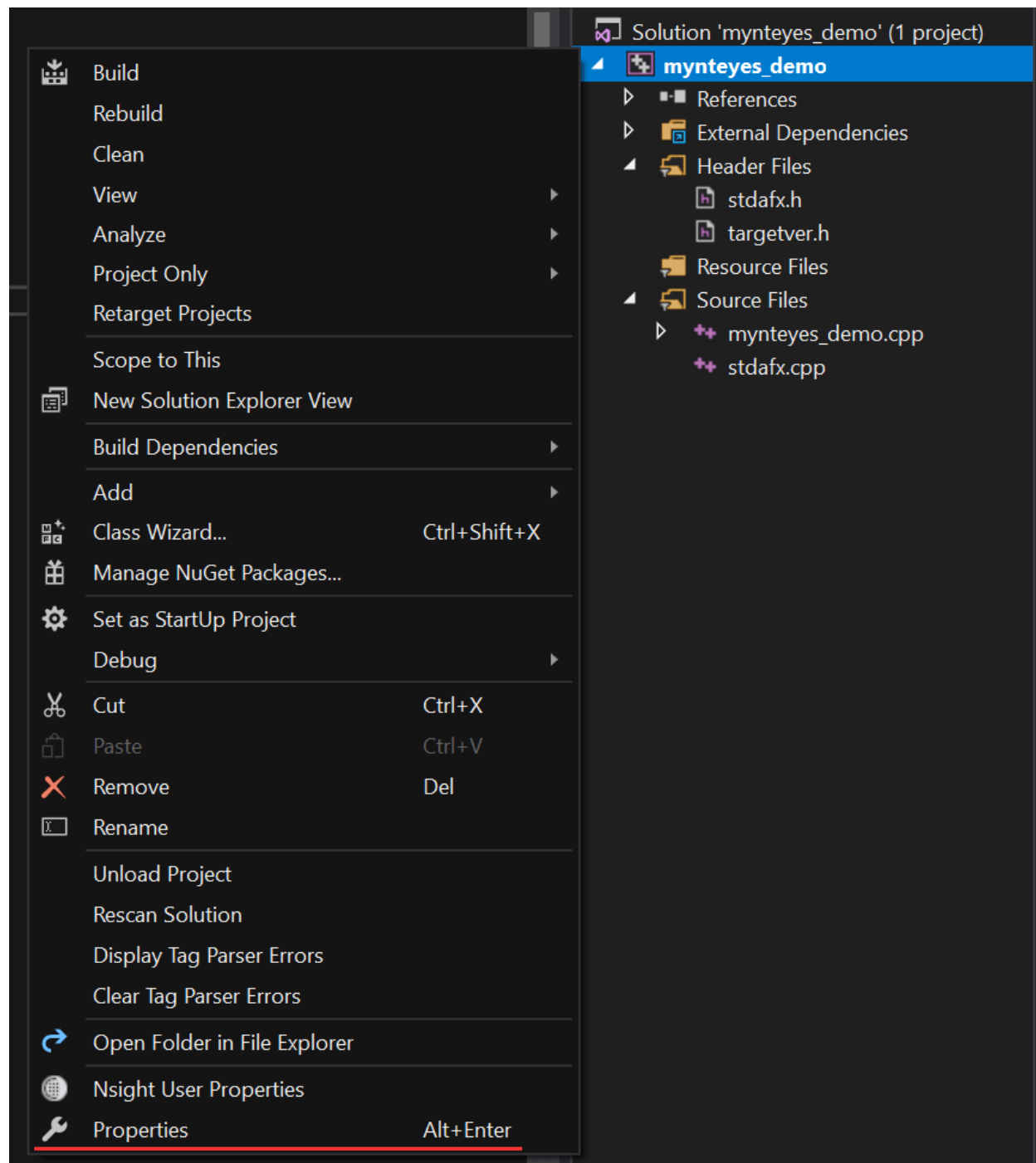


最后，你可以看到一个新项目被创建，



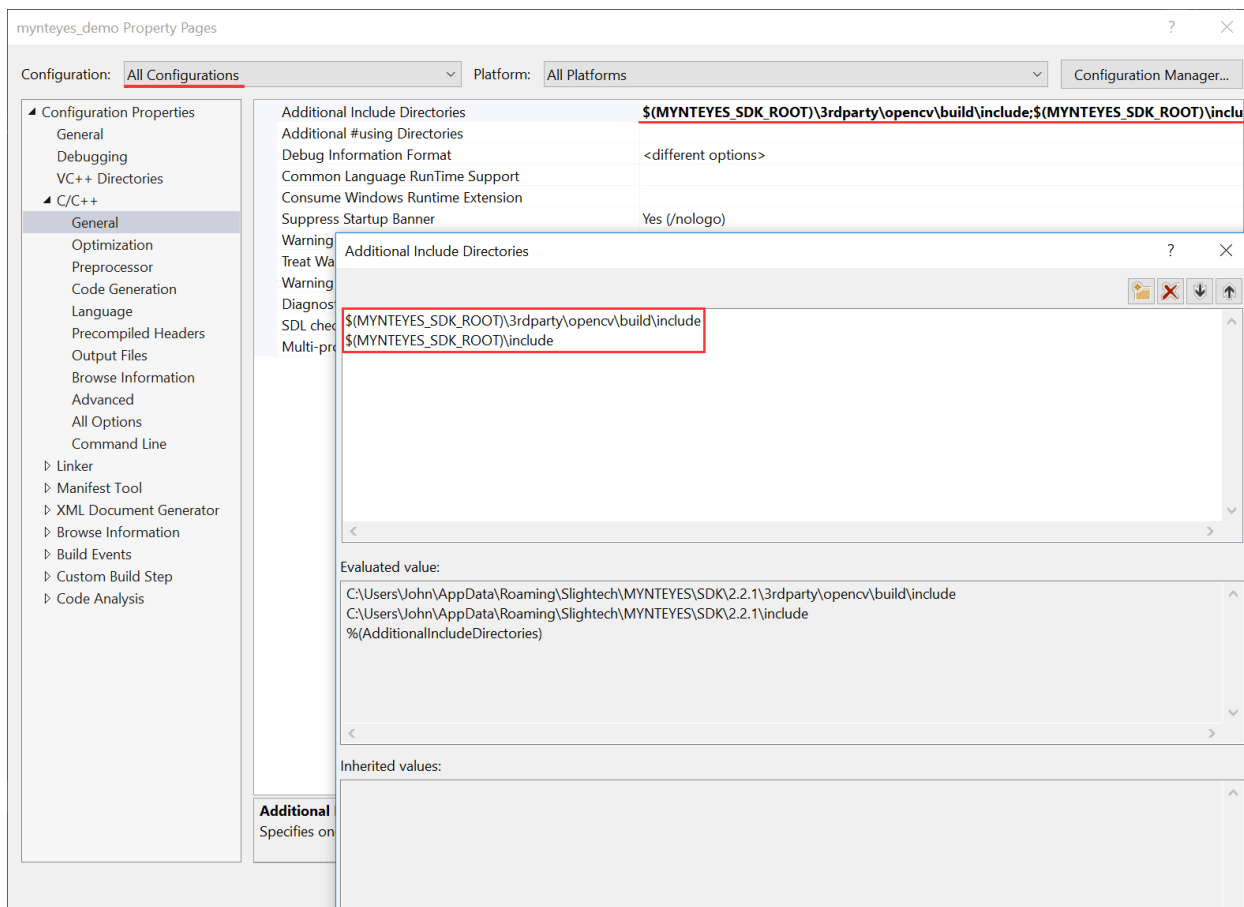
配置项目

右键点击该项目，打开“Properties”窗口，



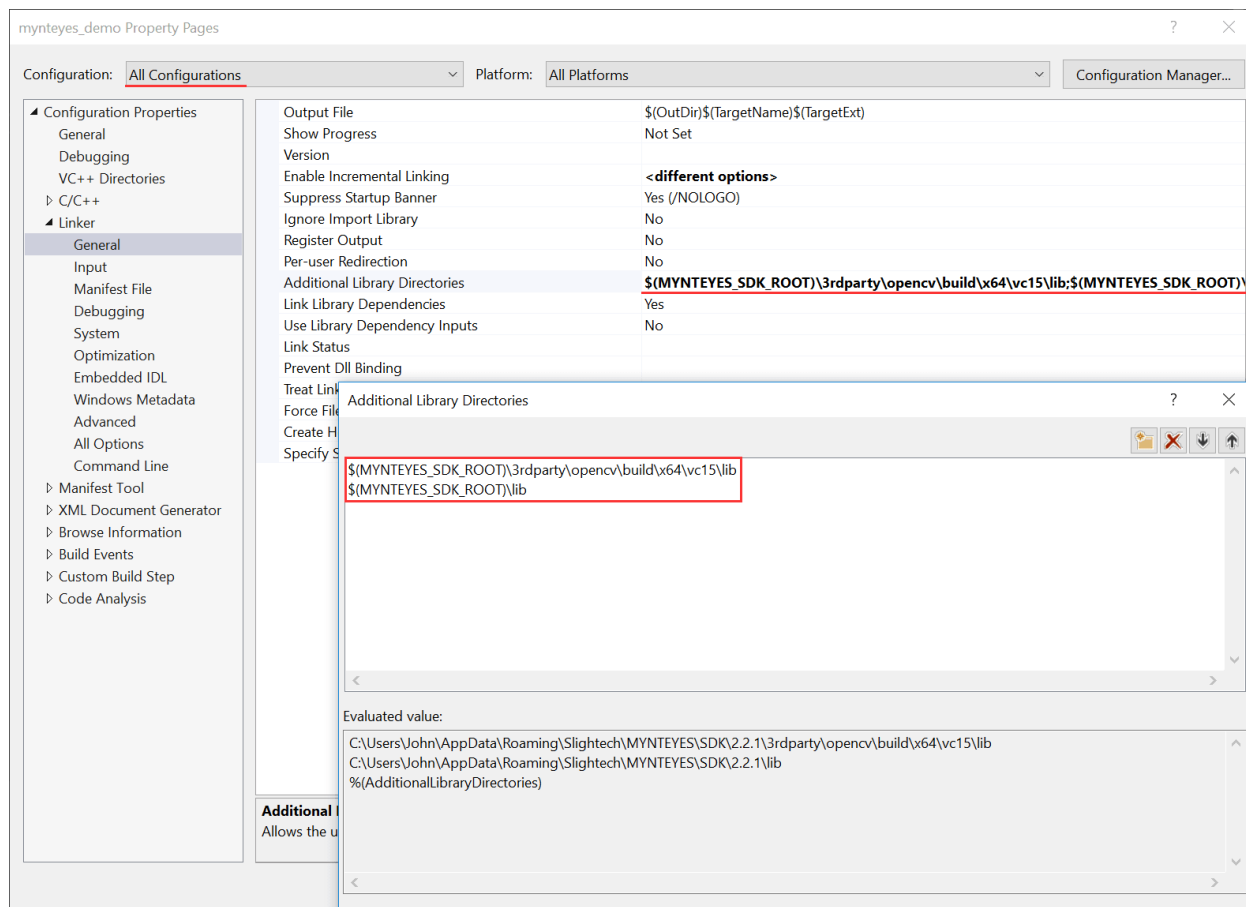
将“Configuration”更改为“All Configurations”，然后添加以下路径到“Additional Include Directories”，

```
$ (MYNTEYES_SDK_ROOT) \include
$ (MYNTEYES_SDK_ROOT) \3rdparty\opencv\build\include
```



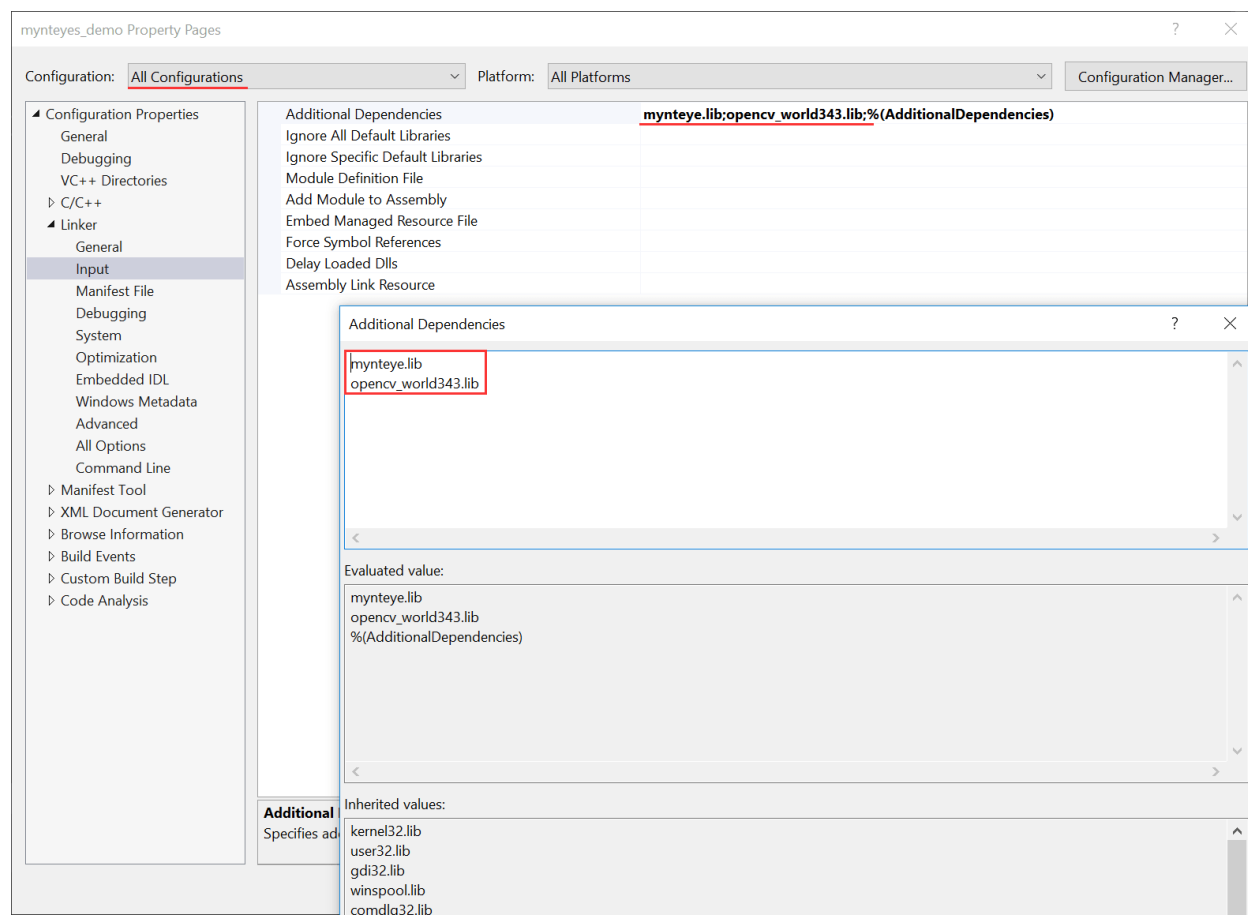
添加以下路径到 “Additional Library Directories”,

```
$(MYNTEYES_SDK_ROOT)\lib
$(MYNTEYES_SDK_ROOT)\3rdparty\opencv\build\x64\vc15\lib
```



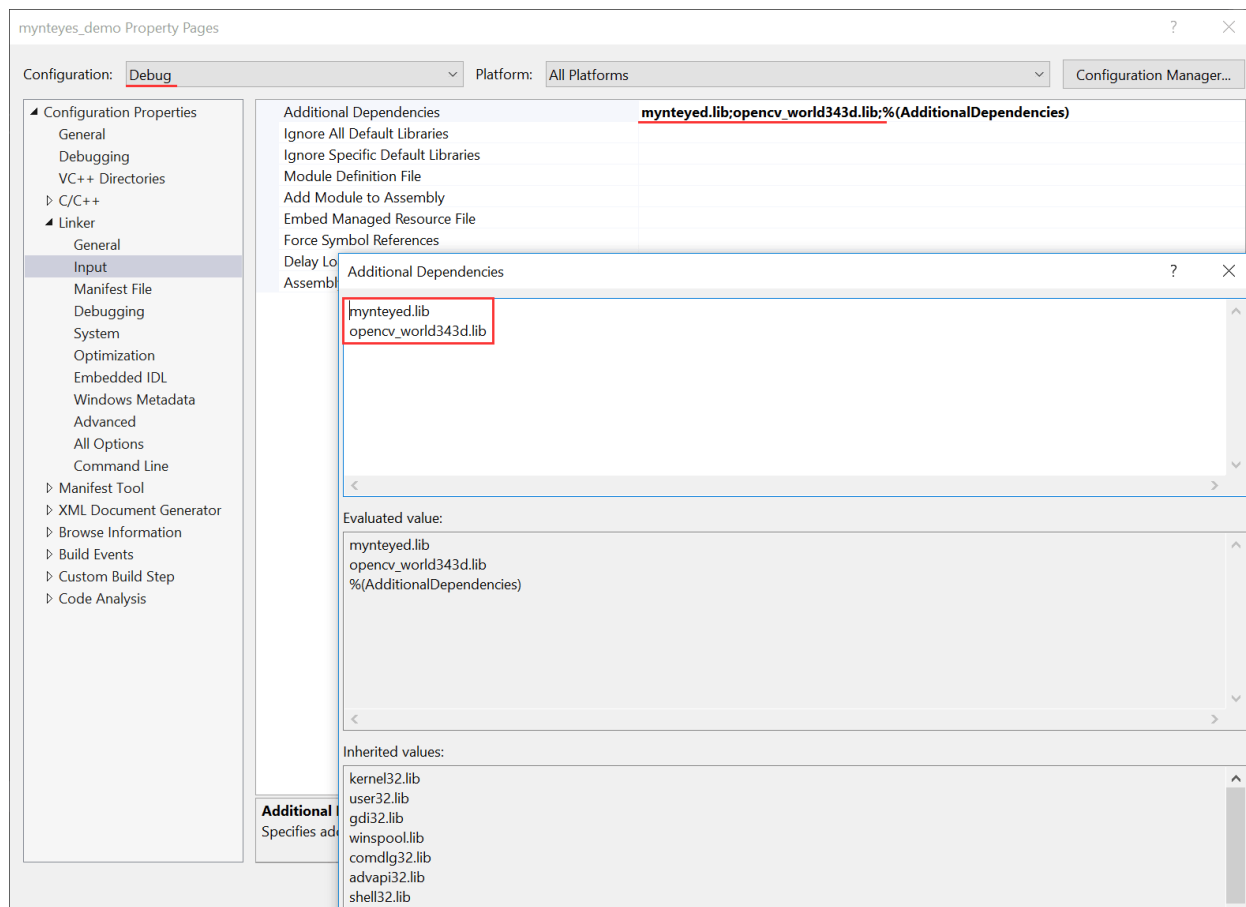
添加以下库到 “Additional Dependencies”,

```
mynteye.lib
opencv_world343.lib
```

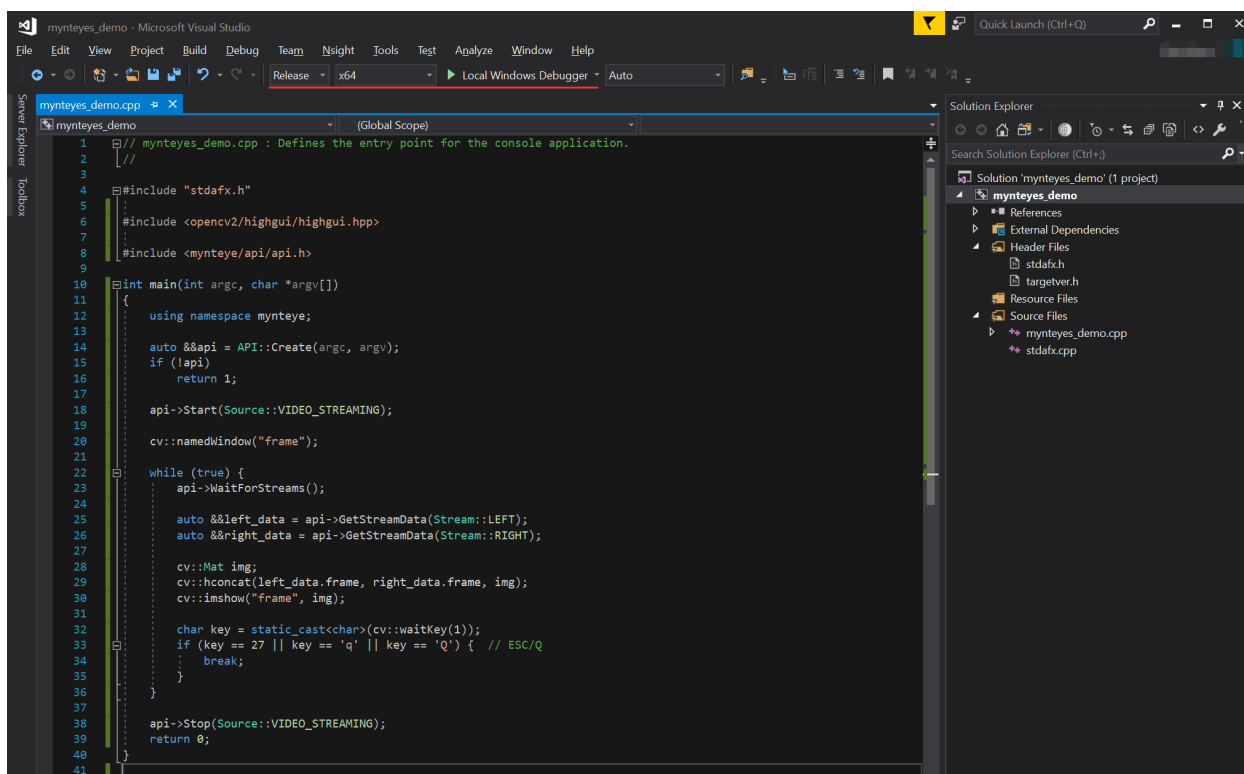
如果需要使用 debug 模式，可以改变 “Configuration” 到 “Debug” 添加下列 debug 的库：

```
mynteyed.lib
opencv_world343d.lib
```

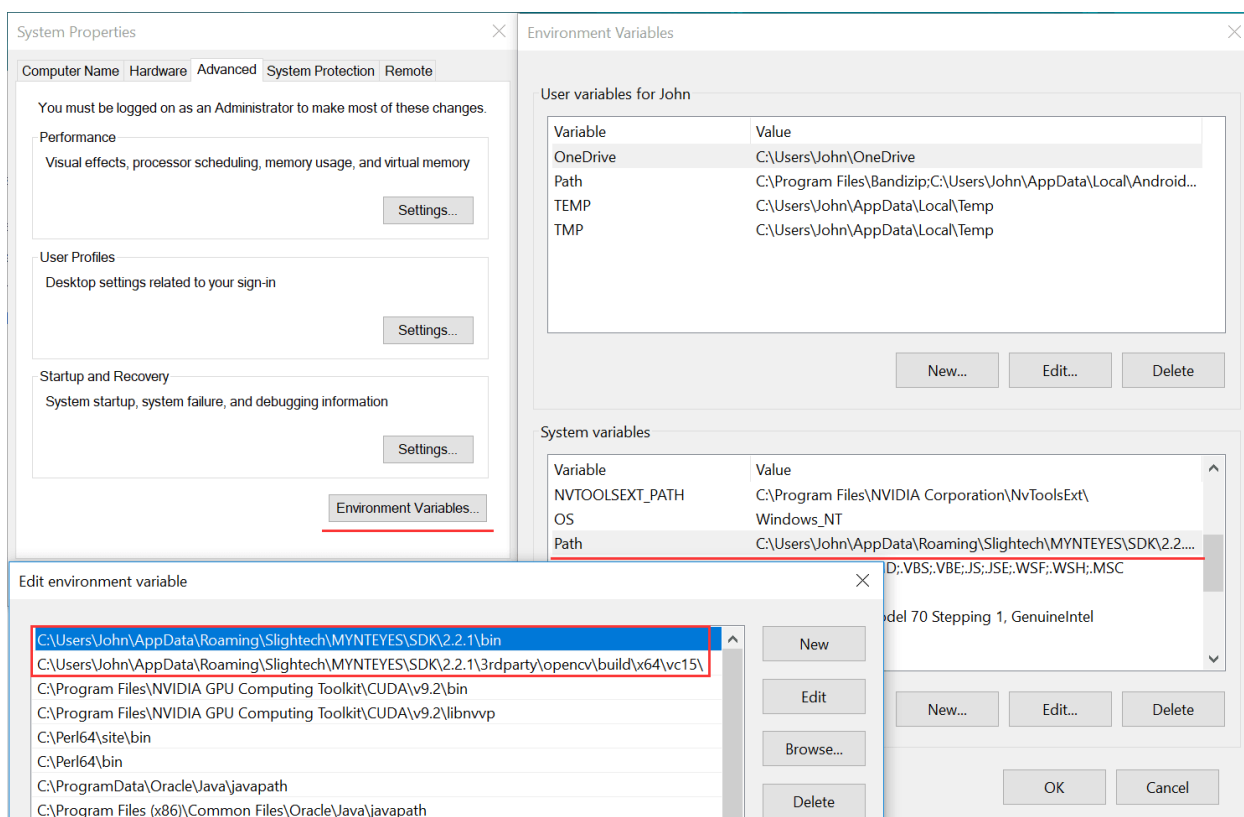


使用 SDK

添加头文件和使用 API ,



选择“Release x64”或者“Debug x64”来运行项目。



2.6 更新日志

2.6.1 2019-10-21(v2.5.0)

1. 改善 SDK 目录结构
2. 改善代码质量，减少依赖
3. `get_depth_with_region` 样例中增加标尺功能.
4. 修复了一些 bug.

2.6.2 2019-09-4(v2.4.2)

1. 整理剔除了一些例子
2. 优化了视差质量.
3. 改善 ros 中 3d 模型的显示逻辑.
4. 修复了一些 bug.

2.6.3 2019-08-17(v2.4.1)

1. 优化视差默认计算

2.6.4 2019-08-09(v2.4.0)

1. 优化图像和 IMU 同步，TD 估计少于 1ms
2. 修复 Ubuntu 4.16+ 内核上的使用问题
3. 修复 `mynteye_multiple.launch` 启动 S1030 的问题
4. 修复图像信息里没有 frame id 的问题
5. 新增可以保存单个图片的例程 `save_single_image`

2.6.5 2019-07-03(v2.3.9)

1. 修复 ROS 时间戳换算
2. 改进文档结构和内容

2.6.6 2019-05-20(v2.3.8)

1. 改进对 VINS-Fusion 开源项目的支持
2. 改进对 VINS-MONO 开源项目的支持
3. 修复左右目纠正图像对应错误的问题

2.6.7 2019-04-19(2.3.7)

1. 改进对 VINS-Fusion 开源项目的支持
2. 改进对 ORB-SLAM2 开源项目的支持

2.6.8 2019-04-15(2.3.6)

1. 修复 ROS 里 imu 对齐的问题
2. 修复 Ubuntu14.04 的编译问题
3. 增加 S2100 对 IIC 地址设置的支持

2.6.9 2019-04-01(2.3.5)

1. 完善 camera info 信息
2. 算法参数通过 yaml 文件输入
3. 增加 ROS 同时打开多设备样例
4. 增加 S210A IIC 地址设置 API
5. 增加图像/imu 数据外部时间源标志位
6. 提供适配 S1030 的 LaserScan 样例
7. 修改 ros 点云默认朝向

2.6.10 2019-03-18(2.3.4)

1. 增加获取协处理芯片及 ISP 版本 API (依赖 S2100/S210A 1.1 固件 & 1.0 辅助芯片固件)
2. 修复算法点云残影问题
3. 增加对 S1030 376*240 分辨率的支持 (依赖 S1030 固件版本 2.4.0)
4. 增加对 S2100/S210A imu 数据温漂等处理接口 (依赖对 imu 的标定)
5. 增加版本对比功能
6. 修复使用插件, 订阅深度图崩溃问题
7. 文档优化

3.1 固件说明

3.1.1 固件与 SDK 适配性

S1030 Firmwares	SDK Version
MYNTEYE-S1030-2.7.0.img	2.5.0 (2.5.0 ~ latest)
MYNTEYE-S1030-2.5.0.img	2.4.0 (2.4.0 ~ 2.5.0)
MYNTEYE_S_2.4.0.img	2.3.4 (2.3.4 ~ 2.3.9)
MYNTEYE_S_2.3.0.img	2.3.0 (2.2.2-rc1 ~ 2.3.3)
MYNTEYE_S_2.2.2.img	2.3.0 (2.2.2-rc1 ~ 2.3.0)
MYNTEYE_S_2.0.0_rc.img	2.0.0-rc (2.0.0-rc ~ 2.0.0-rc2)
MYNTEYE_S_2.0.0_rc2.img	2.0.0-rc2 (2.0.0-rc ~ 2.0.0-rc2)
MYNTEYE_S_2.0.0_rc1.img	2.0.0-rc1
MYNTEYE_S_2.0.0_rc0.img	2.0.0-rc0 (2.0.0-rc1 ~ 2.0.0-alpha1)
MYNTEYE_S_2.0.0_alpha1.1.img	2.0.0-alpha1 (2.0.0-rc1 ~ 2.0.0-alpha1)
MYNTEYE_S_2.0.0_alpha1.img	2.0.0-alpha1 (2.0.0-rc1 ~ 2.0.0-alpha1)
MYNTEYE_S_2.0.0_alpha0.img	2.0.0-alpha0

S21X0 Firmwares	SDK Version
MYNTEYE-S21X0-2.1.x.img	2.5.0 (2.5.0 ~ latest)
MYNTEYE-S21X0-1.4.0.img	2.4.2(2.4.2 ~ 2.5.0)
MYNTEYE-S2100-1.3.2.img	2.4.0(2.4.0 ~ 2.4.1)
MYNTEYE_S2100_1.2.img	2.3.5(2.3.5 ~ 2.3.9)
MYNTEYE_S2100_1.1.img	2.3.4

注意：请先确认相机型号，然后使用对应的固件。

Firmwares 表明固件文件名称。其在 [MYNTEYE_BOX\(点此下载\)](#) 的 Firmwares 目录内。

SDK Version 表明该固件适配的 SDK 版本，括号内指可用版本范围。

3.2 固件升级

3.2.1 升级主处理芯片固件

主处理芯片固件升级，需要使用我们提供的固件升级程序：MYNT EYE TOOL。

固件及 MYNT EYE TOOL 的安装包，都在 [MYNTEYE_BOX\(点此下载\)](#) 的 Firmwares 目录内。文件结构如下：

```
Firmwares/
├Checksum.txt           # File checksum
├MYNTEYE-S1030-2.7.0.img # S1030 firmware
├MYNTEYE-S21x0-2.1.2.img # S21x0 firmware
├...
└mynt-eye-tool-setup.zip # MYNT EYE TOOL zip
```

固件升级程序，目前仅支持 Windows，所以需要你在 Windows 下进行操作。步骤如下：

下载准备

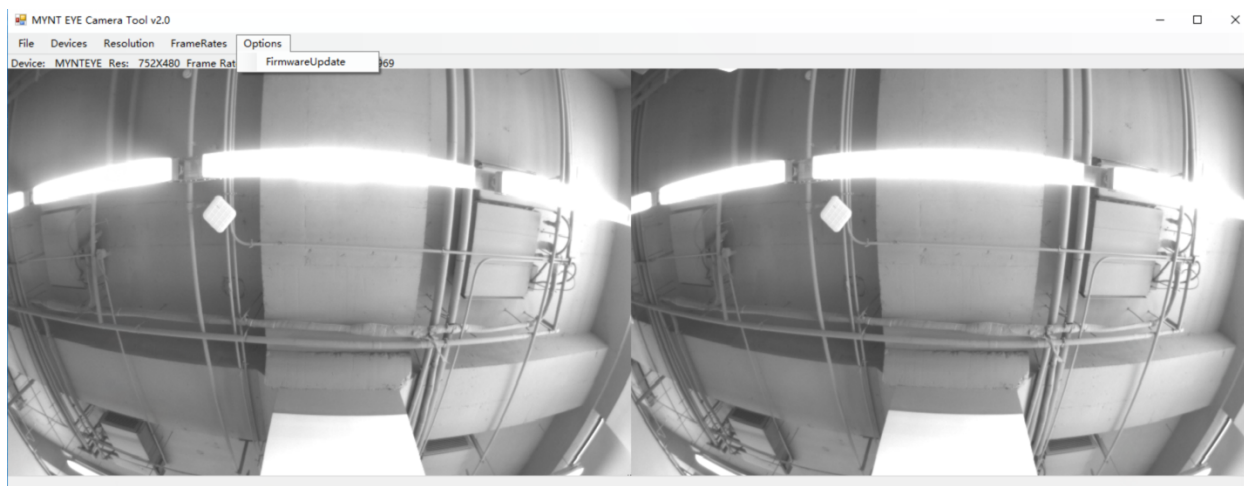
- 下载并解压 mynt-eye-tool-setup.zip。
- 找到固件，如 MYNTEYE-S1030-2.7.0.img。
 - 请见 [固件与 SDK 适配性](#) 选择适合当前 SDK 版本的固件。

安装 MYNT EYE TOOL

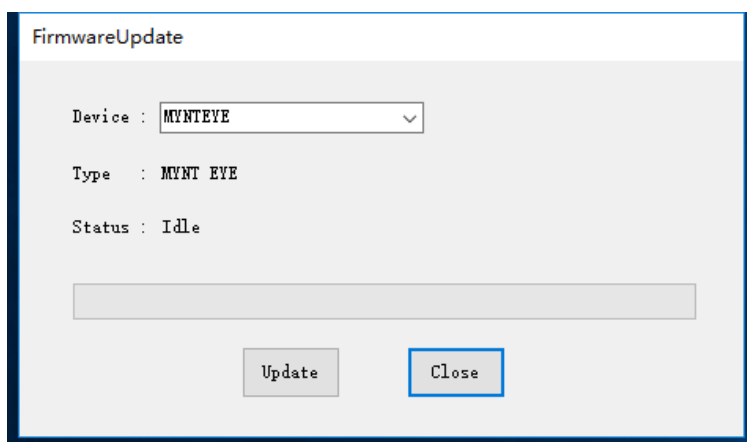
- 双击 setup.msi 安装固件升级程序。

升级固件

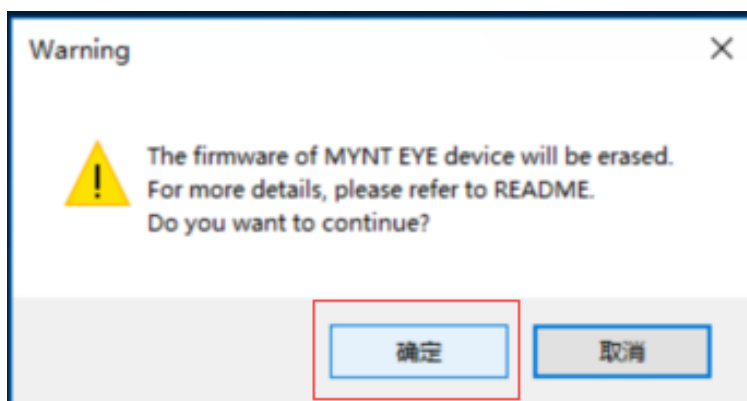
- USB3.0 口插上 MYNT® EYE 设备。
- 打开 MYNT EYE TOOL，选择 Options/FirmwareUpdate。

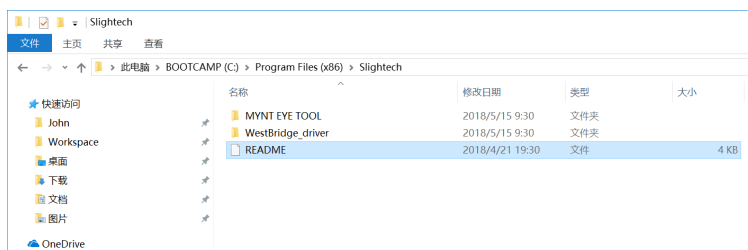


- 点击 Update 。

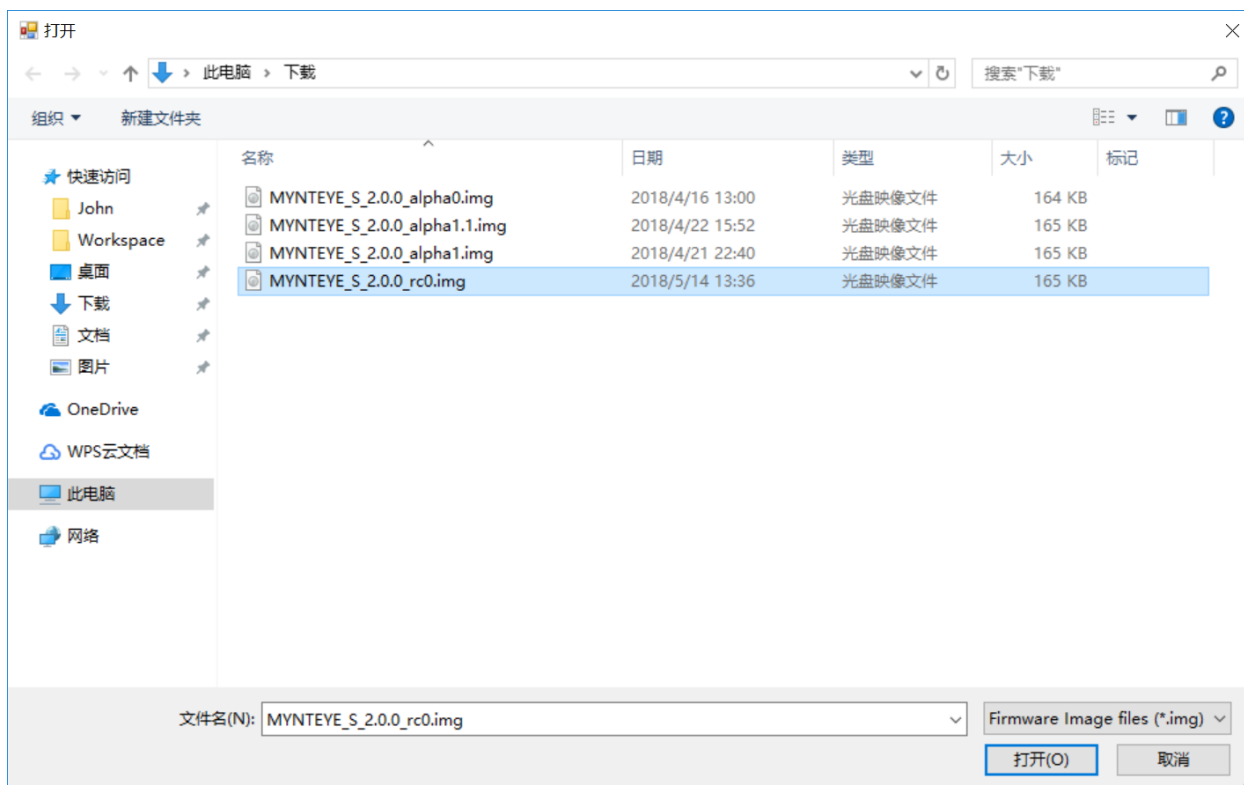


- 弹出警告对话框，直接 确定即可。
 - 由于该操作会擦除固件，所以弹出警告。详情见 README 。
 - * 通常在升级过程中，MYNT EYE TOOL 会自动安装驱动。
 - * 如果升级遇到问题，参考 README 解决。

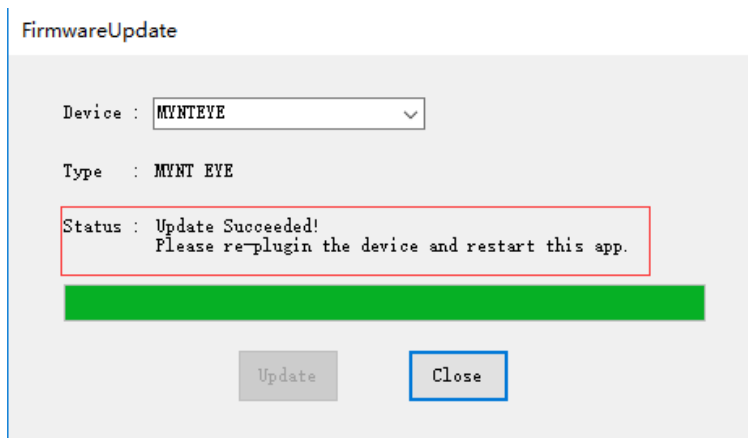




- 在打开的文件选择框里，选择要升级的固件，开始升级。



- 升级完成后，状态变为 Succeeded。



- 关闭 MYNT EYE TOOL，结束。

注意：如果在设备管理器中同时找不到 MYNT 图像设备、WestBridge_driver 以及 Cypress USB BootLoader 则尝试换一台电脑执行以上操作。如果还是不能升级成功，请及时联系我们。

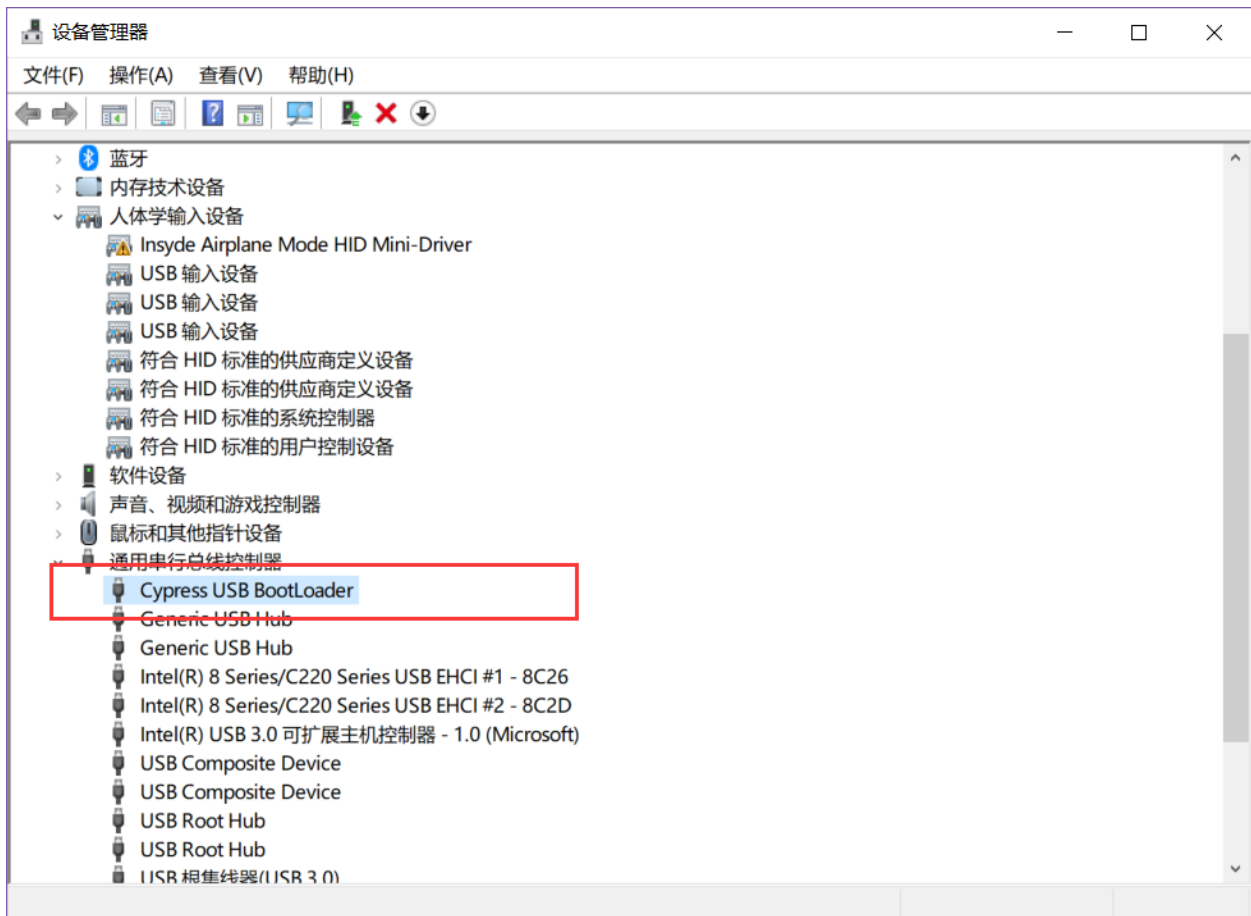
手动更新驱动

- 如果应用提示您升级失败，则可能是自动安装驱动失败，您可以尝试手动安装驱动然后重新升级。以下为手动安装驱动的步骤。
- 打开设备管理器，找到 WestBridge_driver 设备，然后右键更新驱动，选择 [应用安装目录] \ WestBridge_driver \ [对应系统文件夹] (win7 以上选择 win7 \ [系统对应位数])。

✓ 其他设备

⚠ WestBridge

- 以 win 10 64 位默认安装路径为例，需要选择的文件夹为 C:\Program Files (x86)\slightech\MYNT EYE TOOL 2.0\WestBridge_driver\win7\amd64。
- 安装驱动成功之后，可以在设备管理器中找到 Cypress USB BootLoader 设备。



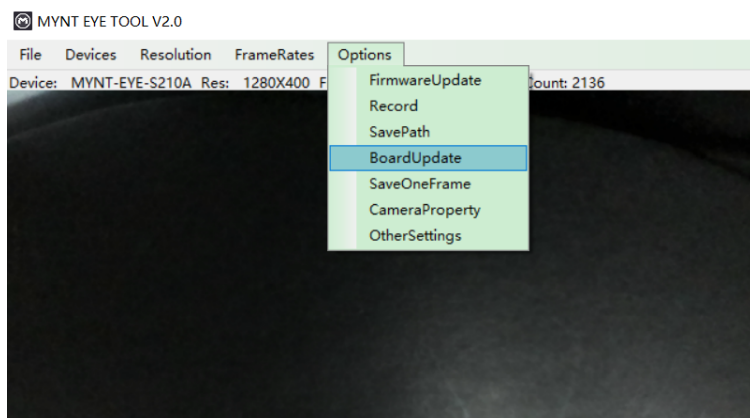
- 然后拔插摄像头，再次打开该应用进行升级。

警告：固件升级后，初次打开 MYNT® EYE 设备时，请静置 3 秒，其会有一个零漂补偿过程。或者，请主动调用控制接口 `RunOptionAction (Option::ZERO_DRIFT_CALIBRATION)` 来进行零漂补偿。

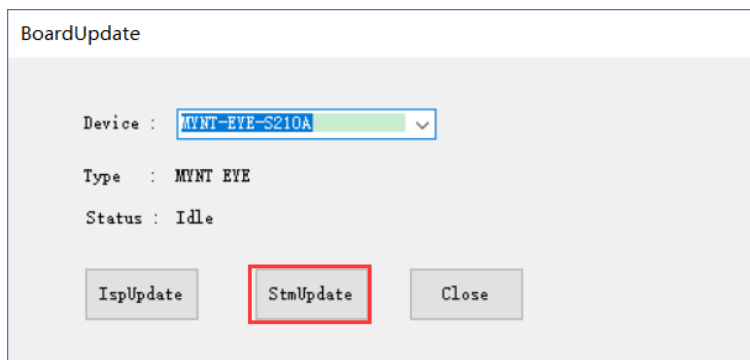
3.2.2 升级协处理芯片固件

升级协处理芯片 (仅支持 S2100/S210A)

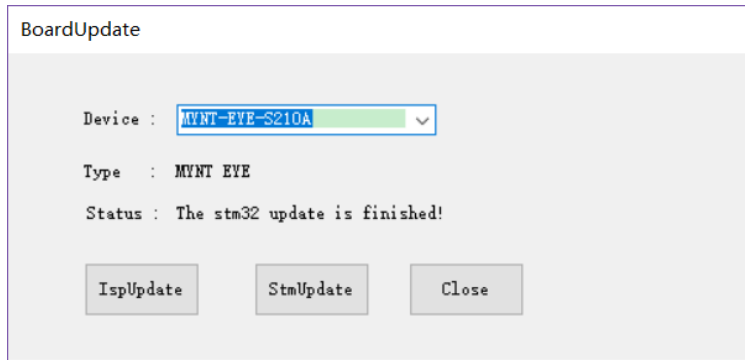
- USB3.0 口插上 MYNT® EYE 设备。
- 打开 MYNT EYE TOOL，选择 Options/BoardUpdate。



- 点击 StmUpdate。



- 在打开的文件选择框里，选择要升级的固件 MYNTEYE-S21X0-auxiliary-chip-1.4.2.bin，开始升级。
- 升级完成后，会显示升级结束。



3.3 更新日志

3.3.1 2020-01-02

S21X0 主处理芯片固件: MYNTEYE-S21X0-2.1.2.img

1. 优化了一些功能

3.3.2 2019-11-25

S1030 主处理芯片固件: MYNTEYE-S1030-2.7.0.img

1. 修复一些问题

S21X0 主处理芯片固件: MYNTEYE-S21X0-2.1.0.img

1. 协议版本升级
2. 修复和优化了一些其他问题

3.3.3 2019-09-09

S21X0 主处理芯片固件: MYNTEYE-S21X0-1.4.0.img

1. 添加 S2110 设备支持

3.3.4 2019-08-09

S1030 主处理芯片固件: MYNTEYE-S1030-2.5.0.img

1. 优化图像和 IMU 同步 (TD 估计 0.2ms 左右)
2. 不保存上层用户配置参数
3. 修正低分辨率下过爆问题
4. 修正 USB 2.0 首次打开失败问题
5. 新增错刷固件时自动恢复功能

S2100 主处理芯片固件: MYNTEYE-S2100-1.3.2.img

1. 优化图像和 IMU 同步 (TD 估计 0.6ms 左右)

2. 不保存上层用户配置参数
3. 优化了 IMU 低通滤波默认值
4. 优化了曝光时间计算方式，最大曝光时间限制为 66.5ms
5. 新增错刷固件时自动恢复功能
6. 修复和优化了一些其他问题

S2100 协处理芯片固件：MYNTEYE-S2100-auxiliary-chip-1.4.2.bin

1. 时间同步添加 `uart` 接口，判断中断 `io` 的功能
2. 时间同步接口 `i2c` 添加 `whoami`、读取时间戳和中值滤波开启状态的接口
3. 修复和优化了一些其他问题

4.1 标定工具的使用

4.1.1 介绍

4.1.2 1.1 支持平台

目前标定工具只支持了 Ubuntu 16.04 LTS 上的发布。但有支持官方、ROS 多版 OpenCV 依赖。

平台	架构	不同依赖
Ubuntu 16.04 LTS	x64(amd64)	libopencv-dev
Ubuntu 16.04 LTS	x64(amd64)	ros-kinetic-opencv3

4.1.3 1.2 工具包说明

Ubuntu 上提供的是 deb/ppa 安装包，名称上会区分架构、依赖和版本。如下：

- mynteye-s-calibrator-opencv-official-1.0.0_amd64.deb
- mynteye-s-calibrator-opencv-ros-kinetic-1.0.0_amd64.deb

其中，

依赖标识	依赖包名	详细说明
opencv-official	libopencv-dev	https://packages.ubuntu.com/xenial/libopencv-dev
opencv-ros-kinetic	ros-kinetic-opencv3	http://wiki.ros.org/opencv3

4.1.4 1.3 deb 工具包获取

获取方式	获取地址
百度网盘	https://pan.baidu.com/s/19rW0fPKUIQj6eldZpZFoAA 提取码: a6ps
Google Drive	https://drive.google.com/open?id=1RsV2WEKAsfxbn-Z5nGjk5g3ml1UDEsDc

4.1.5 安装

4.1.6 2.1 安装准备

- Ubuntu 16.04 LTS 环境, x64 架构
- 标定工具的 deb 包, 按需选择 OpenCV 依赖 (PPA 安装不需要此步)

4.1.7 2.2 安装 ppa 包

```
$ sudo add-apt-repository ppa:slightech/mynt-eye-s-sdk
$ sudo apt-get update
$ sudo apt-get install mynteye-s-calibrator
$ sudo ln -sf /opt/myntai/mynteye-s-calibrator/mynteye-s-calibrator /usr/local/bin/
↪mynteye-s-calibrator
```

4.1.8 2.3 安装 deb 包

sudo dpkg -i 即可安装 deb 包。如下:

```
$ sudo dpkg -i mynteye-s-calibrator-opencv-official-1.0.0_amd64.deb
...
(Reading database ... 359020 files and directories currently installed.)
Preparing to unpack mynteye-s-calibrator-opencv-official-1.0.0_amd64.deb ...
Unpacking mynteye-s-calibrator (1.0.0) over (1.0.0) ...
Setting up mynteye-s-calibrator (1.0.0) ...
```

如果遇到了依赖包未安装的错误, 例如:

```
$ sudo dpkg -i mynteye-s-calibrator-opencv-official-1.0.0_amd64.deb
Selecting previously unselected package mynteye-s-calibrator.
(Reading database ... 358987 files and directories currently installed.)
Preparing to unpack mynteye-s-calibrator-opencv-official-1.0.0_amd64.deb ...
Unpacking mynteye-s-calibrator (1.0.0) ...
dpkg: dependency problems prevent configuration of mynteye-s-calibrator:
mynteye-s-calibrator depends on libatlas-base-dev; however:
Package libatlas-base-dev is not installed.

dpkg: error processing package mynteye-s-calibrator (--install):
dependency problems - leaving unconfigured
Errors were encountered while processing:
mynteye-s-calibrator
```

可以继续执行 `sudo apt-get -f install` 完成安装,

```

$ sudo apt-get -f install
Reading package lists... Done
Building dependency tree
Reading state information... Done

Correcting dependencies... Done
The following additional packages will be installed:
libatlas-base-dev
Suggested packages:
libblas-doc liblapack-doc
The following NEW packages will be installed:
libatlas-base-dev
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
1 not fully installed or removed.
Need to get 3,596 kB of archives.
After this operation, 30.8 MB of additional disk space will be used.
Do you want to continue? [Y/n]
Get:1 http://cn.archive.ubuntu.com/ubuntu xenial/universe amd64 libatlas-base-dev_
↳amd64 3.10.2-9 [3,596 kB]
Fetched 3,596 kB in 3s (1,013 kB/s)
Selecting previously unselected package libatlas-base-dev.
(Reading database ... 358993 files and directories currently installed.)
Preparing to unpack .../libatlas-base-dev_3.10.2-9_amd64.deb ...
Unpacking libatlas-base-dev (3.10.2-9) ...
Setting up libatlas-base-dev (3.10.2-9) ...
update-alternatives: using /usr/lib/atlas-base/atlas/libblas.so to provide /usr/lib/
↳libblas.so (libblas.so) in auto mode
update-alternatives: using /usr/lib/atlas-base/atlas/liblapack.so to provide /usr/lib/
↳liblapack.so (liblapack.so) in auto mode
Setting up mynteye-s-calibrator (1.0.0) ...

```

4.1.9 使用

4.1.10 3.1 使用准备

- MYNT EYE S 相机
- 棋盘格标定板
- 光照均匀的场景

4.1.11 3.2 使用命令

- 安装好标定工具后，在终端可直接运行 `mynteye-s-calibrator` 命令进行标定。`-h` 可见其选项：

```

$ mynteye-s-calibrator -h
Usage: mynteye-s-calibrator [options]
help: mynteye-s-calibrator -h
calibrate: mynteye-s-calibrator -x 11 -y 7 -s 0.036 -n 6

Calibrate MYNT EYE S device.

```

参数:

`-h, --help` 显示帮助信息并退出

- x WIDTH, --width=WIDTH 棋盘格宽, 默认: 11
- y HEIGHT, --height=HEIGHT 棋盘格高, 默认: 7
- s METERS, --square=METERS 棋盘格格子边长, 默认: 0.036
- n NUMBER, --number=NUMBER 用于标定的图片张数, 默认: 11
- p PATH, --path=PATH 保存结果的文件夹名, 默认: 相机 SN 名

- -x -y -s 用于设定标定板的宽、高、格子大小。宽、高分别指棋盘格横纵向的黑白交叉点数。格子大小, 单位是 m

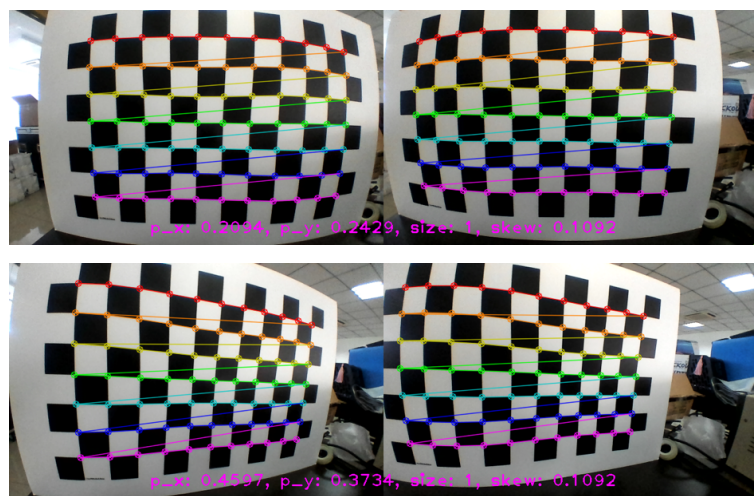
4.1.12 3.3 使用步骤

- 首先, 连接好 MYNT EYE S 相机。
- 然后, 终端里运行 mynteye-s-calibrator < 标定板参数 > 命令, 标定板参数需要根据使用的标定板来设置, 参数说明见上

```
john@john-ubuntu:~$ mynteye-s-calibrator
I/main.cc:68 Calibrate MYNT EYE S device with chessboard 11x7, size: 0.036m, num: 11
I/utills.cc:35 Detecting MYNT EYE devices
I/utills.cc:48 MYNT EYE devices:
I/utills.cc:51 index: 0, name: MYNT-EYE-S2100, sn: 030E1D2C0009072B, firmware: 1.2
I/utills.cc:60 Only one MYNT EYE device, select index: 0
I/synthetic.cc:59 camera calib model: kannala_brandt
E/disparity_processor.cc:51 BM not supported in opencv 2.x, use sgbm
I/utills.cc:93 MYNT EYE requests:
I/utills.cc:96 index: 0, request: width: 1280, height: 400, format: Format::YUVV, fps: 10
I/utills.cc:96 index: 1, request: width: 1280, height: 400, format: Format::YUVV, fps: 20
I/utills.cc:96 index: 2, request: width: 1280, height: 400, format: Format::YUVV, fps: 30
I/utills.cc:96 index: 3, request: width: 1280, height: 400, format: Format::YUVV, fps: 60
I/utills.cc:96 index: 4, request: width: 1280, height: 800, format: Format::YUVV, fps: 10
I/utills.cc:96 index: 5, request: width: 2560, height: 800, format: Format::YUVV, fps: 20
I/utills.cc:96 index: 6, request: width: 2560, height: 800, format: Format::YUVV, fps: 30
I/utills.cc:107 There are 7 stream requests, select index:
2
I/calibrator.cc:76 Had selected 1 imgs
I/calibrator.cc:76 Had selected 2 imgs
```

- 按提示选择相机某个分辨率的 index, 进行此分辨率下的图像标定。
- S1030 相机只需要标定 752*480 分辨率。S2100 相机需要标定 2560*800, 1280*400 两个分辨率。
- 标定时尽量让标定板铺满相机左右目图像, 且照顾到四周 (畸变最大)。标定工具会自动评估出合格的图像用于标定计算, 在终端上会提示已选中了多少张。

参考的采集图像, 如下:





- 注: p_x , p_y , size, skew 分别表示采集到图像时, 标定板于 x 轴、y 轴、缩放、倾斜的比例。作一点参考用。
- 一旦达到标定需求采集的图像数目后, 就会进行标定计算、输出结果。如下:

```
[stereo] INFO: Final extrinsics:
r: 0.001 p: -0.020 yaw: -0.000
x: -0.080 y: -0.000 z: -0.001
[left] INFO: Final reprojection error: 0.201 pixels
[left] INFO: Camera Parameters:
  model_type KANNALA_BRANDT
  camera_name left
  image_width 640
  image_height 400
Projection Parameters
  k2 0.50591359548087900
  k3 0.40223915642684421
  k4 -0.83080480547133262
  k5 0.35678495671651012
  mu 196.73770341765487046
  mv 196.80201619192507678
  u0 314.09848864933849200
  v0 208.44004910270189157

[right] INFO: Final reprojection error: 0.199 pixels
[right] INFO: Camera Parameters:
  model_type KANNALA_BRANDT
  camera_name right
  image_width 640
  image_height 400
Projection Parameters
  k2 0.52895559600607733
  k3 0.30569625497761727
  k4 -0.68909502929151389
  k5 0.29354415946915002
  mu 196.75176710382709189
  mv 196.73648511086881285
  u0 317.70351593043682215
  v0 196.07326925100898052

I/calibrator.cc:91 Complete rectify
I/calibrator.cc:93 Calibration took a total time of 0.483 sec
I/calibrator.cc:96 Wrote calibration files to SN030E1D2C0009072B-190603101122
Write the image params to device? [Y/n]
```

1. 终端会打印出左右目的标定结果
2. 标定结果会写进 SNXXX 目录的文件中

- a) camera_left.yaml: 左目参数
 - b) camera_right.yaml: 右目参数
 - c) extrinsics.yaml: 双目外参
 - d) img.params.equidistant: 相机参数, 可用于 S SDK 写入
 - e) stereo_reprojection_error.yaml: 重投影误差
- 最后, 还会询问是否写入相机设备。回车或 ‘y’ 即表示确认,

```
Write the image params to device? [Y/n]
I/device_writer.cc:69 Write img params success
I/device_writer.cc:71 Resolution: {width: 640, height: 480}
I/device_writer.cc:73 Intrinsics left: {equidistant, width: 640, height: 480, k2: 0.58591359548887988, k3: 0.40
223915642684421, k4: -0.83888480547133262, k5: 0.35678495671651012, mu: 196.73778341765487046, mv: 196.88201619
192507678, u0: 314.09848864933849208, v0: 208.44084910270189157}
I/device_writer.cc:74 Intrinsics right: {equidistant, width: 640, height: 480, k2: 0.528955596060607733, k3: 0.3
0569625497761727, k4: -0.68909502929151389, k5: 0.29354415946915082, mu: 196.75176710382709189, mv: 196.7364851
1086081285, u0: 317.70351593043682215, v0: 196.07226925108898052}
I/device_writer.cc:75 Extrinsics right to left: {rotation: [0.99979040047159962, 0.00043455861950726, -0.020468
66589802020, -0.00045902396407190, 0.99999918591344961, -0.00119057525526974, 0.02046813186001524, 0.0011997213
1941748, 0.99978978602850144], translation: [-80.14418563298774245, -0.08203749911335115, -0.83212568292361200]
}
I/device_writer.cc:71 Resolution: {width: 1280, height: 800}
I/device_writer.cc:73 Intrinsics left: {equidistant, width: 1280, height: 800, k2: 0.48300291178331717, k3: 0.5
4056124589564269, k4: -1.10117149306269679, k5: 0.50804676388658865, mu: 400.27710465370626025, mv: 400.1906678
3303583179, u0: 628.62288176453512278, v0: 416.77574072500596003}
I/device_writer.cc:74 Intrinsics right: {equidistant, width: 1280, height: 800, k2: 0.50175285806124067, k3: 0.
40439108804698687, k4: -0.83550042281540371, k5: 0.35506857449872198, mu: 400.16857662504761083, mv: 400.039853
65464365832, u0: 635.35774529938328214, v0: 391.87026421600774029}
I/device_writer.cc:75 Extrinsics right to left: {rotation: [0.99978063717736054, 0.00022852037457626, -0.020943
38329089379, -0.00026218828365026, 0.99999867787837904, -0.00160483606573623, 0.02094298886345506, 0.0016099751
3408585, 0.99977937526112870], translation: [-79.83619072534425149, 0.25641071959367268, -1.48486816542545474]}
Write to device done
```

- 写入设备后, 将提示 “Write to device done”。

4.1.13 3.4 标定结果

标定结果, 要求重投影误差最好能达到 0.2 或更低。如果超过 1, 需要重新标定。

重投影误差, 可见标定完成后的输出 “Final reprojection error: 0.201 pixels”, 或者见标定结果文件 “stereo_reprojection_error.yaml”。

5.1 VINS-Mono 如何整合

5.1.1 在 MYNT® EYE 上运行 VINS-Mono，请依照这些步骤：

1. 下载 [MYNT-EYE-S-SDK](#) 及安装 `mynt_eye_ros_wrapper`。
2. 按照一般步骤安装 VINS-Mono。
3. 运行 `mynt_eye_ros_wrapper` 和 VINS-Mono。

5.1.2 快捷安装 ROS Kinetic (若已安装，请忽略)

```
cd ~
wget https://raw.githubusercontent.com/oroca/oroca-ros-pkg/master/ros_install.sh && \
chmod 755 ./ros_install.sh && bash ./ros_install.sh catkin_ws kinetic
```

5.1.3 安装 Docker

```
sudo apt-get update
sudo apt-get install \
    apt-transport-https \
    ca-certificates \
    curl \
    gnupg-agent \
    software-properties-common
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
sudo add-apt-repository \
    "deb [arch=amd64] https://download.docker.com/linux/ubuntu \
    $(lsb_release -cs) \
```

(下页继续)

(续上页)

```
stable"
sudo apt-get update
sudo apt-get install docker-ce docker-ce-cli containerd.io
```

然后通过 `sudo usermod -aG docker $YOUR_USER_NAME` 命令将账号加到 docker 组。如果遇到 `Permission denied` 错误，请登出后再重新登录。

5.1.4 安装 MYNT-EYE-VINS-Sample

确认 ROS 和 docker 都安装完后，使用下面命令安装 vins

```
git clone -b docker_feat https://github.com/slightech/MYNT-EYE-VINS-Sample.git
cd MYNT-EYE-VINS-Sample/docker
make build
```

编译 docker 推荐 16G 以上内存，或者内存和虚拟内存加起来大于 16G。

(如果安装失败，请尝试换一台系统干净的电脑或者重新安装系统与 ROS)

5.1.5 在 MYNT® EYE 上运行 VINS-Mono

1. 运行 mynteye 节点

```
cd (local path of MYNT-EYE-S-SDK)
source ./wrappers/ros/devel/setup.bash
roslaunch mynt_eye_ros_wrapper vins_mono.launch
```

2. 打开另一个命令行运行 vins

```
cd path/to/MYNT-EYE-VINS-Sample/docker
./run.sh mynteye_s.launch
# ./run.sh mynteye_s2100.launch # mono with s2100
# ./run.sh mynteye_s2110.launch # mono with s2110
```

5.2 VINS-Fusion 如何整合

5.2.1 在 MYNT® EYE 上运行 VINS-Fusion，请依照这些步骤：

1. 下载 [MYNT-EYE-S-SDK](#) 及安装 `mynt_eye_ros_wrapper`。
2. 按照一般步骤安装 VINS-Fusion。
3. 运行 `mynt_eye_ros_wrapper` 和 VINS-Fusion。

5.2.2 快捷安装 ROS Kinetic (若已安装, 请忽略)

```
cd ~
wget https://raw.githubusercontent.com/oroca/oroca-ros-pkg/master/ros_install.sh && \
chmod 755 ./ros_install.sh && bash ./ros_install.sh catkin_ws kinetic
```

5.2.3 安装 Docker

```
sudo apt-get update
sudo apt-get install \
    apt-transport-https \
    ca-certificates \
    curl \
    gnupg-agent \
    software-properties-common
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
sudo add-apt-repository \
    "deb [arch=amd64] https://download.docker.com/linux/ubuntu \
    $(lsb_release -cs) \
    stable"
sudo apt-get update
sudo apt-get install docker-ce docker-ce-cli containerd.io
```

然后通过 `sudo usermod -aG docker $YOUR_USER_NAME` 命令将账号加到 docker 组。如果遇到 Permission denied 错误, 请登出后再重新登录。

5.2.4 安装 MYNT-EYE-VINS-FUSION-Samples

```
git clone https://github.com/slightech/MYNT-EYE-VINS-FUSION-Samples.git
cd MYNT-EYE-VINS-FUSION-Samples/docker
make build
```

编译 docker 推荐 16G 以上内存, 或者内存和虚拟内存加起来大于 16G。

(如果安装失败, 请尝试换一台系统干净的电脑或者重新安装系统与 ROS)

5.2.5 在 MYNT® EYE 上运行 VINS-FUSION

1. 运行 mynteye 节点

```
cd (local path of MYNT-EYE-S-SDK)
source ./wrappers/ros/devel/setup.bash
roslaunch mynt_eye_ros_wrapper vins_fusion.launch
```

2. 打开另一个命令行运行 vins

```
cd path/to/MYNT-EYE-VINS-FUSION-Samples/docker
./run.sh mynteye-s/mynt_stereo_imu_config.yaml # Stereo fusion
# ./run.sh mynteye-s2100/mynt_stereo_config.yaml # Stereo fusion with mynteye-s2100
# ./run.sh mynteye-s2100/mynt_stereo_imu_config.yaml # Stereo+imu fusion with mynteye-
↪ s2100
```

(下页继续)

(续上页)

```
# ./run.sh mynteye-s2110/mynt_stereo_config.yaml # Stereo fusion with mynteye-s2110
# ./run.sh mynteye-s2110/mynt_stereo_imu_config.yaml # Stereo+imu fusion with mynteye-
→s2110
```

5.3 ORB_SLAM2 如何整合

5.3.1 在 MYNT® EYE 上运行 ORB_SLAM2，请依照这些步骤：

1. 下载 MYNT-EYE-S-SDK 及安装。
2. 按照一般步骤安装 ORB_SLAM2。
3. 在 MYNT® EYE 上运行例子。

5.3.2 安装依赖

```
sudo apt-get -y install libglew-dev cmake libgoogle-glog-dev
cd ~
git clone https://github.com/stevenlovegrove/Pangolin.git
cd Pangolin
mkdir build
cd build
cmake ..
cmake --build .
sudo make install
```

5.3.3 ROS 下创建双目节点

- 添加 Examples/ROS/ORB_SLAM2 路径到环境变量 ROS_PACKAGE_PATH。打开 .bashrc 文件，在最后添加下面命令行。

```
export ROS_PACKAGE_PATH=${ROS_PACKAGE_PATH}:/catkin_ws/src/MYNT-EYE-ORB-SLAM2-Sample
```

- 运行脚本 *build_ros.sh*：

```
chmod +x build.sh
./build.sh
chmod +x build_ros.sh
./build_ros.sh
```


Stereo_ROS 例子

- 运行 ORB_SLAM2 Stereo_ROS 例子

1. 运行 mynteye 节点

```
cd [path of mynteye-s-sdk]
make ros
source ./wrappers/ros/devel/setup.bash
roslaunch mynt_eye_ros_wrapper mynteye.launch
```

2. 打开另一个命令行运行 ORB_SLAM2

```
roslaunch ORB_SLAM2 mynteye_s_stereo ./Vocabulary/ORBvoc.txt ./config/mynteye_s_stereo.
↪yaml false /mynteye/left_rect/image_rect /mynteye/right_rect/image_rect
```

5.4 OKVIS 如何整合

5.4.1 在 MYNT® EYE 上运行 OKVIS，请依照这些步骤：

1. 下载 MYNT-EYE-S-SDK 并安装。
2. 安装依赖，按照原始 OKVIS 步骤安装 MYNT-EYE-OKVIS-Sample。
3. 更新相机参数到 <OKVIS>/config/config_mynteye.yaml。
4. 在 MYNT® EYE 上运行 OKVIS。

小技巧： OKVIS 暂不支持 arm 平台

5.4.2 安装 MYNT® EYE OKVIS

首先安装原始 OKVIS 及依赖：

```
sudo apt-get install libgoogle-glog-dev

git clone -b mynteye https://github.com/slightech/MYNT-EYE-OKVIS-Sample.git
cd MYNT-EYE-OKVIS-Sample/
mkdir build && cd build
cmake ..
make
```


5.4.3 获取相机校准参数

通过 MYNT-EYE-S-SDK API 的 `GetIntrinsics()` 函数和 `GetExtrinsics()` 函数，可以获得当前工作设备的图像校准参数：

```
cd MYNT-EYE-S-SDK
./samples/_output/bin/tutorials/get_img_params
```

这时，可以获得针孔模型下的 `distortion_parameters` 和 `projection_parameters` 参数，然后在 [这里](#) 更新。

小技巧： 获取相机校准参数时可以看到相机模型，如果相机为等距模型不能直接写入参数，需要自己标定针孔模型或者按照 [写入图像标定参数](#) 写入 SDK 中的针孔模型参数来使用。

```
distortion_coefficients: [coeffs]    # only first four parameters of coeffs need to be
↪filled
focal_length: [fx, fy]
principal_point: [cx, cy]
distortion_type: radiatangential
```

5.4.4 运行 MYNT® EYE OKVIS

在 MYNT-EYE-OKVIS-Sample/build 中运行 `okvis_app_mynteye_s`：

```
cd MYNT-EYE-OKVIS-Sample/bin
./okvis_app_mynteye_s ../config/config_mynteye_s.yaml
```

5.5 VIORB 如何整合

5.5.1 在 MYNT® EYE 上运行 VIORB，请依照这些步骤：

1. 下载 MYNT-EYE-S-SDK，安装 `mynt_eye_ros_wrapper`。
2. 按照一般步骤安装 VIORB。
3. 更新相机参数到 `<VIO>/config/mynteye_s.yaml`。
4. 运行 `mynt_eye_ros_wrapper` 和 VIORB。

5.5.2 安装 MYNT-EYE-VIORB-Sample.

```
git clone -b mynteye https://github.com/slightech/MYNT-EYE-VIORB-Sample.git
cd MYNT-EYE-VIORB-Sample
```

添加 `Examples/ROS/ORB_VIO` 路径到环境变量 `ROS_PACKAGE_PATH`。打开 `.bashrc` 文件，在最后添加下面命令行。PATH 为当前 MYNT-EYE-VIORB-Sample. 存放路径：

```
export ROS_PACKAGE_PATH=${ROS_PACKAGE_PATH}:PATH/Examples/ROS/ORB_VIO
```

执行：

```
cd MYNT-EYE-VIORB-Sample
./build.sh
```

5.5.3 获取相机校准参数

使用 MYNT® EYE 的左目摄像头和 IMU。通过 MYNT-EYE-S-SDK API 的 `GetIntrinsics()` 函数和 `GetExtrinsics()` 函数，可以获得当前工作设备的图像校准参数：

```
cd MYNT-EYE-S-SDK
./samples/_output/bin/tutorials/get_img_params
```

这时，可以获得针孔模型下的 `distortion_parameters` 和 `projection_parameters` 参数，然后在 `<MYNT-EYE-VIORB-Sample>/config/mynteye_s.yaml` 中更新。

小技巧： 获取相机校准参数时可以看到相机模型，-如果相机为等距模型不能直接写入参数，需要自己标定针孔模型或者按照写入图像标定参数 写入 SDK 中的针孔模型参数来使用。

5.5.4 运行 VIORB 和 mynt_eye_ros_wrapper

1. 运行 mynteye 节点

```
roslaunch mynt_eye_ros_wrapper mynteye.launch
```

2. 打开另一个命令行运行 viorb

```
roslaunch ORB_VIO testmynteye_s.launch
```

最后，`pyplotscripts` 下的脚本会将结果可视化。

5.6 Maplab 如何整合

6.1 API

6.1.1 API

class API

The *API* class to communicate with MYNT® EYE device.

Public Types

using stream_callback_t = std::function<void (**const** api::*StreamData* &data) >
The *api::StreamData* callback.

using motion_callback_t = std::function<void (**const** api::*MotionData* &data) >
The *api::MotionData* callback.

using stream_switch_callback_t = std::function<void (**const** *Stream* &stream) >
The enable/disable switch callback.

Public Functions

Model **GetModel** () **const**
Get the model.

bool **Supports** (**const** *Stream* &stream) **const**
Supports the stream or not.

bool **Supports** (**const** *Capabilities* &capability) **const**
Supports the capability or not.

bool **Supports** (**const** *Option* &option) **const**
Supports the option or not.

bool Supports (const *AddOns* &addon) const
Supports the addon or not.

***StreamRequest* SelectStreamRequest (bool *ok) const**
Log all stream requests and prompt user to select one.

const std::vector<*StreamRequest*> &GetStreamRequests (const *Capabilities* &capability) const
Get all stream requests of the capability.

void ConfigStreamRequest (const *Capabilities* &capability, const *StreamRequest* &request)
Config the stream request to the capability.

const *StreamRequest* &GetStreamRequest (const *Capabilities* &capability) const
Get the config stream requests of the capability.

const std::vector<*StreamRequest*> &GetStreamRequests () const
Get all stream requests of the key stream capability.

void ConfigStreamRequest (const *StreamRequest* &request)
Config the stream request to the key stream capability.

const *StreamRequest* &GetStreamRequest () const
Get the config stream requests of the key stream capability.

std::shared_ptr<DeviceInfo> GetInfo () const
Get the device info.

std::string GetInfo (const *Info* &info) const
Get the device info.

std::string GetSDKVersion () const
Get the sdk version.

***IntrinsicsPinhole* GetIntrinsics (const *Stream* &stream) const**

template<typename T>
***T* GetIntrinsics (const *Stream* &stream) const**
Get the intrinsics of stream.

std::shared_ptr<IntrinsicsBase> GetIntrinsicsBase (const *Stream* &stream) const
Get the intrinsics base of stream.

***Extrinsics* GetExtrinsics (const *Stream* &from, const *Stream* &to) const**
Get the extrinsics from one stream to another.

***MotionIntrinsics* GetMotionIntrinsics () const**
Get the intrinsics of motion.

***Extrinsics* GetMotionExtrinsics (const *Stream* &from) const**
Get the extrinsics from one stream to motion.

void LogOptionInfos () const
Log all option infos.

***OptionInfo* GetOptionInfo (const *Option* &option) const**
Get the option info.

std::int32_t GetOptionValue (const *Option* &option) const
Get the option value.

void **SetDisparityComputingMethodType** (const *DisparityComputingMethod* &MethodType)
Set the disparity computing method.

void **SetRectifyAlpha** (const double &alpha)
Set the rectify bord cut alpha.

void **setDuplicate** (bool isEnabled)
Set if the duplicate frames is enable.

void **SetOptionValue** (const *Option* &option, std::int32_t value)
Set the option value.

bool **SetOptionValue** (const *Option* &option, std::uint64_t value)
Set the option value.

bool **RunOptionAction** (const *Option* &option) const
Run the option action.

void **SetStreamCallback** (const *Stream* &stream, *stream_callback_t* callback)
Set the callback of stream.

void **SetMotionCallback** (*motion_callback_t* callback)
Set the callback of motion.

bool **HasStreamCallback** (const *Stream* &stream) const
Has the callback of stream.

bool **HasMotionCallback** () const
Has the callback of motion.

void **Start** (const *Source* &source)
Start capturing the source.

void **Stop** (const *Source* &source)
Stop capturing the source.

void **WaitForStreams** ()
Wait the streams are ready.

void **EnableStreamData** (const *Stream* &stream)
Enable the data of stream.

Note must enable the stream if it' s a synthetic one. This means the stream in not native, the device has the capability to provide this stream, but still support this stream.

void **EnableStreamData** (const *Stream* &stream, *stream_switch_callback_t* callback, bool try_tag = false)
Enable the data of stream.

callback function will call before the father processor enable. when try_tag is true, the function will do nothing except callback.

void **DisableStreamData** (const *Stream* &stream)
Disable the data of stream.

void **DisableStreamData** (const *Stream* &stream, *stream_switch_callback_t* callback, bool try_tag = false)
Disable the data of stream.

callback function will call before the children processor disable. when `try_tag` is true, the function will do nothing except callback.

api::*StreamData* **GetStreamData** (const *Stream* &stream)

Get the latest data of stream.

std::vector<api::*StreamData*> **GetStreamDatas** (const *Stream* &stream)

Get the datas of stream.

Note default cache 4 datas at most.

void **EnableMotionDatas** (std::size_t max_size = std::numeric_limits<std::size_t>::max())

Enable cache motion datas.

std::vector<api::*MotionData*> **GetMotionDatas** ()

Get the motion datas.

void **EnableImuTimestampCorrespondence** (bool is_enable)

enable motion datas timestamp correspondence in device.

void **EnableTimestampCorrespondence** (const *Stream* &stream, bool keep_accel_then_gyro = true)

Enable motion datas with timestamp correspondence of some stream in api.

void **EnablePlugin** (const std::string &path)

Enable the plugin.

void **EnableProcessMode** (const ProcessMode &mode)

Enable process mode, e.g.

imu assembly, temp_drift

void **EnableProcessMode** (const std::int32_t &mode)

Enable process mode, e.g.

imu assembly, temp_drift

std::shared_ptr<struct CameraROSMsgInfoPair> **GetCameraROSMsgInfoPair** ()

Get ROS need camera info struct.

bool **ConfigDisparityFromFile** (const std::string &config_file)

Load disparity config from file.

Public Static Functions

static std::shared_ptr<*API*> **Create** (int argc, char *argv[])

Create the *API* instance.

Return the *API* instance.

Note This will init glog with args and call *device::select()* to select a device.

Parameters

- argc: the arg count.
- argv: the arg values.

static std::shared_ptr<*API*> **Create** (int *argc*, char **argv*[], **const** std::shared_ptr<*Device*> &*device*)
Create the *API* instance.

Return the *API* instance.

Note This will init glog with args.

Parameters

- *argc*: the arg count.
- *argv*: the arg values.
- *device*: the selected device.

static std::shared_ptr<*API*> **Create** (**const** std::shared_ptr<*Device*> &*device*)
Create the *API* instance.

Return the *API* instance.

Parameters

- *device*: the selected device.

6.1.2 api::StreamData

struct StreamData

API stream data.

Public Members

std::shared_ptr<*ImgData*> **img**
ImgData.

cv::Mat **frame**
Frame.

std::shared_ptr<device::*Frame*> **frame_raw**
Raw frame.

std::uint16_t **frame_id**
Frame ID.

6.1.3 api::MotionData

struct MotionData

API motion data.

Public Members

`std::shared_ptr<ImuData> imu`
ImuData.

6.2 Device

6.2.1 Device

class Device

The *Device* class to communicate with MYNT® EYE device.

Public Types

using stream_callback_t = device::StreamCallback
The *device::StreamData* callback.

using motion_callback_t = device::MotionCallback
The *device::MotionData* callback.

Public Functions

Model **GetModel () const**
Get the model.

bool Supports (const Stream &stream) const
Supports the stream or not.

bool Supports (const Capabilities &capability) const
Supports the capability or not.

bool Supports (const Option &option) const
Supports the option or not.

bool Supports (const AddOns &addon) const
Supports the addon or not.

const std::vector<StreamRequest> &GetStreamRequests (const Capabilities &capability) const
Get all stream requests of the capability.

void ConfigStreamRequest (const Capabilities &capability, const StreamRequest &request)
Config the stream request to the capability.

const StreamRequest &GetStreamRequest (const Capabilities &capability) const
Get the config stream requests of the capability.

const std::vector<StreamRequest> &GetStreamRequests () const
Get all stream requests of the key stream capability.

void ConfigStreamRequest (const StreamRequest &request)
Config the stream request to the key stream capability.

const *StreamRequest* &GetStreamRequest () const
Get the config stream requests of the key stream capability.

std::shared_ptr<DeviceInfo> GetInfo () const
Get the device info.

std::string GetInfo (const *Info* &info) const
Get the device info of a field.

std::shared_ptr<IntrinsicsBase> GetIntrinsics (const *Stream* &stream) const
Get the intrinsics of stream.

***Extrinsics* GetExtrinsics (const *Stream* &from, const *Stream* &to) const**
Get the extrinsics from one stream to another.

***MotionIntrinsics* GetMotionIntrinsics () const**
Get the intrinsics of motion.

***Extrinsics* GetMotionExtrinsics (const *Stream* &from) const**
Get the extrinsics from one stream to motion.

std::shared_ptr<IntrinsicsBase> GetIntrinsics (const *Stream* &stream, bool *ok) const
Get the intrinsics of stream.

***Extrinsics* GetExtrinsics (const *Stream* &from, const *Stream* &to, bool *ok) const**
Get the extrinsics from one stream to another.

***MotionIntrinsics* GetMotionIntrinsics (bool *ok) const**
Get the intrinsics of motion.

***Extrinsics* GetMotionExtrinsics (const *Stream* &from, bool *ok) const**
Get the extrinsics from one stream to motion.

void SetIntrinsics (const *Stream* &stream, const std::shared_ptr<IntrinsicsBase> &in)
Set the intrinsics of stream.

void SetExtrinsics (const *Stream* &from, const *Stream* &to, const *Extrinsics* &ex)
Set the extrinsics from one stream to another.

void SetMotionIntrinsics (const *MotionIntrinsics* &in)
Set the intrinsics of motion.

void SetMotionExtrinsics (const *Stream* &from, const *Extrinsics* &ex)
Set the extrinsics from one stream to motion.

void LogOptionInfos () const
Log all option infos.

***OptionInfo* GetOptionInfo (const *Option* &option) const**
Get the option info.

std::int32_t GetOptionValue (const *Option* &option) const
Get the option value.

void SetOptionValue (const *Option* &option, std::int32_t value)
Set the option value.

bool SetOptionValue (const *Option* &option, std::uint64_t value)
Set the option value.

bool RunOptionAction (**const** *Option* &*option*) **const**
Run the option action.

void SetStreamCallback (**const** *Stream* &*stream*, *stream_callback_t* *callback*, **bool** *async* = false)
Set the callback of stream.

void SetMotionCallback (*motion_callback_t* *callback*, **bool** *async* = false)
Set the callback of motion.

bool HasStreamCallback (**const** *Stream* &*stream*) **const**
Has the callback of stream.

bool HasMotionCallback () **const**
Has the callback of motion.

virtual void Start (**const** *Source* &*source*)
Start capturing the source.

virtual void Stop (**const** *Source* &*source*)
Stop capturing the source.

void WaitForStreams ()
Wait the streams are ready.

device::StreamData GetStreamData (**const** *Stream* &*stream*)
Get the latest data of stream.

device::StreamData GetLatestStreamData (**const** *Stream* &*stream*)

std::vector<device::StreamData> GetStreamDatas (**const** *Stream* &*stream*)
Get the datas of stream.

Note default cache 4 datas at most.

void DisableMotionDatas ()
Disable cache motion datas.

void EnableMotionDatas ()
Enable cache motion datas.

void EnableImuCorrespondence (**bool** *is_enable*)
Enable motion datas timestamp correspondence.

void EnableMotionDatas (**std::size_t** *max_size*)
Enable cache motion datas.

std::vector<device::MotionData> GetMotionDatas ()
Get the motion datas.

void EnableProcessMode (**const** *ProcessMode* &*mode*)
Enable process mode, e.g.
imu assembly, temp_drift

void EnableProcessMode (**const** **std::int32_t** &*mode*)
Enable process mode, e.g.
imu assembly, temp_drift

Public Static Functions

static std::shared_ptr<*Device*> **Create** (**const** std::string &*name*, std::shared_ptr<uvc::device> *device*)

Create the *Device* instance.

Return the *Device* instance.

Parameters

- *name*: the device name.
- *device*: the device from uvc.

6.2.2 device::Frame

class Frame

Frame with raw data.

Public Functions

Frame (**const** *StreamRequest* &*request*, **const** void **data*)

Construct the frame with *StreamRequest* and raw data.

Frame (std::uint16_t *width*, std::uint16_t *height*, *Format* *format*, **const** void **data*)

Construct the frame with stream info and raw data.

std::uint16_t **width** () **const**

Get the width.

std::uint16_t **height** () **const**

Get the height.

Format **format** () **const**

Get the format.

std::uint8_t ***data** ()

Get the data.

const std::uint8_t ***data** () **const**

Get the const data.

std::size_t **size** () **const**

Get the size of data.

Frame **clone** () **const**

Clone a new frame.

6.2.3 device::StreamData

struct StreamData

Device stream data.

Public Members

std::shared_ptr<ImgData> **img**
ImgData.

std::shared_ptr<Frame> **frame**
Frame.

std::uint16_t **frame_id**
Frame ID.

6.2.4 device::MotionData

struct MotionData

Device motion data.

Public Members

std::shared_ptr<ImuData> **imu**
ImuData.

6.3 Enums

6.3.1 Model

enum mynteye::Model

Device model.

Values:

STANDARD
Standard.

STANDARD2
Standard 2.

STANDARD210A
Standard 210a.

STANDARD200B
Standard 200b.

6.3.2 Stream

enum mynteye::Stream

Streams define different type of data.

Values:

LEFT

Left stream.

RIGHT

Right stream.

LEFT_RECTIFIED

Left stream, rectified.

RIGHT_RECTIFIED

Right stream, rectified.

DISPARITY

Disparity stream.

DISPARITY_NORMALIZED

Disparity stream, normalized.

DEPTH

Depth stream.

POINTS

Point cloud stream.

6.3.3 Capabilities

enum mynteye::Capabilities

Capabilities define the full set of functionality that the device might provide.

Values:

STEREO

Provides stereo stream.

STEREO_COLOR

Provide stereo color stream.

COLOR

Provides color stream.

DEPTH

Provides depth stream.

POINTS

Provides point cloud stream.

FISHEYE

Provides fisheye stream.

INFRARED

Provides infrared stream.

INFRARED2

Provides second infrared stream.

IMU

Provides IMU (accelerometer, gyroscope) data.

6.3.4 Info

enum mynteye::Info

Camera info fields are read-only strings that can be queried from the device.

Values:

DEVICE_NAME

Device name.

SERIAL_NUMBER

Serial number.

FIRMWARE_VERSION

Firmware version.

HARDWARE_VERSION

Hardware version.

SPEC_VERSION

Spec version.

LENS_TYPE

Lens type.

IMU_TYPE

IMU type.

NOMINAL_BASELINE

Nominal baseline.

AUXILIARY_CHIP_VERSION

Auxiliary chip version.

ISP_VERSION

Isp version.

6.3.5 Option

enum mynteye::Option

Camera control options define general configuration controls.

Values:

GAIN

Image gain, valid if manual-exposure.

range: [0,48], default: 24

BRIGHTNESS

Image brightness, valid if manual-exposure.

range: [0,240], default: 120

CONTRAST

Image contrast, valid if manual-exposure.

range: [0,254], default: 116

FRAME_RATE

Image frame rate, must set IMU_FREQUENCY together.

values: {10,15,20,25,30,35,40,45,50,55,60}, default: 25

IMU_FREQUENCY

IMU frequency, must set FRAME_RATE together.

values: {100,200,250,333,500}, default: 200

EXPOSURE_MODE

Exposure mode.

0: enable auto-exposure 1: disable auto-exposure (manual-exposure)

MAX_GAIN

Max gain, valid if auto-exposure.

range of standard 1: [0,48], default: 48 range of standard 2: [0,255], default: 8

MAX_EXPOSURE_TIME

Max exposure time, valid if auto-exposure.

range of standard 1: [0,240], default: 240 range of standard 2: [0,655], default: 333

MIN_EXPOSURE_TIME

min exposure time, valid if auto-exposure

range: [0,655], default: 0

DESIRED_BRIGHTNESS

Desired brightness, valid if auto-exposure.

range of standard 1: [0,255], default: 192 range of standard 2: [1,255], default: 122

IR_CONTROL

IR control.

range: [0,160], default: 0

HDR_MODE

HDR mode.

0: normal 1: WDR

ACCELEROMETER_RANGE

The range of accelerometer.

value of standard 1: {4,8,16,32}, default: 8 value of standard 2: {6,12,24,48}, default: 12

GYROSCOPE_RANGE

The range of gyroscope.

value of standard 1: {500,1000,2000,4000}, default: 1000 value of standard 2: {250,500,1000,2000,4000}, default: 1000

ACCELEROMETER_LOW_PASS_FILTER

The parameter of accelerometer low pass filter.

values: {0,1,2}, default: 2

GYROSCOPE_LOW_PASS_FILTER

The parameter of gyroscope low pass filter.

values: {23,64}, default: 64

IIC_ADDRESS_SETTING

The setting of IIC address.

range: [0,127], default: 0

ZERO_DRIFT_CALIBRATION

Zero drift calibration.

ERASE_CHIP

Erase chip.

SYNC_TIMESTAMP

Sync timestamp.

6.3.6 Source

enum mynteye::Source

Source allows the user to choose which data to be captured.

Values:

VIDEO_STREAMING

Video streaming of stereo, color, depth, etc.

MOTION_TRACKING

Motion tracking of IMU (accelerometer, gyroscope)

ALL

Enable everything together.

6.3.7 AddOns

enum mynteye::AddOns

Add-Ons are peripheral modules of our hardware.

Values:

INFRARED

Infrared.

INFRARED2

Second infrared.

6.3.8 Format

enum mynteye::Format

Formats define how each stream can be encoded.

Values:

GREY = ((std::uint32_t)('G') | ((std::uint32_t)('R') << 8) | ((std::uint32_t)('E') << 16) | ((std::uint32_t)('Y') << 24))

Greyscale, 8 bits per pixel.

YUYV = ((std::uint32_t)('Y') | ((std::uint32_t)('U') << 8) | ((std::uint32_t)('Y') << 16) | ((std::uint32_t)('V') << 24))

YUV 4:2:2, 16 bits per pixel.

BGR888 = ((std::uint32_t)('B') | ((std::uint32_t)('G') << 8) | ((std::uint32_t)('R') << 16) | ((std::uint32_t)('3') << 24))

BGR 8:8:8, 24 bits per pixel.

RGB888 = ((std::uint32_t)('R') | ((std::uint32_t)('G') << 8) | ((std::uint32_t)('B') << 16) | ((std::uint32_t)('3') << 24))
 RGB 8:8:8, 24 bits per pixel.

6.3.9 CalibrationModel

enum mynteye::CalibrationModel

Camera calibration model.

Values:

PINHOLE = 0

Pinhole.

KANNALA_BRANDT = 1

Equidistant: KANNALA_BRANDT.

UNKNOWN

Unknow.

6.3.10 DisparityComputingMethod

enum mynteye::DisparityComputingMethod

Camera disparity computing method type.

Values:

SGBM = 0

bm

BM = 1

sgbm

UNKNOWN

unknow

6.4 Types

6.4.1 OptionInfo

struct OptionInfo

Option info.

Public Members

std::int32_t **min**

Minimum value.

std::int32_t **max**

Maximum value.

std::int32_t **def**

Default value.

6.4.2 Resolution

struct Resolution

Resolution.

Public Members

std::uint16_t **width**

Width.

std::uint16_t **height**

Height.

6.4.3 StreamRequest

struct StreamRequest

Stream request.

Public Members

std::uint16_t **width**

Stream width in pixels.

std::uint16_t **height**

Stream height in pixels.

Format **format**

Stream pixel format.

std::uint16_t **fps**

Stream frames per second.

6.4.4 Intrinsics

IntrinsicsPinhole

struct IntrinsicsPinhole : public mynteye::IntrinsicsBase

Stream intrinsics (Pinhole)

Public Members

double **fx**

The focal length of the image plane, as a multiple of pixel width.

double **fy**

The focal length of the image plane, as a multiple of pixel height.

double **cx**

The horizontal coordinate of the principal point of the image.

double **cy**

The vertical coordinate of the principal point of the image.

std::uint8_t **model**
The distortion model of the image

double **coeffs**[5]
The distortion coefficients: k1,k2,p1,p2,k3.

IntrinsicsEquidistant

struct IntrinsicsEquidistant : public mynteye::IntrinsicsBase
Stream intrinsics (Equidistant: KANNALA_BRANDT)

Public Members

double **coeffs**[8]
The distortion coefficients: k2,k3,k4,k5,mu,mv,u0,v0.

ImuIntrinsics

struct ImuIntrinsics
IMU intrinsics: scale, drift and variances.

Public Members

double **scale**[3][3]
Scale matrix.

Scale X	cross axis	cross axis
cross axis	Scale Y	cross axis
cross axis	cross axis	Scale Z

double **assembly**[3][3]
Assembly error [3][3].

double **drift**[3]
Zero-drift: X, Y, Z.

double **noise**[3]
Noise density variances.

double **bias**[3]
Random walk variances.

double **x**[2]
Temperature drift.

0	- Constant value
1	- Slope

MotionIntrinsics

struct MotionIntrinsics

Motion intrinsics, including accelerometer and gyroscope.

Public Members

ImuIntrinsics **accel**

Accelerometer intrinsics.

ImuIntrinsics **gyro**

Gyroscope intrinsics.

6.4.5 Extrinsics

struct Extrinsics

Extrinsics, represent how the different datas are connected.

Public Functions

Extrinsics **Inverse()** **const**

Inverse this extrinsics.

Return the inversed extrinsics.

Public Members

double **rotation**[3][3]

Rotation matrix.

double **translation**[3]

Translation vector.

6.4.6 ImgData

struct ImgData

Image data.

Public Members

std::uint16_t **frame_id**

Image frame id.

std::uint64_t **timestamp**

Image timestamp in 1us.

std::uint16_t **exposure_time**

Image exposure time, virtual value in [1, 480].

bool **is_ets** = false

Is external time source.

6.4.7 ImuData

struct ImuData

IMU data.

Public Members

std::uint32_t **frame_id**

IMU frame id.

std::uint8_t **flag**

IMU accel or gyro flag.

0: accel and gyro are both valid 1: accel is valid

2: gyro is valid

bool **is_ets** = false

Is external time source.

std::uint64_t **timestamp**

IMU timestamp in 1us.

double **accel**[3]

IMU accelerometer data for 3-axis: X, Y, Z.

double **gyro**[3]

IMU gyroscope data for 3-axis: X, Y, Z.

double **temperature**

IMU temperature.

6.5 Utils

6.5.1 select

std::shared_ptr<Device> mynteye::device::select()

Detecting MYNT EYE devices and prompt user to select one.

Return the selected device, or nullptr if none.

6.5.2 select_request

MYNTEYE_NAMESPACE::StreamRequest mynteye::device::select_request(const
std::shared_ptr<Device>
&device, bool
*ok)

List stream requests and prompt user to select one.

Return the selected request.

6.5.3 get_real_exposure_time

`float mynteye::utils::get_real_exposure_time (std::int32_t frame_rate, std::uint16_t exposure_time)`

Get real exposure time in ms from virtual value, according to its frame rate.

Return the real exposure time in ms, or the virtual value if frame rate is invalid.

Parameters

- `frame_rate`: the frame rate of the device.
- `exposure_time`: the virtual exposure time.

6.5.4 get_sdk_root_dir

`std::string mynteye::utils::get_sdk_root_dir()`

Get sdk root dir.

6.5.5 get_sdk_install_dir

`std::string mynteye::utils::get_sdk_install_dir()`

Get sdk install dir.

7.1 常见问题

如果遇到相机使用问题, 请先查阅以下文档:

<http://support.myntai.com/hc/>

7.2 联系我们

如果无法解决问题, 可以通过客户服务联系我们。

<http://support.myntai.com/hc/request/new/>

M

- mynteye::ACCELEROMETER_LOW_PASS_FILTER (C++ *enumerator*), 99
- mynteye::ACCELEROMETER_RANGE (C++ *enumerator*), 99
- mynteye::AddOns (C++ *enum*), 100
- mynteye::ALL (C++ *enumerator*), 100
- mynteye::API (C++ *class*), 87
- mynteye::API::ConfigDisparityFromFile (C++ *function*), 90
- mynteye::API::ConfigStreamRequest (C++ *function*), 88
- mynteye::API::Create (C++ *function*), 90, 91
- mynteye::API::DisableStreamData (C++ *function*), 89
- mynteye::API::EnableImuTimestampCorrespondence (C++ *function*), 90
- mynteye::API::EnableMotionDatas (C++ *function*), 90
- mynteye::API::EnablePlugin (C++ *function*), 90
- mynteye::API::EnableProcessMode (C++ *function*), 90
- mynteye::API::EnableStreamData (C++ *function*), 89
- mynteye::API::EnableTimestampCorrespondence (C++ *function*), 90
- mynteye::API::GetCameraROSMsgInfoPair (C++ *function*), 90
- mynteye::API::GetExtrinsics (C++ *function*), 88
- mynteye::API::GetInfo (C++ *function*), 88
- mynteye::API::GetIntrinsics (C++ *function*), 88
- mynteye::API::GetIntrinsicsBase (C++ *function*), 88
- mynteye::API::GetModel (C++ *function*), 87
- mynteye::API::GetMotionDatas (C++ *function*), 90
- mynteye::API::GetMotionExtrinsics (C++ *function*), 88
- mynteye::API::GetMotionIntrinsics (C++ *function*), 88
- mynteye::API::GetOptionInfo (C++ *function*), 88
- mynteye::API::GetOptionValue (C++ *function*), 88
- mynteye::API::GetSDKVersion (C++ *function*), 88
- mynteye::API::GetStreamData (C++ *function*), 90
- mynteye::API::GetStreamDatas (C++ *function*), 90
- mynteye::API::GetStreamRequest (C++ *function*), 88
- mynteye::API::GetStreamRequests (C++ *function*), 88
- mynteye::API::HasMotionCallback (C++ *function*), 89
- mynteye::API::HasStreamCallback (C++ *function*), 89
- mynteye::API::LogOptionInfos (C++ *function*), 88
- mynteye::API::motion_callback_t (C++ *type*), 87
- mynteye::api::MotionData (C++ *class*), 91
- mynteye::api::MotionData::imu (C++ *member*), 92
- mynteye::API::RunOptionAction (C++ *function*), 89
- mynteye::API::SelectStreamRequest (C++ *function*), 88
- mynteye::API::SetDisparityComputingMethodType (C++ *function*), 89
- mynteye::API::setDuplicate (C++ *function*), 89
- mynteye::API::SetMotionCallback (C++ *function*), 89
- mynteye::API::SetOptionValue (C++ *function*), 89

tion), 89
 mynteye::API::SetRectifyAlpha (C++ function), 89
 mynteye::API::SetStreamCallback (C++ function), 89
 mynteye::API::Start (C++ function), 89
 mynteye::API::Stop (C++ function), 89
 mynteye::API::stream_callback_t (C++ type), 87
 mynteye::API::stream_switch_callback_t (C++ type), 87
 mynteye::api::StreamData (C++ class), 91
 mynteye::api::StreamData::frame (C++ member), 91
 mynteye::api::StreamData::frame_id (C++ member), 91
 mynteye::api::StreamData::frame_raw (C++ member), 91
 mynteye::api::StreamData::img (C++ member), 91
 mynteye::API::Supports (C++ function), 87, 88
 mynteye::API::WaitForStreams (C++ function), 89
 mynteye::AUXILIARY_CHIP_VERSION (C++ enumerator), 98
 mynteye::BGR888 (C++ enumerator), 100
 mynteye::BM (C++ enumerator), 101
 mynteye::BRIGHTNESS (C++ enumerator), 98
 mynteye::CalibrationModel (C++ enum), 101
 mynteye::Capabilities (C++ enum), 97
 mynteye::COLOR (C++ enumerator), 97
 mynteye::CONTRAST (C++ enumerator), 98
 mynteye::DEPTH (C++ enumerator), 97
 mynteye::DESIRED_BRIGHTNESS (C++ enumerator), 99
 mynteye::Device (C++ class), 92
 mynteye::Device::ConfigStreamRequest (C++ function), 92
 mynteye::Device::Create (C++ function), 95
 mynteye::Device::DisableMotionDatas (C++ function), 94
 mynteye::Device::EnableImuCorrespondence (C++ function), 94
 mynteye::Device::EnableMotionDatas (C++ function), 94
 mynteye::Device::EnableProcessMode (C++ function), 94
 mynteye::device::Frame (C++ class), 95
 mynteye::device::Frame::clone (C++ function), 95
 mynteye::device::Frame::data (C++ function), 95
 mynteye::device::Frame::format (C++ function), 95
 mynteye::device::Frame::Frame (C++ function), 95
 mynteye::device::Frame::height (C++ function), 95
 mynteye::device::Frame::size (C++ function), 95
 mynteye::device::Frame::width (C++ function), 95
 mynteye::Device::GetExtrinsics (C++ function), 93
 mynteye::Device::GetInfo (C++ function), 93
 mynteye::Device::GetIntrinsics (C++ function), 93
 mynteye::Device::GetLatestStreamData (C++ function), 94
 mynteye::Device::GetModel (C++ function), 92
 mynteye::Device::GetMotionDatas (C++ function), 94
 mynteye::Device::GetMotionExtrinsics (C++ function), 93
 mynteye::Device::GetMotionIntrinsics (C++ function), 93
 mynteye::Device::GetOptionInfo (C++ function), 93
 mynteye::Device::GetOptionValue (C++ function), 93
 mynteye::Device::GetStreamData (C++ function), 94
 mynteye::Device::GetStreamDatas (C++ function), 94
 mynteye::Device::GetStreamRequest (C++ function), 92
 mynteye::Device::GetStreamRequests (C++ function), 92
 mynteye::Device::HasMotionCallback (C++ function), 94
 mynteye::Device::HasStreamCallback (C++ function), 94
 mynteye::Device::LogOptionInfos (C++ function), 93
 mynteye::Device::motion_callback_t (C++ type), 92
 mynteye::device::MotionData (C++ class), 96
 mynteye::device::MotionData::imu (C++ member), 96
 mynteye::Device::RunOptionAction (C++ function), 94
 mynteye::device::select (C++ function), 105
 mynteye::device::select_request (C++ function), 105
 mynteye::Device::SetExtrinsics (C++ function), 93
 mynteye::Device::SetIntrinsics (C++ function), 93

mynteye::Device::SetMotionCallback (C++ function), 94
 mynteye::Device::SetMotionExtrinsics (C++ function), 93
 mynteye::Device::SetMotionIntrinsics (C++ function), 93
 mynteye::Device::SetOptionValue (C++ function), 93
 mynteye::Device::SetStreamCallback (C++ function), 94
 mynteye::Device::Start (C++ function), 94
 mynteye::Device::Stop (C++ function), 94
 mynteye::Device::stream_callback_t (C++ type), 92
 mynteye::device::StreamData (C++ class), 96
 mynteye::device::StreamData::frame (C++ member), 96
 mynteye::device::StreamData::frame_id (C++ member), 96
 mynteye::device::StreamData::img (C++ member), 96
 mynteye::Device::Supports (C++ function), 92
 mynteye::Device::WaitForStreams (C++ function), 94
 mynteye::DEVICE_NAME (C++ enumerator), 98
 mynteye::DISPARITY (C++ enumerator), 97
 mynteye::DISPARITY_NORMALIZED (C++ enumerator), 97
 mynteye::DisparityComputingMethod (C++ enum), 101
 mynteye::ERASE_CHIP (C++ enumerator), 100
 mynteye::EXPOSURE_MODE (C++ enumerator), 99
 mynteye::Extrinsics (C++ class), 104
 mynteye::Extrinsics::Inverse (C++ function), 104
 mynteye::Extrinsics::rotation (C++ member), 104
 mynteye::Extrinsics::translation (C++ member), 104
 mynteye::FIRMWARE_VERSION (C++ enumerator), 98
 mynteye::FISHEYE (C++ enumerator), 97
 mynteye::Format (C++ enum), 100
 mynteye::FRAME_RATE (C++ enumerator), 98
 mynteye::GAIN (C++ enumerator), 98
 mynteye::GREY (C++ enumerator), 100
 mynteye::GYROSCOPE_LOW_PASS_FILTER (C++ enumerator), 99
 mynteye::GYROSCOPE_RANGE (C++ enumerator), 99
 mynteye::HARDWARE_VERSION (C++ enumerator), 98
 mynteye::HDR_MODE (C++ enumerator), 99
 mynteye::IIC_ADDRESS_SETTING (C++ enumerator), 99
 mynteye::ImuData (C++ class), 105
 mynteye::ImuData::accel (C++ member), 105
 mynteye::ImuData::flag (C++ member), 105
 mynteye::ImuData::frame_id (C++ member), 105
 mynteye::ImuData::gyro (C++ member), 105
 mynteye::ImuData::is_ets (C++ member), 105
 mynteye::ImuData::temperature (C++ member), 105
 mynteye::ImuData::timestamp (C++ member), 105
 mynteye::ImuIntrinsics (C++ class), 103
 mynteye::ImuIntrinsics::assembly (C++ member), 103
 mynteye::ImuIntrinsics::bias (C++ member), 103
 mynteye::ImuIntrinsics::drift (C++ member), 103
 mynteye::ImuIntrinsics::noise (C++ member), 103
 mynteye::ImuIntrinsics::scale (C++ member), 103
 mynteye::ImuIntrinsics::x (C++ member), 103
 mynteye::Info (C++ enum), 98
 mynteye::INFRARED (C++ enumerator), 97, 100
 mynteye::INFRARED2 (C++ enumerator), 97, 100
 mynteye::IntrinsicsEquidistant (C++ class), 103
 mynteye::IntrinsicsEquidistant::coeffs (C++ member), 103
 mynteye::IntrinsicsPinhole (C++ class), 102
 mynteye::IntrinsicsPinhole::coeffs (C++ member), 103
 mynteye::IntrinsicsPinhole::cx (C++ member), 102
 mynteye::IntrinsicsPinhole::cy (C++ member), 102
 mynteye::IntrinsicsPinhole::fx (C++ member), 102
 mynteye::IntrinsicsPinhole::fy (C++ member), 102

mynteye::IntrinsicsPinhole::model (C++ member), 102
 mynteye::IR_CONTROL (C++ enumerator), 99
 mynteye::ISP_VERSION (C++ enumerator), 98
 mynteye::KANNALA_BRANDT (C++ enumerator), 101
 mynteye::LEFT (C++ enumerator), 97
 mynteye::LEFT_RECTIFIED (C++ enumerator), 97
 mynteye::LENS_TYPE (C++ enumerator), 98
 mynteye::MAX_EXPOSURE_TIME (C++ enumerator), 99
 mynteye::MAX_GAIN (C++ enumerator), 99
 mynteye::MIN_EXPOSURE_TIME (C++ enumerator), 99
 mynteye::Model (C++ enum), 96
 mynteye::MOTION_TRACKING (C++ enumerator), 100
 mynteye::MotionIntrinsics (C++ class), 104
 mynteye::MotionIntrinsics::accel (C++ member), 104
 mynteye::MotionIntrinsics::gyro (C++ member), 104
 mynteye::NOMINAL_BASELINE (C++ enumerator), 98
 mynteye::Option (C++ enum), 98
 mynteye::OptionInfo (C++ class), 101
 mynteye::OptionInfo::def (C++ member), 101
 mynteye::OptionInfo::max (C++ member), 101
 mynteye::OptionInfo::min (C++ member), 101
 mynteye::PINHOLE (C++ enumerator), 101
 mynteye::POINTS (C++ enumerator), 97
 mynteye::Resolution (C++ class), 102
 mynteye::Resolution::height (C++ member), 102
 mynteye::Resolution::width (C++ member), 102
 mynteye::RGB888 (C++ enumerator), 100
 mynteye::RIGHT (C++ enumerator), 97
 mynteye::RIGHT_RECTIFIED (C++ enumerator), 97
 mynteye::SERIAL_NUMBER (C++ enumerator), 98
 mynteye::SGBM (C++ enumerator), 101
 mynteye::Source (C++ enum), 100
 mynteye::SPEC_VERSION (C++ enumerator), 98
 mynteye::STANDARD (C++ enumerator), 96
 mynteye::STANDARD2 (C++ enumerator), 96
 mynteye::STANDARD200B (C++ enumerator), 96
 mynteye::STANDARD210A (C++ enumerator), 96
 mynteye::STEREO (C++ enumerator), 97
 mynteye::STEREO_COLOR (C++ enumerator), 97
 mynteye::Stream (C++ enum), 97
 mynteye::StreamRequest (C++ class), 102
 mynteye::StreamRequest::format (C++ member), 102
 mynteye::StreamRequest::fps (C++ member), 102
 mynteye::StreamRequest::height (C++ member), 102
 mynteye::StreamRequest::width (C++ member), 102
 mynteye::SYNC_TIMESTAMP (C++ enumerator), 100
 mynteye::UNKNOWN (C++ enumerator), 101
 mynteye::utils::get_real_exposure_time (C++ function), 106
 mynteye::utils::get_sdk_install_dir (C++ function), 106
 mynteye::utils::get_sdk_root_dir (C++ function), 106
 mynteye::VIDEO_STREAMING (C++ enumerator), 100
 mynteye::YUYV (C++ enumerator), 100
 mynteye::ZERO_DRIFT_CALIBRATION (C++ enumerator), 100

