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# **MYNT® EYE S SDK Documentation**

***Release 2.3.8***

**MYNTAI**

**May 22, 2019**



# CONTENTS

<b>1</b>	<b>MYNT® EYE product introduction</b>	<b>1</b>
1.1	Product description . . . . .	1
1.2	MYNTEYE-S1030 Size and structure . . . . .	2
1.3	MYNTEYE-S1030 IMU coordinata system . . . . .	2
1.4	S1030-IR-120/Mono Product Specification . . . . .	3
1.5	MYNTEYE-S2100 Size and structure . . . . .	4
1.6	MYNTEYE-S2100 IMU coordinata system . . . . .	5
1.7	S2100-146/Color Product Specification . . . . .	6
<b>2</b>	<b>MYNT® EYE SDK</b>	<b>7</b>
2.1	Changelog . . . . .	7
2.2	Supported platforms . . . . .	8
2.3	Ubuntu SDK PPA Installation . . . . .	8
2.4	Windows SDK exe Installation . . . . .	9
2.5	Ubuntu SDK Source Installation . . . . .	9
2.6	Windows SDK Source Installation . . . . .	11
2.7	MacOS Installation x . . . . .	17
2.8	ROS Installation . . . . .	17
2.9	OpenCV independency . . . . .	18
<b>3</b>	<b>MYNT® EYE Firmware</b>	<b>21</b>
3.1	Firmware and SDK compatibility . . . . .	21
3.2	How to update Main Processing Chip . . . . .	21
3.3	Change from SDK 1.x to 2.x . . . . .	26
<b>4</b>	<b>MYNT® EYE Data</b>	<b>27</b>
4.1	Get device information . . . . .	27
4.2	Get image calibration parameters . . . . .	27
4.3	Get IMU calibration parameters . . . . .	28
4.4	Get original binocular image . . . . .	29
4.5	Get stereo camera correction image . . . . .	29
4.6	Get disparity image . . . . .	30
4.7	Get depth image . . . . .	31
4.8	Get point image . . . . .	32
4.9	Get IMU data . . . . .	33
4.10	Get IMU data with timestamp correspondence . . . . .	34
4.11	Get data from callbacks . . . . .	37
4.12	Using the plugin to get data . . . . .	39
4.13	Save device infomation and parameters . . . . .	41
4.14	Write image parameters . . . . .	41

4.15	Write IMU parameters . . . . .	42
<b>5</b>	<b>MYNT® EYE Control</b>	<b>43</b>
5.1	Set the frame rate of image & IMU frequency . . . . .	43
5.2	Set the range of accelerometer & gyroscope . . . . .	45
5.3	Enable auto exposure and its adjustment function . . . . .	47
5.4	Enable manual exposure and its adjustment function . . . . .	49
5.5	Enable IR and its adjustments function . . . . .	51
5.6	Low-pass Filter . . . . .	52
5.7	Set IIC Address . . . . .	53
<b>6</b>	<b>Running log</b>	<b>55</b>
6.1	Enable log file . . . . .	55
6.2	Enabled detailed level . . . . .	55
<b>7</b>	<b>Wrapper interface</b>	<b>57</b>
7.1	How to use ROS . . . . .	57
<b>8</b>	<b>Data Analytics</b>	<b>61</b>
8.1	Recording data sets . . . . .	61
8.2	Analyzing IMU . . . . .	62
8.3	Analyze time stamps . . . . .	63
<b>9</b>	<b>Open Source project Support</b>	<b>65</b>
9.1	How to use in VINS-Mono . . . . .	65
9.2	How to use in VINS-Fusion . . . . .	66
9.3	How to use in ORB_SLAM2 . . . . .	67
9.4	How to use in OKVIS . . . . .	68
9.5	How to use in VIORB . . . . .	69
9.6	How to use in Maplab x . . . . .	70
<b>10</b>	<b>API DOC</b>	<b>71</b>
10.1	API . . . . .	71
10.2	Device . . . . .	75
10.3	Enums . . . . .	79
10.4	Types . . . . .	84
10.5	Utils . . . . .	88

## MYNT® EYE PRODUCT INTRODUCTION

### 1.1 Product description

MYNT® EYE S Series includes MYNT EYE S, MYNT EYE SE and MYNT EYE SC. The “Binocular + IMU” inertial navigation solution for MYNT® EYE S Series provides accurate six-axis complementary data for vSLAM applications and is more accurate and robust than other single solutions.

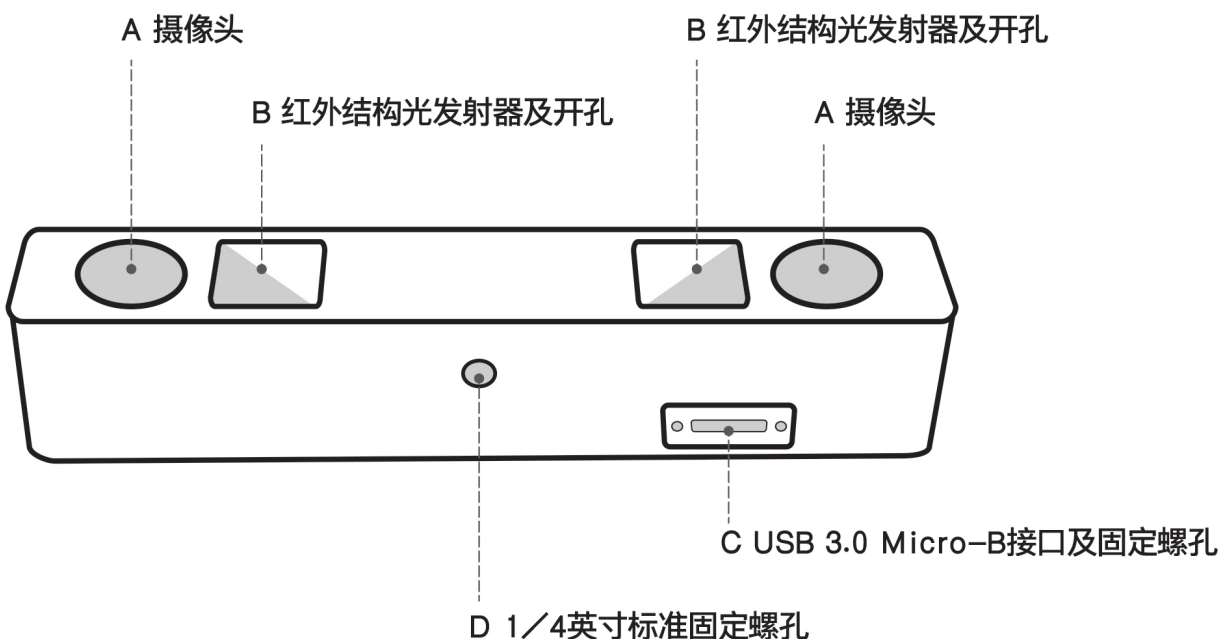
Combined with self-developed camera synchronization, auto exposure, and white balance control camera technology, MYNT® EYE S Series provides a CUDA-based GPU real-time acceleration solution that outputs high-precision, synchronized image sources to help reduce the difficulty of algorithm development and speed up the efficiency of algorithm research and development. At the same time, MYNT EYE S is equipped with a six-axis sensor (IMU) and an infrared active light (IR). Among them, six-axis sensor (IMU) can provide data complementation and correction for the research of visual positioning algorithm, suitable for algorithm research of visual inertial odometer (VIO), help improve positioning accuracy; infrared active light (IR) can help solve the problem of identifying indoor white walls and non-textured objects, and improve the recognition accuracy of image sources. The difference between MYNT EYE SE and MYNT EYE S is that MYNT EYE SE does not include IR and offers customers with lower cost hardware. MYNT EYE SC provides 8cm/12cm optional baseline solution, super wide angle 146°FOV, providing a wider depth recognition range and accuracy level, with color image sensor, upgraded brand new BMI088 six-axis IMU, IR active light, I2C time synchronization Chip, global shutter, etc., with resolutions up to 1280x800/60fps and accuracy is up to centimeters. In addition, MYNT EYE S Series also provides a rich SDK interface and VSLAM open source project support, which can help customers quickly integrate solutions, accelerate the product development process, and achieve rapid productization and implementation.

As a hardware product for research and development of stereo vision computing applications, MYNT® EYE S Series can be widely used in a field of visual positioning navigation (vSLAM), including visual real-time positioning navigation system of driverless vehicle and robots, visual positioning system of UAV, obstacle avoidance navigation system for driverless Vehicle, Augmented Reality (AR), Virtual Reality (VR), etc. At the same time, it can be used in a field of visual recognition, including Stereoscopic face recognition, three-dimensional object recognition, space motion tracking, three-dimensional gestures, and somatosensory recognition. And of course, you can use it for measurement which includes assisted driving system (ADAS), binocular volume calculation, industrial visual screening, etc. At present, MYNTAI has carried out service and cooperation with more than 500 domestic and foreign enterprise clients.

In order to ensure the quality of the output data of the camera products, we have calibrated the binocular and IMU. The product has passed various hardware stability tests, such as high-temperature and humidity continuous work and operation, low-temperature dynamic aging, high-temperature operation, low-temperature storage, whole-machine thermal shock, sinusoidal vibration and random vibration tests to ensure the stability and reliability of the product. In addition to the research and development of products and technologies, it can also be directly applied to mass production, accelerating the process from R&D to productization.

## 1.2 MYNTEYE-S1030 Size and structure

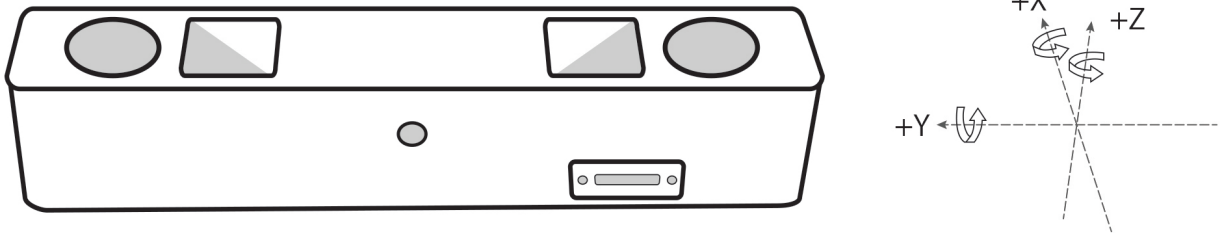
Shell(mm)	PCBA board(mm)
165x31.5x29.6	149x24



- A. Camera: please pay attention to protect the camera sensor lenses, to avoid imaging quality degradation.
- B. Infrared structured-light transmitter and outlet: the infrared structured-light can effectively solve the problem associated with the visual positioning calculations of white wall non-textured object (For non-IR version, the outlet is reserved but there is no internal structured-light emitter).
- C. USB Micro-B interface and set screw holes: during usage, plug in the USB Micro-B cable and secure it by fastening the set screws to avoid damage to the interface and to ensure stability in connection.
- D. 1/4 inch standardized set screw hole: for fixing the stereo camera to tripods or other devices.

## 1.3 MYNTEYE-S1030 IMU coordinata system

IMU coordinate system is right-handed, the axis directions are as follows:



## 1.4 S1030-IR-120/Mono Product Specification

### 1.4.1 Product Specification:

Model	S1030-IR-120/Mono
Size	PCB dimension:149x24mm, Total dimension:165x31.5x29.6mm
Frame Rate	10/15/20/25/30/35/40/45/50/55/60FPS
Resolution	752*480,376*240
Depth Resolution	Base on CPU/GPU Up to 752*480@60FPS
Pixel Size	6.0*6.0m
Baseline	120.0mm
Camera Lens	Replacable Standard M12
Visual Angle	D:146° H:122° V:76°
Focal Length	2.1mm
IR Support	Yes
IR detectable range	3m
Color Mode	Monochrome
Working Distance	0.7-2m
Scanning Mode	Global Shutter
Power	1~2.7W@5V DC from USB
Output data format	Raw data
Data transfer Interface	USB3.0
Weight	184g
UVC MODE	Yes

## 1.4.2 Work Environment

Operating Temperature	50°C
Storage Temperature	-20°C

## 1.4.3 Package:

Package Contents	MYNT EYE x1 USB Micro-B Cable x1
------------------	----------------------------------

## 1.4.4 Warranty

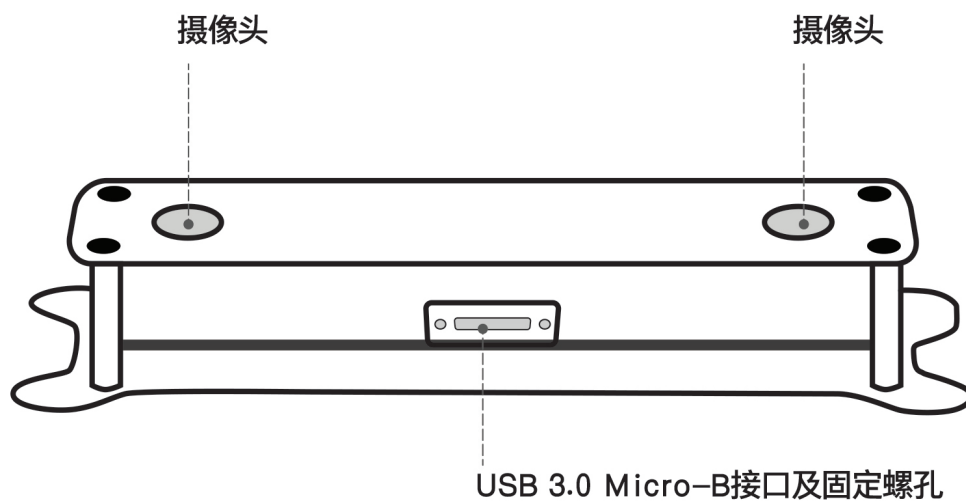
Product Warranty	12 Months Limited Manufacturer's Warranty
------------------	---

## 1.4.5 Accuracy

Depth Distance Deviation	Less than 4%
--------------------------	--------------

## 1.5 MYNTEYE-S2100 Size and structure

Shell(mm)	PCBA board(mm)
125x47x40	100x15

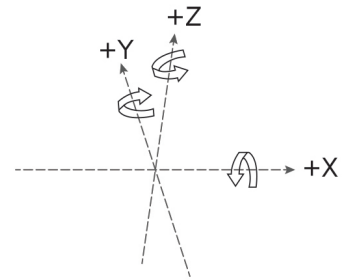
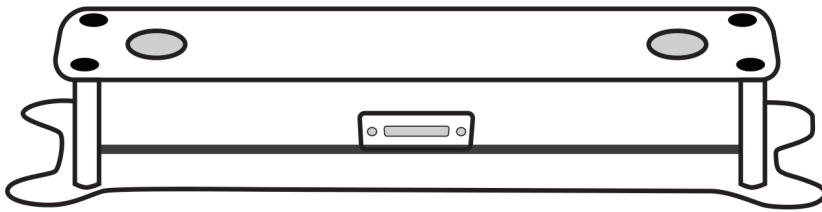




- A. Camera: please pay attention to protect the camera sensor lenses, to avoid imaging quality degradation.
- B. USB Micro-B interface and set screw holes: during usage, plug in the USB Micro-B cable and secure it by fastening the set screws to avoid damage to the interface and to ensure stability in connection.

## 1.6 MYNTEYE-S2100 IMU coordinata system

IMU coordinate system is right-handed, the axis directions are as follows:



## 1.7 S2100-146/Color Product Specification

### 1.7.1 Product Specification:

Model	S2100-146/Color
Size	PCB dimension:15x100mm Total dimension:125x47x26.6mm
Frame Rate	1280x400@10/20/30/60fps 2560x800@10/20/30fps
Resolution	1280x400; 2560x800
Pixel Size	3.0*3.0m
Baseline	80.0mm
Camera Lens	Replacable Standard M7
Visual Angle	D:141° H:124° V:87°
Focal Length	0.95mm
Color Mode	Color
Working Distance	0.26-1m
Scanning Mode	Global Shutter
Power	1.1W@5V DC from USB
Output data format	YUYV
Data transfer Interface	USB3.0
Weight	62g
UVC MODE	Yes

### 1.7.2 Work Environment

Operating Temperature	-15°C~60°C
Storage Temperature	-20°C~80°C

### 1.7.3 Package:

Package Contents	MYNT EYE x1 USB Micro-B Cable x1
------------------	----------------------------------

### 1.7.4 Warranty

Product Warranty	12 Months Limited Manufacturer's Warranty
------------------	---

### 1.7.5 Accuracy

Depth Distance Deviation	Less than 4%
--------------------------	--------------

## 2.1 Changelog

### 2.1.1 2019-05-20(v2.3.8)

1. Improve VINS-Fusion supporting
2. Improve VINS-MONO supporting
3. Fix left/right rect image order error

### 2.1.2 2019-04-19(v2.3.7)

1. Improve VINS-Fusion supporting
2. Improve ORB-SLAM2 supporting

### 2.1.3 2019-04-15(v2.3.6)

1. Fix imu align bug of ros wrapper
2. Fix 14.04 compile error of ros wrapper
3. Support set iic address for s2100

### 2.1.4 2019-04-01(v2.3.5)

1. Improve camera info.
2. Modify image algorithm parameters by yaml file.
3. Add opening multi devices launch file in ROS.
4. Add setting IIC address API of S210A.
5. Add image/imu flag of external time source.
6. Add LaserScan sample for S1030.
7. Modify default orientation of point in ROS.

### 2.1.5 2019-03-18(v2.3.4)

1. Add API to get auxiliary chip&ISP's version(Depend on S2100/S210A 1.1 firmware & 1.0 subsidiary chip firmware).
2. Fix point fragment issue in image algorithm.
3. Add 376\*240 resolution support to S1030(Depend on 2.4.0 firmware of S1030).
4. Add API to handle imu temperature drift.(Depend on imu calibration)
5. Add version check feature.
6. Fix depth image crash issue when use CUDA plugin.
7. Documents update.

## 2.2 Supported platforms

SDK is built on CMake and can be used cross multiple platforms such as “Linux, Windows, etc. We provides two installation: Download and install, and Compile and install from source code.

These are the platforms that can be used:

- Windows 10
- Ubuntu 18.04.1 / 16.04.6 / 14.04.5
- Jetson TX1/TX2 / Xavier
- firefly RK3399

**Warning:** Due to the requirement of hardware transmission rate, please use the USB 3 interface. In addition, virtual machines have USB driver compatibility problems, thus they are not recommended.

## 2.3 Ubuntu SDK PPA Installation

Ubuntu 14.04	Ubuntu 16.04	Ubuntu 18.04
✓	✓	✓

### 2.3.1 x64 PPA installation

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

### 2.3.2 armv8 PPA installation

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

### 2.3.3 Run samples

---

**Tip:** samples path: /opt/mynt-eye-s-sdk/samples; tools path:/opt/mynt-eye-s-sdk/tools

---

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

## 2.4 Windows SDK exe Installation

Windows 10
✓

### 2.4.1 Download and install SDK

---

**Tip:** Download here: mynteye-s-2.3.6-win-x64-opencv-3.4.3.exe [Google Drive](#) [Baidu Pan](#) .

---

After you install the win pack of SDK, there will be a shortcut to the SDK root directory on your desktop.

Goto the <SDK\_ROOT\_DIR>\bin\samples\tutorials directory and click get\_stereo.exe to run.

### 2.4.2 Generate samples project

First, you should install [Visual Studio 2017](#) and [CMake](#) .

Second, goto the <SDK\_ROOT\_DIR>\samples directory and click generate.bat to generate project.

---

**Tip:** Right click sample and select Set as StartUp Project then launch with Release x64 mode.

---

The tutorials of samples are here: <https://slightech.github.io/MYNT-EYE-S-SDK-Guide/src/data/contents.html>.

### 2.4.3 Start using SDK with Visual Studio 2017

Goto the <SDK\_ROOT\_DIR>\projects\vs2017, see the README.md.

## 2.5 Ubuntu SDK Source Installation

Ubuntu 14.04	Ubuntu 16.04	Ubuntu 18.04
✓	✓	✓

---

**Tip:** If you used any other Linux distributions without apt-get package manager, you need to install required packages manually instead of using make init.

---

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>

---

## 2.5.1 Getting Source Code

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

## 2.5.2 Required Packages

```
cd <sdk>
make init
```

- [OpenCV](#)

---

**Tip:** To build and install OpenCv, Please refer to [Installation in Linux](#) . Alternatively, refer to the command below:

```
[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
```

## 2.5.3 Building code

**Tip:** If opencv is installed in custom directory or if you want to specify a version, you should set the path before building:

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

Otherwise, CMake will prompt cannot find OpenCV. If you need sdk without OpenCV, please read *OpenCV independency*.

Build and install:

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

Finally, sdk will install in `/usr/local` by default.

## 2.5.4 Building samples

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

Run samples:

```
./samples/_output/bin/api/camera_a
```

Tutorial samples, please read *MYNT® EYE Data* and *MYNT® EYE Control*.

## 2.5.5 Building tools

```
cd <sdk>
make tools
```

Installation requirement:

```
cd <sdk>/tools/
sudo pip install -r requirements.txt
```

The usage of tools and scripts will be introduced later.

## 2.5.6 Conclusion

If your project will use SDK, you can refer to the settings in `samples/CMakeLists.txt` for CMake. Alternatively, import the head file and dynamic library in the installation directory.

## 2.6 Windows SDK Source Installation

Windows 10
------------

✓
---

---

**Tip:** Windows does not provide Visual Studio \*.sln file directly and requires CMake to build. Firstly, CMake can be used across multiple platforms, it is easy to configure and can be maintained in a sustainable way. Secondly, the third-party codes (Glog, OpenCV) are built using CMake.

---

---

**Tip:** There is currently no binary installer available, which requires you to compile from source. It is also the process of configuring the development environment.

---

## 2.6.1 Prerequisites

### CMake (provide build

- CMake used to build and compile (necessary).
- Git used to get code (optional).
- Doxygen used to generate documents (optional).

After you install the above tools, confirm that you can run this command in CMD (Command Prompt):

```
>cmake --version
cmake version 3.10.1

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

>doxygen --version
1.8.13
```

### Visual Studio (provide compilation)

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

After installing Visual Studio, confirm that the following command can run in the Visual Studio Command Prompt:

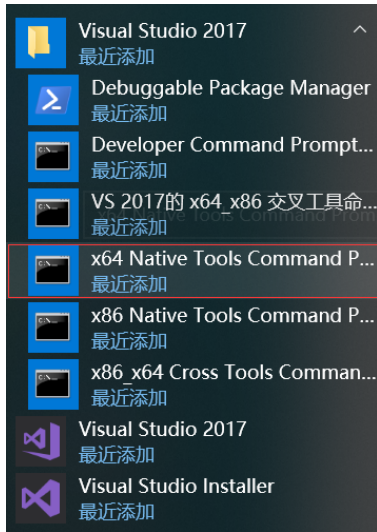
```
>cl
Microsoft (R) C/C++ Optimizing Compiler Version 19.14.26429.4 for x86

>msbuild
Microsoft (R) 15.7.179.6572
```

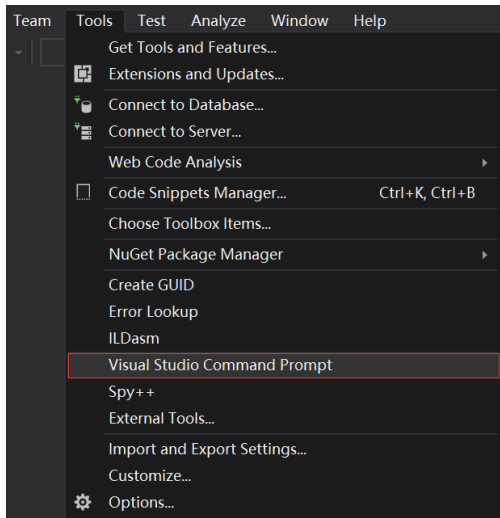
---

**Tip:** Visual Studio Command Prompt can be opened from the Start menu,





You can also open it from the Visual Studio Tools menu.



However, if you do not have the Visual Studio 2015 Tools menu, you can add one yourself.

Open Tools's External Tools. . . and Add the following:

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)

In Visual Studio command Prompt, you can use the compile command `cl link lib msbuild`, etc.(need finish MSYS2``and ``Getting Source Code steps first)

```

C:\WINDOWS\system32\cmd.exe

c:\Program Files (x86)\Microsoft Visual Studio\2017\Community\Common7\Tools>c1
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 (provide Linux command)

- MSYS2
  - mirror
  - pacman

After installation, verify that the following path has been added to the system environment variable PATH:

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

Then, open MSYS2 MSYS, perform the update and install make:

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

Finally, the CMD (Command Prompt) can run the following command:

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

## 2.6.2 Getting Source Code

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

### 2.6.3 Required Packages

```
>cd <sdk>
>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](#)

**Tip:** The official OpenCV provides the exe for installation. If you want to compile from the source code, see the Official document [Installation in Windows](#) . or refer to the following command:

```
>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" ^
..

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

### 2.6.4 Building Code

**Tip:** If OpenCV is installed in a custom directory or wants to specify a version, you can set the path as follows before compiling:

```
# OpenCV_DIR is the path where OpenCVConfig.cmake in
set OpenCV_DIR=C:\opencv
```

Otherwise, CMake will prompt that OpenCV could not be found. If you don't want to rely on OpenCV, read [OpenCV independency](#).

---

Build and install:

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

Finally, the SDK will install in <sdk>/\_install by default.

## 2.6.5 Building samples

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

Run samples:

```
.\samples\_output\bin\api\camera_a.bat
```

For tutorial samples, please read [MYNT® EYE Data](#) and [MYNT® EYE Control](#).

---

**Tip:** All compiled sample programs exe will have a corresponding bat. bat will temporarily set system environment variables and then run exe. So it is recommended to run bat.

If you run “exe” directly, it may prompt that cannot find dll. Then you should add <sdk>\\\_install\bin %OPENCV\_DIR%\bin to PATH in system environment variable.

How to set the environment variable for OpenCV, refer to the official document [Set the OpenCV environment variable and add it to the systems path](#).

---

## 2.6.6 Building tools

```
cd <sdk>
make tools
```

The usage of tools and scripts will be introduced later.

---

**Tip:** The script is based on Python. You need to install Python and its package management tool pip first, and then install the dependencies as follows:

```
cd <sdk>\tools
pip install -r requirements.txt
```

Note: Python is also in MSYS2, but fail install Matplotlib in test.

---

## 2.6.7 Conclusion

If your project will use SDK, you can refer to the settings in `samples/CMakeLists.txt` for CMake. Or just import the head file and dynamic library in the installation directory.

## 2.7 MacOS Installation x

TODO

## 2.8 ROS Installation

ROS Kinetic	ROS Indigo
✓	✓

### 2.8.1 Prepare Environment

- ROS

#### 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://ha.pool.sks-keyservers.net:80 --recv-key_
↳421C365BD9FF1F717815A3895523BAEEB01FA116
sudo apt update
sudo apt install ros-melodic-desktop-full
sudo rosdep init
rosdep update
```

#### ROS Kinetic (Ubuntu 16.04)

```
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
```

#### ROS Indigo (Ubuntu 14.04)

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

### 2.8.2 Compiling Code

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

### 2.8.3 Running node

```
source wrappers/ros/devel/setup.bash
roslaunch mynt_eye_ros_wrapper mynteye.launch # this node doesn't have preview
```

Run the node, and preview by RViz:

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

## 2.8.4 Testing Services

Run the node as follows, provide device information getting service, see follows:

```
$ 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
```

## 2.8.5 Common issues - ROS Indigo

### Cannot find libopencv while make ros

```
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) Install OpenCV 2:

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

#### Solution 2) Install OpenCV 3 & re-compiled 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/
```

Then run `make ros` again

## 2.8.6 Conclusion

About more details, check the [How to use ROS](#) .

## 2.9 OpenCV independency

SDK provides a three-tier interface with OpenCV dependencies:

- `api`, upper interface, with OpenCV dependencies

- `device`, interlayer interface, without OpenCV dependencies
- `uvc`, bottom interface, without OpenCV dependencies

If you don't want to use OpenCV, edit `<sdk>/cmake/Option.cmake`, set `WITH_API` to `OFF`. This will stop the compilation of the interface api:

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

For samples for the interface `device`, please refer to `device/camera.cc`.





## MYNT® EYE FIRMWARE

### 3.1 Firmware and SDK compatibility

S1030 Firmwares	SDK Version
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
MYNTEYE_S_2.2.2.img	2.3.0 (2.2.2-rc1 ~ 2.3.0)
MYNTEYE_S_2.3.0.img	2.3.0 (2.2.2-rc1 ~ 2.3.3)
MYNTEYE_S_2.4.0.img	2.3.4 (2.3.4 ~ 2.3.5)

S2100 Firmwares	SDK Version
MYNTEYE_S2100_1.1.img	2.3.4
MYNTEYE_S2100_1.2.img	2.3.5

**Attention:** Please CONFIRM your device model and use CORRECT firmware.

`Firmwares` indicates the firmware file name. It's in [MYNTEYE\\_BOX\(Download Link\)](#) in the `Firmwares` directory.

`SDK Version` indicates the version of the SDK that the firmware is adapted to, and the range of available versions are indicated in parentheses.

### 3.2 How to update Main Processing Chip

Please use the MYNT EYE TOOL to update main processing chip.

You can download the firmware and MYNT EYE TOOL installation package in the `Firmwares` folder of [MYNT-EYE\\_BOX\(Download Link\)](#) . The file structure is as follows:

```

Firmwares/
├──Checksum.txt                # file checksum
├──MYNTEYE_S_2.4.0.img        # S1030 firmware
├──MYNTEYE_S2100_1.2.img      # S2100 firmware
├──...
└──setup.zip                  # MYNTEYE TOOL zip

```

The firmware upgrade program currently only supports Windows, so you need to operate under Windows. Proceed as follows:

### 3.2.1 Download preparation

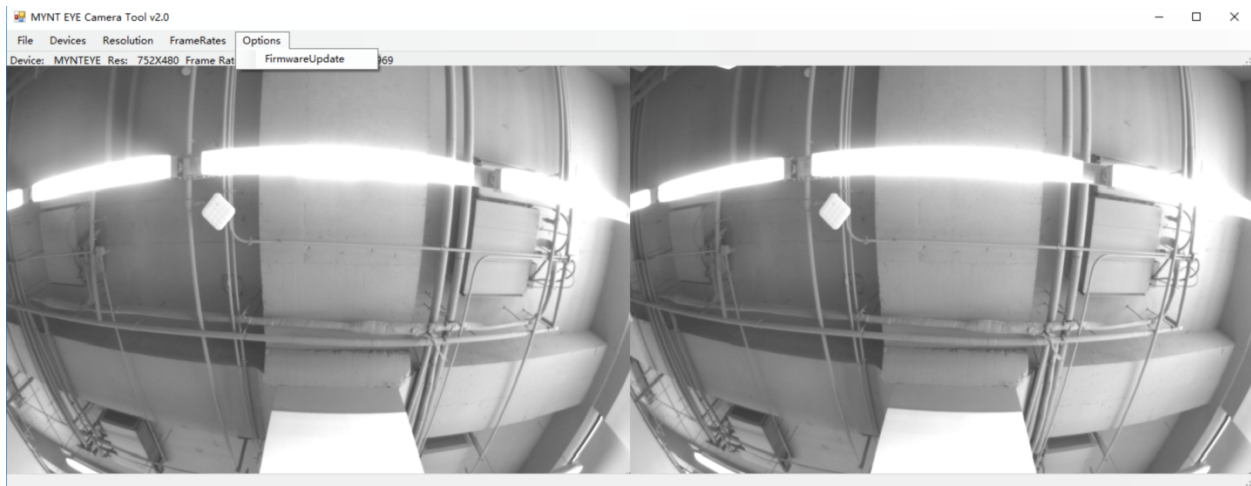
- Download and unzip `setup.zip`
- Find firmware, such as `MYNTEYE_S_2.4.0.img`
  - Please refer to [Firmware and SDK compatibility](#) to select the firmware suitable for the SDK version
  - Please refer to `Checksum.txt` to find the firmware check code as follows:
    - \* Run the command in CMD `certutil -hashfile <*.img> MD5`.
    - \* If the check code is incorrect, it means that the download went wrong. Please download it again!

### 3.2.2 Install MYNT EYE TOOL

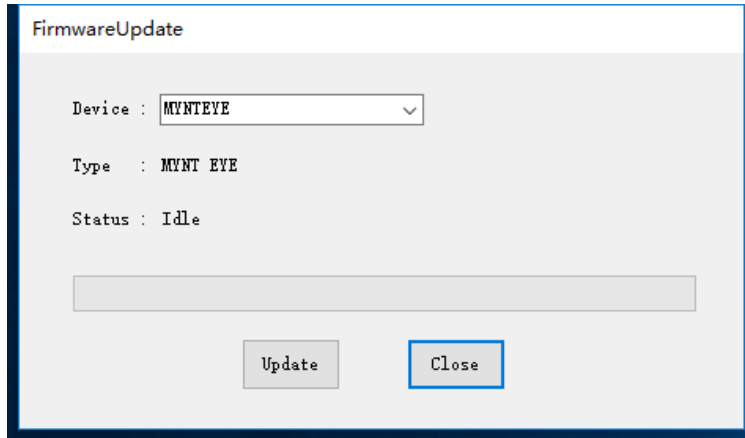
- Double click on `setup.msi` and install the application.

### 3.2.3 Update Firmware

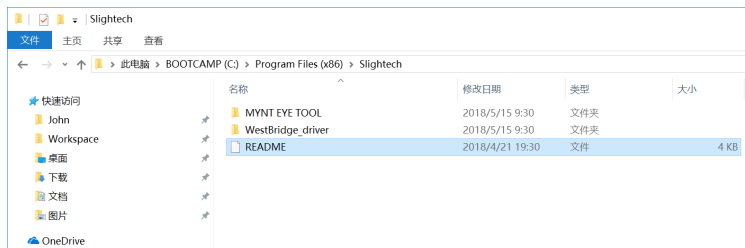
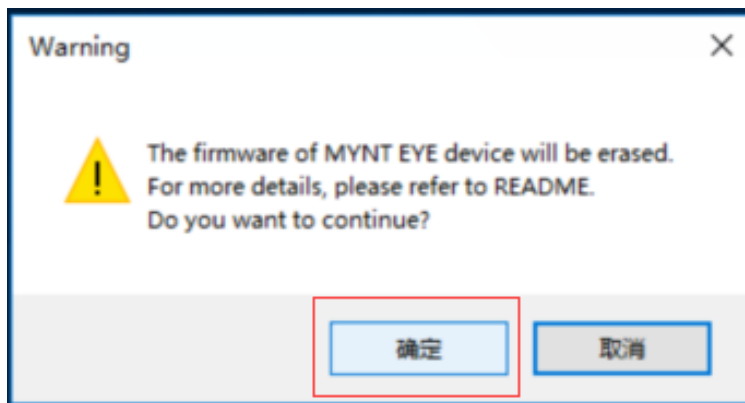
- Plug in the MYNT® EYE camera into a USB3.0 port
- Open MYNT EYE TOOL and select `Options/FirmwareUpdate`.



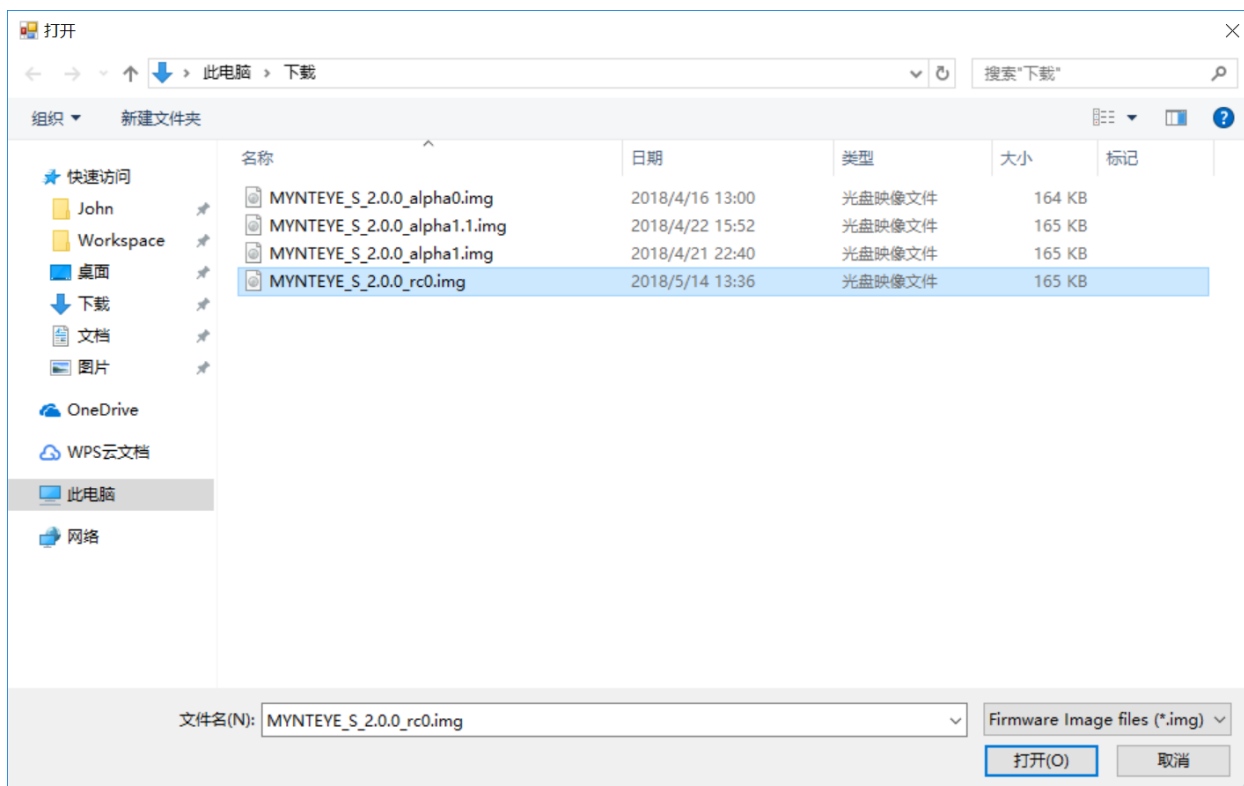
- Click `Update`.



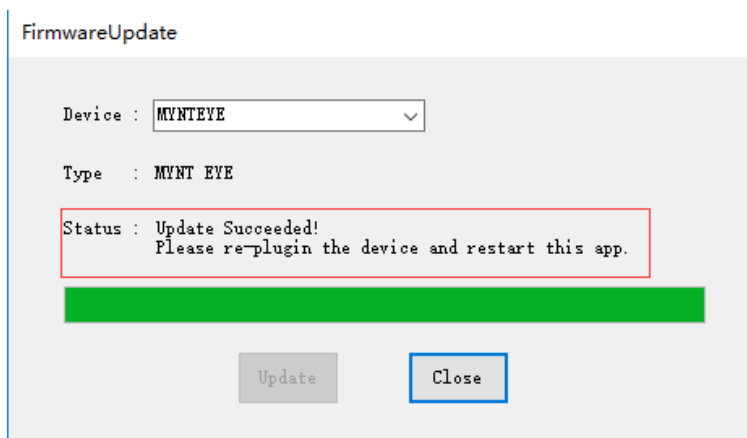
- A warning dialog box will pop up, click yes .
  - This operation will erase the firmware, for details see README.
    - \* Usually, the MYNT EYE TOOL automatically installs the driver during the upgrade process.
    - \* If the upgrade fails, refer to README.



- In the open file selection box, select the firmware you want to upgrade and start upgrading.



- Once the upgrade is complete, the status will changes to Succeeded.



- Close the MYNT EYE TOOL finish.

**Attention:** If you can't find MYNT image device, WestBridge\_driver, and Cypress USB BootLoader at the same time in the device manager, try another computer to perform the above operation. If you can not upgrade successfully, please contact us in time.

### 3.2.4 Manually update drivers

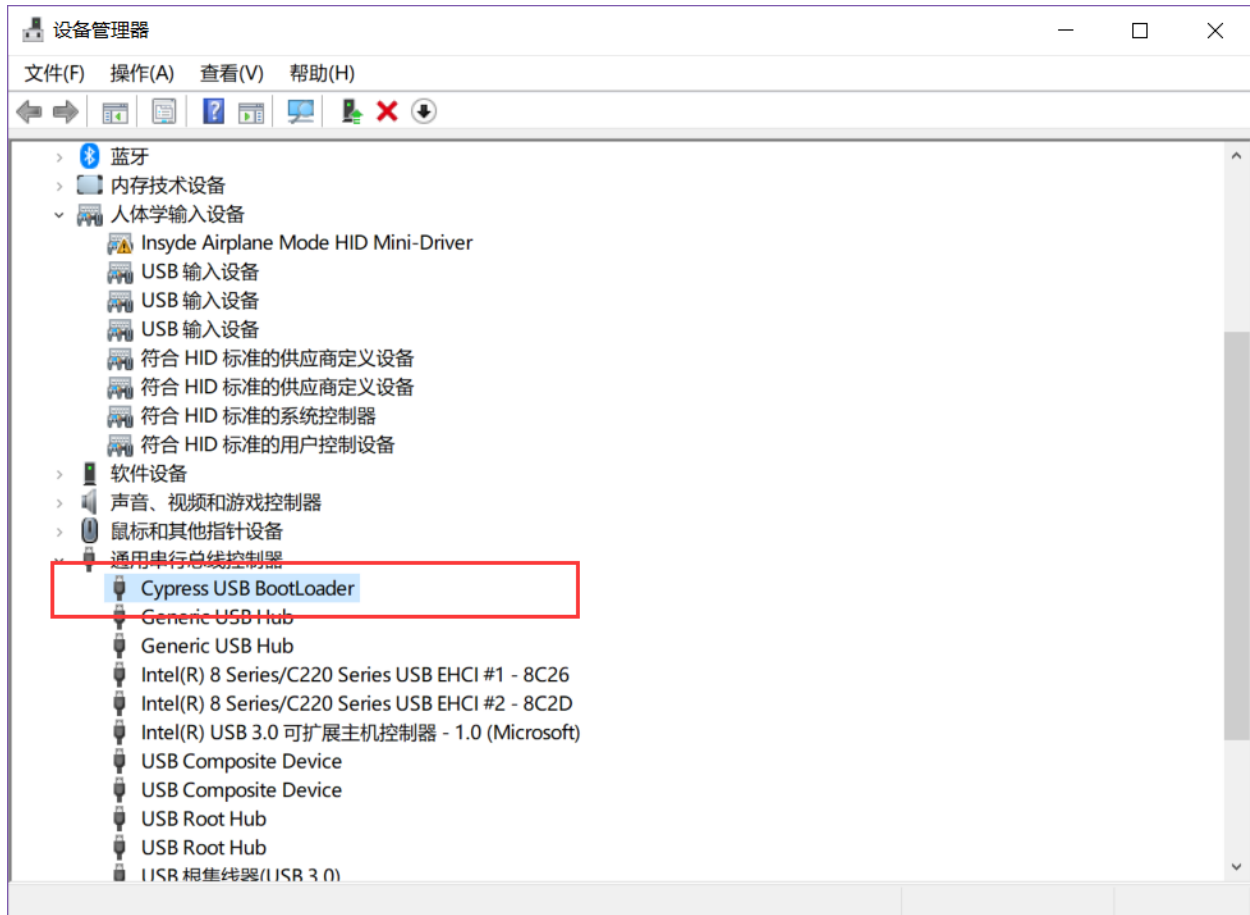
- If the application indicates that you failed to update, you may fail to install the driver automatically. You can try to install the driver manually and then update it. The following is the manual installation of the driver.

- Open device manager, locate WestBridge\_driver device, and right click Update Driver,select [application directory]WestBridge\_driver\\[corresponding system folders] (If it is more than win7, choose wlh)\\[system bits].

### ✓ 其他设备

#### ⚠ WestBridge

- For example,if it is the win10 64 bit system computer,and the application is installed under the default path,you should select C:\Program Files (x86)\slightech\MYNT EYE TOOL 2.0\WestBridge\_driver\wlh\x64.
- After the installation driver is successful, you can find the Cypress USB BootLoader device in the device manager.



- Then plug in the camera and open the application again to update.

**Warning:** During the first time you open the MYNT® EYE camera after a firmware update, please hold the camera steadily for 3 seconds, for a zero drift compensation process. You can also call the API `RunOptionAction(Option::ZERO_DRIFT_CALIBRATION)` for zero drift correction.

## 3.3 Change from SDK 1.x to 2.x

To replace the SDK version 1.x to 2.x, need to:

1 Install SDK 2, Check the *MYNT® EYE SDK* .

2 Upgrade firmware to 2.x version Check the *MYNT® EYE Firmware* .

3 After launch the SDK 1.x , the image calibration parameters will be saved in <MYNTEYE\_SDK\_ROOT>/settings/SN\*.conf .Please check the *Write image parameters* and write SN\*.conf into the devices.

## MYNT® EYE DATA

### 4.1 Get device information

Use `GetInfo()` function to get various current information values.

Reference code snippet:

```
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);
```

Reference result on Linux:

```
$ ./samples/_output/bin/tutorials/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
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
```

Complete code examples, see [get\\_device\\_info.cc](#).

### 4.2 Get image calibration parameters

Use `GetIntrinsics()` & `GetExtrinsics()` to get image calibration parameters.

---

**Tip:** The detailed meaning of parameters can reference the files in `tools/writer/config`, of these the image calibration parameters of S2100/S210A are in `tools/writer/config/S210A` the image calibration parameters

---

of S1030 are in `tools/writer/config/S1030`

Reference code snippet:

```
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) << "}";
```

Reference result on Linux:

```
$ ./samples/_output/bin/tutorials/get_img_params
I0510 15:00:22.643263 6980 utils.cc:26] Detecting MYNT EYE devices
I0510 15:00:23.138811 6980 utils.cc:33] MYNT EYE devices:
I0510 15:00:23.138849 6980 utils.cc:37] index: 0, name: MYNT-EYE-S1000
I0510 15:00:23.138855 6980 utils.cc:43] Only one MYNT EYE device, select index: 0
I0510 15:00:23.210491 6980 get_img_params.cc:23] Intrinsics left: {width: 752,
→height: 480, fx: 736.38305001095545776, fy: 723.50066150722432212, cx: 356.
→91961817119693023, cy: 217.27271340923883258, model: 0, coeffs: [-0.
→54898645145016478, 0.52837141203888638, 0.0000000000000000, 0.0000000000000000, 0.
→0000000000000000]}
I0510 15:00:23.210551 6980 get_img_params.cc:24] Intrinsics right: {width: 752,
→height: 480, fx: 736.38305001095545776, fy: 723.50066150722432212, cx: 456.
→68367112303980093, cy: 250.7008333536796199, model: 0, coeffs: [-0.
→51012886039889305, 0.38764476500996770, 0.0000000000000000, 0.0000000000000000, 0.
→0000000000000000]}
I0510 15:00:23.210577 6980 get_img_params.cc:26] Extrinsics left to right:
→{rotation: [0.99701893306553813, -0.00095378124886237, -0.07715139279485062, 0.
→00144939967628305, 0.99997867219985104, 0.00636823256494144, 0.07714367342455503, -
→0.00646107164115277, 0.99699905125522237], translation: [-118.88991734400046596, -0.
→04560580387053091, -3.95313736911933855]}
```

Complete code examples, see `get_img_params.cc`.

## 4.3 Get IMU calibration parameters

Use `GetMotionIntrinsics()` & `GetMotionExtrinsics()` to get current IMU calibration parameters.

Reference commands:

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

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

Complete code examples, see `get_imu_params.cc`.



## 4.4 Get original binocular image

Use `Start()` or `Stop()` , to start or stop data capturing. If you only need the image data, use `Source::VIDEO_STREAMING` .

When data capturing starts, call `WaitForStreams()` function. Once data capturing begins, use `GetStreamData()` to get your data.

Reference commands:

```
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);
```

The above code uses OpenCV to display the image. When the display window is selected, pressing `ESC/Q` will end the program.

Complete code examples, see [get\\_stereo.cc](#) .

## 4.5 Get stereo camera correction image

The `GetStreamData()` API provided can only get the raw data of the hardware, for example, the stereo camera raw image.

The stereo camera correction image belongs to the upper layer of synthetic data. For such data, you need to enable `EnableStreamData()` before you can get `GetStreamData()` .

In addition, `WaitForStreams()` waits for the key of the raw data. At the beginning when the synthetic data may still being processed, the value taken out will be null, so it needs to check not empty.

---

**Tip:** If you want the synthetic data once it is generated, see [Get data from callbacks](#).

---

Reference code snippet:

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

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

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);
```

OpenCV is used to display the image above. Select the display window, press ESC/Q to exit the program.

Complete code examples, see [get\\_stereo\\_rectified.cc](#).

## 4.6 Get disparity image

Disparity image belongs to the upper layer of synthetic data. You need to start the `EnableStreamData()` beforehand, to get it through `GetStreamData()`. In addition, it should be checked not to be empty before use.

For detailed process description, please see *[Get original binocular image](#)* *[Get stereo camera correction image](#)*.

It is recommended to use plugin to calculate depth: the depth map will be better with a higher frame rate. Please see *[Using the plugin to get data](#)*.

---

**Tip:** The `SetDisparityComputingMethodType` method is used to change disparity computing method. Currently, BM and SGBM are available.

---

Reference code snippet:

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

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

api->SetDisparityComputingMethodType(DisparityComputingMethod::BM);
```

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```

api->Start (Source::VIDEO_STREAMING);

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

```

The above code uses OpenCV to display the image. Select the display window, press ESC/Q to exit in the program.

Complete code examples, see [get\\_disparity.cc](#) .

## 4.7 Get depth image

Depth images belongs to the upper layer of synthetic data. You need to start the `EnableStreamData()` beforehand, to get it through `GetStreamData()`. The depth image type is `CV_16UC1`. In addition, it should be check not be empty before use.

For detailed process description, please see *[Get original binocular image](#)* *[Get stereo camera correction image](#)*.

In addition, it is recommended to use plugins to calculate depth: Depth images work better and operate faster. Please refer to *[Using the plugin to get data](#)*.

Reference code snippet:

```

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

api->EnableStreamData (Stream::DEPTH);

```

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```

api->Start(Source::VIDEO_STREAMING);

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

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 &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);

```

The above code uses OpenCV to display the image. When the display window is selected, pressing ESC/Q will end the program.

Complete code examples, see [get\\_depth.cc](#).

Preview the value of a region of the depth image, see [get\\_depth\\_with\\_region.cc](#).

## 4.8 Get point image

Point images belongs to upper layer of synthetic data. To get this kind of data through `GetStreamData()`, you need to start the `EnableStreamData()` beforehand. It should be check not empty before use.

For detail process description, please see *Get original binocular image* *Get stereo camera correction image*.

It is recommended to use plugin to calculate depth: the depth map will be better with a higher frame rate. Please see *Using the plugin to get data* for detail.

Sample code snippet:

```

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

api->EnableStreamData(Stream::POINTS);

api->Start(Source::VIDEO_STREAMING);

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

```

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```

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 &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);

```

PCL is used to display point images above. Program will close when point image window is closed.

Complete code examples, see [get\\_points.cc](#).

**Attention:** Sample code only compiles when PCL is ready. If your PCL was installed in a different directory, please set CMAKE\_PREFIX\_PATH in [tutorials/CMakeLists.txt](#) to the path of PCLConfig.cmake. You can find CMAKE\_PREFIX\_PATH near find\_package(PCL).

## 4.9 Get IMU data

The API offers `Start()` / `Stop()` function to start/stop capturing data. You can set the argument to “Source::MOTION\_TRACKING” to capture IMU data only, or set it to `Source::ALL` to capture both image and IMU data.

During capturing data, you need `EnableMotionDatas()` to enable caching in order to get IMU data from `GetMotionDatas()`. Otherwise, IMU data is only available through the callback interface, see [Get data from callbacks](#).

Sample code snippet:

```

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

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

api->Start(Source::ALL);

```

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```

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);

    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);
    if (!motion_datas.empty()) {
        painter.DrawImuData(img, *motion_datas[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);

```

OpenCV is used to display image and data. When window is selected, press ESC/Q to exit program.

Complete code examples, see [get\\_imu.cc](#).

## 4.10 Get IMU data with timestamp correspondence

If wanna get image with timestamp in the middle of IMU datas, you could call *EnableTimestampCorrespondence()* to enable this feature.

Reference code snippet:

```

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");

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);

```

Reference result on Linux:

```

$ ./samples/_output/bin/tutorials/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

```

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```

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
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

```

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```
I/get_imu_correspondence.cc:61 Imu timestamp: 171421660, diff_prev=2010, diff_
↳img=18624
```

Complete code examples, see `get_imu_correspondence.cc` .

## 4.11 Get data from callbacks

API offers function `SetStreamCallback()` and `SetMotionCallback()` to set callbacks for various data.

**Attention:** Make sure to not block callback. If the data processing time is too long, use the callback as a data producer.

Reference code snippet:

```
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);
```

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```

        imu = data.imu;
    }
});

api->Start(Source::ALL);

CVPainter painter;

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

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

```

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```

    break;
}
}

api->Stop(Source::ALL);

```

OpenCV is used to display images and data above. When the window is selected, pressing `ESC/Q` will exit program. Complete code examples, see [get\\_from\\_callbacks.cc](#).

## 4.12 Using the plugin to get data

API provides a `EnablePlugin()` function to enable plugins under a path.

Official provided plugins for calculating binocular parallax are now available in the `MYNTEYE_BOX` located in the `Plugins` directory.

```

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/

```

- The `linux-x86_64` directory shows the system and architecture.
  - You can find your CPU architecture from system information or `uname -a`.
- The library name `libplugin_*` shows the plugin identity and the third party dependency.
  - `b g` is a plugin identifier, indicating that different algorithms are used.
  - `ocl1.2` shows it dependence on OpenCL 1.2, if it exists.
  - `cuda9.1` shows it dependence on CUDA 9.1, if it exists.
  - `opencv3.4.0` shows it dependence on OpenCV 3.4.0, if it exists.
  - `mynteye2.0.0` shows it dependency on MYNT EYE SDK 2.0.0, if it exists.

First, select the plugins that you are going to use depending on your situation. If you relying on third parties, please install a corresponding version.

Then, enable the plugin with the following code:

```

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

api->EnablePlugin("plugins/linux-x86_64/libplugin_g_cuda9.1_opencv3.4.0.so");

```

The path can be an absolute path or a relative path (relative to the current working directory).

Finally, just call the API to get the data as before.

**Tip:** If the plugin is not enabled, `api->Start(Source::VIDEO_STREAMING);` will automatically find the appropriate plug-in in the `<sdk>/plugins/<platform>` directory to load.

In other words, you can move the plug-in directory of the current platform into the < SDK > / plugins directory. To automatically load the official plugin, install the corresponding CUDA OpenCV plugin dependency, recompiling and then run API layer interface program.

---

Before running, please execute the following commands to ensure that the plugin's dependency library can be searched:

```
# Linux
export LD_LIBRARY_PATH=/usr/local/lib:$LD_LIBRARY_PATH
# /usr/local/lib means the path of dependency library

# macOS
export DYLD_LIBRARY_PATH=/usr/local/lib:$DYLD_LIBRARY_PATH
# /usr/local/lib means the path of dependency library

# Windows
set PATH=C:\opencv\x64\vc14\bin;%PATH%
# add to PATH of system environment
```

In addition, the following command can be executed to check whether the dependency Library of the plug-in can be searched:

```
# Linux
ldd *.so
# *.so means plugin path

# macOS
otool -L *.dylib
# *.dylib means plugin path

# Windows
# please download Dependency Walker open DLL .
```

If the plugin's dependent library is not found, it will report an error "Open plugin failed" when loading.

Complete code sample, see [get\\_with\\_plugin.cc](#) .

---

**Tip:** Linux can also add a dependency library path to the system environment, so that the compiled program can run directly. (does not require `export LD_LIBRARY_PATH` in the terminal then run again).

- Create a `/etc/ld.so.conf.d/libmynteye.conf` file and write the dependent library path.
- Execute the `sudo /sbin/ldconfig` command in the terminal and refresh the cache.

Listing 1: e.g. libmynteye.conf

```
# libmynteye configuration
#
# 1) Copy this file to: /etc/ld.so.conf.d/libmynteye.conf
# 2) Run this cmd in Terminal: sudo /sbin/ldconfig

/usr/local/cuda/lib64
$HOME/opencv-3.4.1/lib
```

## 4.13 Save device information and parameters

The SDK provides a tool `save_all_infos` for save information and parameters. For more information, please read [tools/README.md](#).

Reference commands:

```
./tools/_output/bin/writer/save_all_infos

# Windows
.\tools\_output\bin\writer\save_all_infos.bat
```

Reference result on Linux:

```
$ ./tools/_output/bin/writer/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"
```

Result save into `<workdir>/config` by default. You can also add parameters to select other directory for save.

Saved contents:

```
<workdir>/
└─config/
   └─SN0610243700090720/
      ├──device.info
      ├──img.params
      └──imu.params
```

## 4.14 Write image parameters

The SDK provides a tool `img_params_writer` for writing image parameters. For details, read [tools/README.md](#).

For getting image parameters, please read [Get image calibration parameters](#). This is used to calculate the deviation.

Reference commands:

```
./tools/_output/bin/writer/img_params_writer tools/writer/config/img.params  
  
# Windows  
.\tools\_output\bin\writer\img_params_writer.bat tools\writer\config\img.params
```

**Warning:** Please don't override parameters, you can use `save_all_infos` to backup parameters.

And, `tools/writer/config/S1030/img.params.pinhole` is the path of S1030 pinhole parameters file. If you calibrated parameters yourself, you can edit it and run previous commands to write them into the devices.

**Tip:** The image calibration parameters of S2100/S210A are in `tools/writer/config/S210A`. The image calibration parameters of S1030 are in `tools/writer/config/S1030`.

**Tip:** You can also write into devices with `SN*.conf` provided by old SDK.

## 4.15 Write IMU parameters

SDK provides the tool `imu_params_writer` to write IMU parameters. For detail, please read `tools/README.md`.

Information about how to get IMU parameters, please read *Get IMU calibration parameters*.

Reference commands:

```
./tools/_output/bin/writer/imu_params_writer tools/writer/config/imu.params  
  
# Windows  
.\tools\_output\bin\writer\imu_params_writer.bat tools\writer\config\imu.params
```

The path of parameters file can be found in `tools/writer/config/img.params`. If you calibrated the parameters yourself, you can edit the file and run above commands to write them into the device.

**Warning:** Please don't override parameters, you can use `save_all_infos` to backup parameters.

## MYNT® EYE CONTROL

### 5.1 Set the frame rate of image & IMU frequency

Using the `SetOptionValue()` function in the API, you can set various control values for the current device.

For mynteye s1030, to set the image frame rate and IMU frequency, set `Option::FRAME_RATE` and `Option::IMU_FREQUENCY`.

**Attention:**

- The effective fps of the image: 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60.
- The effective frequency of IMU: 100, 200, 250, 333, 500.

For mynteye s2100/s210a, the image frame rate should be selected when running the sample, and the frame rate and resolution are combined as follows:

```
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
```

**Reference Code:**

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
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);
```

s2100/s210a

```

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()'";

```

Reference running results on Linux:

s1030

```

$ ./samples/_output/bin/tutorials/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

```

s2100/s210a

```

$ ./samples/_output/bin/tutorials/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

```

After the sample program finishes running with ESC/Q, it will output the calculated value of the frame rate of image & IMU frequency.



Complete code samples please see [framerate.cc](http://framerate.cc).

## 5.2 Set the range of accelerometer & gyroscope

Using the `SetOptionValue()` function in the API, you can set various control values for the current device.

To set the range of accelerometer and gyroscope, set `Option::ACCELEROMETER_RANGE` and `Option::GYROSCOPE_RANGE`.

**Attention:** For mynteye s1030, the available settings are:

- The effective range of accelerometer(unit:g): 4, 8, 16, 32.
- Gyroscope Range Valid value (unit: DEG/S): 500, 1000, 2000, 4000.

For mynteye s2100/s210a, the available settings are:

- The effective range of accelerometer(unit:g): 6, 12, 24, 48.
- The effective range of gyroscope(unit:deg/s): 250, 500, 1000, 2000, 4000.

Reference Code:

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);
```

s2100/s210a

```
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);
```

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

Reference running results on Linux:

s1030

```
$ ./samples/_output/bin/tutorials/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
```

s2100/s210a

```
$ ./samples/_output/bin/tutorials/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
```

After the sample program finishes running with ESC/Q, the ranges of imu setting is complete. The ranges will be kept inside the hardware and not affected by power off.

Complete code samples please see [imu\\_range.cc](#).

## 5.3 Enable auto exposure and its adjustment function

Using the `SetOptionValue()` function of the API, you can set various control values of the current open device.

To enable auto exposure, set `Option::EXPOSURE_MODE` to 0.

For mynteye s1030, the settings available for adjustment during auto exposure are:

- `Option::MAX_GAIN` Maximum gain.
- `Option::MAX_EXPOSURE_TIME` Maximum exposure time.
- `Option::DESIRED_BRIGHTNESS` Expected brightness.

For mynteye s2100/s210a, the settings available for adjustment during auto exposure are:

- `Option::MAX_GAIN` Maximum gain.
- `Option::MAX_EXPOSURE_TIME` Maximum exposure time.
- `Option::DESIRED_BRIGHTNESS` Expected brightness.
- `Option::MIN_EXPOSURE_TIME` Minimum exposure time.

Reference Code:

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);
```

s2100/s210a

```
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);
```

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```
// max_exposure_time: range [0,1000], default 333
api->SetOptionValue(Option::MAX_EXPOSURE_TIME, 333);
// desired_brightness: range [1,255], default 122
api->SetOptionValue(Option::DESIRED_BRIGHTNESS, 122);
// min_exposure_time: range [0,1000], 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);
```

## Reference running results on Linux:

s1030

```
$ ./samples/_output/bin/tutorials/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
```

s2100/s210a

```
$ ./samples/_output/bin/tutorials/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
```

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```
I/auto_exposure.cc:73 Set EXPOSURE_MODE to 0
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
```

The sample program displays an image with a real exposure time in the upper left corner, in milliseconds.

Complete code examples, see [auto\\_exposure.cc](#).

## 5.4 Enable manual exposure and its adjustment function

Using the `SetOptionValue()` function of the API, you can set various control values for the current open device.

To enabling manual exposure, set `Option::EXPOSURE_MODE` to 1.

For mynteye s1030, during manual exposure, the settings available for adjustment are:

- `Option::GAIN` Gain.
- `Option::BRIGHTNESS` Brightness (Exposure time).
- `Option::CONTRAST` Contrast (Black level calibration).

For mynteye s2100/s210a, during manual exposure, the settings available for adjustment are:

- `Option::BRIGHTNESS` Brightness (Exposure time).

Reference Code:

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 [0,255], default 127
api->SetOptionValue(Option::CONTRAST, 127);

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);
```

s2100/s210a

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

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

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

// brightness/exposure_time: range [0,240], 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);
```

## Reference running results on Linux:

s1030

```
$ ./samples/_output/bin/tutorials/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 127
```

s2100/s210a

```
$ ./samples/_output/bin/tutorials/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
```

The sample program displays an image with a real exposure time in the upper left corner, in milliseconds.

Complete code samples see [manual\\_exposure.cc](#).

## 5.5 Enable IR and its adjustments function

Using the `SetOptionValue()` function of the API, you can set various control values for the current open device. Enabling IR is setting `Option::IR_CONTROL` greater than 0. The greater the value, the greater the IR's intensity.

### Attention:

- mynteye s2100/s210a doesn't support this feature.

Reference Code:

```
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 << "}";

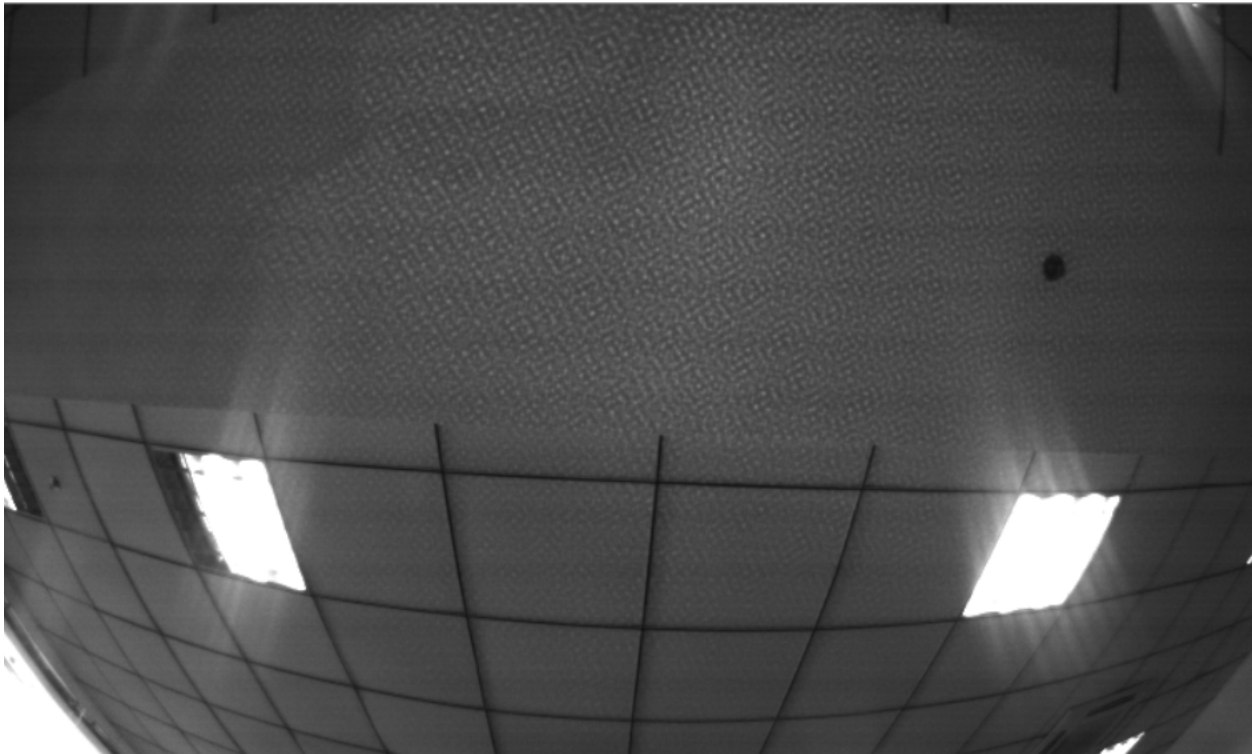
// Set infrared intensity value
api->SetOptionValue(Option::IR_CONTROL, 80);
```

Reference running results on Linux:

```
$ ./samples/_output/bin/tutorials/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}
```

At this point, if the image is displayed, you can see IR speckle on the image, as below:

frame



**Attention:** The hardware will not record the IR value after being turned off. In order to keep IR enabled, you must set the IR value after turning on the device.

Complete code samples see [infrared.cc](http://infrared.cc).

## 5.6 Low-pass Filter

Using the `SetOptionValue()` function in the API, you can set various control values for the current device.

To set the value of accelerometer low-pass filter and gyroscope low-pass filter, set `Option::ACCELEROMETER_LOW_PASS_FILTER` and `Option::GYROSCOPE_LOW_PASS_FILTER`.

**Attention:**

- s1030 doesn't support this feature

Reference Code:

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

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

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```

api->ConfigStreamRequest(request);

// 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);

```

#### Reference running results on Linux:

```

$ ./samples/_output/bin/tutorials/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

```

After the sample program finishes running with ESC/Q, the low-pass filter of imu setting is complete. The ranges will be kept inside the hardware and not affected by power off.

Complete code samples please see `imu_low_pass_filter.cc`

## 5.7 Set IIC Address

Using the `SetOptionValue()` function in the API, you can set various control values for the current device.

To set the IIC address, set `Option::IIC_ADDRESS_SETTING`.

**Attention:** Only support S210A/2100

Reference Code:

s210a/s2100

```
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);
}
```

Reference running results on Linux:

s210a/s2100

```
$ ./samples/_output/bin/tutorials/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
```

After the sample program finishes running with ESC/Q. Complete code samples please see [iic\\_address.cc](#).

## RUNNING LOG

### 6.1 Enable log file

---

**Tip:** If import glog to build.

---

The general configuration of the log in the head file `logger.h`.

Uncomment `FLAGS_log_dir = \".\";` recompile and save to current work directory. Run `camera_a` log file as follows:

```
<workdir>/
-camera_a.ERROR
-camera_a.FATAL
-camera_a.INFO
-camera_a.WARNING
-camera_a.john-ubuntu.john.log.ERROR.20180513-141833.519
-camera_a.john-ubuntu.john.log.FATAL.20180513-141833.519
-camera_a.john-ubuntu.john.log.INFO.20180513-141832.519
-camera_a.john-ubuntu.john.log.WARNING.20180513-141833.519
```

`camera_a.INFO` shows the program and levers of log it is running. The link to the real log file is `camera_a.john-ubuntu.john.log.INFO.20180513-141832.519`. Even if it ran several times, `camera_a.INFO` still leaves the link to last log file.

Excute *make cleanlog* to clean all log files.

### 6.2 Enabled detailed level

---

**Tip:** If import glog to build.

---

The general configuration of the log is in the head file `logger.h`.

Uncomment `FLAGS_v = 2`; and recompile to enable the detail levels, the log is printed by `VLOG(n)`

For information on how to use the log library, such as how to configure, print, etc., please open its document and learn more:

```
$ ./scripts/open.sh third_party/glog/doc/glog.html
```



## WRAPPER INTERFACE

### 7.1 How to use ROS

Compile and run the node according to *ROS Installation* .

---

**Tip:** Before doing below you need open a terminal to launch ros node first

---

`rostopic list` lists all released nodes:

```
$ rostopic list
/mynteye/depth/image_raw
/mynteye/disparity/image_norm
/mynteye/disparity/image_raw
/mynteye/imu/data_raw
/mynteye/left/camera_info
/mynteye/left/image_raw
/mynteye/left/image_rect
/mynteye/points/data_raw
/mynteye/right/camera_info
/mynteye/right/image_raw
/mynteye/right/image_rect
/mynteye/temp/data_raw
...
```

`rostopic hz <topic>` checks the data:

```
$ rostopic hz /mynteye/imu/data_raw
subscribed to [/mynteye/imu/data_raw]
average rate: 505.953
  min: 0.000s max: 0.018s std dev: 0.00324s window: 478
average rate: 500.901
  min: 0.000s max: 0.018s std dev: 0.00327s window: 975
average rate: 500.375
  min: 0.000s max: 0.019s std dev: 0.00329s window: 1468
...
```

`rostopic echo <topic>` can print and release data. Please read `rostopic` for more information.

The ROS file is structured like follows:

```
<sdk>/wrappers/ros/
├── src/
│   └── mynt_eye_ros_wrapper/
```

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In `mynteye.launch`, you can configure the topics and `frame_ids`, decide which data to enable, `standard.yaml` (`standard2.yaml` is S2100/S210A config file) can set parameters for device. Please set `gravity` to the local gravity acceleration.

`standard.yaml/standard2.yaml`:

```

# s2100/s210a modify frame/resolution
standard2/request_index: 2

# s1030 modify frame/imu hz
# standard/frame_rate range: {10,15,20,25,30,35,40,45,50,55,60}
standard/frame_rate: -1
# standard/frame_rate: 25

# standard/imu_frequency range: {100,200,250,333,500}
standard/imu_frequency: -1
# standard/imu_frequency: 200
...

# s2100 modify brightness
# standard2/brightness range: [0,240]
standard2/brightness: -1
# standard2/brightness: 120
...

# s210a modify brightness
# standard210a/brightness range: [0,240]
standard210a/brightness: -1
# standard210a/brightness: 120
...

```

`mynteye.launch`:

```
<arg name="gravity" default="9.8" />
```

For printing debug info, replace `Info` in `wrapper_node.cc` to `Debug`:

```
ros::console::set_logger_level(  
    ROSCONSOLE_DEFAULT_NAME, ros::console::levels::Info);
```





## DATA ANALYTICS

### 8.1 Recording data sets

The SDK provides the tool `record` for recording data sets. Tool details can be seen in [tools/README.md](#).

Reference run command:

```
./tools/_output/bin/dataset/record2  
  
# Windows  
.\tools\_output\bin\dataset\record2.bat
```

Reference run results on Linux:

```
$ ./tools/_output/bin/dataset/record  
I0513 21:28:57.128947 11487 utils.cc:26] Detecting MYNT EYE devices  
I0513 21:28:57.807116 11487 utils.cc:33] MYNT EYE devices:  
I0513 21:28:57.807155 11487 utils.cc:37]   index: 0, name: MYNT-EYE-S1000  
I0513 21:28:57.807163 11487 utils.cc:43] Only one MYNT EYE device, select index: 0  
I0513 21:28:57.808437 11487 channels.cc:114] Option::GAIN: min=0, max=48, def=24,  
↳cur=24  
I0513 21:28:57.809999 11487 channels.cc:114] Option::BRIGHTNESS: min=0, max=240,  
↳def=120, cur=120  
I0513 21:28:57.818678 11487 channels.cc:114] Option::CONTRAST: min=0, max=255,  
↳def=127, cur=127  
I0513 21:28:57.831529 11487 channels.cc:114] Option::FRAME_RATE: min=10, max=60,  
↳def=25, cur=25  
I0513 21:28:57.848914 11487 channels.cc:114] Option::IMU_FREQUENCY: min=100, max=500,  
↳def=200, cur=500  
I0513 21:28:57.865185 11487 channels.cc:114] Option::EXPOSURE_MODE: min=0, max=1,  
↳def=0, cur=0  
I0513 21:28:57.881434 11487 channels.cc:114] Option::MAX_GAIN: min=0, max=48, def=48,  
↳cur=48  
I0513 21:28:57.897598 11487 channels.cc:114] Option::MAX_EXPOSURE_TIME: min=0,  
↳max=240, def=240, cur=240  
I0513 21:28:57.913918 11487 channels.cc:114] Option::DESIRED_BRIGHTNESS: min=0,  
↳max=255, def=192, cur=192  
I0513 21:28:57.930177 11487 channels.cc:114] Option::IR_CONTROL: min=0, max=160,  
↳def=0, cur=0  
I0513 21:28:57.946341 11487 channels.cc:114] Option::HDR_MODE: min=0, max=1, def=0,  
↳cur=0  
Saved 1007 imgs, 20040 imus to ./dataset  
I0513 21:29:38.608772 11487 record.cc:118] Time beg: 2018-05-13 21:28:58.255395, end:  
↳2018-05-13 21:29:38.578696, cost: 40323.3ms
```

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```
I0513 21:29:38.608853 11487 record.cc:121] Img count: 1007, fps: 24.9732
I0513 21:29:38.608873 11487 record.cc:123] Imu count: 20040, hz: 496.983
```

Results save into `<workdir>/dataset` by default. You can also add parameter, select other directory to save.

Record contents:

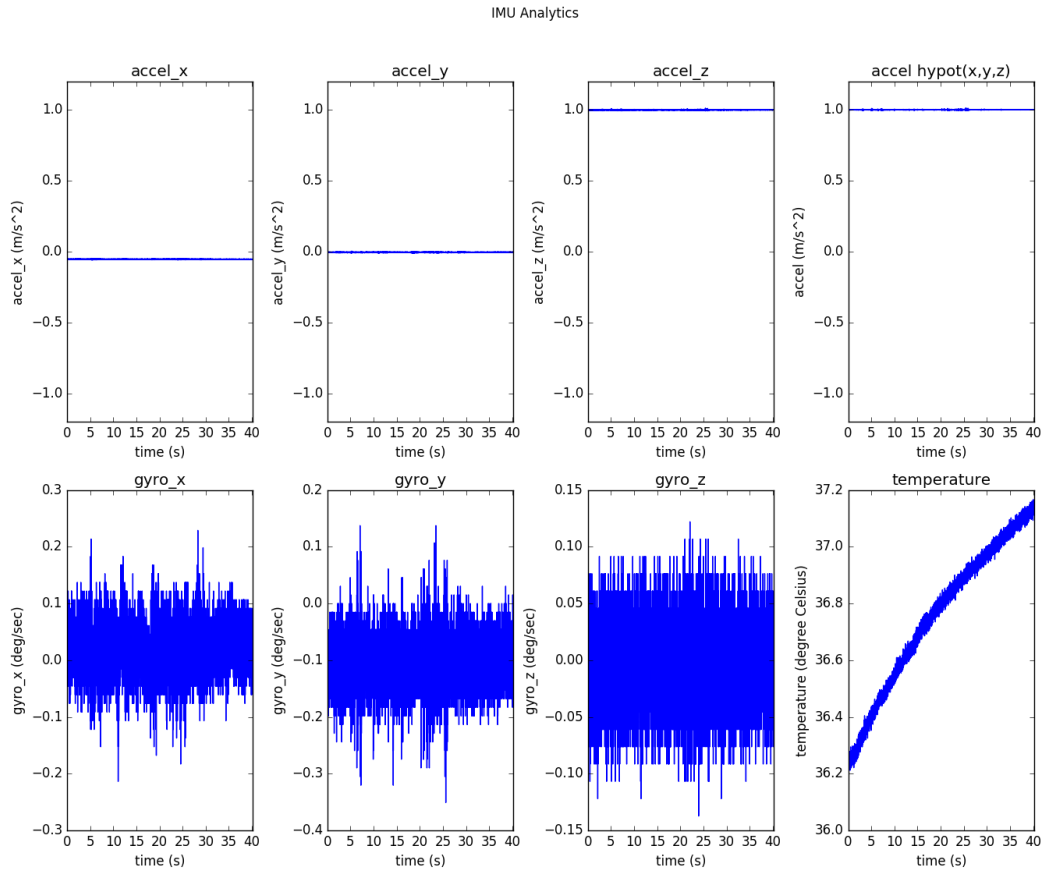
```
<workdir>/
└─dataset/
   └─left/
      ├──stream.txt  # Image infomation
      ├──000000.png  # Imageindex 0
      └─...
   └─right/
      ├──stream.txt  # Image information
      ├──000000.png  # Imageindex 0
      └─...
   └─motion.txt  # IMU information
```

## 8.2 Analyzing IMU

The SDK provides the script `imu_analytics.py` for IMU analysis. The tool details can be seen in [tools/README.md](#). Refer to run commands and results on Linux:

```
$ python tools/analytics/imu_analytics.py -i dataset -c tools/config/mynteye/mynteye_
↪config.yaml -al=-1.2,1.2 -gl= -gdu=d -gsu=d -kl=
imu analytics ...
  input: dataset
  outdir: dataset
  gyro_limits: None
  accel_limits: [(-1.2, 1.2), (-1.2, 1.2), (-1.2, 1.2), (-1.2, 1.2)]
  time_unit: None
  time_limits: None
  auto: False
  gyro_show_unit: d
  gyro_data_unit: d
  temp_limits: None
open dataset ...
  imu: 20040, temp: 20040
  timebeg: 4.384450, timeend: 44.615550, duration: 40.231100
save figure to:
  dataset/imu_analytics.png
imu analytics done
```

The analysis result graph will be saved in the data set directory, as follows:



In addition, the script specific options can be executed `-h`:

```
$ python tools/analytics/imu_analytics.py -h
```

## 8.3 Analyze time stamps

SDK provides a script for timestamp analysis `stamp_analytics.py`. Tool details are visible in [tools/README.md](#).

Reference run commands and results on Linux:

```
$ python tools/analytics/stamp_analytics.py -i dataset -c tools/config/mynteye/
↪mynteye_config.yaml
stamp analytics ...
  input: dataset
  outdir: dataset
open dataset ...
save to binary files ...
  binimg: dataset/stamp_analytics_img.bin
  binimu: dataset/stamp_analytics_imu.bin
  img: 1007, imu: 20040

rate (Hz)
```

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```

img: 25, imu: 500
sample period (s)
img: 0.04, imu: 0.002

diff count
imgs: 1007, imus: 20040
imgs_t_diff: 1006, imus_t_diff: 20039

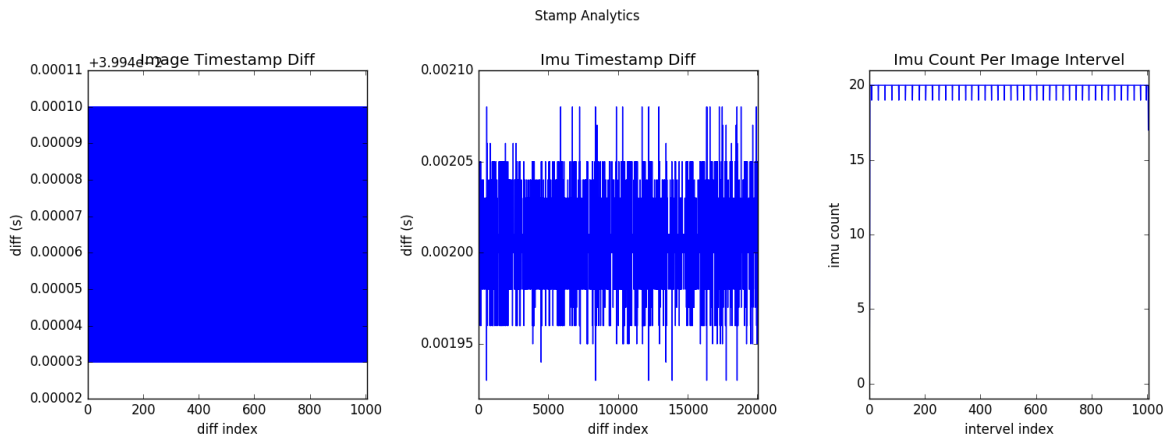
diff where (factor=0.1)
imgs where diff > 0.04*1.1 (0)
imgs where diff < 0.04*0.9 (0)
imus where diff > 0.002*1.1 (0)
imus where diff < 0.002*0.9 (0)

image timestamp duplicates: 0

save figure to:
dataset/stamp_analytics.png
stamp analytics done

```

The analysis result graph will be saved in the dataset directory, as follows:



In addition, the script specific options can be executed `-h` to understand:

```
$ python tools/analytics/stamp_analytics.py -h
```

**Tip:** Suggestions when recording data sets `record.cc` annotation display image inside `cv::imshow()`, `dataset.cc` annotation display image inside `cv::imwrite()`. Because these operations are time-consuming, they can cause images to be discarded. In other words, consumption can't keep up with production, so some images are discarded. `GetStreamDatas()` used in `record.cc` only caches the latest 4 images.

## OPEN SOURCE PROJECT SUPPORT

### 9.1 How to use in VINS-Mono

#### 9.1.1 If you wanna run VINS-Mono with MYNT EYE camera, please follow the steps:

1. Download [MYNT-EYE-S-SDK](#) and install mynt\_eye\_ros\_wrapper.
2. Follow the normal procedure to install VINS-Mono.
3. Run mynt\_eye\_ros\_wrapper and VINS-Mono.

#### 9.1.2 Install ROS Kinetic conveniently (if already installed, please ignore)

```
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
```

#### 9.1.3 Install 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
```

Then add your account to docker group by `sudo usermod -aG docker $YOUR_USER_NAME`. Relaunch the terminal or logout and re-login if you get Permission denied error.

To comply with docker, we recommend that you should use more than 16G RAM, or ensure that the RAM and virtual memory space is greater than 16G.

### 9.1.4 Install MYNT-EYE-VINS-Sample

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

Note that the docker building process may take a while depends on your network and machine. After VINS-Mono successfully started, open another terminal and play your bag file, then you should be able to see the result. If you need modify the code, simply run `./run.sh LAUNCH_FILE_NAME` after your changes.

### 9.1.5 Run VINS-Mono with MYNT® EYE

1. Launch mynteye node

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

2. Open another terminal and run vins

```
cd path/to/VINS-Mono/docker
./run.sh mynteye_s.launch
# ./run.sh mynteye_s2100.launch # mono with s2100
```

## 9.2 How to use in VINS-Fusion

### 9.2.1 If you wanna run VINS-Fusion with MYNT EYE camera, please follow the steps:

1. Download [MYNT-EYE-S-SDK](#) and install mynt\_eye\_ros\_wrapper.
2. Follow the normal procedure to install VINS-Fusion.
3. Run mynt\_eye\_ros\_wrapper and VINS-Fusion.

### 9.2.2 Install ROS Kinetic conveniently (if already installed, please ignore)

```
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
```

### 9.2.3 Install Docker

```
sudo apt-get update
sudo apt-get install \
  apt-transport-https \
  ca-certificates \
  curl \
  gnupg-agent \
```

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```
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
```

Then add your account to docker group by `sudo usermod -aG docker $YOUR_USER_NAME`. Relaunch the terminal or logout and re-login if you get `Permission denied` error.

To comply with docker, we recommend that you should use more than 16G RAM, or ensure that the RAM and virtual memory space is greater than 16G.

## 9.2.4 Install 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
```

Note that the docker building process may take a while depends on your network and machine. After VINS-Mono successfully started, open another terminal and play your bag file, then you should be able to see the result. If you need modify the code, simply run `./run.sh LAUNCH_FILE_NAME` after your changes.

## 9.2.5 Run VINS-FUSION with MYNT® EYE

### 1. Launch mynteye node

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

### 2. Open another terminal and run vins

```
cd path/to/this_repo/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
```

## 9.3 How to use in ORB\_SLAM2

### 9.3.1 If you wanna run ORB\_SLAM2 with MYNT EYE camera, please follow the steps:

1. Download [MYNT-EYE-S-SDK](#) and follow steps to install.
2. Follow the normal procedure to install ORB\_SLAM2.
3. Run examples by MYNT® EYE.

### 9.3.2 Prerequisites

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

### 9.3.3 Building the nodes for mono and stereo (ROS)

- Add the path including Examples/ROS/ORB\_SLAM2 to the ROS\_PACKAGE\_PATH environment variable. Open .bashrc file and add at the end the following line.

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

- Execute *build\_ros.sh*:

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

### Stereo\_ROS Example

- Launch ORB\_SLAM2 Stereo\_ROS

1. Launch mynteye node

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

2. Open another terminal and run 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
```

## 9.4 How to use in OKVIS

### 9.4.1 If you wanna run OKVIS with MYNT EYE camera, please follow the steps:

1. Download [MYNT-EYE-S-SDK](#) and install it.
2. Install dependencies and build MYNT-EYE-OKVIS-Sample follow the procedure of the original OKVIS.
3. Update camera parameters to <OKVIS>/config/config\_mynteye.yaml.
4. Run OKVIS using MYNT® EYE.



## 9.4.2 Install MYNTEYE OKVIS

First install dependencies based on the original OKVIS, and the follow:

```
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
```

## 9.4.3 Get camera calibration parameters

Through the `GetIntrinsics()` and `GetExtrinsics()` function of the **MYNT-EYE-S-SDK** API, you can get the camera calibration parameters of the currently open device, follow the steps:

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

After running the above type, `pinhole's distortion_parameters` and `projection_parameters` is obtained , and then update to [here](#) .

**Tip:** You can get the camera model of device when get camera calibration parameters, if model is equidistant you need calibrate pinhole model by yourself or reference *Write image parameters* to write a default pinhole config file to your device.

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

## 9.4.4 Run MYNTEYE OKVIS

Go to `MYNT-EYE-OKVIS-Sample/build` folder and Run the application `okvis_app_mynteye_s` :

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

## 9.5 How to use in VIORB

### 9.5.1 If you wanna run VIORB with MYNT® EYEplease follow the steps:

1. Download **MYNT-EYE-S-SDK** and install `mynt_eye_ros_wrapper`.
2. Follow the normal procedure to install VIORB.
3. Update camera parameters to `<VIO>/config/mynteye_s.yaml`.
4. Run `mynt_eye_ros_wrapper` and VIORB.

### 9.5.2 Install MYNT-EYE-VIORB-Sample.

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

ROS\_PACKAGE\_PATH environment variable. Open `.bashrc` file and add at the end the following line. Replace PATH by the folder where you cloned MYNT-EYE-VIORB-Sample:

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

Execute:

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

### 9.5.3 Get image calibration parameters

Assume that the left eye of the mynteye camera is used with IMU. Through the `GetIntrinsics()` and `GetExtrinsics()` function of the MYNT-EYE-S-SDK API, you can get the image calibration parameters of the currently open device:

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

After running the above type, `pinhole's distortion_parameters` and `projection_parameters` is obtained, and then update to `<MYNT-EYE-VIORB-Sample>/config/mynteye.yaml`.

---

**Tip:** You can get the camera model of device when get camera calibration parameters, if model is equidistant you need calibrate pinhole model by yourself or reference *Write image parameters* to write a default pinhole config file to your device.

---

### 9.5.4 Run VIORB and mynt\_eye\_ros\_wrapper

1. Launch mynteye node

```
roslaunch mynt_eye_ros_wrapper mynteye.launch
```

2. Open another terminal and run viorb

```
roslaunch ORB_VIO testmynteye_s.launch
```

Finally, `pyplotscripts` can be used to visualize some results.

## 9.6 How to use in Maplab x

## 10.1 API

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

**void SetOptionValue (const *Option* &option, std::int32\_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 is 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 EnableTimestampCorrespondence (const Stream &stream, bool keep_accel_then_gyro = true)`  
Enable motion datas with timestamp correspondence of some stream.

`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.

### 10.1.2 `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.

### 10.1.3 `api::MotionData`

**struct MotionData**

*API* motion data.

**Public Members**

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

## 10.2 Device

### 10.2.1 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 **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 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.

## 10.2.2 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.

### 10.2.3 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.

### 10.2.4 device::MotionData

**struct MotionData**

*Device* motion data.

#### Public Members

`std::shared_ptr<ImuData> imu`

*ImuData*.

## 10.3 Enums

### 10.3.1 Model

**enum mynteye::Model**

*Device* model.

*Values:*

**STANDARD**

Standard.

**STANDARD2**

Standard 2.

**STANDARD210A**

Standard 210a.

## 10.3.2 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.

## 10.3.3 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.

### 10.3.4 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.

### 10.3.5 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: [0,255], default: 127

**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: [0,1000], default: 333

**MIN\_EXPOSURE\_TIME**

min exposure time, valid if auto-exposure

range: [0,1000], 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: 10-bit 1: 12-bit

**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.

### 10.3.6 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.

### 10.3.7 AddOns

**enum mynteye::AddOns**

Add-Ons are peripheral modules of our hardware.

*Values:*

**INFRARED**

Infrared.

**INFRARED2**

Second infrared.

### 10.3.8 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.

### 10.3.9 CalibrationModel

**enum** mynteye::CalibrationModel

Camera calibration model.

*Values:*

**PINHOLE** = 0

Pinhole.

**KANNALA\_BRANDT** = 1

Equidistant: KANNALA\_BRANDT.

**UNKNOWN**

Unknow.

### 10.3.10 DisparityComputingMethod

**enum** mynteye::DisparityComputingMethod

Camera disparity computing method type.

*Values:*

**SGBM** = 0

bm

**BM** = 1

sgbm

**UNKNOWN**

unknow

## 10.4 Types

### 10.4.1 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.

## 10.4.2 Resolution

**struct Resolution**  
*Resolution.*

### Public Members

`std::uint16_t width`  
Width.

`std::uint16_t height`  
Height.

## 10.4.3 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.

## 10.4.4 Intrinsic

### IntrinsicPinhole

**struct IntrinsicPinhole : public mynteye::IntrinsicBase**  
Stream intrinsic (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 **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.

## 10.4.5 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.

## 10.4.6 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.

## 10.4.7 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.

## 10.5 Utils

### 10.5.1 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.

### 10.5.2 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.

### 10.5.3 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.

#### 10.5.4 `get_sdk_root_dir`

```
std::string mynteye::utils::get_sdk_root_dir()  
    Get sdk root dir.
```

#### 10.5.5 `get_sdk_install_dir`

```
std::string mynteye::utils::get_sdk_install_dir()  
    Get sdk install dir.
```



## M

- mynteye::ACCELEROMETER\_LOW\_PASS\_FILTER (C++ enumerator), 82
- mynteye::ACCELEROMETER\_RANGE (C++ enumerator), 82
- mynteye::AddOns (C++ enum), 83
- mynteye::ALL (C++ enumerator), 83
- mynteye::API (C++ class), 71
- mynteye::API::ConfigDisparityFromFile (C++ function), 74
- mynteye::API::ConfigStreamRequest (C++ function), 71, 72
- mynteye::API::Create (C++ function), 74
- mynteye::API::DisableStreamData (C++ function), 73
- mynteye::API::EnableMotionDatas (C++ function), 73
- mynteye::API::EnablePlugin (C++ function), 74
- mynteye::API::EnableProcessMode (C++ function), 74
- mynteye::API::EnableStreamData (C++ function), 73
- mynteye::API::EnableTimestampCorrespondence (C++ function), 74
- mynteye::API::GetCameraROSMsgInfoPair (C++ function), 74
- mynteye::API::GetExtrinsics (C++ function), 72
- mynteye::API::GetInfo (C++ function), 72
- mynteye::API::GetIntrinsics (C++ function), 72
- mynteye::API::GetIntrinsicsBase (C++ function), 72
- mynteye::API::GetModel (C++ function), 71
- mynteye::API::GetMotionDatas (C++ function), 73
- mynteye::API::GetMotionExtrinsics (C++ function), 72
- mynteye::API::GetMotionIntrinsics (C++ function), 72
- mynteye::API::GetOptionInfo (C++ function), 72
- mynteye::API::GetOptionValue (C++ function), 72
- mynteye::API::GetSDKVersion (C++ function), 72
- mynteye::API::GetStreamData (C++ function), 73
- mynteye::API::GetStreamDatas (C++ function), 73
- mynteye::API::GetStreamRequest (C++ function), 72
- mynteye::API::GetStreamRequests (C++ function), 71, 72
- mynteye::API::HasMotionCallback (C++ function), 73
- mynteye::API::HasStreamCallback (C++ function), 73
- mynteye::API::LogOptionInfos (C++ function), 72
- mynteye::API::motion\_callback\_t (C++ type), 71
- mynteye::api::MotionData (C++ class), 75
- mynteye::api::MotionData::imu (C++ member), 75
- mynteye::API::RunOptionAction (C++ function), 73
- mynteye::API::SelectStreamRequest (C++ function), 71
- mynteye::API::SetDisparityComputingMethodType (C++ function), 72
- mynteye::API::setDuplicate (C++ function), 72
- mynteye::API::SetMotionCallback (C++ function), 73
- mynteye::API::SetOptionValue (C++ function), 72
- mynteye::API::SetStreamCallback (C++ function), 73
- mynteye::API::Start (C++ function), 73
- mynteye::API::Stop (C++ function), 73
- mynteye::API::stream\_callback\_t (C++ type), 71

```

mynteye::API::stream_switch_callback_t
    (C++ type), 71
mynteye::api::StreamData (C++ class), 75
mynteye::api::StreamData::frame (C++
    member), 75
mynteye::api::StreamData::frame_id (C++
    member), 75
mynteye::api::StreamData::frame_raw
    (C++ member), 75
mynteye::api::StreamData::img (C++ mem-
    ber), 75
mynteye::API::Supports (C++ function), 71
mynteye::API::WaitForStreams (C++ func-
    tion), 73
mynteye::AUXILIARY_CHIP_VERSION (C++
    enumerator), 81
mynteye::BGR888 (C++ enumerator), 84
mynteye::BM (C++ enumerator), 84
mynteye::BRIGHTNESS (C++ enumerator), 81
mynteye::CalibrationModel (C++ enum), 84
mynteye::Capabilities (C++ enum), 80
mynteye::COLOR (C++ enumerator), 80
mynteye::CONTRAST (C++ enumerator), 82
mynteye::DEPTH (C++ enumerator), 80
mynteye::DESIRED_BRIGHTNESS (C++ enumera-
    tor), 82
mynteye::Device (C++ class), 75
mynteye::Device::ConfigStreamRequest
    (C++ function), 76
mynteye::Device::Create (C++ function), 78
mynteye::Device::DisableMotionDatas
    (C++ function), 78
mynteye::Device::EnableMotionDatas (C++
    function), 78
mynteye::Device::EnableProcessMode (C++
    function), 78
mynteye::device::Frame (C++ class), 78
mynteye::device::Frame::clone (C++ func-
    tion), 79
mynteye::device::Frame::data (C++ func-
    tion), 79
mynteye::device::Frame::format (C++ func-
    tion), 79
mynteye::device::Frame::Frame (C++ func-
    tion), 78
mynteye::device::Frame::height (C++ func-
    tion), 79
mynteye::device::Frame::size (C++ func-
    tion), 79
mynteye::device::Frame::width (C++ func-
    tion), 78
mynteye::Device::GetExtrinsics (C++ func-
    tion), 76
mynteye::Device::GetInfo (C++ function), 76
mynteye::Device::GetIntrinsics (C++ func-
    tion), 76
mynteye::Device::GetLatestStreamData
    (C++ function), 77
mynteye::Device::GetModel (C++ function), 76
mynteye::Device::GetMotionDatas (C++
    function), 78
mynteye::Device::GetMotionExtrinsics
    (C++ function), 76, 77
mynteye::Device::GetMotionIntrinsics
    (C++ function), 76, 77
mynteye::Device::GetOptionInfo (C++ func-
    tion), 77
mynteye::Device::GetOptionValue (C++
    function), 77
mynteye::Device::GetStreamData (C++ func-
    tion), 77
mynteye::Device::GetStreamDatas (C++
    function), 77
mynteye::Device::GetStreamRequest (C++
    function), 76
mynteye::Device::GetStreamRequests (C++
    function), 76
mynteye::Device::HasMotionCallback (C++
    function), 77
mynteye::Device::HasStreamCallback (C++
    function), 77
mynteye::Device::LogOptionInfos (C++
    function), 77
mynteye::Device::motion_callback_t (C++
    type), 75
mynteye::device::MotionData (C++ class), 79
mynteye::device::MotionData::imu (C++
    member), 79
mynteye::Device::RunOptionAction (C++
    function), 77
mynteye::device::select (C++ function), 88
mynteye::device::select_request (C++
    function), 88
mynteye::Device::SetExtrinsics (C++ func-
    tion), 77
mynteye::Device::SetIntrinsics (C++ func-
    tion), 77
mynteye::Device::SetMotionCallback (C++
    function), 77
mynteye::Device::SetMotionExtrinsics
    (C++ function), 77
mynteye::Device::SetMotionIntrinsics
    (C++ function), 77
mynteye::Device::SetOptionValue (C++
    function), 77
mynteye::Device::SetStreamCallback (C++
    function), 77
mynteye::Device::Start (C++ function), 77

```



mynteye::Device::Stop (C++ function), 77  
 mynteye::Device::stream\_callback\_t (C++ type), 75  
 mynteye::device::StreamData (C++ class), 79  
 mynteye::device::StreamData::frame (C++ member), 79  
 mynteye::device::StreamData::frame\_id (C++ member), 79  
 mynteye::device::StreamData::img (C++ member), 79  
 mynteye::Device::Supports (C++ function), 76  
 mynteye::Device::WaitForStreams (C++ function), 77  
 mynteye::DEVICE\_NAME (C++ enumerator), 81  
 mynteye::DISPARITY (C++ enumerator), 80  
 mynteye::DISPARITY\_NORMALIZED (C++ enumerator), 80  
 mynteye::DisparityComputingMethod (C++ enum), 84  
 mynteye::ERASE\_CHIP (C++ enumerator), 83  
 mynteye::EXPOSURE\_MODE (C++ enumerator), 82  
 mynteye::Extrinsics (C++ class), 87  
 mynteye::Extrinsics::Inverse (C++ function), 87  
 mynteye::Extrinsics::rotation (C++ member), 87  
 mynteye::Extrinsics::translation (C++ member), 87  
 mynteye::FIRMWARE\_VERSION (C++ enumerator), 81  
 mynteye::FISHEYE (C++ enumerator), 80  
 mynteye::Format (C++ enum), 83  
 mynteye::FRAME\_RATE (C++ enumerator), 82  
 mynteye::GAIN (C++ enumerator), 81  
 mynteye::GREY (C++ enumerator), 83  
 mynteye::GYROSCOPE\_LOW\_PASS\_FILTER (C++ enumerator), 83  
 mynteye::GYROSCOPE\_RANGE (C++ enumerator), 82  
 mynteye::HARDWARE\_VERSION (C++ enumerator), 81  
 mynteye::HDR\_MODE (C++ enumerator), 82  
 mynteye::IIC\_ADDRESS\_SETTING (C++ enumerator), 83  
 mynteye::ImgData (C++ class), 87  
 mynteye::ImgData::exposure\_time (C++ member), 87  
 mynteye::ImgData::frame\_id (C++ member), 87  
 mynteye::ImgData::is\_ets (C++ member), 87  
 mynteye::ImgData::timestamp (C++ member), 87  
 mynteye::IMU (C++ enumerator), 81  
 mynteye::IMU\_FREQUENCY (C++ enumerator), 82  
 mynteye::IMU\_TYPE (C++ enumerator), 81  
 mynteye::ImuData (C++ class), 87  
 mynteye::ImuData::accel (C++ member), 88  
 mynteye::ImuData::flag (C++ member), 88  
 mynteye::ImuData::frame\_id (C++ member), 88  
 mynteye::ImuData::gyro (C++ member), 88  
 mynteye::ImuData::is\_ets (C++ member), 88  
 mynteye::ImuData::temperature (C++ member), 88  
 mynteye::ImuData::timestamp (C++ member), 88  
 mynteye::ImuIntrinsics (C++ class), 86  
 mynteye::ImuIntrinsics::assembly (C++ member), 86  
 mynteye::ImuIntrinsics::bias (C++ member), 86  
 mynteye::ImuIntrinsics::noise (C++ member), 86  
 mynteye::ImuIntrinsics::scale (C++ member), 86  
 mynteye::ImuIntrinsics::x (C++ member), 86  
 mynteye::Info (C++ enum), 81  
 mynteye::INFRARED (C++ enumerator), 81, 83  
 mynteye::INFRARED2 (C++ enumerator), 81, 83  
 mynteye::IntrinsicsEquidistant (C++ class), 86  
 mynteye::IntrinsicsEquidistant::coeffs (C++ member), 86  
 mynteye::IntrinsicsPinhole (C++ class), 85  
 mynteye::IntrinsicsPinhole::coeffs (C++ member), 86  
 mynteye::IntrinsicsPinhole::cx (C++ member), 85  
 mynteye::IntrinsicsPinhole::cy (C++ member), 85  
 mynteye::IntrinsicsPinhole::fx (C++ member), 85  
 mynteye::IntrinsicsPinhole::fy (C++ member), 85  
 mynteye::IntrinsicsPinhole::model (C++ member), 86  
 mynteye::IR\_CONTROL (C++ enumerator), 82  
 mynteye::ISP\_VERSION (C++ enumerator), 81  
 mynteye::KANNALA\_BRANDT (C++ enumerator), 84  
 mynteye::LEFT (C++ enumerator), 80  
 mynteye::LEFT\_RECTIFIED (C++ enumerator), 80  
 mynteye::LENS\_TYPE (C++ enumerator), 81  
 mynteye::MAX\_EXPOSURE\_TIME (C++ enumerator), 82  
 mynteye::MAX\_GAIN (C++ enumerator), 82  
 mynteye::MIN\_EXPOSURE\_TIME (C++ enumerator), 82

*tor*), 82  
mynteye::Model (C++ *enum*), 79  
mynteye::MOTION\_TRACKING (C++ *enumerator*), 83  
mynteye::MotionIntrinsics (C++ *class*), 86  
mynteye::MotionIntrinsics::accel (C++ *member*), 87  
mynteye::MotionIntrinsics::gyro (C++ *member*), 87  
mynteye::NOMINAL\_BASELINE (C++ *enumerator*), 81  
mynteye::Option (C++ *enum*), 81  
mynteye::OptionInfo (C++ *class*), 84  
mynteye::OptionInfo::def (C++ *member*), 84  
mynteye::OptionInfo::max (C++ *member*), 84  
mynteye::OptionInfo::min (C++ *member*), 84  
mynteye::PINHOLE (C++ *enumerator*), 84  
mynteye::POINTS (C++ *enumerator*), 80  
mynteye::Resolution (C++ *class*), 85  
mynteye::Resolution::height (C++ *member*), 85  
mynteye::Resolution::width (C++ *member*), 85  
mynteye::RGB888 (C++ *enumerator*), 84  
mynteye::RIGHT (C++ *enumerator*), 80  
mynteye::RIGHT\_RECTIFIED (C++ *enumerator*), 80  
mynteye::SERIAL\_NUMBER (C++ *enumerator*), 81  
mynteye::SGBM (C++ *enumerator*), 84  
mynteye::Source (C++ *enum*), 83  
mynteye::SPEC\_VERSION (C++ *enumerator*), 81  
mynteye::STANDARD (C++ *enumerator*), 79  
mynteye::STANDARD2 (C++ *enumerator*), 80  
mynteye::STANDARD210A (C++ *enumerator*), 80  
mynteye::STEREO (C++ *enumerator*), 80  
mynteye::STEREO\_COLOR (C++ *enumerator*), 80  
mynteye::Stream (C++ *enum*), 80  
mynteye::StreamRequest (C++ *class*), 85  
mynteye::StreamRequest::format (C++ *member*), 85  
mynteye::StreamRequest::fps (C++ *member*), 85  
mynteye::StreamRequest::height (C++ *member*), 85  
mynteye::StreamRequest::width (C++ *member*), 85  
mynteye::UNKNOW (C++ *enumerator*), 84  
mynteye::utils::get\_real\_exposure\_time (C++ *function*), 88  
mynteye::utils::get\_sdk\_install\_dir (C++ *function*), 89  
mynteye::utils::get\_sdk\_root\_dir (C++ *function*), 89  
mynteye::VIDEO\_STREAMING (C++ *enumerator*), 83  
mynteye::YUYV (C++ *enumerator*), 83  
mynteye::ZERO\_DRIFT\_CALIBRATION (C++ *enumerator*), 83