

MYNT EYE D SDK

1.7.0

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Chapter 1

MYNT EYE D SDK

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- [SDK 安装](#)
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- [SDK 工具](#)
- [工程样例](#)
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Chapter 2

产品说明

- [产品介绍](#)
- [产品外观](#)
- [图像分辨率支持列表](#)
- [IMU 坐标系统](#)

2.1 产品介绍

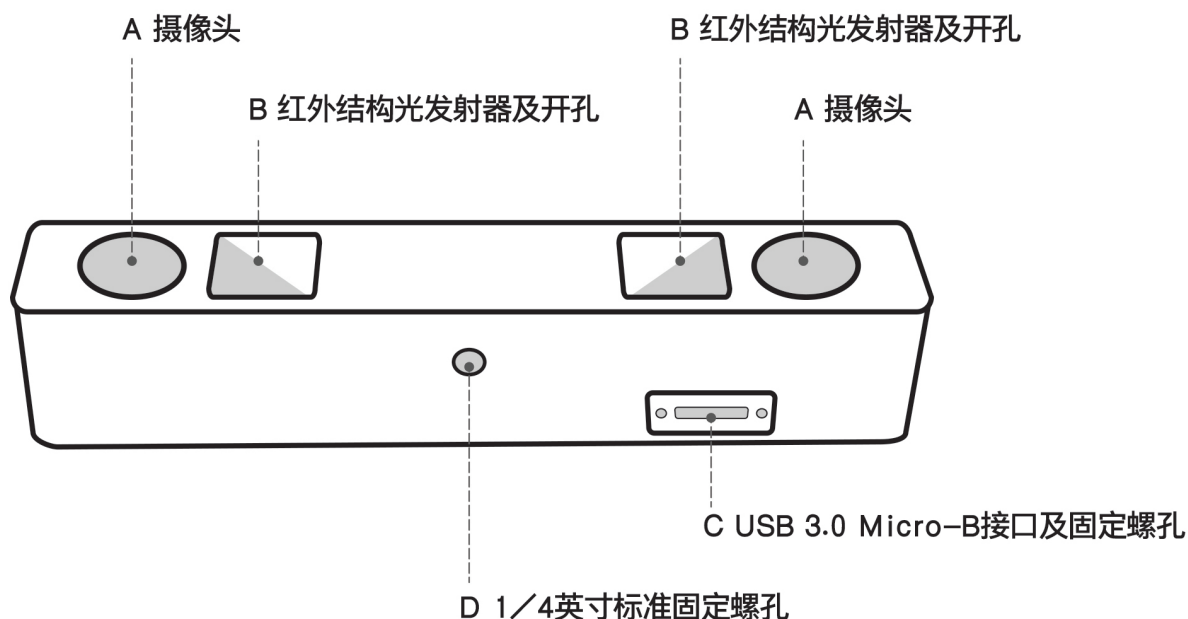
作为基于视觉识别技术的3D传感器，小觅双目摄像头深度版可适用于室内外双重环境。无惧室外强光环境，完全黑暗的室内环境亦可工作。标配的IR主动光，可以完美解决了室内白墙和无纹理物体的识别难题。“双目+IMU”的惯性导航方案，可为vSLAM的应用提供精准的六轴互补数据，并且相较其他单一方案拥有更高精度和鲁棒性。此外，小觅双目摄像头深度版产品（MYNT EYE Depth）还提供丰富的SDK接口和VSLAM开源项目支持，可以帮助客户迅速进行方案集成，加速实现产品研发进程，实现方案的快速产品化和落地。

小觅双目摄像头深度版（MYNT EYE Depth）可广泛应用于视觉定位导航（vSLAM）领域，包括：无人车和机器人的视觉实时定位导航系统、无人机视觉定位系统、无人驾驶避障导航系统、增强现实（AR）、虚拟现实（VR）等；双目也可应用于视觉识别领域，包括：立体人脸识别、三维物体识别、空间运动追踪、三维手势与体感识别等；应用于测量领域，包括：辅助驾驶系统（ADAS）、双目体积计算、工业视觉筛检等。

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

2.2 产品外观

外壳(mm)	PCB
165x31.↔ 5x29.6	149x24



A. 摄像头：摄像头传感器镜头，在使用中请注意保护，以避免成像质量下降。

B. 红外结构光发射器及开孔：通过红外结构光可有效解决白墙等无纹理表面的视觉计算。(非 IR 版，此孔保留，但内部无结构光发射装置)

C. USB Micro-B 接口及固定孔：使用中，插上 USB Micro-B 数据线后，请使用接口端的螺丝紧固接口，以避免使用中损坏接口，也保证数据连接的稳定性。

D. 1/4 英寸标准固定螺孔：用于将双目摄像头固定于摄影三角架等装置。

2.3 图像分辨率支持列表

L'=left rectify, L=left, R'=right rectify, R=right, D=depth	interface	color resolution	color fps	depth resolution	depth fps
L'+D	USB3.0	1280x720	60/30/20/10	1280x720	60/30/20/10
L'+D	USB3.0	640x480	60/30	640x480	60/30
L'+R'+D	USB3.0	2560x720	30	1280x720	30
L'+R'+D	USB3.0	1280x480	60/30	1280x480	60/30
L+D	USB3.0	1280x720	60/30/20/10	1280x720	60/30/20/10
L+D	USB3.0	640x480	60/30	640x480	60/30
L+R+D	USB3.0	2560x720	30	1280x720	30
L+R+D	USB3.0	1280x480	60/30	1280x480	60/30
L+R	USB3.0	2560x720	60/30	not open	null
L'+R'	USB3.0	2560x720	60/30	not open	null
D	USB3.0	not open	null	1280x720	60/30
D	USB3.0	not open	null	640x480	60/30
L+R	USB2.0	2560x720	5	not open	null
L'+R'	USB2.0	2560x720	5	not open	null
L+R	USB2.0	1280x480	15	not open	null

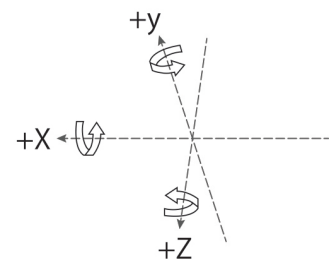
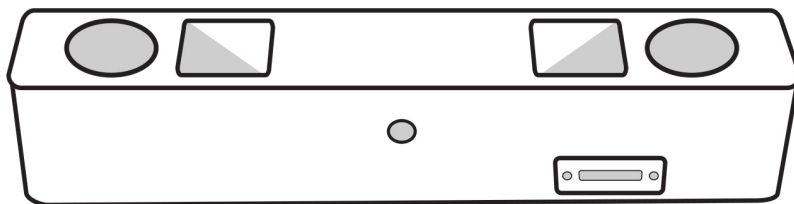
L'=left rectify, L=left, R'=right rectify, R=right, D=depth	interface	color resolution	color fps	depth resolution	depth fps
L'+R'	USB2.0	1280x480	15	not open	null
L'+D	USB2.0	1280x720	5	640x720	5
L'+D	USB2.0	640x480	15	640x480	15
L+D	USB2.0	1280x720	5	640x720	5
L+D	USB2.0	640x480	15	640x480	15
L'	USB2.0	1280x720	5	not open	null
L	USB2.0	1280x720	5	not open	null
D	USB2.0	not open	null	1280x720	5
D	USB2.0	not open	null	640x480	15
L+R	USB2.0/MJPG	2560x720	5	not open	null
L+R	USB2.0/MJPG	1280x480	15	not open	null
L	USB2.0/MJPG	1280x720	5	not open	null

注意:

- L'=left rectify image, L=left image
- R'=right rectify image, R=right image, D=depth image
- 在IR Depth Only模式下, 帧率只支持15fps和30fps.

2.4 IMU 坐标系统

IMU 坐标系统为右手系, 坐标轴方向如下:



Chapter 3

SDK 安装

- [支持平台](#)
- [Linux SDK 用户指南](#)
- [Windows SDK 用户指南](#)
- [Windows 预编译 exe 安装](#)
- [ROS 安装](#)
- [ROS 如何使用](#)

3.1 支持平台

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

已测试可用的平台有：

- * Windows 10
- * Ubuntu 18.04/16.04/14.04
- * Jetson TX2
- * RK3399

Tips:

- ubuntu系统仅支持源码编译安装。
- Ubuntu 14.04需要升级至gcc5.

Warning: 由于硬件传输速率要求，请尽量使用USB3.0接口。另外，虚拟机因大多存在USB驱动兼容性问题，不建议使用。

3.2 Linux SDK 用户指南

1. 安装 SDK 依赖

1.1 安装 OpenCV

如果您已经安装了 *opencv* 或者您想要使用 *ROS*，您可以跳过这步。

1.1.1 apt 或者编译安装 OpenCV (选择一个)

1.1.1.1 使用 apt 安装 OpenCV (推荐)

```
sudo apt-get install libopencv-dev
```

1.1.1.2 编译安装 OpenCV

OpenCV 如何编译安装，请见官方文档 Installation in Linux <https://docs.opencv.org/master/d7/d9f/tutorial_linux_install.html>_。或参考如下命令：

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

git clone https://github.com/opencv/opencv.git
cd opencv/
git checkout tags/3.4.0

cd opencv/
mkdir build
cd build/

cmake ..

make -j4
sudo make install
```

1.2 安装点云例程依赖的 PCL 库 (可选)

```
sudo apt-get install libpcl-dev libproj-dev libopenni2-dev libopenni-dev
```

1.3 建立 libGL.so 软链接用以解决在 TX1/TX2 上的 bug (可选)

```
sudo ln -sf /usr/lib/aarch64-linux-gnu/tegra/libGL.so /usr/lib/aarch64-linux-gnu/libGL.so
```

2. 编译 SDK

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

2.1 初始化 SDK

注意：因为设备权限的问题，命令执行完成之后，您必须重新拔插设备(这个操作在同一台电脑上，只需要做一次)。

```
make init
```

2.2 编译 SDK

```
make all
```

3. 运行例程

Note:: 默认打开矫正后的图像。(跑vio时需要使用原图, 跑深度或者点云使用矫正后的图像)

1) `get_image` 显示左右目的图像和彩色深度图

```
./samples/_output/bin/get_image
```

2) `get_depth` 显示左目的图像, 16UC1的深度图和鼠标选中的像素的深度值(mm)

```
./samples/_output/bin/get_depth
```

3) `get_points` 显示左目的图像, 16UC1的深度图和点云

```
./samples/_output/bin/get_points
```

4) `get_imu` 打印 imu 数据

```
./samples/_output/bin/get_imu
```

5) `get_img_params` 打印相机参数并保存在文件中

```
./samples/_output/bin/get_img_params
```

6) `get_imu_params` 打印 imu 参数并保存在文件中

```
./samples/_output/bin/get_imu_params
```

7) `get_from_callbacks` 使用回调方式获取图像和 imu 数据

```
./samples/_output/bin/get_from_callbacks
```

8) `get_all_with_options` 使用不同参数打开设备

```
./samples/_output/bin/get_all_with_options
```

4 安装带有 OpenCV 的 ROS

如果您不使用 ROS(The Robot Operation System), 您可以跳过此部分.

4.1 安装 ROS Kinectic 版本

```
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
```

ROS Kinetic 会自动安装 OpenCV, JPEG.

4.2 编译 ROS Wrapper

```
make ros
```

Core:

```
roscore
```

RViz Display:

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

Publish:

```
source ./wrappers/ros/devel/setup.bash  
roslaunch mynteye_wrapper_d mynteye.launch
```

Subscribe:

```
source ./wrappers/ros/devel/setup.bash  
roslaunch mynteye_wrapper_d mynteye_listener_d
```

4.3 编译内测版设备 ROS Wrapper

```
make ros
```

Core:

```
roscore
```

RViz Display:

```
source ./wrappers/beta_ros/devel/setup.bash  
roslaunch mynteye_wrapper_d_beta display.launch
```

Publish:

```
source ./wrappers/beta_ros/devel/setup.bash  
roslaunch mynteye_wrapper_d_beta mynteye.launch
```

Subscribe:

```
source ./wrappers/beta_ros/devel/setup.bash  
roslaunch mynteye_wrapper_d_beta mynteye_listener_d_beta
```


5. 打包

如果打包指定版本OpenCV的包:

```
cd <sdk>
make cleanall
export OpenCV_DIR=<install prefix>

export OpenCV_DIR=/usr/local
export OpenCV_DIR=$HOME/opencv-2.4.13.3
```

Packaging:

```
cd <sdk>
make pkg
```

6. 清理

```
cd <sdk>
make cleanall
```

3.3 Windows SDK 用户指南

以下源码编译安装过程。如果只需使用预编译好的库，请参考 [Windows 预编译 exe 安装](#)。

1. 安装编译工具

1.1 安装 Visual Studio

从 <https://visualstudio.microsoft.com/> 下载并安装

1.2 安装 CMake

从 <https://cmake.org/> 下载并安装

1.3 安装 MSYS2

1) 从 http://mirrors.ustc.edu.cn/msys2/distrib/x86_64/ 下载并安装

2) 将 bin 目录的路径添加到系统变量的 PATH 变量列表中

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

3) 安装 make

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

2. 安装 SDK 依赖

2.1 安装 OpenCV

2.1.1 用预先建立的库安装 OpenCV (Recommend)

更多信息您可以参考 *OpenCV* 官方文档 (https://docs.opencv.org/3.4.2/d3/d52/tutorial_←_windows_install.html)

1) 进入 *OpenCV* 源码页 <http://sourceforge.net/projects/opencvlibrary/files/opencv-win/>
 2) 下载一个您想要安装的安装包. 例如 3.4.2/opencv-3.4.2-vc14_vc15.exe 3) 使用管理员权限运行安装包 4) 安装完成之后, 设置 *OpenCV* 环境变量并添加到系统的 path 变量中

2.1.2 设置环境变量

开启 cmd, 输入以下命令:

将 "D:\OpenCV" 替换为您自己的解压缩目录

```
setx -m OPENCV_DIR D:\OpenCV\Build\x64\vc14\lib      (suggested for Visual Studio 2015 - 64 bit Windows)
setx -m OPENCV_DIR D:\OpenCV\Build\x64\vc15\lib      (suggested for Visual Studio 2017 - 64 bit Windows)
```

将 *OpenCV* bin 路径添加到系统环境变量的 PATH 变量列表中

```
D:\OpenCV\Build\x64\vc14\bin      (suggested for Visual Studio 2015 - 64 bit Windows)
D:\OpenCV\Build\x64\vc15\bin      (suggested for Visual Studio 2017 - 64 bit Windows)
```

2.2 安装 libjpeg-turbo

1) 从 <https://sourceforge.net/projects/libjpeg-turbo/files/> 下载 libjpeg-turbo 并安装

2) 将 bin 目录的路径添加到系统变量的 PATH 变量列表中

```
C:\libjpeg-turbo64\bin
```

2.3 安装点云例程依赖的 PCL 库 (可选)

从 <https://github.com/PointCloudLibrary/pcl/releases> 下载集成安装程序(PCL + dependencies)

3. 编译 SDK

打开 "x64 Native Tools Command Prompt for VS 2017"(适用于 VS 2017 的 x64 本机工具命令提示) 命令行界面

```
git clone https://github.com/slightech/MYNT-EYE-D-SDK.git
cd MYNT-EYE-D-SDK
make all
```

4. 运行例程

Note: 默认打开矫正后的图像。(跑vio时需要使用原图, 跑深度或者点云使用矫正后的图像)

1) `get_image` 显示左右目的图像和彩色深度图

```
.\samples\_output\bin\get_image.bat
```

2) `get_depth` 显示左目的图像, 16UC1的深度图和鼠标选中的像素的深度值(mm)

```
.\samples\_output\bin\get_depth.bat
```

3) `get_points` 显示左目的图像, 16UC1的深度图和点云

```
.\samples\_output\bin\get_points.bat
```

4) `get_imu` 打印 imu 数据

```
.\samples\_output\bin\get_imu
```

5) `get_img_params` 打印相机参数并保存在文件中

```
.\samples\_output\bin\get_img_params
```

6) `get_imu_params` 打印 imu 参数并保存在文件中

```
.\samples\_output\bin\get_imu_params
```

7) `get_from_callbacks` 使用回调方式获取图像和 imu 数据

```
.\samples\_output\bin\get_from_callbacks
```

8) `get_all_with_options` 使用不同参数打开设备

```
.\samples\_output\bin\get_all_with_options
```

5. 清理

```
cd <sdk>  
make cleanall
```

3.4 Windows 预编译 exe 安装

下载地址: [mynteye-d-1.7.0-win-x64-opencv-3.4.3.exe](#) [Google Drive](#), [百度网盘](#)

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

进入 "<SDK_ROOT_DIR>\bin\samples" 目录, 双击 "get_image.exe" 运行, 即可看到相机画面。

生成样例工程

首先，安装好 Visual Studio 2017 <https://visualstudio.microsoft.com/> 和 CMake <https://cmake.org/>。

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

如何于 Visual Studio 2017 下使用 SDK

进入 "<SDK_ROOT_DIR>\projects\vs2017"，见 "README.md" 说明。

3.5 ROS 安装

4.1 安装 ROS Kinetic 版本

```
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
```

ROS Kinetic 会自动安装 OpenCV, JPEG.

4.2 编译 ROS Wrapper

```
make ros
```

Core:

```
roscore
```

RViz Display:

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

Publish:

```
source ./wrappers/ros/devel/setup.bash
roslaunch mynteye_wrapper_d mynteye.launch
```

Subscribe:

```
source ./wrappers/ros/devel/setup.bash
roslaunch mynteye_wrapper_d mynteye_listener_d
```

4.3 编译内测版设备 ROS Wrapper

```
make ros
```

Core:

```
roscore
```

RViz Display:

```
source ./wrappers/beta_ros/devel/setup.bash
roslaunch mynteye_wrapper_d_beta display.launch
```

Publish:

```
source ./wrappers/beta_ros/devel/setup.bash
roslaunch mynteye_wrapper_d_beta mynteye.launch
```

Subscribe:

```
source ./wrappers/beta_ros/devel/setup.bash
roslaunch mynteye_wrapper_d_beta mynteye_listener_d_beta
```

3.6 ROS 如何使用

按照 [ROS 安装](#) ，编译再运行节点。

`rostopic list` 可以列出发布的节点:

```
/mynteye/depth/camera_info
/mynteye/depth/image_raw
/mynteye/depth/image_raw/compressed
/mynteye/depth/image_raw/compressed/parameter_descriptions
/mynteye/depth/image_raw/compressed/parameter_updates
/mynteye/depth/image_raw/compressedDepth
/mynteye/depth/image_raw/compressedDepth/parameter_descriptions
/mynteye/depth/image_raw/compressedDepth/parameter_updates
/mynteye/depth/image_raw/theora
/mynteye/depth/image_raw/theora/parameter_descriptions
/mynteye/depth/image_raw/theora/parameter_updates
/mynteye/imu/data_raw
/mynteye/imu/data_raw_processed
/mynteye/left/camera_info
/mynteye/left/image_color
/mynteye/left/image_color/compressed
...
```

`rostopic hz <topic>` 可以检查是否有数据:

```
subscribed to [/mynteye/imu/data_raw]
average rate: 202.806
  min: 0.000s max: 0.021s std dev: 0.00819s window: 174
average rate: 201.167
  min: 0.000s max: 0.021s std dev: 0.00819s window: 374
average rate: 200.599
  min: 0.000s max: 0.021s std dev: 0.00819s window: 574
average rate: 200.461
  min: 0.000s max: 0.021s std dev: 0.00818s window: 774
average rate: 200.310
  min: 0.000s max: 0.021s std dev: 0.00818s window: 974
...
```

`rostopic echo <topic>` 可以打印发布数据等。了解更多，请阅读 [rostopic](#)。

ROS 封装的文件结构，如下所示：

```
<sdk>/wrappers/ros/  
├── src/  
│   └── mynteye_wrapper_d/  
│       ├── launch/  
│       │   ├── display.launch  
│       │   └── mynteye.launch  
│       ├── msg/  
│       ├── rviz/  
│       └── src/  
│           ├── mynteye_listener.cc  
│           ├── mynteye_wrapper_nodelet.cc  
│           ├── mynteye_wrapper_node.cc  
│           ├── pointcloud_generatort.cc  
│           └── pointcloud_generator.h  
├── CMakeLists.txt  
├── nodelet_plugins.xml  
└── package.xml
```

其中 `mynteye.launch` 里，可以配置发布的 `topics` 与 `frame_ids`、决定启用哪些数据、以及设定控制选项。其中，`gravity` 请配置成当地重力加速度。

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

Chapter 4

SDK 样例

- 获取双目图像
- 获取深度图像
- 获取点云图像
- 获取IMU数据
- 从回调接口获取数据
- 通过设置参数获取不同类型的数据
- 获取图像标定参数
- 获取IMU标定参数
- 设定打开参数
- 相机控制参数API

4.1 获取双目图像

API 通过 `DeviceMode::DEVICE_COLOR` 参数获取图像数据，或者 `DeviceMode::DEVICE_ALL` 同时捕获图像和深度数据。

通过 `GetStreamData()` 函数，就能获取想要的的数据。

参考代码片段：

```
// Device mode, default DEVICE_ALL
//  DEVICE_COLOR: IMAGE_LEFT_COLOR y IMAGE_RIGHT_COLOR - IMAGE_DEPTH n
//  DEVICE_DEPTH: IMAGE_LEFT_COLOR n IMAGE_RIGHT_COLOR n IMAGE_DEPTH y
//  DEVICE_ALL:   IMAGE_LEFT_COLOR y IMAGE_RIGHT_COLOR - IMAGE_DEPTH y
// Note: y: available, n: unavailable, -: depends on #stream_mode
params.dev_mode = DeviceMode::DEVICE_DEPTH;

auto left_color = cam.GetStreamData(ImageType::IMAGE_LEFT_COLOR);
if (left_color.img) {
    cv::Mat left = left_color.img->To(ImageFormat::COLOR_BGR)->ToMat();
    painter.DrawSize(left, CVPainter::TOP_LEFT);
    painter.DrawStreamData(left, left_color, CVPainter::TOP_RIGHT);
    painter.DrawInformation(left, util::to_string(counter.fps()),
        CVPainter::BOTTOM_RIGHT);
    cv::imshow("left color", left);
}
```

完整代码样例，请见 [get_image.cc](#)。

4.2 获取深度图像

深度图像，属于上层合成数据。

可以通过设置depth_mode来改变深度图显示。

```
// Depth mode: colorful(default), gray, raw
params.depth_mode = DepthMode::DEPTH_RAW;
```

然后使用GetStreamData () 获取。另外，判断不为空后再使用。

参考代码片段:

```
auto image_depth = cam.GetStreamData(ImageType::IMAGE_DEPTH);
if (image_depth.img) {
    cv::Mat depth = image_depth.img->To(ImageFormat::DEPTH_RAW)->ToMat();

    cv::setMouseCallback("depth", OnDepthMouseCallback, &depth_region);
    // Note: DrawRect will change some depth values to show the rect.
    depth_region.DrawRect(depth);
    cv::imshow("depth", depth);

    depth_region.ShowElems<ushort>(depth, [](const ushort& elem) {
        return std::to_string(elem);
    }, 80, depth_info);
}
```

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

完整代码样例，请见[get_depth.cc](#)。

4.3 获取点云图像

点云图像，属于上层合成数据。API使用GetStreamData () 获取。另外，判断不为空后再使用。

参考代码片段:

```
auto image_color = cam.GetStreamData(ImageType::IMAGE_LEFT_COLOR);
auto image_depth = cam.GetStreamData(ImageType::IMAGE_DEPTH);
if (image_color.img && image_depth.img) {
    cv::Mat color = image_color.img->To(ImageFormat::COLOR_BGR)
        ->ToMat();
    painter.DrawSize(color, CVPainter::TOP_LEFT);
    painter.DrawStreamData(color, image_color, CVPainter::TOP_RIGHT);
    painter.DrawInformation(color, util::to_string(counter.fps()),
        CVPainter::BOTTOM_RIGHT);

    cv::Mat depth = image_depth.img->To(ImageFormat::DEPTH_RAW)
        ->ToMat();

    cv::imshow("color", color);

    viewer.Update(color, depth);
}
```

上述代码，用了 PCL 来显示点云。关闭点云窗口时，也会结束程序。

完整代码样例，请见[get_points.cc](#)。

4.4 获取IMU数据

使用EnableMotionDatas()来启用缓存, 才能通过GetMotionDatas()函数来获取到IMU数据。否则, 只能通过回调接口得到IMU数据, 请参阅(从回调接口获取数据) []。

参考代码片段:

```
auto motion_datas = cam.GetMotionDatas();
if (motion_datas.size() > 0) {
    std::cout << "Imu count: " << motion_datas.size() << std::endl;
    for (auto data : motion_datas) {
        if (data.imu) {
            if (data.imu->flag == MYNTEYE_IMU_ACCEL) {
                counter.IncrAccelCount();
                std::cout << "[accel] stamp: " << data.imu->timestamp
                    << ", x: " << data.imu->accel[0]
                    << ", y: " << data.imu->accel[1]
                    << ", z: " << data.imu->accel[2]
                    << ", temp: " << data.imu->temperature
                    << std::endl;
            } else if (data.imu->flag == MYNTEYE_IMU_GYRO) {
                counter.IncrGyroCount();
                std::cout << "[gyro] stamp: " << data.imu->timestamp
                    << ", x: " << data.imu->gyro[0]
                    << ", y: " << data.imu->gyro[1]
                    << ", z: " << data.imu->gyro[2]
                    << ", temp: " << data.imu->temperature
                    << std::endl;
            } else {
                std::cerr << "Imu type is unknown" << std::endl;
            }
        } else {
            std::cerr << "Motion data is empty" << std::endl;
        }
    }
    std::cout << std::endl;
}
```

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

完整代码样例, 请见[get_imu.cc](#)。

4.5 从回调接口获取数据

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

参考代码片段:

```
cam.SetImgInfoCallback([](const std::shared_ptr<ImgInfo>& info) {
    std::cout << " [img_info] fid: " << info->frame_id
        << ", stamp: " << info->timestamp
        << ", expos: " << info->exposure_time << std::endl
        << std::flush;
});
for (auto&& type : types) {
    // Set stream data callback
    cam.SetStreamCallback(type, [](const StreamData& data) {
        std::cout << " [" << data.img->type() << "] fid: "
            << data.img->frame_id() << std::endl
            << std::flush;
    });
}

// Set motion data callback
cam.SetMotionCallback([](const MotionData& data) {
    if (data.imu->flag == MYNTEYE_IMU_ACCEL) {
        std::cout << "[accel] stamp: " << data.imu->timestamp
            << ", x: " << data.imu->accel[0]
            << ", y: " << data.imu->accel[1]
            << ", z: " << data.imu->accel[2]
```

```

    << ", temp: " << data.imu->temperature
    << std::endl;
} else if (data.imu->flag == MYNTEYE_IMU_GYRO) {
    std::cout << "[gyro] stamp: " << data.imu->timestamp
    << ", x: " << data.imu->gyro[0]
    << ", y: " << data.imu->gyro[1]
    << ", z: " << data.imu->gyro[2]
    << ", temp: " << data.imu->temperature
    << std::endl;
}
std::cout << std::flush;
});

```

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

完整代码样例，请见 [get_from_callbacks.cc](#)。

4.6 通过设置参数获取不同类型的数据

get_all_with_options 样例可以通过添加参数来设定当前设备的各类控制值。

get_all_with_options -h 参数说明:

Open device with different options.

```

Options:
-h, --help          show this help message and exit
-m, --imu           Enable imu datas

Open Params:
The open params

-i INDEX, --index=INDEX
                    Device index
-f RATE, --rate=RATE
                    Framerate, range [0,60], [30](STREAM_2560x720),
                    default: 10
--dev-mode=MODE    Device mode, default 2 (DEVICE_ALL)
                    0: DEVICE_COLOR, left y right - depth n
                    1: DEVICE_DEPTH, left n right n depth y
                    2: DEVICE_ALL, left y right - depth y
                    Note: y: available, n: unavailable, -: depends on
                    stream mode
--cm=MODE          Color mode, default 0 (COLOR_RAW)
                    0: COLOR_RAW, color raw
                    1: COLOR_RECTIFIED, color rectified
--dm=MODE          Depth mode, default 2 (DEPTH_COLORFUL)
                    0: DEPTH_RAW
                    1: DEPTH_GRAY
                    2: DEPTH_COLORFUL
--sm=MODE          Stream mode of color & depth,
                    default 2 (STREAM_1280x720)
                    0: STREAM_640x480, 480p, vga, left
                    1: STREAM_1280x480, 480p, vga, left+right
                    2: STREAM_1280x720, 720p, hd, left
                    3: STREAM_2560x720, 720p, hd, left+right
--csf=MODE         Stream format of color,
                    default 1 (STREAM_YUYV)
                    0: STREAM_MJPEG
                    1: STREAM_YUYV
--dsf=MODE         Stream format of depth,
                    default 1 (STREAM_YUYV)
                    1: STREAM_YUYV
--ae              Enable auto-exposure
--awb             Enable auto-white balance
--ir=VALUE        IR intensity, range [0,6], default 0
--ir-depth        Enable ir-depth-only

Feature Toggles:
The feature toggles

--proc=MODE        Enable process mode, e.g. imu assembly, temp_drift
                    0: PROC_NONE
                    1: PROC_IMU_ASSEMBLY
                    2: PROC_IMU_TEMP_DRIFT
                    3: PROC_IMU_ALL
--img-info         Enable image info, and sync with image

```

例如 `./samples/_output/bin/get_all_with_options -f 60 --dev-mode=0 --sm=2` 显示的是1280x720的60帧左目未矫正图像。

完整代码样例 [get_all_with_options](#)。

4.7 获取图像标定参数

通过获取API `GetStreamIntrinsics()`,`GetStreamExtrinsics()`函数, 可以获取当前打开设备的图像标定参数。

参考代码片段:

```
auto vga_intrinsics = cam.GetStreamIntrinsics(StreamMode::STREAM_1280x480, &in_ok);
auto vga_extrinsics = cam.GetStreamExtrinsics(StreamMode::STREAM_1280x480, &ex_ok);
std::cout << "VGA Intrinsics left: {" << vga_intrinsics.left << "}" << std::endl;
std::cout << "VGA Intrinsics right: {" << vga_intrinsics.right << "}" << std::endl;
std::cout << "VGA Extrinsics left to right: {" << vga_extrinsics << "}" << std::endl;
out << "VGA Intrinsics left: {" << vga_intrinsics.left << "}" << std::endl;
out << "VGA Intrinsics right: {" << vga_intrinsics.right << "}" << std::endl;
out << "VGA Extrinsics left to right: {" << vga_extrinsics << "}" << std::endl;
```

运行结果保存在当前目录下, 参考运行结果:

```
VGA Intrinsics left: {width: [640], height: [480], fx: [358.45721435546875000], fy:
[359.53115844726562500], cx: [311.12109375000000000], cy: [242.63494873046875000]coeffs: [-0.28297042846679688,
0.06178283691406250, -0.00030517578125000, 0.00218200683593750, 0.00000000000000000]}
VGA Intrinsics right: {width: [640], height: [480], fx: [360.13885498046875000], fy:
[360.89624023437500000], cx: [325.11029052734375000], cy: [251.46371459960937500]coeffs: [-0.30667877197265625,
0.08611679077148438, -0.00030136108398438, 0.00155639648437500, 0.00000000000000000]}
VGA Extrinsics left to right: {rotation: [0.99996054172515869, 0.00149095058441162, 0.00875246524810791,
-0.00148832798004150, 0.99999880790710449, -0.00030362606048584, -0.00875294208526611, 0.00029063224792480,
0.99996161460876465], translation: [-120.36341094970703125, 0.00000000000000000, 0.00000000000000000]}
```

完整代码样例, 请见[get_img_params.cc](#)。

4.8 获取IMU标定参数

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

参考代码片段:

```
auto intrinsics = cam.GetMotionIntrinsics(&in_ok);
std::cout << "Motion Intrinsics: {" << intrinsics << "}" << std::endl;
out << "Motion Intrinsics: {" << intrinsics << "}" << std::endl;
```

运行结果保存在当前目录下, 参考运行结果:

```
Motion Intrinsics: {accel: {scale: [1.0020599999004191, 0.00000000000000000, 0.00000000000000000,
0.00000000000000000, 1.00622999999999996, 0.00000000000000000, 0.00000000000000000, 0.00000000000000000,
1.00171999999999994], assembly: [1.00000000000000000, 0.00672262000000000, -0.00364474000000000, 0.00000000000000000,
1.00000000000000000, 0.00101348000000000, -0.00000000000000000, 0.00000000000000000, 1.00000000000000000,
1.00000000000000000], drift: [0.00000000000000000, 0.00000000000000000, 0.00000000000000000], noise:
[0.00000000000000000, 0.00000000000000000, 0.00000000000000000], bias: [0.00000000000000000, 0.00000000000000000,
0.00000000000000000], x: [0.00856165620000000, -0.00098440052800000], y: [0.05968393300000000,
-0.00130967680000000], z: [0.01861442050000000, -0.00016033523000000]}, gyro: {scale: [1.00008999999999992,
0.00000000000000000, 0.00000000000000000, 0.00000000000000000, 0.99617599999999995, 0.00000000000000000, 0.00000000000000000,
0.00000000000000000, 1.00407000000000002], assembly: [1.00000000000000000, -0.00700362000000000,
-0.00326206000000000, 0.00549571000000000, 1.00000000000000000, 0.00224867000000000, 0.00236088000000000,
0.00044507800000000, 1.00000000000000000, 1.00000000000000000], drift: [0.00000000000000000, 0.00000000000000000,
0.00000000000000000], noise: [0.00000000000000000, 0.00000000000000000, 0.00000000000000000], bias:
[0.00000000000000000, 0.00000000000000000, 0.00000000000000000], x: [0.18721455299999998, 0.00077411070000000], y:
[0.60837032000000002, -0.00939702710000000], z: [-0.78549276000000001, 0.02584820200000000]}
```

完整代码样例, 请见[get_imu_params.cc](#)。

4.9 设定打开参数

设定图像分辨率

通过设置 `params.stream_mode` 参数，就可以设定图像的分辨率。

注意

- 图像分辨率现在支持4种: 单目640X480, 1280x720 和双目1280x480, 2560x720

参考代码片段:

```
// Stream mode: left color only
// params.stream_mode = StreamMode::STREAM_640x480; // vga
// params.stream_mode = StreamMode::STREAM_1280x720; // hd
// Stream mode: left+right color
// params.stream_mode = StreamMode::STREAM_1280x480; // vga
params.stream_mode = StreamMode::STREAM_2560x720; // hd
```

设定图像帧率

通过设置 `params.framerate` 参数，就可以设定图像的帧率。

注意

- 图像帧率有效值(0-60)
- 分辨率在2560X720时帧率有效值为(30)

参考代码片段:

```
// Framerate: 10(default), [0,60], [30](STREAM_2560x720)
params.framerate = 30;
```

设定图像模式

通过 `params.color_mode` 参数，就可以设定图像的模式。

COLOR_RAW 为原图，COLOR_RECTIFIED 为矫正图。

参考代码片段:

```
// Color mode: raw(default), rectified
// params.color_mode = ColorMode::COLOR_RECTIFIED;
```

设定深度图模式

通过 `params.depth_mode` 参数，就可以设定深度图的模式。

DEPTH_COLORFUL 为着色后的深度图，DEPTH_GRAY 为灰色深度图，DEPTH_GRAY 为原始深度图。

参考代码片段:

```
// Depth mode: colorful(default), gray, raw
// params.depth_mode = DepthMode::DEPTH_GRAY;
```

启用自动曝光及自动白平衡

通过设置 `params.state_ae` 和 `params.state_awb` 为 `true`，就可以启动自动曝光和自动白平衡。

默认自动曝光和自动白平衡是启用的，如果想关闭，可以设置参数值为 `false`。

参考代码片段:

```
// Auto-exposure: true(default), false
// params.state_ae = false;

// Auto-white balance: true(default), false
// params.state_awb = false;
```

启用IR及其调节

通过设置 `params.ir_intensity` 参数，就可以设定图像的IR强度。

启用IR，就是设定 `params.ir_intensity` 大于0的值。值越大，强度越高(最大为10)。

参考代码片段:

```
// Infrared intensity: 0(default), [0,10]
params.ir_intensity = 4;
```

启用IR Depth Only

通过设置 `params.ir_depth_only` 参数，就可以设定IR Depth Only功能。默认关闭。

注意

- 15帧下此功能不生效

参考代码片段:

```
// IR Depth Only: true, false(default)
// Note: IR Depth Only mode support frame rate between 15fps and 30fps.
//   When dev_mode != DeviceMode::DEVICE_ALL,
//     IR Depth Only mode not be supported.
//   When stream_mode == StreamMode::STREAM_2560x720,
//     frame rate only be 15fps in this mode.
//   When frame rate less than 15fps or greater than 30fps,
//     IR Depth Only mode will be not available.
// params.ir_depth_only = false;
```

调整深度图着色值

通过设置 `params.colour_depth_value` 参数, 默认值是 1000。

参考代码片段:

```
// Colour depth image, default 1000. [0, 16384]
// params.colour_depth_value = 1000;
```

以上功能参考运行结果, 于 Linux 上:

```
Open device: 0, /dev/video1

D/eSPDI_API: SetPropertyValue control=7 value=0D/eSPDI_API: SetPropertyValue control=7 value=35D/eSPDI_API:
  SetPropertyValue control=7 value=1-- Auto-exposure state: enabled
D/eSPDI_API: SetPropertyValue control=7 value=0D/eSPDI_API: SetPropertyValue control=7 value=12D/eSPDI_API:
  SetPropertyValue control=7 value=1-- Auto-white balance state: enabled
-- Framerate: 5
D/eSPDI_API: SetPropertyValue control=7 value=4 SetDepthDataType: 4
-- Color Stream: 1280x720 YUYV
-- Depth Stream: 1280x720 YUYV

D/eSPDI_API: SetPropertyValue control=7 value=0D/eSPDI_API: SetPropertyValue control=7 value=3D/eSPDI_API:
  SetPropertyValue control=7 value=4
-- IR intensity: 4
D/eSPDI_API: CVideoDevice::OpenDevice 1280x720 fps=5

Open device success
```

完整代码样例 [get_image](#)。

4.10 相机控制参数API

打开或关闭自动曝光

```
/** Auto-exposure enabled or not default enabled*/
bool AutoExposureControl(bool enable);    see "camera.h"
```

打开或关闭自动白平衡

```
/** Auto-white-balance enabled or not default enabled*/
bool AutoWhiteBalanceControl(bool enable);    see "camera.h"
```

设置 IR 强度

```
/** set infrared(IR) intensity [0, 10] default 4*/
void SetIRIntensity(const std::uint16_t &value);    see "camera.h"
```

设置全局增益

注意:: 需要关闭自动曝光

```
/** Set global gain [1 - 16]
 * value -- global gain value
 * */
void SetGlobalGain(const float &value);    see "camera.h"
```

设置曝光时间

注意:: 需要关闭自动曝光

```
/** Set exposure time [1ms - 2000ms]
 * value -- exposure time value
 * */
void SetExposureTime(const float &value);    see "camera.h"
```

Chapter 5

SDK 工具

- 分析IMU数据
- 分析时间戳
- 录制数据集
- 保存设备信息和参数
- 写入IMU标定参数
- 升级 HID 设备固件
- 升级相机固件

5.1 分析IMU数据

SDK 提供了 IMU 数据分析工具 `imu_analytics.py`。工具的详细信息见 `tools/README.md`

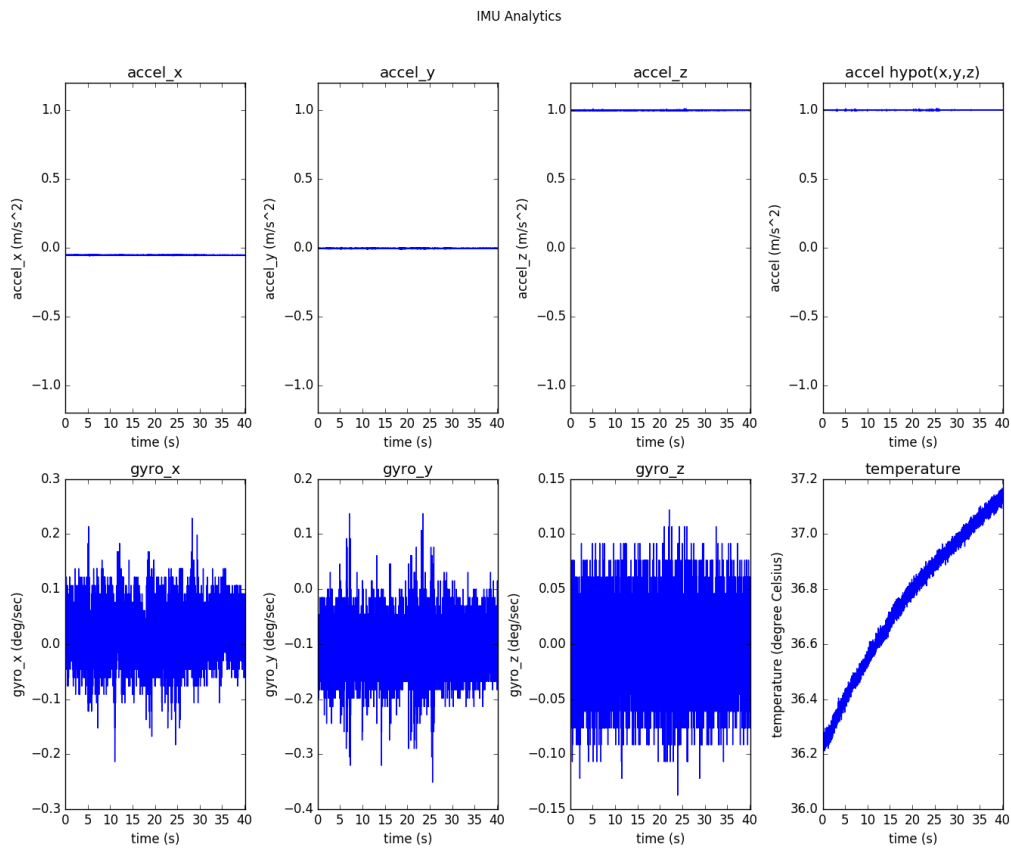
Linux 系统运行命令:

```
$ 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=
```

Linux 系统上的结果参考:

```
$ 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
```

分析结果图保存在 `dataset` 目录中. 如下:



另外, 可以使用 `-h` 参数查看工具详细参数选项.

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

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5.2 分析时间戳

SDK 提供了时间戳分析工具 `stamp_analytics.py`. 工具的详细信息见 `tools/README`.

Linux 系统运行命令:

```
$ python tools/analytics/stamp_analytics.py -i dataset -c tools/config/mynteye/mynteye_config.yaml
```

Linux 系统上的结果参考:


```

$ 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)
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

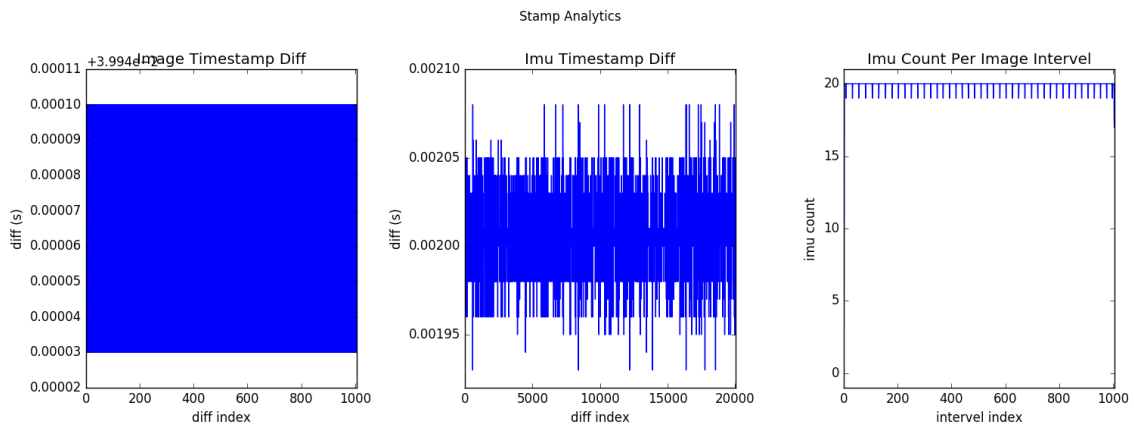
diff where (factor=0.1)
  imgs where diff > 0.04*1.1 (0)
  imgs where diff < 0.04*0.9 (0)
  imus where diff > 0.002*1.1 (0)
  imus where diff < 0.002*0.9 (0)

image timestamp duplicates: 0

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

```

分析结果图保存在 `dataset` 目录中。如下：



另外，可以使用 `-h` 参数查看工具详细参数选项。

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

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5.3 录制数据集

SDK 提供了录制数据集的工具 `record`。工具的详细信息见 `tools/README.md`

Linux 系统运行命令：

```
./tools/_output/bin/dataset/record
```

Windows 系统运行命令:

```
.\tools\_output\bin\dataset\record.bat
```

Linux 系统上的结果参考:

```
$ ./tools/_output/bin/dataset/record
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
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
```

结果默认保存在 `<workdir>/dataset` 中。您也可以使用参数指定自定义目录存放结果。

录制结果目录详情:

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

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5.4 保存设备信息和参数

SDK 提供了保存信息和参数的工具 `save_all_infos`。

参考运行命令:

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

参考运行结果, 于 Linux 上:

```
I/eSPDI_API: eSPDI: EtronDI_Init
Device descriptors:
  name: MYNT-EYE-D1000
  serial_number: 203837533548500F002F0028
  firmware_version: 1.0
  hardware_version: 2.0
  spec_version: 1.0
  lens_type: 0000
  imu_type: 0000
  nominal_baseline: 120
```

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

保存内容如下:

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

完整代码样例 `save_all_infos`。

5.5 写入IMU标定参数

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

有关如何获取, 请阅读 [\[获取IMU标定参数\]\(\)](#)。

参考运行命令:

```
./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
```

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

警告

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

完整代码样例 `imu_params_writer`。

5.6 升级 HID 设备固件

获取固件

最新固件: `mynteye-d-hid-firmware-1.0.bin` [Google Drive](#), [百度网盘](#)

编译 SDK 工具

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

升级固件

```
./tools/_output/bin/writer/device_hid_update <firmware-file-path>
```

5.7 升级相机固件

注意: 此工具仅支持 Windows 上使用, 且不支持内测版设备升级。

获取固件

最新固件: `SICI-B12-B0135P-016-005-ISO_Plugout2M(Interleave).bin` [Google Drive](#), [百度网盘](#)

获取升级工具

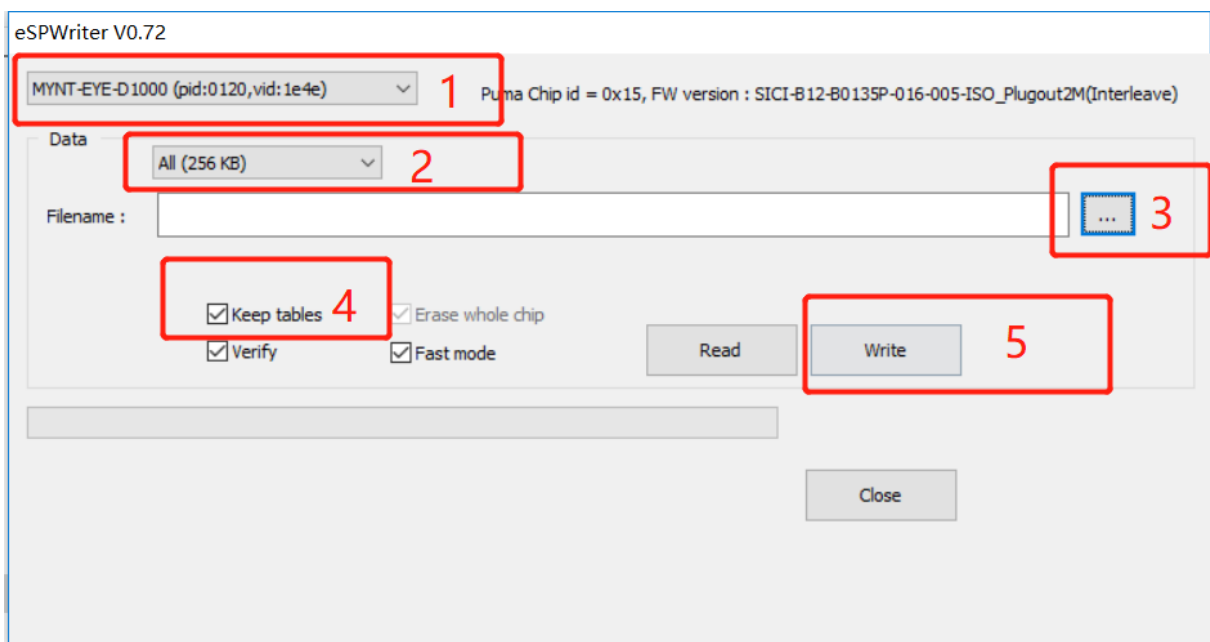
最新工具: eSPWriter_1.0.0.72a.zip [Google Drive](#), [百度网盘](#)

升级固件

注意: 请严格按照步骤升级固件。(否则可能会丢失相机标定参数)

1. 选择相机设备
2. 选择数据类型(256KB)
3. 选择相机固件
4. 选择 Keep tables (保留相机标定参数)
5. 点击 Write

参考图示使用工具:



Chapter 6

工程样例

- [Visual Studio 2017 如何使用 SDK](#)
- [Qt Creator 如何使用 SDK](#)
- [CMake 如何使用 SDK](#)

6.1 Visual Studio 2017 如何使用 SDK

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

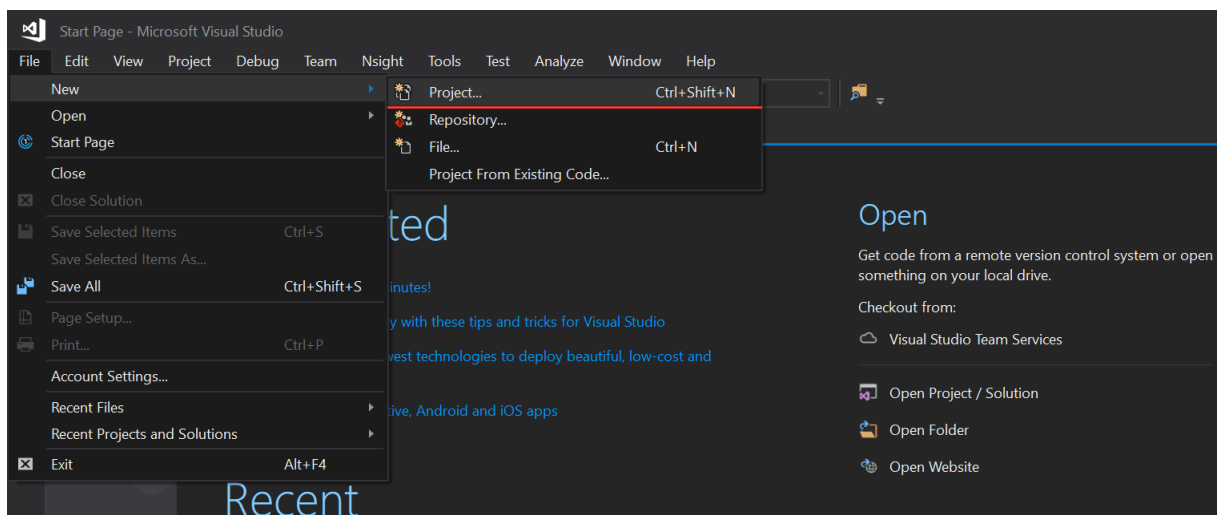
你可以在 `<sdk>/platforms/projects/vs2017` 目录下找到工程样例。

准备

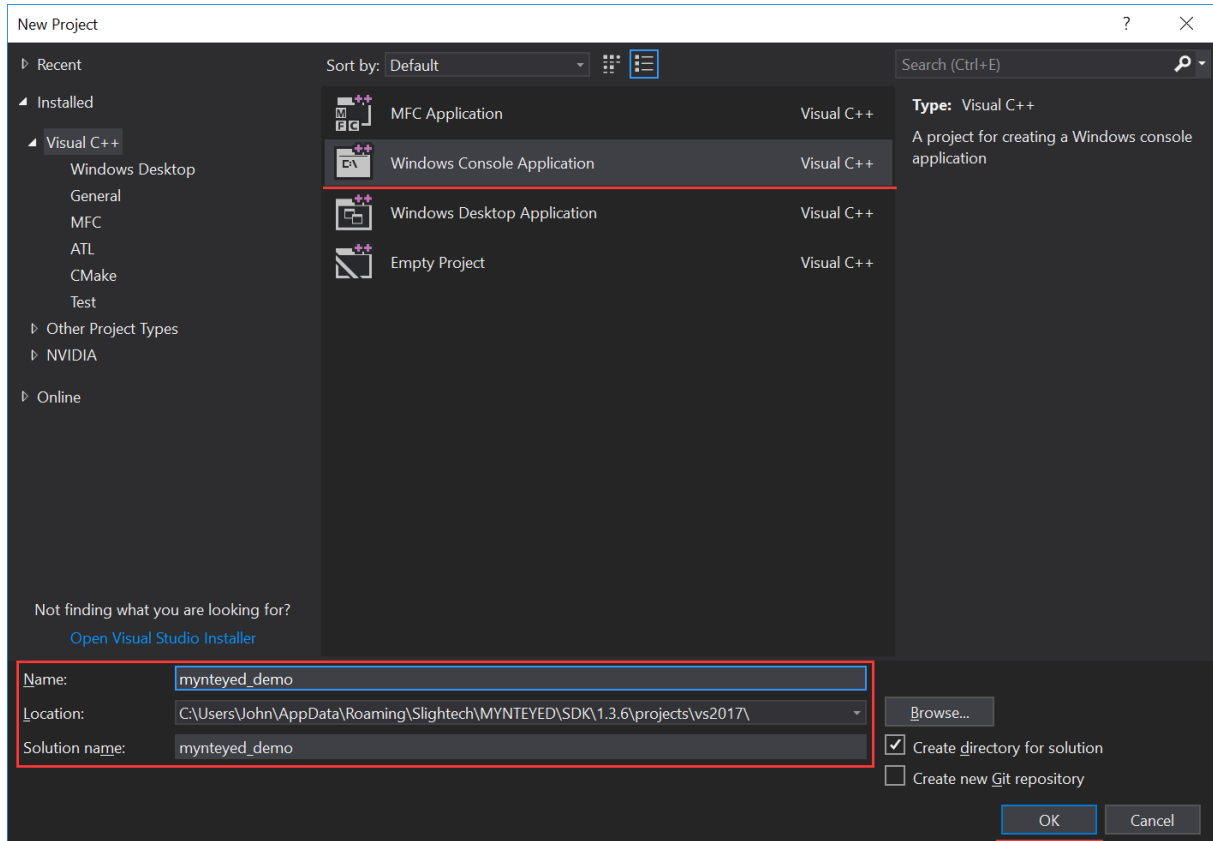
- Windows: 安装 SDK 的 exe 包

创建项目

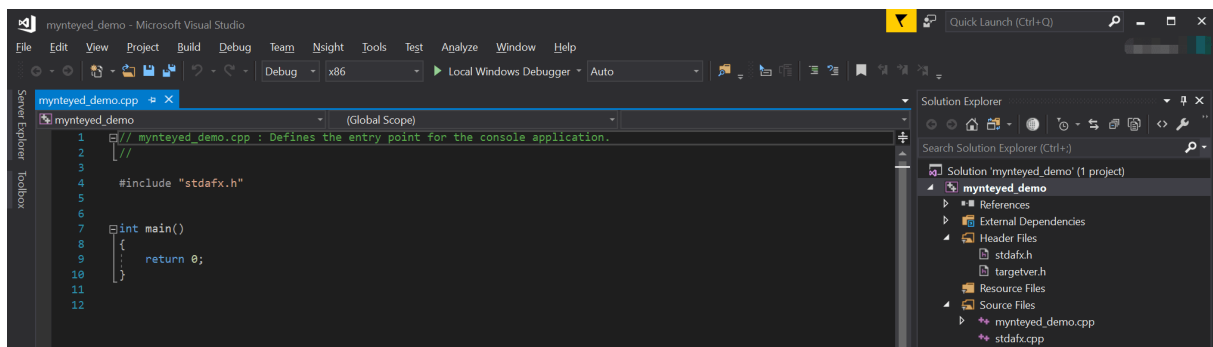
打开 Visual Studio 2017 , 然后 `File > New > Project`,



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

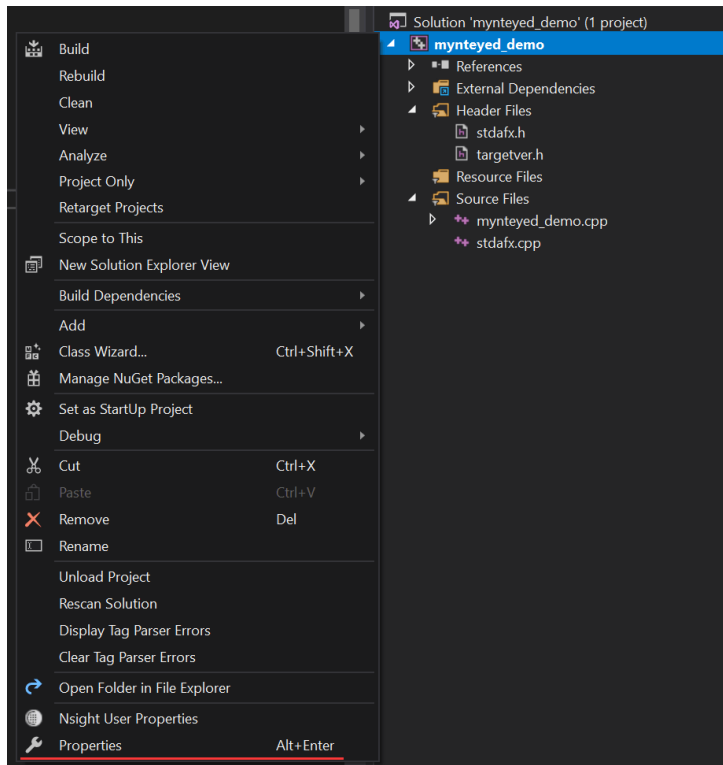


最后， 你可以看到一个新的项目被创建，



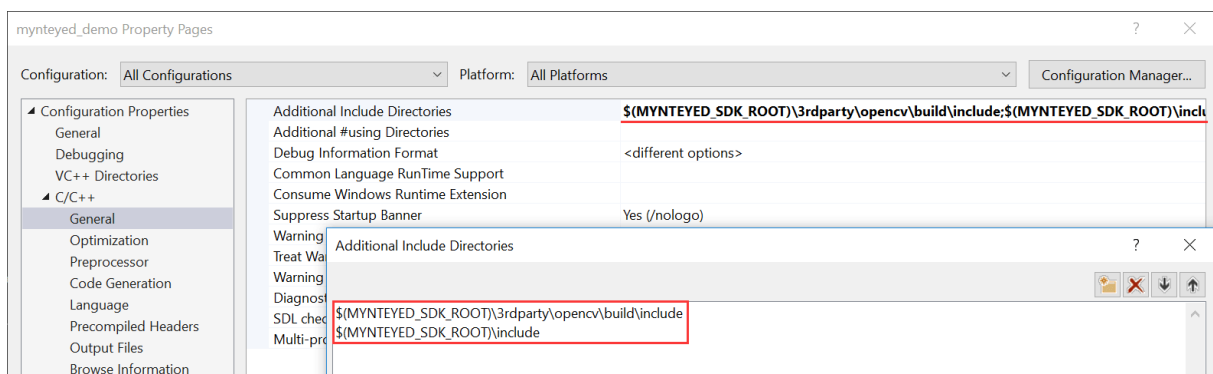
配置项目

右键点击该项目， 打开 "Properties" 窗口，



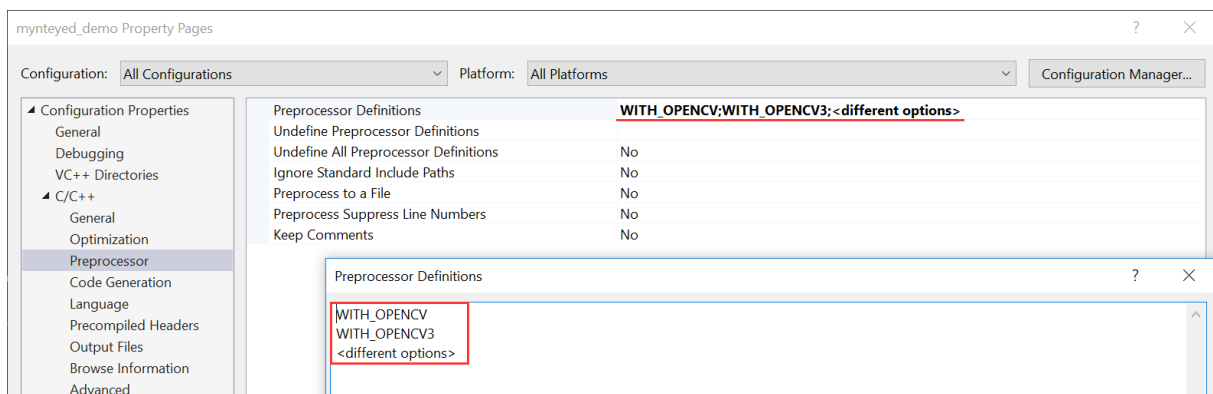
将 "Configuration" 更改为 "All Configurations", 然后添加以下路径到 "Additional Include Directories",

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



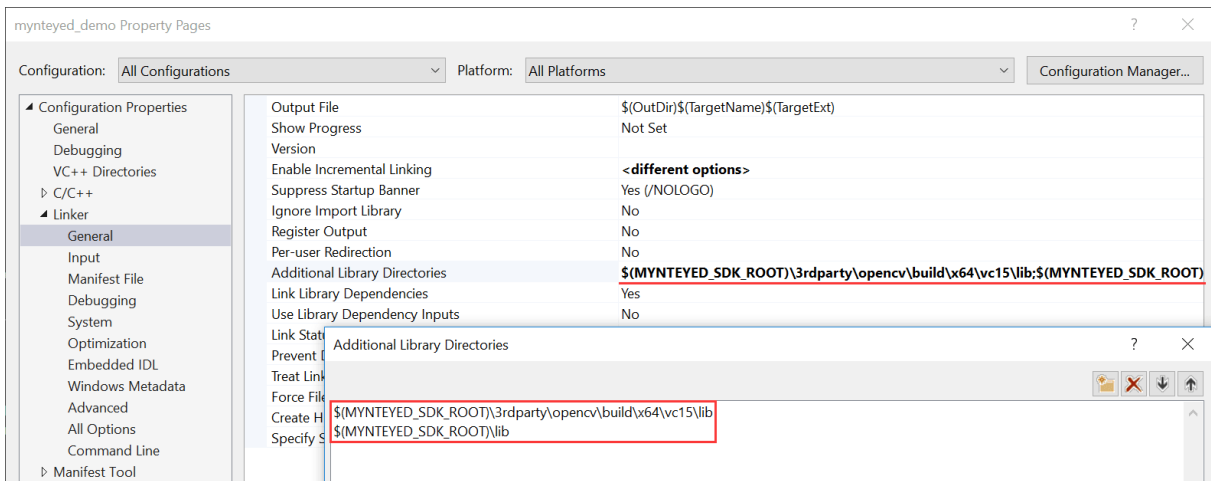
添加以下定义到 "Preprocessor Definitions",

```
WITH_OPENCV
WITH_OPENCV3
```



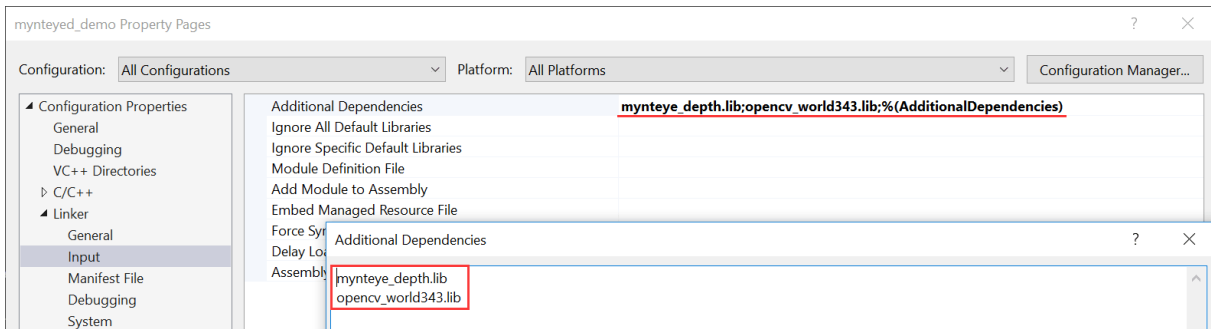
添加以下路径到 "Additional Library Directories",

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



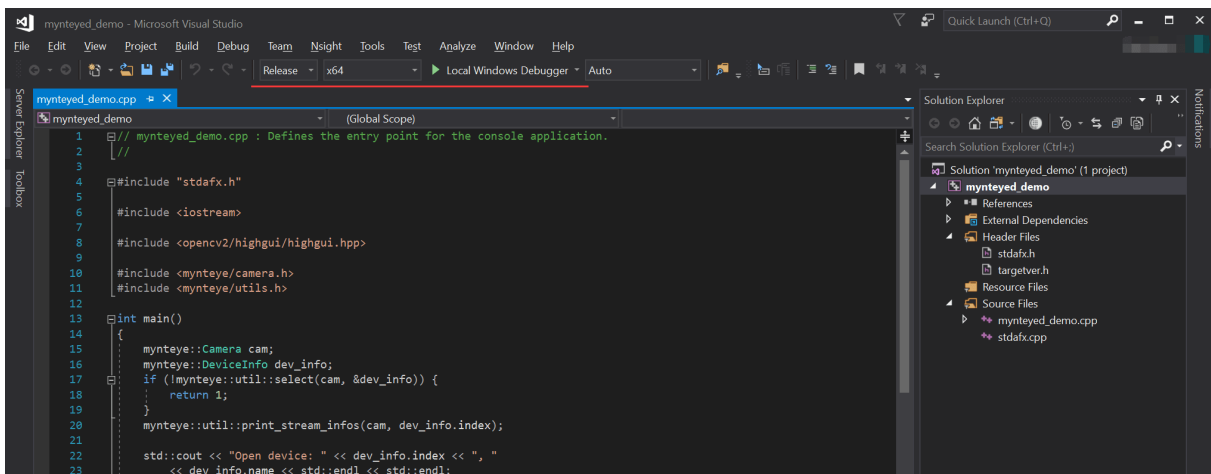
添加以下库到 "Additional Dependencies" ,

```
mynteye_depth.lib
opencv_world343.lib
```



使用SDK

添加头文件和使用 API ,



选择 "Release x64" 来运行项目。

6.2 Qt Creator 如何使用 SDK

该教程将会使用 Qt creator 创建 Qt 项目来运行 SDK 。

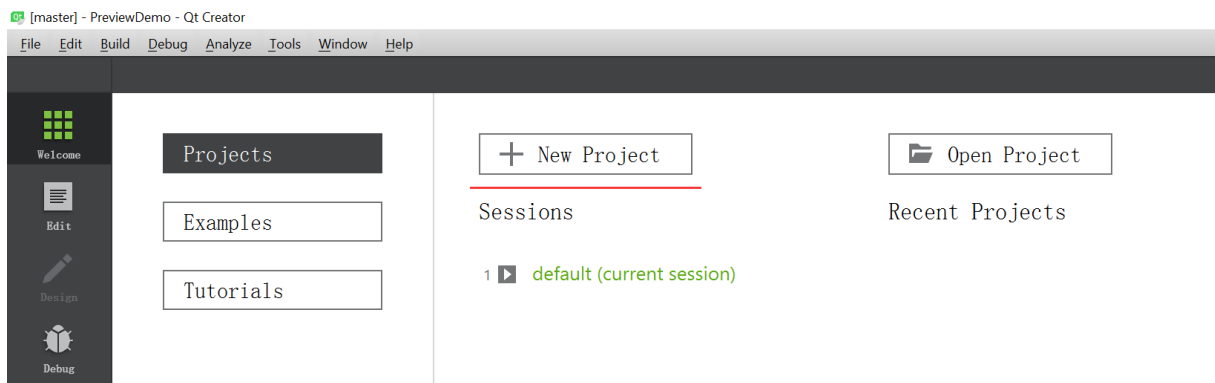
你可以在 `<sdk>/platforms/projects/qtcreator` 目录下找到工程样例。

准备

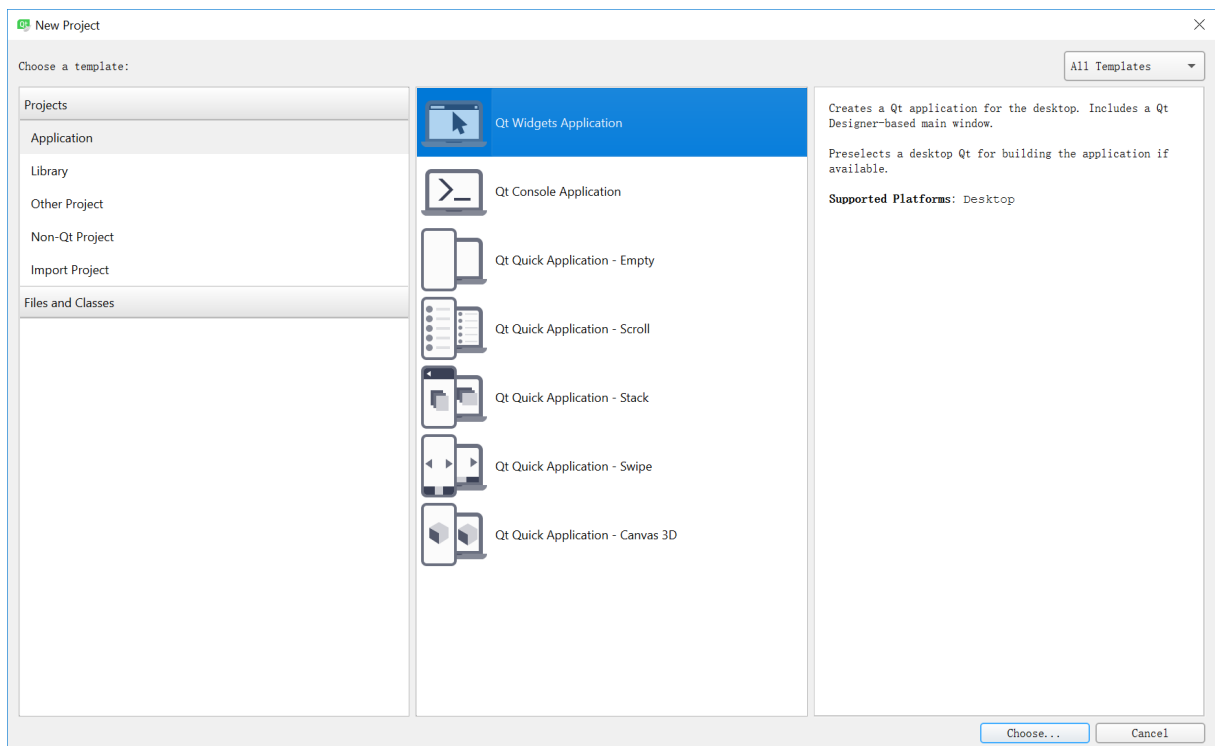
- Windows: 安装 SDK 的 exe 包
- Linux: 使用源代码编译和 `make install`

创建项目

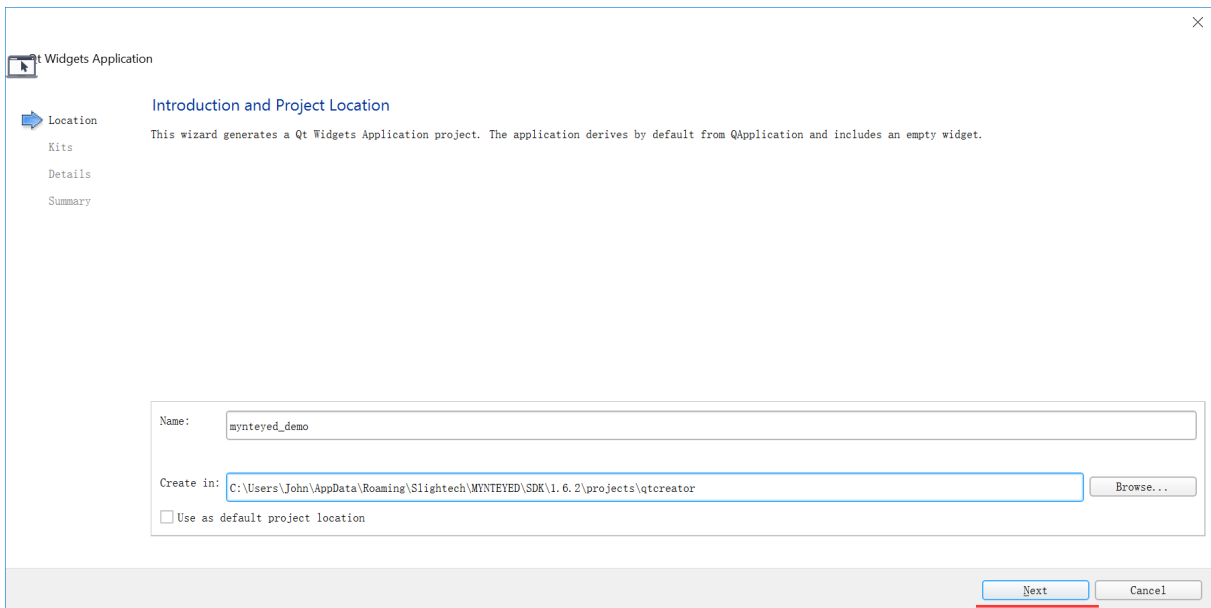
打开 Qt Creator ， 然后 New Project ，



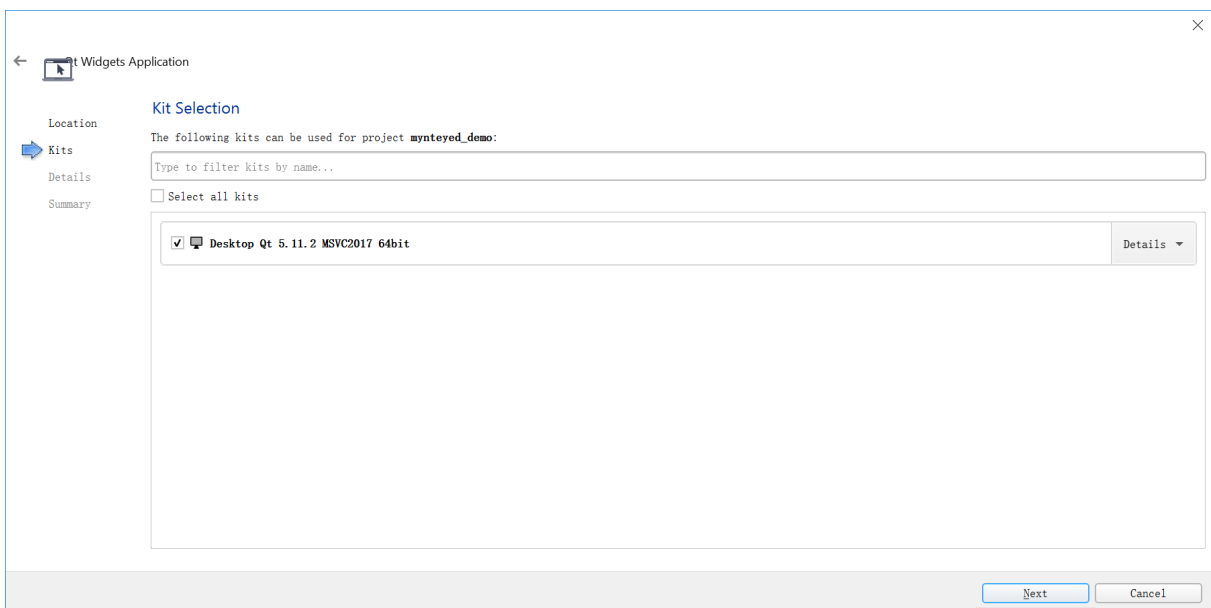
选择 Qt Widgets Application ，



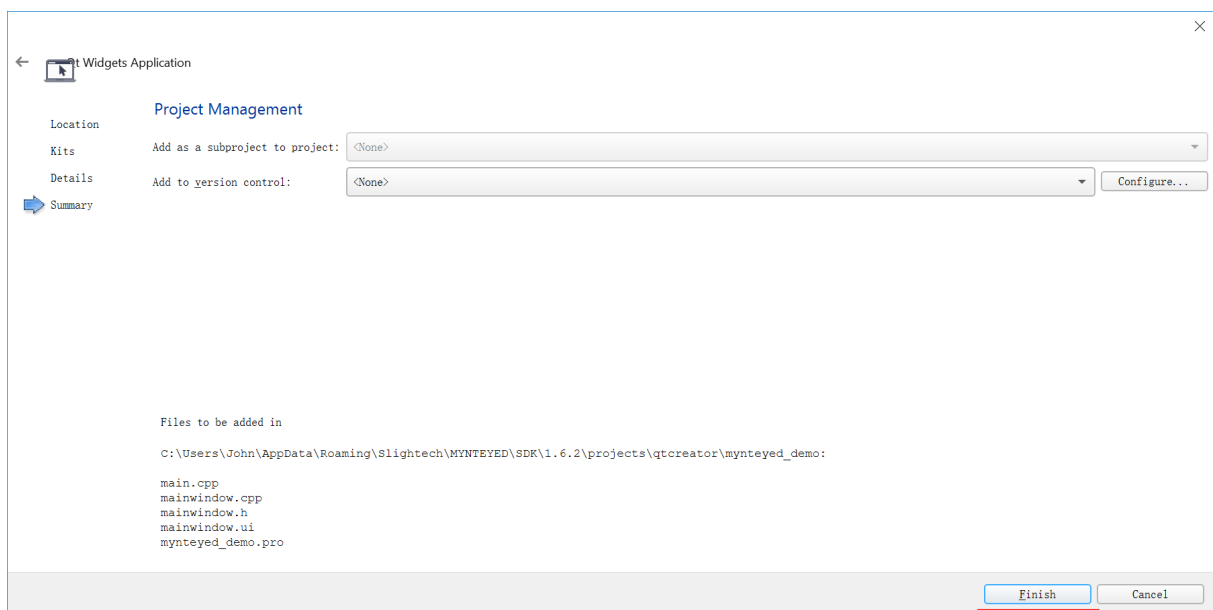
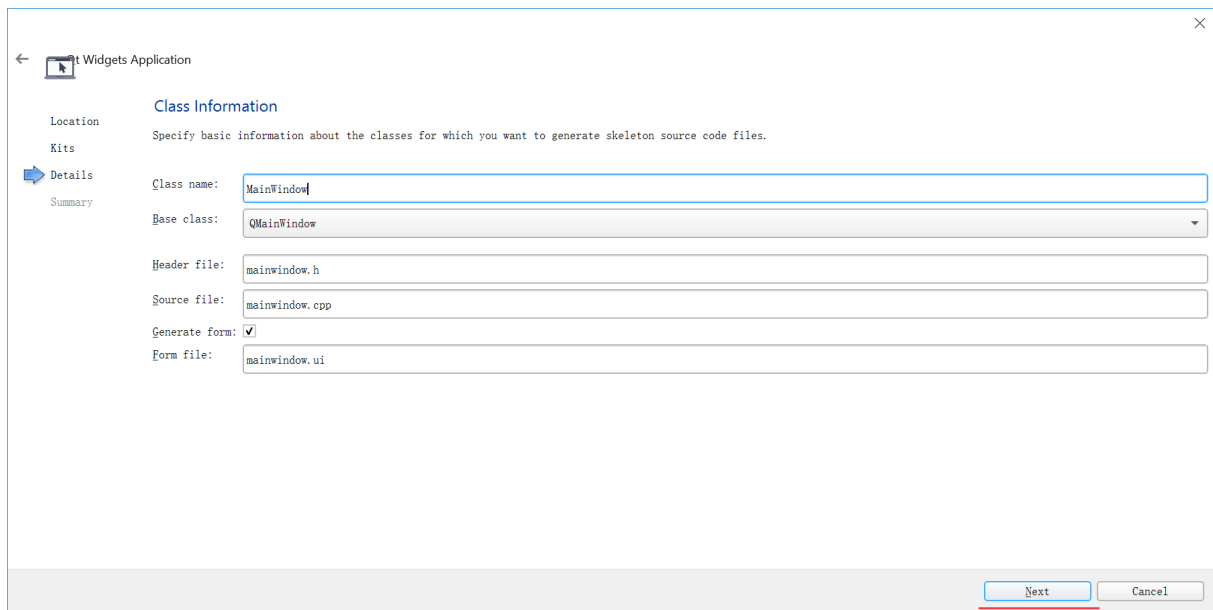
设置项目位置和名字,



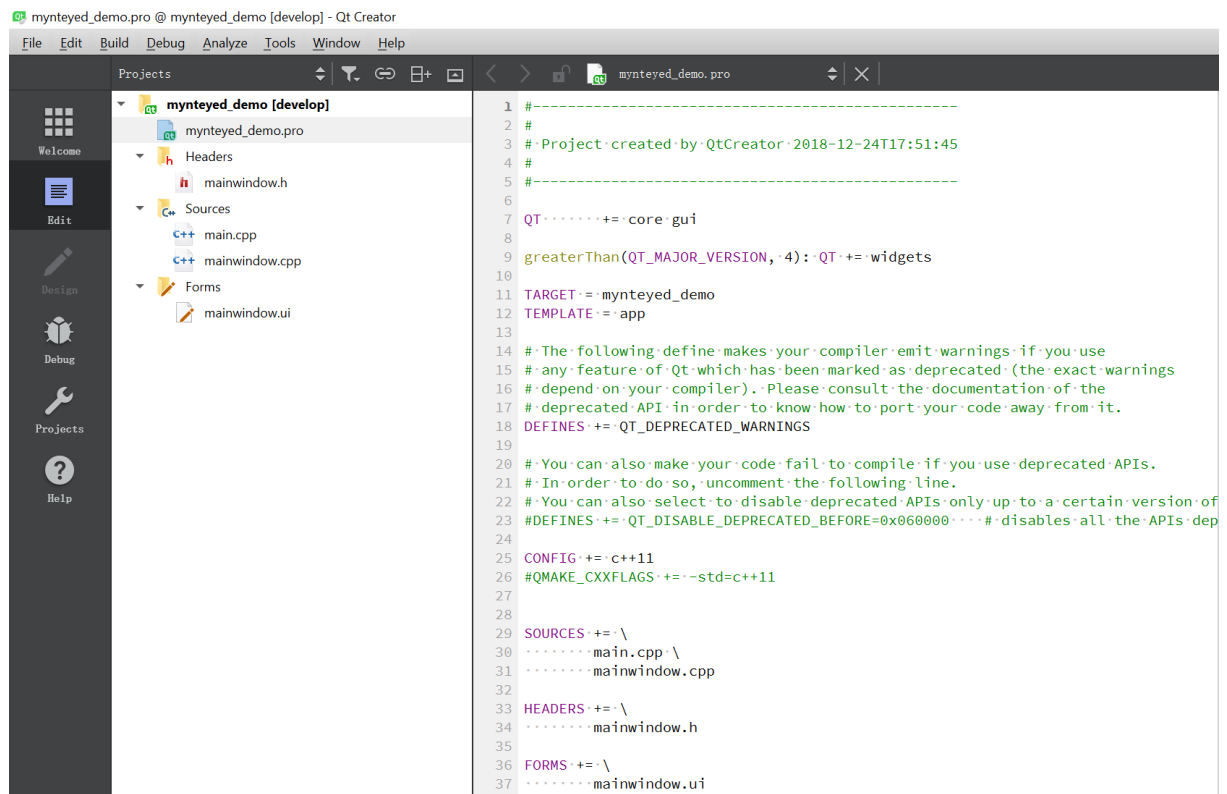
选择 build kits ,



然后他将会生成框架源文件,



最后，你将会看到这样的新项目工程，



配置项目

添加 INCLUDEPATH 和 LIBS 到 mynteyed_demo.pro。

```

win32 {
    SDK_ROOT = "$$(MYNTEYED_SDK_ROOT)"
    isEmpty(SDK_ROOT) {
        error("MYNTEYED_SDK_ROOT not found, please install SDK firstly")
    }
    message("SDK_ROOT: $$SDK_ROOT")

    INCLUDEPATH += "$$SDK_ROOT/include"
    LIBS += "$$SDK_ROOT/lib/mynteye_depth.lib"
}

unix {
    INCLUDEPATH += /usr/local/include
    LIBS += -L/usr/local/lib -lmynteye_depth
}

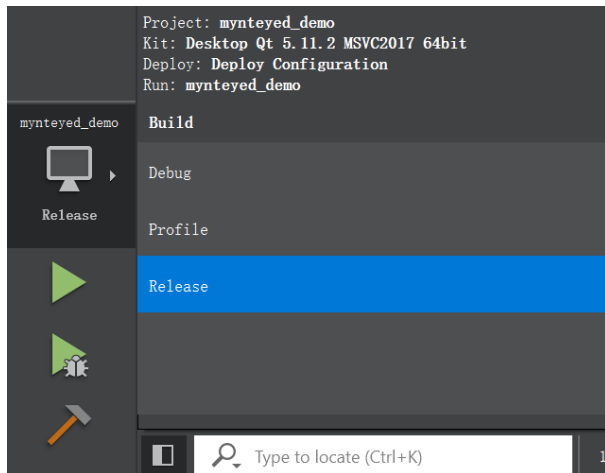
```

使用SDK

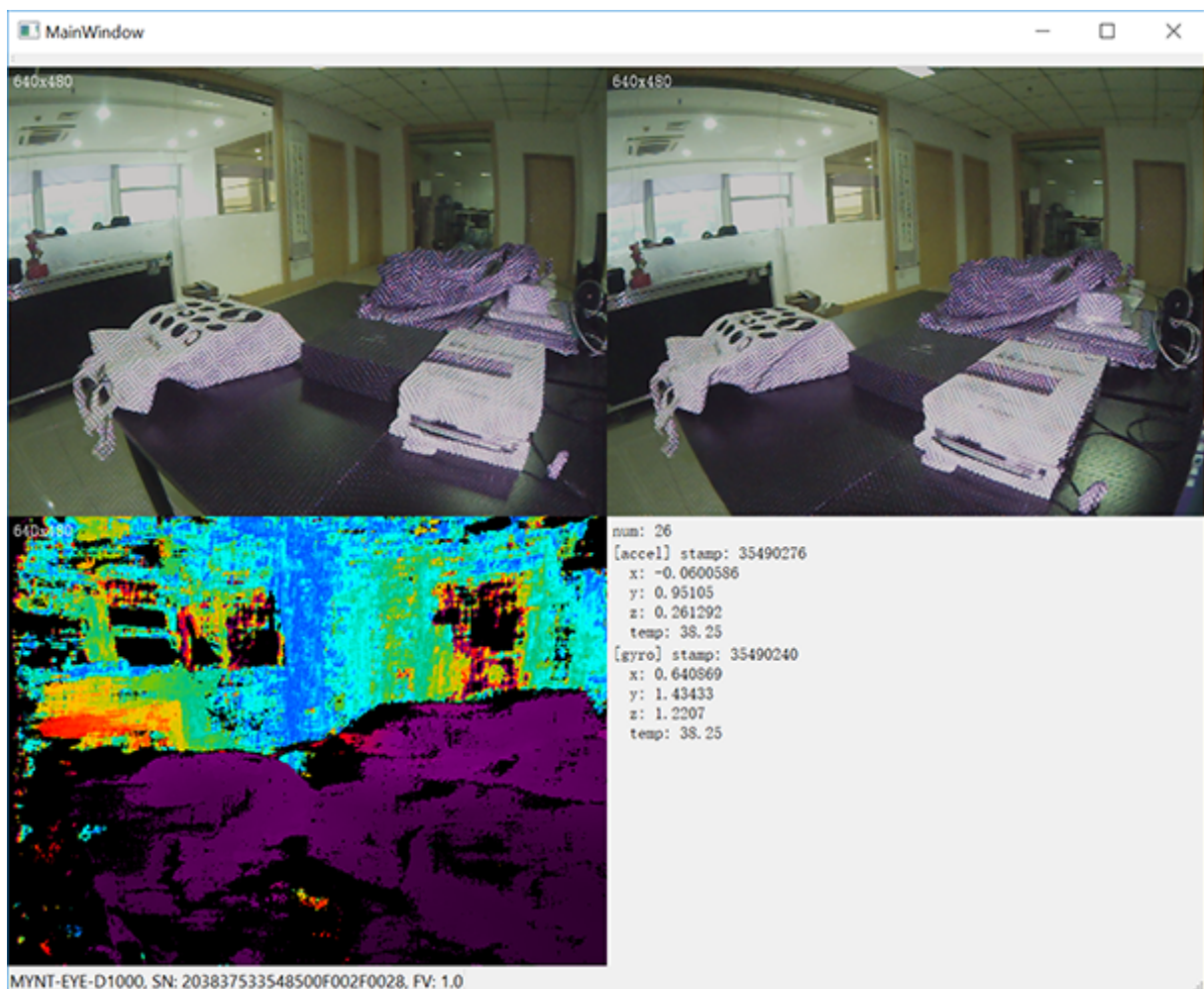
可以参考工程样例添加头文件和使用 API。

Windows

选择 "Release" 来运行项目。



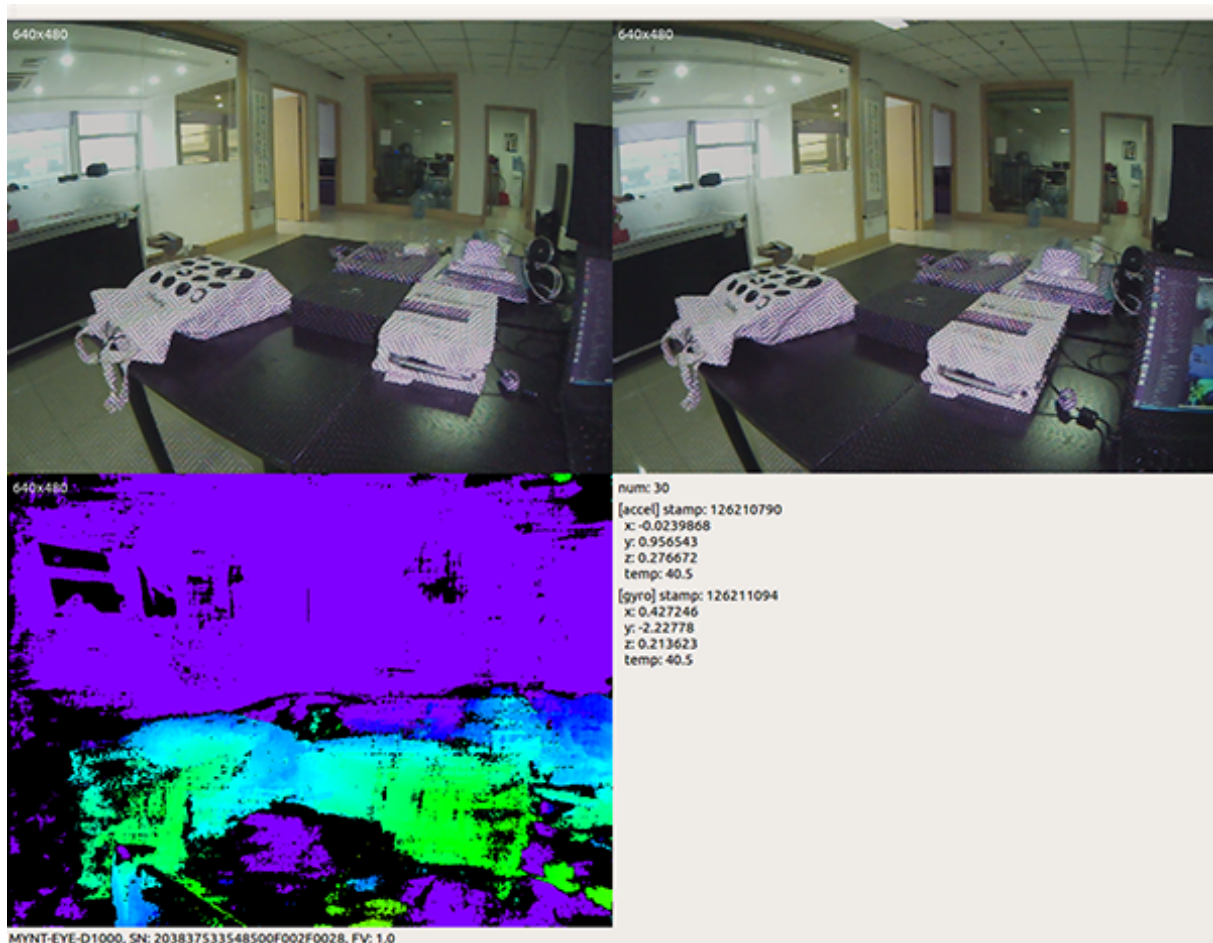
然后你将看到主窗口，



Linux

运行项目，你将看到主窗口，

制作者 MYNTAI



6.3 CMake 如何使用 SDK

本教程将使用 CMake 创建一个项目来使用 SDK。

你可以在 `<sdk>/platforms/projects/cmake` 目录下找到工程样例。

准备

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

创建项目

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

```
cmake_minimum_required(VERSION 3.0)

project(mynteyed_demo VERSION 1.0.0 LANGUAGES C CXX)

# flags

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

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

## mynteyed_demo

add_executable(mynteyed_demo mynteyed_demo.cc)
```

配置项目

增加 mynteyed 和 OpenCV 到 CMakeLists.txt ,

```
# packages

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

## mynteyed

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

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

## OpenCV

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

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

将 include_directories 和 target_link_libraries 添加到 mynteyed_demo 目标,

```
# targets

include_directories(
  ${OPENCV_INCLUDE_DIRS}
)

## mynteyed_demo

add_executable(mynteyed_demo mynteyed_demo.cc)
target_link_libraries(mynteyed_demo mynteye_depth ${OPENCV_LIBS})
```

使用SDK

可以参考工程样例添加头文件和使用 API 。

Windows

可以参考 [Quick Start Guide for Windows](#) 安装编译工具。

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

```
mkdir _build
cd _build

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

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

.\Release\mynteyed_demo.exe
```

Linux

打开命令行来编译和运行,

```
mkdir _build
cd _build/

cmake ..

make

./mynteyed_demo
```


Chapter 7

继承关系索引

7.1 类继承关系

此继承关系列表按字典顺序粗略的排序:

mynteyed::Camera	47
mynteyed::CameraIntrinsics	51
mynteyed::device::Descriptors	51
mynteyed::DeviceInfo	52
enable_shared_from_this	
mynteyed::ImageColor	54
mynteyed::ImageDepth	54
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mynteyed::Image	53
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mynteyed::ImuData	54
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mynteyed::device::ImuParams	56
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mynteyed::StreamData	60
mynteyed::StreamInfo	60
mynteyed::StreamIntrinsics	60
mynteyed::Type	61
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Chapter 8

类索引

8.1 类列表

这里列出了所有类、结构、联合以及接口定义等，并附带简要说明：

mynteyed::Camera	47
mynteyed::CameraIntrinsics Camera intrinsics: size, coeffs and camera matrix	51
mynteyed::device::Descriptors Device descriptors	51
mynteyed::DeviceInfo Device information	52
mynteyed::Extrinsics Extrinsics, represent how the different datas are connected	52
mynteyed::HardwareVersion Hardware version	53
mynteyed::Image	53
mynteyed::ImageColor	54
mynteyed::ImageDepth	54
mynteyed::ImgInfo Image information	54
mynteyed::ImuData Imu data	54
mynteyed::ImuIntrinsics IMU intrinsics: scale, drift and variances	55
mynteyed::device::ImuParams Device imu paramters	56
mynteyed::MotionData Motion data	57
mynteyed::MotionIntrinsics Motion intrinsics, including accelerometer and gyroscope	57
mynteyed::OpenParams Device open parameters	58
mynteyed::Rate	60
mynteyed::StreamData Stream data	60
mynteyed::StreamInfo Stream information	60
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mynteyed::strings_error	
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mynteyed::Type	
Type	61
mynteyed::Version	
Version	61

Chapter 9

类说明

9.1 mynteyed::Camera类 参考

Public 成员函数

- `std::vector< DeviceInfo > GetDeviceInfos () const`
Get all device infos
- `void GetDeviceInfos (std::vector< DeviceInfo > *dev_infos) const`
Get all device infos
- `void GetStreamInfos (const std::int32_t &dev_index, std::vector< StreamInfo > *color_infos, std::vector< StreamInfo > *depth_infos) const`
Get all stream infos
- `ErrorCode Open ()`
Open camera
- `ErrorCode Open (const OpenParams ¶ms)`
Open camera with params
- `bool IsOpened () const`
Whethor camera is opened or not
- `std::shared_ptr< device::Descriptors > GetDescriptors () const`
Get all device descriptors
- `std::string GetDescriptor (const Descriptor &desc) const`
Get one device descriptor
- `StreamIntrinsics GetStreamIntrinsics (const StreamMode &stream_mode) const`
Get the intrinsics of camera
- `StreamIntrinsics GetStreamIntrinsics (const StreamMode &stream_mode, bool *ok) const`
Get the intrinsics of camera
- `StreamExtrinsics GetStreamExtrinsics (const StreamMode &stream_mode) const`
Get the extrinsics of camera
- `StreamExtrinsics GetStreamExtrinsics (const StreamMode &stream_mode, bool *ok) const`
Get the extrinsics of camera
- `bool WriteCameraCalibrationBinFile (const std::string &filename)`
Write camera calibration bin file
- `MotionIntrinsics GetMotionIntrinsics () const`
Get the intrinsics of motion
- `MotionIntrinsics GetMotionIntrinsics (bool *ok) const`
Get the intrinsics of motion

- [MotionExtrinsics GetMotionExtrinsics](#) () const
Get the extrinsics from left to motion
- [MotionExtrinsics GetMotionExtrinsics](#) (bool *ok) const
Get the extrinsics from left to motion
- bool [IsWriteDeviceSupported](#) () const
Whethor write device supported or not
- bool [WriteDeviceFlash](#) (device::Descriptors *desc, device::ImuParams *imu_params, Version *spec_↵ version=nullptr)
Write device flash
- void [EnableProcessMode](#) (const ProcessMode &mode)
Enable process mode, e.g.
- void [EnableProcessMode](#) (const std::int32_t &mode)
Enable process mode, e.g.
- bool [IsImageInfoSupported](#) () const
Whethor image info supported or not
- void [EnableImageInfo](#) (bool sync)
Enable image infos.
- void [DisableImageInfo](#) ()
Disable image info.
- bool [IsImageInfoEnabled](#) () const
Whethor image info enabled or not
- bool [IsImageInfoSynced](#) () const
Whethor image info synced or not
- bool [IsStreamDataEnabled](#) (const ImageType &type) const
Whethor stream data of certain image type enabled or not
- bool [HasStreamDataEnabled](#) () const
Has any stream data enabled
- [StreamData GetStreamData](#) (const ImageType &type)
Get latest stream data
- std::vector< [StreamData](#) > [GetStreamDatas](#) (const ImageType &type)
Get cached stream datas
- bool [IsMotionDatasSupported](#) () const
Whethor motion datas supported or not
- void [EnableMotionDatas](#) (std::size_t max_size=std::numeric_limits< std::size_t >::max())
Enable motion datas.
- void [DisableMotionDatas](#) ()
Disable motion datas.
- bool [IsMotionDatasEnabled](#) () const
Whethor motion datas enabled or not
- std::vector< [MotionData](#) > [GetMotionDatas](#) ()
Get cached motion datas.
- void [SetImgInfoCallback](#) (img_info_callback_t callback, bool async=true)
Set image info callback.
- void [SetStreamCallback](#) (const ImageType &type, stream_callback_t callback, bool async=true)
Set stream data callback.
- void [SetMotionCallback](#) (motion_callback_t callback, bool async=true)
Set motion data callback.
- void [Close](#) ()
Close the camera
- bool [HidFirmwareUpdate](#) (const char *filepath)
Update hid device firmware

- void [SetExposureTime](#) (const float &value)
Set exposure time [1ms - 2000ms] value – exposure time value
- void [GetExposureTime](#) (float &value)
Get exposure time value – return exposure time value
- void [SetGlobalGain](#) (const float &value)
Set global gain [1 - 16] value – global gain value
- void [GetGlobalGain](#) (float &value)
Get global gain value – return global gain value
- void [SetIRIntensity](#) (const std::uint16_t &value)
set infrared(IR) intensity [0, 10] default 4
- bool [AutoExposureControl](#) (bool enable)
Auto-exposure enabled or not default enabled
- bool [AutoWhiteBalanceControl](#) (bool enable)
Auto-white-balance enabled or not default enabled

9.1.1 成员函数说明

9.1.1.1 DisableImageInfo()

```
void mynteyed::Camera::DisableImageInfo ( )
```

Disable image info.

9.1.1.2 DisableMotionDatas()

```
void mynteyed::Camera::DisableMotionDatas ( )
```

Disable motion datas.

9.1.1.3 EnableImageInfo()

```
void mynteyed::Camera::EnableImageInfo (
    bool sync )
```

Enable image infos.

If sync is false, indicates only can get infos from callback. If sync is true, indicates can get infos from callback or access it from [StreamData](#).

9.1.1.4 EnableMotionDatas()

```
void mynteyed::Camera::EnableMotionDatas (
    std::size_t max_size = std::numeric_limits< std::size_t >::max() )
```

Enable motion datas.

If `max_size <= 0`, indicates only can get datas from callback. If `max_size > 0`, indicates can get datas from callback or using [GetMotionDatas\(\)](#).

Note: if `max_size > 0`, the motion datas will be cached until you call [GetMotionDatas\(\)](#).

9.1.1.5 EnableProcessMode() [1/2]

```
void mynteyed::Camera::EnableProcessMode (
    const ProcessMode & mode )
```

Enable process mode, e.g.

imu assembly, temp_drift

9.1.1.6 EnableProcessMode() [2/2]

```
void mynteyed::Camera::EnableProcessMode (
    const std::int32_t & mode )
```

Enable process mode, e.g.

imu assembly, temp_drift

9.1.1.7 GetMotionDatas()

```
std::vector<MotionData> mynteyed::Camera::GetMotionDatas ( )
```

Get cached motion datas.

Besides, you can also get them from callback

9.1.1.8 SetImgInfoCallback()

```
void mynteyed::Camera::SetImgInfoCallback (
    img_info_callback_t callback,
    bool async = true )
```

Set image info callback.

9.1.1.9 SetMotionCallback()

```
void mynteyed::Camera::SetMotionCallback (
    motion_callback_t callback,
    bool async = true )
```

Set motion data callback.

9.1.1.10 SetStreamCallback()

```
void mynteyed::Camera::SetStreamCallback (
    const ImageType & type,
    stream_callback_t callback,
    bool async = true )
```

Set stream data callback.

9.2 mynteyed::CameraIntrinsics结构体 参考

[Camera](#) intrinsics: size, coeffs and camera matrix.

Public 属性

- `std::uint16_t width`
The width of the image in pixels
- `std::uint16_t height`
The height of the image in pixels
- `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
- `double coeffs [5]`
The distortion coefficients: k_1, k_2, p_1, p_2, k_3

9.2.1 详细描述

[Camera](#) intrinsics: size, coeffs and camera matrix.

9.3 mynteyed::device::Descriptors结构体 参考

Device descriptors.

9.3.1 详细描述

Device descriptors.

9.4 mynteyed::DeviceInfo 结构体 参考

Device information.

Public 属性

- `std::int32_t index`
The device index.
- `std::string name`
The device name.
- `std::uint16_t type`
The device type.
- `std::uint16_t pid`
The product id.
- `std::uint16_t vid`
The vendor id.
- `std::uint16_t chip_id`
The chip id.
- `std::string fw_version`
The firmware version.

9.4.1 详细描述

Device information.

9.5 mynteyed::Extrinsics 结构体 参考

`Extrinsics`, represent how the different datas are connected.

Public 成员函数

- `Extrinsics Inverse () const`
Inverse this extrinsics.

Public 属性

- `double rotation [3][3]`
Rotation matrix left camera to right camera
- `double translation [3]`
Translation vector left camera to right camera

9.5.1 详细描述

[Extrinsics](#), represent how the different datas are connected.

9.5.2 成员函数说明

9.5.2.1 Inverse()

```
Extrinsics mynteyed::Extrinsics::Inverse ( ) const [inline]
```

Inverse this extrinsics.

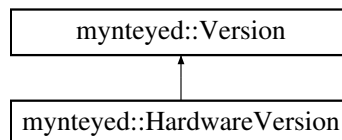
返回

the inversed extrinsics.

9.6 mynteyed::HardwareVersion类 参考

Hardware version.

类 mynteyed::HardwareVersion 继承关系图:

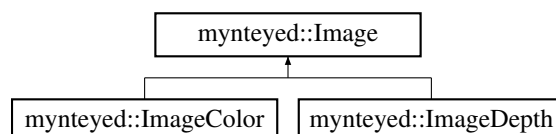


9.6.1 详细描述

Hardware version.

9.7 mynteyed::Image类 参考

类 mynteyed::Image 继承关系图:



9.8 mynteyed::ImageColor类 参考

类 mynteyed::ImageColor 继承关系图:



9.9 mynteyed::ImageDepth类 参考

类 mynteyed::ImageDepth 继承关系图:



9.10 mynteyed::ImglInfo结构体 参考

[Image](#) information

Public 属性

- `std::uint16_t frame_id`
Image frame id
- `std::uint32_t timestamp`
Image timestamp
- `std::uint16_t exposure_time`
Image exposure time

9.10.1 详细描述

[Image](#) information

9.11 mynteyed::ImuData结构体 参考

Imu data

Public 属性

- `std::uint8_t flag`
Data type MYNTEYE_IMU_ACCEL: accelerometer MYNTEYE_IMU_GYRO: gyroscope
- `std::uint64_t timestamp`
Imu gyroscope or accelerometer or frame timestamp
- `double temperature`
temperature
- `double accel [3]`
Imu accelerometer data for 3-axis: X, Y, X.
- `double gyro [3]`
Imu gyroscope data for 3-axis: X, Y, Z.

9.11.1 详细描述

Imu data

9.11.2 类成员变量说明

9.11.2.1 accel

```
double mynteyed::ImuData::accel[3]
```

Imu accelerometer data for 3-axis: X, Y, X.

9.11.2.2 gyro

```
double mynteyed::ImuData::gyro[3]
```

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

9.12 mynteyed::ImuIntrinsics结构体 参考

IMU intrinsics: scale, drift and variances.

Public 属性

- double `scale` [3][3]
Scale matrix.
- 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

9.12.1 详细描述

IMU intrinsics: scale, drift and variances.

9.12.2 类成员变量说明

9.12.2.1 scale

```
double mynteyed::ImuIntrinsics::scale[3][3]
```

Scale matrix.

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

9.12.2.2 x

```
double mynteyed::ImuIntrinsics::x[2]
```

Temperature drift

```
0 - Constant value
1 - Slope
```

9.13 mynteyed::device::ImuParams 结构体 参考

Device imu paramters.

9.13.1 详细描述

Device imu paramters.

9.14 mynteyed::MotionData结构体 参考

Motion data.

Public 属性

- `std::shared_ptr< ImuData > imu`
[ImuData](#).

9.14.1 详细描述

Motion data.

9.14.2 类成员变量说明

9.14.2.1 imu

```
std::shared_ptr<ImuData> mynteyed::MotionData::imu
```

[ImuData](#).

9.15 mynteyed::MotionIntrinsics结构体 参考

Motion intrinsics, including accelerometer and gyroscope.

Public 属性

- [ImuIntrinsics accel](#)
Accelerometer intrinsics
- [ImuIntrinsics gyro](#)
Gyroscope intrinsics

9.15.1 详细描述

Motion intrinsics, including accelerometer and gyroscope.

9.16 mynteyed::OpenParams 结构体 参考

Device open parameters.

Public 成员函数

- [OpenParams \(\)](#)
Constructor.
- [~OpenParams \(\)](#)
Destructor.

Public 属性

- `std::int32_t dev_index`
Device index.
- `std::int32_t framerate`
Framerate, range [0,60], [0,30](STREAM_2560x720), default 10.
- DeviceMode `dev_mode`
Device mode, default DEVICE_ALL
- ColorMode `color_mode`
Color mode, default COLOR_RAW.
- DepthMode `depth_mode`
Depth mode, default DEPTH_COLORFUL.
- StreamMode `stream_mode`
Stream mode of color & depth, default STREAM_1280x720.
- StreamFormat `color_stream_format`
Stream format of color, default STREAM_YUYV.
- StreamFormat `depth_stream_format`
Stream format of depth, default STREAM_YUYV.
- bool `state_ae`
Auto-exposure, default true.
- bool `state_awb`
Auto-white balance, default true.
- `std::uint8_t ir_intensity`
IR (Infrared), range [0,10], default 0.
- bool `ir_depth_only`
IR Depth Only mode, default false.
- float `colour_depth_value`
Colour depth image, default 5000.

9.16.1 详细描述

Device open parameters.

9.16.2 构造及析构函数说明

9.16.2.1 OpenParams()

```
mynteyed::OpenParams::OpenParams ( )
```

Constructor.

9.16.2.2 ~OpenParams()

```
mynteyed::OpenParams::~~OpenParams ( )
```

Destructor.

9.16.3 类成员变量说明

9.16.3.1 colour_depth_value

```
float mynteyed::OpenParams::colour_depth_value
```

Colour depth image, default 5000.

[0, 16384]

9.16.3.2 dev_mode

```
DeviceMode mynteyed::OpenParams::dev_mode
```

Device mode, default DEVICE_ALL

- DEVICE_COLOR: IMAGE_LEFT_COLOR y IMAGE_RIGHT_COLOR - IMAGE_DEPTH n
- DEVICE_DEPTH: IMAGE_LEFT_COLOR n IMAGE_RIGHT_COLOR n IMAGE_DEPTH y
- DEVICE_ALL: IMAGE_LEFT_COLOR y IMAGE_RIGHT_COLOR - IMAGE_DEPTH y

Could detect image type is enabled after opened through [Camera::IsStreamDataEnabled\(\)](#).

Note: y: available, n: unavailable, -: depends on [stream_mode](#)

9.16.3.3 ir_depth_only

```
bool mynteyed::OpenParams::ir_depth_only
```

IR Depth Only mode, default false.

Note: When frame rate less than 30fps, IR Depth Only will be not available.

9.17 mynteyed::Rate类 参考

9.18 mynteyed::StreamData结构体 参考

Stream data.

Public 属性

- [std::shared_ptr< Image > img](#)
Image data
- [std::shared_ptr< ImgInfo > img_info](#)
Image information

9.18.1 详细描述

Stream data.

9.19 mynteyed::StreamInfo结构体 参考

Stream information.

Public 属性

- [std::int32_t index](#)
The stream index.
- [std::int32_t width](#)
The stream width.
- [std::int32_t height](#)
The stream height.
- [StreamFormat format](#)
The stream format.

9.19.1 详细描述

Stream information.

9.20 mynteyed::StreamIntrinsics结构体 参考

[Camera](#) intrinsics: size, coeffs and camera matrix.

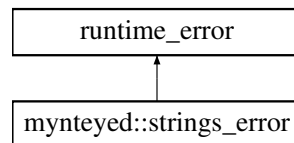
9.20.1 详细描述

[Camera](#) intrinsics: size, coeffs and camera matrix.

9.21 mynteyed::strings_error类 参考

The strings error

类 mynteyed::strings_error 继承关系图:



9.21.1 详细描述

The strings error

9.22 mynteyed::Type类 参考

[Type](#).

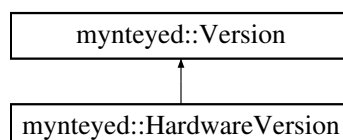
9.22.1 详细描述

[Type](#).

9.23 mynteyed::Version类 参考

[Version](#).

类 mynteyed::Version 继承关系图:



9.23.1 详细描述

[Version](#).

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