OpenCV编译相关文件讲解

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目 录

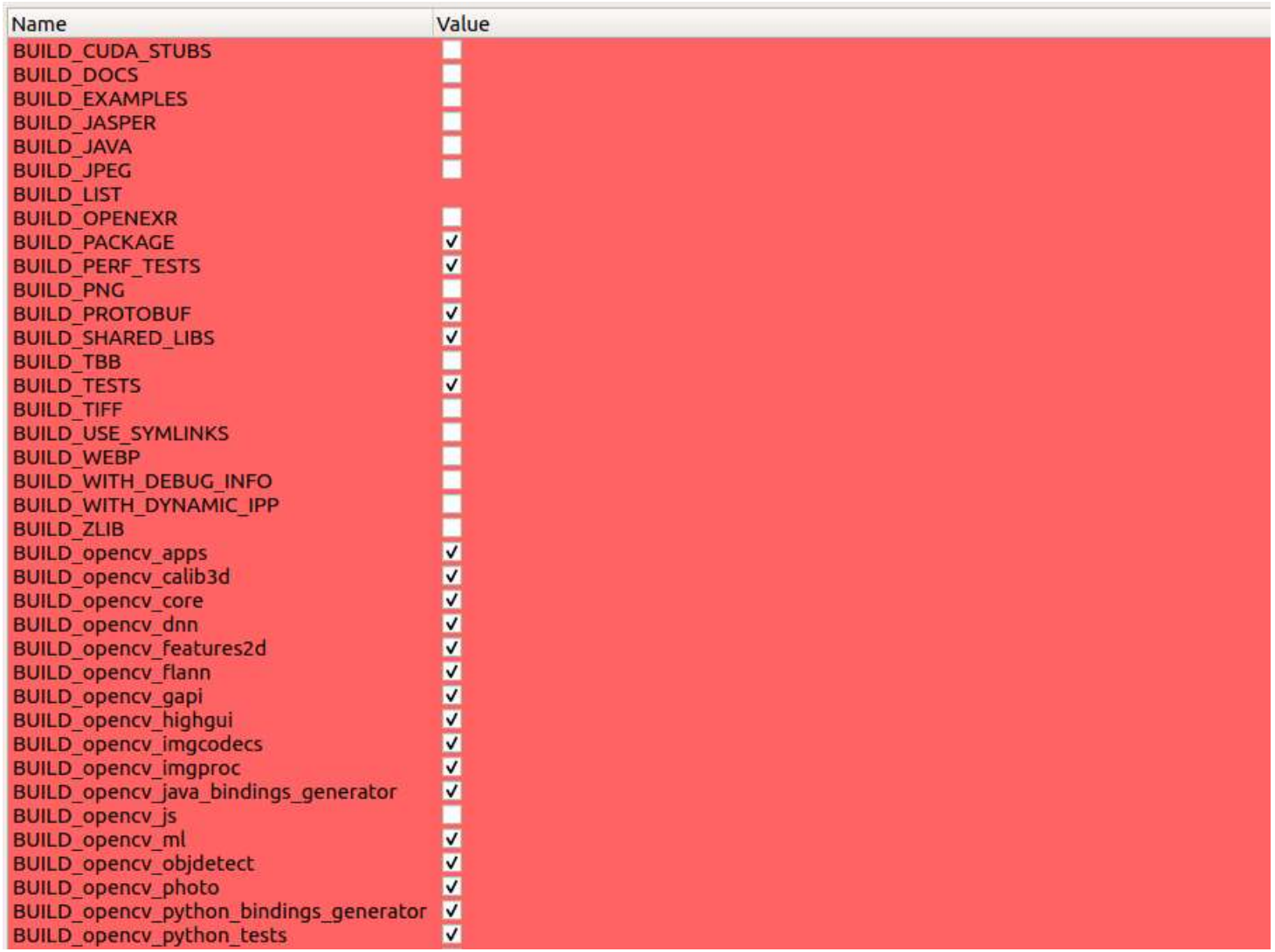
01 回顾

02 OpenCV中的cmake文件

03 cmake交叉编译配置

编译OpenCV时遇到的问题

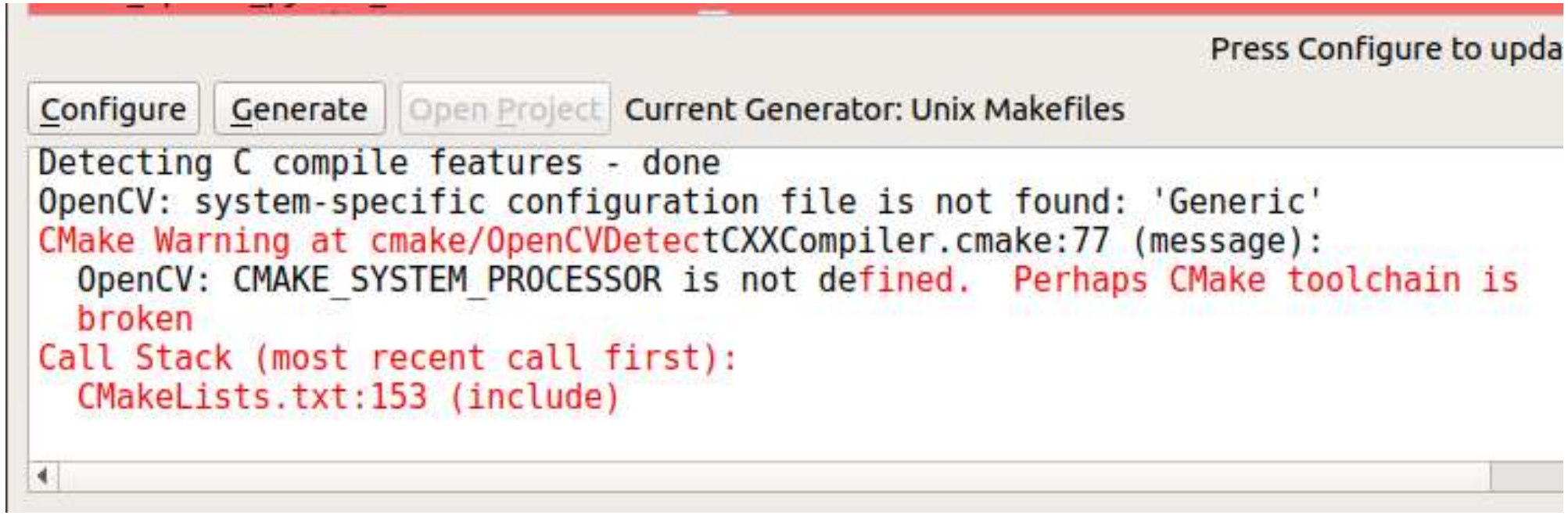
在之前的工作中，我们尝试使用RISC-V的交叉编译工具riscv64-unknown-linux-gnu-gcc对OpenCV进行编译，在这个过程中，我们使用了CMAKE工具，然而出现了如下的错误。



Name	Value
BUILD_CUDA_STUBS	☐
BUILD_DOCS	☐
BUILD_EXAMPLES	☐
BUILD_JASPER	☐
BUILD_JAVA	☐
BUILD_JPEG	☐
BUILD_LIST	
BUILD_OPENEXR	☐
BUILD_PACKAGE	☑
BUILD_PERF_TESTS	☑
BUILD_PNG	☐
BUILD_PROTOBUF	☑
BUILD_SHARED_LIBS	☑
BUILD_TBB	☐
BUILD_TESTS	☑
BUILD_TIFF	☐
BUILD_USE_SYMLINKS	☐
BUILD_WEBP	☐
BUILD_WITH_DEBUG_INFO	☐
BUILD_WITH_DYNAMIC_IPP	☐
BUILD_ZLIB	☐
BUILD_opencv_apps	☑
BUILD_opencv_calib3d	☑
BUILD_opencv_core	☑
BUILD_opencv_dnn	☑
BUILD_opencv_features2d	☑
BUILD_opencv_flann	☑
BUILD_opencv_gapi	☑
BUILD_opencv_highgui	☑
BUILD_opencv_imgcodecs	☑
BUILD_opencv_imgproc	☑
BUILD_opencv_java_bindings_generator	☑
BUILD_opencv_js	☐
BUILD_opencv_ml	☑
BUILD_opencv_objdetect	☑
BUILD_opencv_photo	☑
BUILD_opencv_python_bindings_generator	☑
BUILD_opencv_python_tests	☑

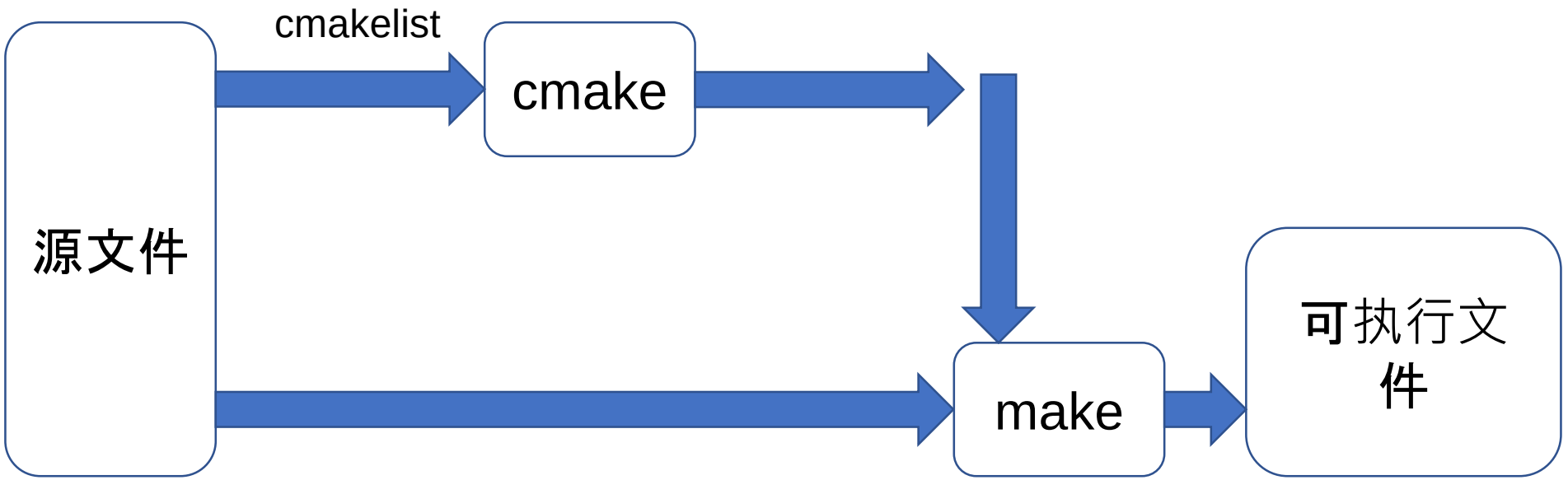
编译OpenCV时遇到的问题

我们在主界面上找不到错误选项，所以回到下方界面，发现原因在于一个叫做OpenCVDetectCXXCompiler.cmake 的文件中出现了错误。



OpenCV中的cmake文件

Cmake是用来makefile的一个工具：读入所有源文件之后，自动生成makefile。



OpenCV中的cmake文件

copy_files.cmake	2020/2/3 21:34	CMAKE 文件	4 KB
FindCUDA.cmake	2020/2/3 21:34	CMAKE 文件	75 KB
FindCUDNN.cmake	2020/2/3 21:34	CMAKE 文件	3 KB
FindFlake8.cmake	2020/2/3 21:34	CMAKE 文件	1 KB
FindOpenVX.cmake	2020/2/3 21:34	CMAKE 文件	2 KB
FindPylint.cmake	2020/2/3 21:34	CMAKE 文件	1 KB
FindVulkan.cmake	2020/2/3 21:34	CMAKE 文件	1 KB
OpenCVCompilerDefenses.cmake	2020/2/3 21:34	CMAKE 文件	4 KB
OpenCVCompilerOptimizations.cmake	2020/2/3 21:34	CMAKE 文件	38 KB
OpenCVCompilerOptions.cmake	2020/2/3 21:34	CMAKE 文件	19 KB
OpenCVCRTLinkage.cmake	2020/2/3 21:34	CMAKE 文件	5 KB
OpenCVDetectApacheAnt.cmake	2020/2/3 21:34	CMAKE 文件	2 KB
OpenCVDetectCUDA.cmake	2020/2/3 21:34	CMAKE 文件	15 KB
OpenCVDetectCXXCompiler.cmake	2020/2/3 21:34	CMAKE 文件	8 KB
OpenCVDetectDirectX.cmake	2020/2/3 21:34	CMAKE 文件	1 KB
OpenCVDetectHalide.cmake	2020/2/3 21:34	CMAKE 文件	2 KB
OpenCVDetectInferenceEngine.cmake	2020/2/3 21:34	CMAKE 文件	6 KB
OpenCVDetectOpenCL.cmake	2020/2/3 21:34	CMAKE 文件	3 KB
OpenCVDetectPython.cmake	2020/2/3 21:34	CMAKE 文件	14 KB
OpenCVDetectTBB.cmake	2020/2/3 21:34	CMAKE 文件	4 KB
OpenCVDetectTrace.cmake	2020/2/3 21:34	CMAKE 文件	1 KB
OpenCVDetectVTK.cmake	2020/2/3 21:34	CMAKE 文件	3 KB
OpenCVDetectVulkan.cmake	2020/2/3 21:34	CMAKE 文件	1 KB
OpenCVDownload.cmake	2020/2/3 21:34	CMAKE 文件	10 KB

OpenCV中的cmake文件

文件扩展名 camke 文件被格式化为 CMake File。 CMAKE 文件通常被归类为 Developer Files。

- build出可以build出软件本身的全部工程文件，比如makefiles、xcode工程文件、vs的工程文件。然后我们可以通过执行这些工程文件，完成最终的编译。
- 工程相关的文件就不需要上传到版本控制系统中了，只需要上传cmake文件即可。

02 OpenCV中的cmake文件

OpenCVDetectCXXCompiler.cmake

```
# Compilers:
# - CV_GCC - GNU compiler (CMAKE_CXX_COMPILER_ID STREQUAL "GNU")
# - CV_CLANG - Clang-compatible compiler (CMAKE_CXX_COMPILER_ID MATCHES "Clang" - Clang or AppleClang, see CMP0025)
# - CV_ICC - Intel compiler
# - MSVC - Microsoft Visual Compiler (CMake variable)
# - MINGW / CYGWIN / CMAKE_COMPILER_IS_MINGW / CMAKE_COMPILER_IS_CYGWIN (CMake original variables)
#
# CPU Platforms:
# - X86 / X86_64
# - ARM - ARM CPU, not defined for AArch64
# - AARCH64 - ARMv8+ (64-bit)
# - PPC64 / PPC64LE - PowerPC
# - MIPS
#
# OS:
# - WIN32 - Windows | MINGW
# - UNIX - Linux | MacOSX | ANDROID
# - ANDROID
# - IOS
# - APPLE - MacOSX | iOS
# -----------------------------------------------------------------------------
```

02 OpenCV中的cmake文件

OpenCVDetectCXXCompiler.cmake

报错地方：CMAKE_SYSTEM_PROCESSOR is not defined

```
if(NOT DEFINED CMAKE_CXX_COMPILER_VERSION
    AND NOT OPENCV_SUPPRESS_MESSAGE_MISSING_COMPILER_VERSION)
  message(WARNING "OpenCV: Compiler version is not available: CMAKE_CXX_COMPILER_VERSION is not set")
endif()
if((NOT DEFINED CMAKE_SYSTEM_PROCESSOR OR CMAKE_SYSTEM_PROCESSOR STREQUAL "")
    AND NOT OPENCV_SUPPRESS_MESSAGE_MISSING_CMAKE_SYSTEM_PROCESSOR)
  message(WARNING "OpenCV: CMAKE_SYSTEM_PROCESSOR is not defined. Perhaps CMake toolchain is broken")
endif()
if(NOT DEFINED CMAKE_SIZEOF_VOID_P
    AND NOT OPENCV_SUPPRESS_MESSAGE_MISSING_CMAKE_SIZEOF_VOID_P)
  message(WARNING "OpenCV: CMAKE_SIZEOF_VOID_P is not defined. Perhaps CMake toolchain is broken")
endif()
```

02 OpenCV中的cmake文件

CMakeLists.txt

根据cmake官方关于交叉编译的介绍：《Cross Compiling for Linux》，CMAKE_SYSTEM_NAME 和CMAKE_SYSTEM_PROCESSOR是交叉编译的时候必须指定的两个参数。

```
# ========================== build platform ==========================
status("")
status("  Platform:")
if(NOT DEFINED OPENCV_TIMESTAMP
    AND NOT CMAKE_VERSION VERSION_LESS 2.8.11
    AND NOT BUILD_INFO_SKIP_TIMESTAMP
)
  string(TIMESTAMP OPENCV_TIMESTAMP "" UTC)
  set(OPENCV_TIMESTAMP "${OPENCV_TIMESTAMP}" CACHE STRING "Timestamp of OpenCV build configuration" FORCE)
endif()
if(OPENCV_TIMESTAMP)
  status("    Timestamp:"      ${OPENCV_TIMESTAMP})
endif()
status("    Host:"           ${CMAKE_HOST_SYSTEM_NAME} ${CMAKE_HOST_SYSTEM_VERSION} ${CMAKE_HOST_SYSTEM_PROCESSOR})
if(CMAKE_CROSSCOMPILING)
  status("    Target:"         ${CMAKE_SYSTEM_NAME} ${CMAKE_SYSTEM_VERSION} ${CMAKE_SYSTEM_PROCESSOR})
endif()
```

03 cmake交叉编译配置

很多时候，我们在开发的时候是面对嵌入式平台，即在host宿主机上要生成target目标机的程序。涉及相关头文件的切换和编译器的选择以及环境变量的改变等操作。

今天仅仅简单介绍下相关CMake在面对交叉编译的知识，为OpenCV的编译做准备。

03 cmake交叉编译配置

CMakeLists.txt

CMake给交叉编译预留了一个很好的变量CMAKE_TOOLCHAIN_FILE，它定义了一个文件的路径，这个文件即toolChain，里面设置了一系列你需要改变的变量和属性，包括C_COMPILER,CXX_COMPILER等。

03 cmake交叉编译配置

CMakeLists.txt

toolChain脚本中设置的几个重要变量

- CMAKE_SYSTEM_NAME: 目标机target所在的操作系统名称

  只有当CMAKE_SYSTEM_NAME这个变量被设置了，CMake才认为此时正在交叉编译，它会额外设置一个变量CMAKE_CROSSCOMPILING 为TRUE.

- CMAKE_C_COMPILER: C语言编译器，这里可以将变量设置成完整路径或者文件名

- CMAKE_CXX_COMPILER: C++语言编译器

03 cmake交叉编译配置

CMakeLists.txt

toolChain脚本中设置的几个重要变量

- CMAKE_FIND_ROOT_PATH: 指定了一个或者多个优先于其他搜索路径的搜索路径，默认为空

  NEVER : 不在CMAKE_FIND_ROOT_PATH下进行查找
  ONLY : 只在CMAKE_FIND_ROOT_PATH下进行查找
  BOTH : 先查找这个路径，再查找全局路径

- CMAKE_FIND_ROOT_PATH_MODE_LIBRARY: 表示在链接的时候的库的相关选项，交叉编译设置为ONLY

- CMAKE_FIND_ROOT_PATH_MODE_INCLUDE:一般来说也是ONLY

03 cmake交叉编译配置

CMakeLists.txt

toolChain脚本中设置的几个重要变量

- CMAKE_FIND_ROOT_PATH: 指定了一个或者多个优先于其他搜索路径的搜索路径，默认为空

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- CMAKE_FIND_ROOT_PATH_MODE_LIBRARY: 表示在链接的时候的库的相关选项，交叉编译设置为ONLY

- CMAKE_FIND_ROOT_PATH_MODE_INCLUDE:一般来说也是ONLY

03 cmake交叉编译配置

CMakeLists.txt

Cross Compiling for Linux

A typical cross-compiling toolchain for Linux has content such as:

```
set(CMAKE_SYSTEM_NAME Linux)
set(CMAKE_SYSTEM_PROCESSOR arm)

set(CMAKE_SYSROOT /home/devel/rasp-pi-rootfs)
set(CMAKE_STAGING_PREFIX /home/devel/stage)

set(tools /home/devel/gcc-4.7-linaro-rpi-gnueabihf)
set(CMAKE_C_COMPILER ${tools}/bin/arm-linux-gnueabihf-gcc)
set(CMAKE_CXX_COMPILER ${tools}/bin/arm-linux-gnueabihf-g++)

set(CMAKE_FIND_ROOT_PATH_MODE_PROGRAM NEVER)
set(CMAKE_FIND_ROOT_PATH_MODE_LIBRARY ONLY)
set(CMAKE_FIND_ROOT_PATH_MODE_INCLUDE ONLY)
set(CMAKE_FIND_ROOT_PATH_MODE_PACKAGE ONLY)
```

03 cmake交叉编译配置

CMakeLists.txt

修改OpenCV项目中的CMakelists.txt文件，关于其定义交叉编译这一块的内容即可是其能够使用RISC-V交叉编译工具进行编译。

03 cmake交叉编译配置

OpenCV Project Ideas List:

Index	to	Ideas	Below
Circular Calibration	Data Augmentation 1 2	GPU backend for DNN	Binary Neural Nets
Model Zoo	Point Coordinate Regression	Differential Rendering	Image Processing
April Tags or Geometric April Tags	Optical Flow	Python OpenCV	Depth Fusion
Face Landmarks	Boosted Cascades	Tutorials: General; Machine Learning	OpenCV GUI
DNN Quantization	DNN Super-Resolution	Deep Alpha Matting 1 2	Deep Nets on Video
Add Training DNN			

来源于:https://github.com/opencv/opencv/wiki/GSoC_2019

谢 谢

欢迎交流合作

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