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Python常用代码段

- 最新版本： `v1.5`
- 更新时间： `20210817`

简介

整理出crifan总结的Python各个方面常用的代码段，供需要的参考。包括通用逻辑、变量、系统、日期时间、字符和字符串、文件系统，比如文件和文件夹等、以及第三方库，比如BeautifulSoup、以及多媒体音视频类、包括Pillow、以及网络的Requests等，；以及其他常见语法，包括dict字典、list列表、set集合、enum枚举、collections集合等。

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鸣谢

感谢我的老婆**陈雪**的包容理解和悉心照料，才使得我 `crifan` 有更多精力去专注技术专研和整理归纳出这些电子书和技术教程，特此鸣谢。

更多其他电子书

本人 `crifan` 还写了其他 `100+` 本电子书教程，感兴趣可移步至：

crifan/crifan_ebook_readme: Crifan的电子书的使用说明

背景

多年的技术开发，积累了很多关于 Python 的常用的一些函数和功能，都已整理到对应的函数库中：

https://github.com/crifan/crifanLibPython

且也给出了很多函数的demo演示如何使用：

https://github.com/crifan/crifanLibPython/tree/master/crifanLib/demo

但还是解释的不够清楚和全面。

故此处专门把Python的常用的代码段和调用举例，都整理至此，详细解释。

目的：

方便需要时能**快速查阅**：直接看代码，一看就懂，无需额外解释。

常用代码段

下面总结各个方面的Python常用代码段。

通用逻辑

多次运行一个函数，直到成功运行

执行一个函数（可能有多个可变数量的参数），且尝试多次，直到成功或超出最大此时，最终实现是：

```
def multipleRetry(functionInfoDict, maxRetryNum=5, sleepInt
    """
    do something, retry mutiple time if fail

    Args:
        functionInfoDict (dict): function info dict contai
        maxRetryNum (int): max retry number
        sleepInterval (float): sleep time of each interval
        isShowErrWhenFail (bool): show error when fail if t
    Returns:
        bool
    Raises:
    """
    doSuccess = False
    functionCallback = functionInfoDict["functionCallback"]
    functionParaDict = functionInfoDict.get("functionParaDi

    curRetryNum = maxRetryNum
    while curRetryNum > 0:
        if functionParaDict:
            doSuccess = functionCallback(**functionParaDict
        else:
            doSuccess = functionCallback()

        if doSuccess:
            break

        time.sleep(sleepInterval)
        curRetryNum -= 1


    if not doSuccess:
        if isShowErrWhenFail:
            functionName = str(functionCallback)
            # '<bound method DevicesMethods.switchToAppSto
            logging.error("Still fail after %d retry for %s
    return doSuccess
```

说明：

`functionCallback` 函数类型都要符合：返回值是bool类型才可以

调用举例：

（1）没有额外参数

```
foundAndClickedWifi = CommonUtils.multipleRetry({"functionC
```

其中：

```
def iOSFromSettingsIntoWifiList(self):
。。。
    foundAndClickedWifi = self.findAndClickElement(query=wi
    return foundAndClickedWifi
```

类似例子：

```
isSwitchOk = self.multipleRetry({"functionCallback": self.s
```

对比之前原始写法：

```
isSwitchOk = self.switchToAppStoreSearchTab()
```

其他类似例子：

```
foundAndClickedDownload = self.multipleRetry({"functionCal
```

详见：

【已解决】AppStore自动安装iOS的app：逻辑优化加等待和多试几次

（2）有额外参数，参数个数：2个

```
searchInputQuery = {"type":"XCUIElementTypeSearchField", "n
isInputOk = CommonUtils.multipleRetry(
    {
        "functionCallback": self.wait_element_setText,
        "functionParaDict": {
            "locator": searchInputQuery,
            "text": appName,
        }
    }
)
```

对比之前原始写法：

```
searchInputQuery = {"type":"XCUIElementTypeSearchField", "
isInputOk = self.wait_element_setText(searchInputQuery, app
```

其中wait_element_setText的定义是：

```
def wait_element_setText(self, locator, text):
```

对应着之前传入时的：

```
"functionParaDict": {
    "locator": searchInputQuery,
    "text": appName,
}
```

（3）有额外参数，且加上multipleRetry的额外参数

```
isSwitchOk = CommonUtils.multipleRetry(
    {"functionCallback": self.switchToAppStoreSearchTab},
    maxRetryNum = 10,
    sleepInterval = 0.5,
)
```

以及类似的：

```
isIntoDetailOk = self.multipleRetry(
    {
        "functionCallback": self.appStoreSearchResultIntoDe
        "functionParaDict": {
            "appName": appName,
        }
    },
    sleepInterval=0.5
)
```

之前原始写法：

```
isIntoDetailOk = self.appStoreSearchResultIntoDetail(appNar
```

注：

此处是后来加上的

`sleepInterval=0.5`

是因为后来遇到了，即使尝试了5次，依旧没找到，所以增加了没找到的延迟等待时间。

详见：

【已解决】AppStore自动安装iOS的app：逻辑优化加等待和多试几次

（4）

```
isIntoDetailOk = CommonUtils.multipleRetry(
    {
        "functionCallback": self.appStoreSearchResultIntoDe
        "functionParaDict": {
            "appName": appName,
        }
    },
    maxRetryNum = 10,
    sleepInterval = 0.5,
)
```

新版：新增参数isRespFullRetValue

此处最后更新：`20200925`

后续多次优化新增参数：是否返回完整信息

代码：

```
def multipleRetry(functionInfoDict, maxRetryNum=5, sleepInt
    """do something, retry if single call failed, retry mu

    Args:
        functionInfoDict (dict): function info dict contai
        maxRetryNum (int): max retry number
        sleepInterval (float): sleep time (seconds) of eac
        isShowErrWhenFail (bool): show error when fail if
        isRespFullRetValue (bool): whether return full retu
    Returns:
        isRespFullRetValue=False: bool
        isRespFullRetValue=True: bool / tuple/list/...
    Raises:
    """
    finalReturnValue = None
    doSuccess = False
    functionCallback = functionInfoDict["functionCallback"]
    functionParaDict = functionInfoDict.get("functionParaD

    curRetryNum = maxRetryNum
    while curRetryNum > 0:
        if functionParaDict:
            # doSuccess = functionCallback(**functionParaD
            respValue = functionCallback(**functionParaDict
        else:
            # doSuccess = functionCallback()
            respValue = functionCallback()

        doSuccess = False
        if isinstance(respValue, bool):
            doSuccess = bool(respValue)
        elif isinstance(respValue, tuple):
            doSuccess = bool(respValue[0])
        elif isinstance(respValue, list):
            doSuccess = bool(respValue[0])
        else:
            Exception("multipleRetry: Not support type of

        if isRespFullRetValue:
            finalReturnValue = respValue
        else:
            finalReturnValue = doSuccess

        if doSuccess:
            break

        time.sleep(sleepInterval)
        curRetryNum -= 1

    if not doSuccess:
```

```
        if isShowErrWhenFail:
            functionName = str(functionCallback)
            # '<bound method DevicesMethods.switchToAppSto
            logging.error("Still fail after %d retry for %s
    # return doSuccess
    return finalReturnValue
```

调用举例：

(1)默认不返回完整信息，只返回bool值

```
respBoolOrTuple = CommonUtils.multipleRetry(
    functionInfoDict = {
        "functionCallback": self.isGotoPayPopupPage,
        "functionParaDict": {
            "isRespLocation": False,
        },
    },
)
```

(2)返回完整信息

```
respBoolOrTuple = CommonUtils.multipleRetry(
    functionInfoDict = {
        "functionCallback": self.isGotoPayPopupPage,
        "functionParaDict": {
            "isRespLocation": True,
        },
    },
    isRespFullRetValue = True,
)
```

变量

判断变量类型

优先用 `isinstance` ，而不是 `type`

```
>>> isinstance(2, float)
False
>>> isinstance('a', (str, unicode))
True
>>> isinstance((2, 3), (str, list, tuple))
True
```

系统

此处整理用Python处理系统相关的通用的代码。

系统类型

```
import sys

def osIsWinows():
    return sys.platform == "win32"

def osIsCygwin():
    return sys.platform == "cygwin"

def osIsMacOS():
    return sys.platform == "darwin"

def osIsLinux():
    return sys.platform == "linux"

def osIsAix():
    return sys.platform == "aix"
```

命令行

获取命令行执行命令返回结果

代码：

```
def get_cmd_lines(cmd, text=False):
    # 执行cmd命令，将结果保存为列表
    resultStr = ""
    resultStrList = []
    try:
        consoleOutputByte = subprocess.check_output(cmd, sh
        try:
            resultStr = consoleOutputByte.decode("utf-8")
        except UnicodeDecodeError:
            # TODO: use chardet auto detect encoding
            # consoleOutputStr = consoleOutputByte.decode('
            resultStr = consoleOutputByte.decode("gb18030")

        if not text:
            resultStrList = resultStr.splitlines()
    except Exception as err:
        print("err=%s when run cmd=%s" % (err, cmd))

    if text:
        return resultStr
    else:
        return resultStrList
```

硬件信息

获取当前电脑（Win或Mac）的序列号

代码：

```
def getSerialNumber(self):
    """get current computer serial number"""
    # cmd = "wmic bios get serialnumber"
    cmd = ""
    if CommonUtils.osIsWinows():
        # Windows
        cmd = "wmic bios get serialnumber"
    elif CommonUtils.osIsMacOS():
        # macOS
        cmd = "system_profiler SPHardwareDataType | awk '/S
    # TODO: add support other OS
    # AIX: aix
    # Linux: linux
    # Windows/Cygwin: cygwin

    serialNumber = ""
    lines = CommonUtils.get_cmd_lines(cmd)
    if CommonUtils.osIsWinows():
        # Windows
        serialNumber = lines[1]
    elif CommonUtils.osIsMacOS():
        # macOS
        serialNumber = lines[0] # C02Y3N10JHC8

    return serialNumber
```

日期时间

详见：

https://github.com/crifan/crifanLibPython/blob/master/crifanLib/crifanDatetime.py

---

getCurDatetimeStr 生成当前日期时间字符串

```
def getCurDatetimeStr(outputFormat="%Y%m%d_%H%M%S"):
    """
    get current datetime then format to string

    eg:
        20171111_220722

    :param outputFormat: datetime output format
    :return: current datetime formatted string
    """
    curDatetime = datetime.now() # 2017-11-11 22:07:22.705
    curDatetimeStr = curDatetime.strftime(format=outputForr
    return curDatetimeStr
```

调用举例：

```
curDatetimeStr = getCurDatetimeStr() # '20191219_143400'
```

datetime转时间戳

```
import time

def datetimeToTimestamp(self, datetimeVal, withMilliseconds
    """
        convert datetime value to timestamp
        eg:
            "2006-06-01 00:00:00.123" -> 1149091200
            if with milliseconds -> 1149091200123
    :param datetimeVal:
    :return:
    """
    timetupleValue = datetimeVal.timetuple()
    timestampFloat = time.mktime(timetupleValue) # 1531468
    timestamp10DigitInt = int(timestampFloat) # 1531468736
    timestampInt = timestamp10DigitInt

    if withMilliseconds:
        microsecondInt = datetimeVal.microsecond # 817762
        microsecondFloat = float(microsecondInt)/float(1000
        timestampFloat = timestampFloat + microsecondFloat
        timestampFloat = timestampFloat * 1000 # 153146873
        timestamp13DigitInt = int(timestampFloat) # 153146
        timestampInt = timestamp13DigitInt

    return timestampInt
```

获取当前时间戳

```
from datetime import datetime

def getCurTimestamp(withMilliseconds=False):
    """
    get current time's timestamp
        (default)not milliseconds -> 10 digits: 1351670162
        with milliseconds -> 13 digits: 1531464292921
    """
    curDatetime = datetime.now()
    return datetimeToTimestamp(curDatetime, withMillisecon
```

时间戳精确到毫秒

```
from datetime import datetime,timedelta
timestampStr = datetime.now().strftime("%Y%m%d_%H%M%S_%f")
# 20180712_154134_660436
```

字符和字符串

详见：

https://github.com/crifan/crifanLibPython/blob/master/crifanLib/crifanFile.py

---

Python3 str转bytes

Python 3中，把字符串转换成字节码，可以有两种写法：

- 方法1：用bytes去转换

```
convertedBytes = bytes(originStr)
```

- 方法2：用字符串str的编码encode

```
encodedBytes = originStr.encode()
```

其中：

都有额外的encoding参数：

- 由于默认都是UTF-8
  - 所以可加可不加
- 也可以根据需要，去加其他你要的编码
  - 如果要加，就是：

```
convertedBytes = bytes(originStr, "UTF-8")
encodedBytes = originStr.encode("UTF-8")
```

字符串格式化为人类易读格式

```
def formatSize(sizeInBytes, decimalNum=1, isUnitWithI=False
  """
    format size to human readable string

    example:
      3746 -> 3.7KB
      87533 -> 85.5KiB
      98654 -> 96.3 KB
      352 -> 352.0B
      76383285 -> 72.84MB
      763832854988542 -> 694.70TB
      7638328549885426665 -> 678.4199PB

    refer:
      https://stackoverflow.com/questions/1094841/reusable-
  """
  # https://en.wikipedia.org/wiki/Binary_prefix#Specific_un
  # K=kilo, M=mega, G=giga, T=tera, P=peta, E=exa, Z=zetta,
  sizeUnitList = ['','K','M','G','T','P','E','Z']
  largestUnit = 'Y'

  if isUnitWithI:
    sizeUnitListWithI = []
    for curIdx, eachUnit in enumerate(sizeUnitList):
      unitWithI = eachUnit
      if curIdx >= 1:
        unitWithI += 'i'
      sizeUnitListWithI.append(unitWithI)

    # sizeUnitListWithI = ['','Ki','Mi','Gi','Ti','Pi','Ei
    sizeUnitList = sizeUnitListWithI

    largestUnit += 'i'

  suffix = "B"
  decimalFormat = "." + str(decimalNum) + "f" # ".1f"
  finalFormat = "%" + decimalFormat + sizeUnitSeperator + '
  sizeNum = sizeInBytes
  for sizeUnit in sizeUnitList:
      if abs(sizeNum) < 1024.0:
        return finalFormat % (sizeNum, sizeUnit, suffix)
      sizeNum /= 1024.0
  return finalFormat % (sizeNum, largestUnit, suffix)
```

调用：

```
def testKb():
  kbSize = 3746
  kbStr = formatSize(kbSize)
  print("%s -&gt; %s" % (kbSize, kbStr))

def testI():
  iSize = 87533
  iStr = formatSize(iSize, isUnitWithI=True)
  print("%s -&gt; %s" % (iSize, iStr))

def testSeparator():
  seperatorSize = 98654
  seperatorStr = formatSize(seperatorSize, sizeUnitSeperato
  print("%s -&gt; %s" % (seperatorSize, seperatorStr))

def testBytes():
  bytesSize = 352
  bytesStr = formatSize(bytesSize)
  print("%s -&gt; %s" % (bytesSize, bytesStr))

def testMb():
  mbSize = 76383285
  mbStr = formatSize(mbSize, decimalNum=2)
  print("%s -&gt; %s" % (mbSize, mbStr))

def testTb():
  tbSize = 763832854988542
  tbStr = formatSize(tbSize, decimalNum=2)
  print("%s -&gt; %s" % (tbSize, tbStr))

def testPb():
  pbSize = 7638328549885426665
  pbStr = formatSize(pbSize, decimalNum=4)
  print("%s -&gt; %s" % (pbSize, pbStr))

def demoFormatSize():
  testKb()
  testI()
  testSeparator()
  testBytes()
  testMb()
  testTb()
  testPb()
```

文件系统

最新代码详见：

- https://github.com/crifan/crifanLibPython/blob/master/python3/crifanLib/crifanFile.py
- https://github.com/crifan/crifanLibPython/blob/master/python3/crifanLib/demo/crifanFileDemo.py

文件

获取文件最后更新时间

```
import os

def getUpdateTime(curFileOrPath):
    """get file/folder latest update time = modify time

    Args:
        curFileOrPath (str): some file or folder path
    Returns:
        int: time stamp int of 13 digit, with milliseconds
    Raises:
    """
    updateTime = None
    try:
        modifyTime = os.path.getmtime(curFileOrPath) # 1593
        updateTime = int(modifyTime * 1000) # 159374864132
    except OSError as err:
        errMsg = str(err)
        # print("errMsg=%s" % errMsg)
        pass

    return updateTime
```

详见：

【已解决】Python中获取文件最后更新时间

提取文件名后缀

```
def extractSuffix(fileNameOrUrl):
    """
    extract file suffix from name or url
    eg:
https://cdn2.qupeiyin.cn/2018-09-10/15365514898246.mp4 -> m
        15365514894833.srt -> srt
    """
    return fileNameOrUrl.split('.')[-1]
```

创建空文件

```
import os

def createEmptyFile(fullFilename):
    """Create a empty file like touch"""
    filePath = os.path.dirname(fullFilename)
    # create folder if not exist
    if not os.path.exists(filePath):
        os.makedirs(filePath)

    with open(fullFilename, 'a'):
        # Note: not use 'w' for maybe conflict for others
        os.utime(fullFilename, None)
```

读取文件二进制数据

```
def readBinDataFromFile(fileToRead):
    """Read binary data from file"""
    binaryData = None
    try:
        readFp = open(fileToRead, "rb")
        binaryData = readFp.read()
        readFp.close()
    except:
        binaryData = None


    return binaryData
```

调用：

```
imgBinData = readBinDataFromFile(imageFullPath)
```

保存二进制数据到文件

```
def saveDataToFile(fullFilename, binaryData):
    """save binary data info file"""
    with open(fullFilename, 'wb') as fp:
        fp.write(binaryData)
        fp.close()
        # print("Complete save file %s" % fullFilename)
```

保存json到文件

```
import json
import codecs

def saveJsonToFile(fullFilename, jsonValue):
    """save json dict into file"""
    with codecs.open(fullFilename, 'w', encoding="utf-8") a
        json.dump(jsonValue, jsonFp, indent=2, ensure_asci
        # print("Complete save json %s" % fullFilename)
```

从文件中加载出json

```
import json
import codecs

def loadJsonFromFile(fullFilename):
    """load and parse json dict from file"""
    with codecs.open(fullFilename, 'r', encoding="utf-8") a
        jsonDict = json.load(jsonFp)
        # print("Complete load json from %s" % fullFilename
        return jsonDict
```

通过二进制生成文件类型对象

（1）Python 3

```
import io

audioBinaryData = audioObj.read()
audioFileLikeObj = io.BytesIO(audioBinaryData)
```

得到对应的文件类型的对象的：`<_io.BytesIO object at 0x115964468>`，即可去像操作文件一样去操作这个io。

（2）Python 2

```
import StringIO

audioFileLikeObj = StringIO.StringIO()
audioFileLikeObj.write(audioBinaryData)
```

一行代码把字符串写入保存到文件

```
open(fullFilePath, "w").write(fileContentStr).close()
```

举例：

```
open("0408_1600.xml", "w").write(page).close()
```

给文件增加可执行权限：实现 chmod +x 的效果

代码：

```
import os
import stat

curState = os.stat(someFile)
newState = curState.st_mode | stat.S_IEXEC
os.chmod(someFile, newState)
```

再去优化为函数：

```
import os
import stat

def chmodAddX(someFile):
    """add file executable mode, like chmod +x

    Args:
        someFile (str): file full path
    Returns:
        soup
    Raises:
    """
    if os.path.exists(someFile):
        if os.path.isfile(someFile):
            # add executable
            curState = os.stat(someFile)
            newState = curState.st_mode | stat.S_IEXEC
            os.chmod(someFile, newState)
```

调用：

```
chmodAddX(shellFullPath)
```

继续优化：

参考 How do you do a simple "chmod +x" from within python? - Stack Overflow

如果想要加上，给任何人都有可执行权限，则可以用：

```
def chmodAddX(someFile):
    """add file executable mode, like chmod +x

    Args:
        someFile (str): file full path
    Returns:
        soup
    Raises:
    """
    if os.path.exists(someFile):
        if os.path.isfile(someFile):
            # add executable
            curState = os.stat(someFile)
            # STAT_OWNER_EXECUTABLE = stat.S_IEXEC
            # executableMode = STAT_OWNER_EXECUTABLE
            STAT_EVERYONE_EXECUTABLE = stat.S_IXUSR | stat.
            executableMode = STAT_EVERYONE_EXECUTABLE
            newState = curState.st_mode | executableMode
            os.chmod(someFile, newState)
```

效果：

- 之前：`-rw-r--r--`
- 之后：`-rwxr-xr-x`
  - 给 user group other 都加上 `x` 的**可执行权限**

详见：

【已解决】Python中给Mac中文件加上可执行权限

判断是否是文件对象

```python
import sys

def isFileObject(fileObj):
    """check is file like object or not"""
    if sys.version_info[0] == 2:
        return isinstance(fileObj, file)
    else:
        # for python 3:
        # has read() method for:
        # io.IOBase
        # io.BytesIO
        # io.StringIO
        # io.RawIOBase
        return hasattr(fileObj, 'read')
```

计算当前文件名，如果重名，则位数加1

```
import os
import re

def findNextNumberFilename(curFilename):
    """Find the next available filename from current name

    Args:
        curFilename (str): current filename
    Returns:
        next available (not existed) filename
    Raises:
    Examples:
        (1) 'crifanLib/demo/input/image/20201219_172616_dra
            not exist -> 'crifanLib/demo/input/image/20201
        (2) 'crifanLib/demo/input/image/20191219_172616_dra
            exsit -> next until not exist 'crifanLib/demo/
    """
    newFilename = curFilename

    newPathRootPart, pointSuffix = os.path.splitext(newFile
    # 'crifanLib/demo/input/image/20191219_172616_drawRect_
    filenamePrefix = newPathRootPart
    while os.path.exists(newFilename):
        newTailNumberInt = 1
        foundTailNumber = re.search("^(?P<filenamePrefix>.+
        if foundTailNumber:
            tailNumberStr = foundTailNumber.group("tailNumb
            tailNumberInt = int(tailNumberStr)
            newTailNumberInt = tailNumberInt + 1 # 2
            filenamePrefix = foundTailNumber.group("filenam
        # existed previously saved, change to new name
        newPathRootPart = "%s_%s" % (filenamePrefix, newTai
        # 'crifanLib/demo/input/image/20191219_172616_drawR
        newFilename = newPathRootPart + pointSuffix
        # 'crifanLib/demo/input/image/20191219_172616_drawR

    return newFilename
```

调用：

```
notExistFile = "crifanLib/demo/input/image/some_not_exist
nextFilename = findNextNumberFilename(notExistFile)
print("notExistFile=%s -> nextFilename=%s" % (notExistFi
# notExistFile=crifanLib/demo/input/image/some_not_exist_

realExistFile = "crifanLib/demo/input/image/20191219_172
nextUntilNotExistFilename = findNextNumberFilename(realEx
print("realExistFile=%s -> nextUntilNotExistFilename=%s"
# realExistFile=crifanLib/demo/input/image/20191219_1726
```

从文件名后缀推断出MIME类型

用库：

- mime
  - GitHub
    - https://github.com/liluo/mime

安装mime：

```
pip install mime
```

代码：

```
import mime

fileMimeType = mime.Types.of(curAudioFullFilename)[0].conte
```

- 输入文件：`'Lots of Hearts.mp3'`
- 输出信息：`'audio/mpeg'`

文件夹=文件路径

新建文件夹

对于：`python 3.2+`

```
import os

def createFolder(folderFullPath):
    """
        create folder, even if already existed
        Note: for Python 3.2+
    """
    os.makedirs(folderFullPath, exist_ok=True)
    # print("Created folder: %s" % folderFullPath)
```

或：

对于：`python 3.5+`

```
import pathlib
pathlib.Path('/my/directory').mkdir(parents=True, exist_ok=
```

批量删除非空文件夹

```
import shutil

if os.path.exists(folderToDelete):
    shutil.rmtree(folderToDelete)
```

注意：

- 删除之前要先用 `os.path.exists` 判断是非存在该目录
  - 如果不存在就去删除，则会报错：`OSError: [Errno 2] No such file or directory`

os.path 路径处理

```python
#!/usr/bin/python
# -*- coding: utf-8 -*-
# Author: Crifan Li
# Update: 20191219
# Function: Demo os.path common used functions

import os

def osPathDemo():
    currentSystemInfo = os.uname()
    print("currentSystemInfo=%s" % (currentSystemInfo, ))
    # currentSystemInfo=posix.uname_result(sysname='Darwin

    pathSeparatorInCurrentOS = os.path.sep
    print("pathSeparatorInCurrentOS=%s" % pathSeparatorInCu
    # pathSeparatorInCurrentOS=/

    fullFilePath = "/Users/limao/dev/crifan/python/notEnou
    print("fullFilePath=%s" % fullFilePath)
    # fullFilePath=/Users/limao/dev/crifan/python/notEnough

    dirname = os.path.dirname(fullFilePath)
    print("dirname=%s" % dirname)
    # dirname=/Users/limao/dev/crifan/python/notEnoughUnpa
    basename = os.path.basename(fullFilePath)
    print("basename=%s" % basename)
    # basename=Snip20191212_113.png
    joinedFullPath = os.path.join(dirname, basename)
    print("joinedFullPath=%s" % joinedFullPath)
    # joinedFullPath=/Users/limao/dev/crifan/python/notEnou
    isSame = (fullFilePath == joinedFullPath)
    print("isSame=%s" % isSame)
    # isSame=True

    root, pointSuffix = os.path.splitext(fullFilePath)
    print("root=%s, pointSuffix=%s" % (root, pointSuffix))
    # root=/Users/limao/dev/crifan/python/notEnoughUnpack/S
    head, tail = os.path.split(fullFilePath)
    print("head=%s, tail=%s" % (head, tail))
    # head=/Users/limao/dev/crifan/python/notEnoughUnpack,
    drive, tail = os.path.splitdrive(fullFilePath)
    print("drive=%s, tail=%s" % (drive, tail))
    # drive=, tail=/Users/limao/dev/crifan/python/notEnough

    curPath = os.getcwd()
    print("curPath=%s" % curPath)
    # curPath=/Users/limao/dev/crifan/python
    relativePath = os.path.relpath(fullFilePath)
    print("relativePath=%s" % relativePath)
    # relativePath=notEnoughUnpack/Snip20191212_113.png
```

```
    isFile = os.path.isfile(fullFilePath)
    print("isFile=%s" % isFile)
    # isFile=True
    isDirectory = os.path.isdir(fullFilePath)
    print("isDirectory=%s" % isDirectory)
    # isDirectory=False

    fileSize = os.path.getsize(fullFilePath)
    print("fileSize=%s" % fileSize)
    # fileSize=368810

    isFileOrFolderRealExist = os.path.exists(fullFilePath)
    print("isFileOrFolderRealExist=%s" % isFileOrFolderRea
    # isFileOrFolderRealExist=True

if __name__ == "__main__":
    osPathDemo()
```

列出目录中的文件（和文件夹，且支持递归）

```
def listSubfolderFiles(subfolder, isIncludeFolder=True, isR
    """os.listdir recursively

    Args:
        subfolder (str): sub folder path
        isIncludeFolder (bool): whether is include folder.
        isRecursive (bool): whether is recursive, means co
    Returns:
        list of str
    Raises:
    """
    allSubItemList = []
    curSubItemList = os.listdir(path=subfolder)
    for curSubItem in curSubItemList:
        curSubItemFullPath = os.path.join(subfolder, curSub
        if os.path.isfile(curSubItemFullPath):
            allSubItemList.append(curSubItemFullPath)
        else:
            if isIncludeFolder:
                if os.path.isdir(curSubItemFullPath):
                    subSubItemList = listSubfolderFiles(cu
                    allSubItemList.extend(subSubItemList)

    if isIncludeFolder:
        allSubItemList.append(subfolder)

    return allSubItemList
```

多媒体

详见：

- https://github.com/crifan/crifanLibPython/blob/master/crifanLib/crifanMultimedia.py
- https://github.com/crifan/crifanLibPython/blob/master/crifanLib/demo/crifanMultimediaDemo.py

---

此处整理多媒体相关的常用Python代码段，主要包含如下内容：

- 图片=图像
- 音频
- 视频

图像

Python中图像处理用的最多是： `Pillow`

下面图像处理处理的代码，基本上都是用 `Pillow` 实现的。

Pillow

- Pillow
  - 继承自：`PIL`
    - `PIL` = `Python Imaging Library`
  - 官网资料：
    - Image Module — Pillow (PIL Fork) 7.0.0 documentation
    - Image Module — Pillow (PIL Fork) 3.1.2 documentation

从二进制生成Image

```
if isinstance(inputImage, bytes):
  openableImage = io.BytesIO(inputImage)
  curPillowImage = Image.open(openableImage)
```

pillow变量是：

```
# <PIL.PngImagePlugin.PngImageFile image mode=RGBA size=354
# <PIL.JpegImagePlugin.JpegImageFile image mode=RGB size=10
```

详见：

- 【已解决】Python如何从二进制数据中生成Pillow的Image
- 【已解决】Python的Pillow如何从二进制数据中读取图像数据

从Pillow的Image获取二进制数据

```
import io

imageIO = io.BytesIO()
curImg.save(imageIO, curImg.format)
imgBytes = imageIO.getvalue()
```

详见：

【已解决】Python的Pillow如何返回图像的二进制数据

缩放图片

```
import io
from PIL import Image, ImageDraw

def resizeImage(inputImage,
                newSize,
                resample=Image.BICUBIC, # Image.LANCZOS,
                outputFormat=None,
                outputImageFile=None
                ):
    """
        resize input image
        resize normally means become smaller, reduce size
    :param inputImage: image file object(fp) / filename / b
    :param newSize: (width, height)
    :param resample: PIL.Image.NEAREST, PIL.Image.BILINEAR,
        https://pillow.readthedocs.io/en/stable/reference/I
    :param outputFormat: PNG/JPEG/BMP/GIF/TIFF/WebP/..., mo
        https://pillow.readthedocs.io/en/stable/handbook/im
        if input image is filename with suffix, can omit th
    :param outputImageFile: output image file filename
    :return:
        input image file filename: output resized image to
        input image binary bytes: resized image binary byte
    """
    openableImage = None
    if isinstance(inputImage, str):
        openableImage = inputImage
    elif isFileObject(inputImage):
        openableImage = inputImage
    elif isinstance(inputImage, bytes):
        inputImageLen = len(inputImage)
        openableImage = io.BytesIO(inputImage)

    imageFile = Image.open(openableImage) # <PIL.PngImageP
    imageFile.thumbnail(newSize, resample)
    if outputImageFile:
        # save to file
        imageFile.save(outputImageFile)
        imageFile.close()
    else:
        # save and return binary byte
        imageOutput = io.BytesIO()
        # imageFile.save(imageOutput)
        outputImageFormat = None
        if outputFormat:
            outputImageFormat = outputFormat
        elif imageFile.format:
            outputImageFormat = imageFile.format
        imageFile.save(imageOutput, outputImageFormat)
        imageFile.close()
```

```
        compressedImageBytes = imageOutput.getvalue()
        compressedImageLen = len(compressedImageBytes)
        compressRatio = float(compressedImageLen)/float(inp
        print("%s -> %s, resize ratio: %d%%" % (inputImageL
        return compressedImageBytes
```

调用：

```
import sys
import os
curFolder = os.path.abspath(__file__)
parentFolder = os.path.dirname(curFolder)
parentParentFolder = os.path.dirname(parentFolder)
parentParentParentFolder = os.path.dirname(parentParentFold
sys.path.append(curFolder)
sys.path.append(parentFolder)
sys.path.append(parentParentFolder)
sys.path.append(parentParentParentFolder)

import datetime
from crifanMultimedia import resizeImage

def testFilename():
  imageFilename = "/Users/crifan/dev/tmp/python/resize_imag
  outputImageFilename = "/Users/crifan/dev/tmp/python/resiz
  print("imageFilename=%s" % imageFilename)
  beforeTime = datetime.datetime.now()
  resizeImage(imageFilename, (300, 300), outputImageFile=ou
  afterTime = datetime.datetime.now()
  print("procesTime: %s" % (afterTime - beforeTime))

  outputImageFilename = "/Users/crifan/dev/tmp/python/resiz
  beforeTime = datetime.datetime.now()
  resizeImage(imageFilename, (800, 800), outputImageFile=ou
  afterTime = datetime.datetime.now()
  print("procesTime: %s" % (afterTime - beforeTime))

def testFileObject():
  imageFilename = "/Users/crifan/dev/tmp/python/resize_imag
  imageFileObj = open(imageFilename, "rb")
  outputImageFilename = "/Users/crifan/dev/tmp/python/resiz
  beforeTime = datetime.datetime.now()
  resizeImage(imageFileObj, (600, 600), outputImageFile=out
  afterTime = datetime.datetime.now()
  print("procesTime: %s" % (afterTime - beforeTime))

def testBinaryBytes():
  imageFilename = "/Users/crifan/dev/tmp/python/resize_imag
  imageFileObj = open(imageFilename, "rb")
  imageBytes = imageFileObj.read()
  # return binary bytes
  beforeTime = datetime.datetime.now()
  resizedImageBytes = resizeImage(imageBytes, (800, 800))
  afterTime = datetime.datetime.now()
  print("procesTime: %s" % (afterTime - beforeTime))
  print("len(resizedImageBytes)=%s" % len(resizedImageBytes

  # save to file
```

```
    outputImageFilename = "/Users/crifan/dev/tmp/python/resiz
    beforeTime = datetime.datetime.now()
    resizeImage(imageBytes, (750, 750), outputImageFile=outpu
    afterTime = datetime.datetime.now()
    print("procesTime: %s" % (afterTime - beforeTime))

    imageFileObj.close()

def demoResizeImage():
    testFilename()
    testFileObject()
    testBinaryBytes()

if __name__ == "__main__":
    demoResizeImage()

    # imageFilename=/Users/crifan/dev/tmp/python/resize_image
    # procesTime: 0:00:00.619377
    # procesTime: 0:00:00.745228
    # procesTime: 0:00:00.606060
    # 1146667 -> 753258, resize ratio: 65%
    # procesTime: 0:00:00.773289
    # len(resizedImageBytes)=753258
    # procesTime: 0:00:00.738237
```

给图片画元素所属区域的边框，且带自动保存加了框后的图片

```python
from PIL import Image
from PIL import ImageDraw

def imageDrawRectangle(inputImgOrImgPath,
    rectLocation,
    outlineColor="green",
    outlineWidth=0,
    isShow=False,
    isAutoSave=True,
    saveTail="_drawRect_%wx%h",
    isDrawClickedPosCircle=True,
    clickedPos=None,
):
    """Draw a rectangle for image (and a small circle), and

    Args:
        inputImgOrImgPath (Image/str): a pillow(PIL) Image
        rectLocation (tuple/list/Rect): the rectangle locat
        outlineColor (str): Color name
        outlineWidth (int): rectangle outline width
        isShow (bool): True to call image.show() for debug
        isAutoSave (bool): True to auto save the image file
        saveTail(str): save filename tail part. support for
        clickedPos (tuple): x,y of clicked postion; default
        isDrawClickedPosCircle (bool): draw small circle in
    Returns:
        modified image
    Raises:
    """
    inputImg = inputImgOrImgPath
    if isinstance(inputImgOrImgPath, str):
        inputImg = Image.open(inputImgOrImgPath)
    draw = ImageDraw.Draw(inputImg)

    isRectObj = False
    hasX = hasattr(rectLocation, "x")
    hasY = hasattr(rectLocation, "y")
    hasWidth = hasattr(rectLocation, "width")
    hasHeight = hasattr(rectLocation, "height")
    isRectObj = hasX and hasY and hasWidth and hasHeight
    if isinstance(rectLocation, tuple):
        x, y, w, h = rectLocation
    if isinstance(rectLocation, list):
        x = rectLocation[0]
        y = rectLocation[1]
        w = rectLocation[2]
        h = rectLocation[3]
    elif isRectObj:
        x = rectLocation.x
        y = rectLocation.y
```

```
            w = rectLocation.width
            h = rectLocation.height

        w = int(w)
        h = int(h)
        x0 = x
        y0 = y
        x1 = x0 + w
        y1 = y0 + h
        draw.rectangle(
            [x0, y0, x1, y1],
            # fill="yellow",
            # outline="yellow",
            outline=outlineColor,
            width=outlineWidth,
        )

        if isDrawClickedPosCircle:
            # radius = 3
            # radius = 2
            radius = 4
            # circleOutline = "yellow"
            circleOutline = "red"
            circleLineWidthInt = 1
            # circleLineWidthInt = 3

            if clickedPos:
                clickedX, clickedY = clickedPos
            else:
                clickedX = x + w/2
                clickedY = y + h/2
            startPointInt = (int(clickedX - radius), int(clicke
            endPointInt = (int(clickedX + radius), int(clickedY
            draw.ellipse([startPointInt, endPointInt], outline=

        if isShow:
            inputImg.show()

        if isAutoSave:
            saveTail = saveTail.replace("%x", str(x))
            saveTail = saveTail.replace("%y", str(y))
            saveTail = saveTail.replace("%w", str(w))
            saveTail = saveTail.replace("%h", str(h))

            inputImgPath = None
            if isinstance(inputImgOrImgPath, str):
                inputImgPath = str(inputImgOrImgPath)
            elif inputImg.filename:
                inputImgPath = str(inputImg.filename)

            if inputImgPath:
```

```
            imgFolderAndName, pointSuffix = os.path.splitex
            imgFolderAndName = imgFolderAndName + saveTail
            newImgPath = imgFolderAndName + pointSuffix
            newImgPath = findNextNumberFilename(newImgPath)
        else:
            curDatetimeStr = getCurDatetimeStr() # '201912
            suffix = str(inputImg.format).lower() # 'jpeg'
            newImgFilename = "%s%s.%s" % (curDatetimeStr, s
            imgPathRoot = os.getcwd()
            newImgPath = os.path.join(imgPathRoot, newImgFi

        inputImg.save(newImgPath)

    return inputImg
```

说明：

相关函数，详见：findNextNumberFilename，或者干脆去掉这个逻辑即可。

调用：

```
curBoundList = self.get_ElementBounds(eachElement)
curWidth = curBoundList[2] - curBoundList[0]
curHeight = curBoundList[3] - curBoundList[1]
curRect = [curBoundList[0], curBoundList[1], curWidth, curH
curImg = CommonUtils.imageDrawRectangle(curImg, curRect, is
```

或：

```
curTimeStr = CommonUtils.getCurDatetimeStr("%H%M%S")
curSaveTal = "_rect_{}_%x|%y|%w|%h".format(curTimeStr)
curImg = CommonUtils.imageDrawRectangle(imgPath, curRect, s
```

效果：

（1）给原图加上单个元素所属边框

（2）多次循环后，给同一张图中多个元素加上边框后

其他调用：

```
imageDrawRectangle(curPillowImg, curLocation)

imageDrawRectangle(curPillowImg, calculatedLocation)

curImg = imageDrawRectangle(imgPath, firstMatchLocation, c

curImg = imageDrawRectangle(imgPath, firstMatchLocation)
```

百度OCR

详见：

https://github.com/crifan/crifanLibPython/blob/master/crifanLib/crifanBaiduOcr.py

---

在做安卓和iOS的移动端自动化测试期间，会涉及到**从图像中提取文字**，用的是百度OCR。

其中有些通用的功能，整理出函数，贴出供参考。

百度OCR初始化

```
import os
import re
import base64
import requests
import time
import logging
from collections import OrderedDict
from PIL import Image, ImageDraw

class BaiduOCR():
    # OCR_URL = "https://aip.baidubce.com/rest/2.0/ocr/v1/g
    # OCR_URL = "https://aip.baidubce.com/rest/2.0/ocr/v1/g
    # OCR_URL = "https://aip.baidubce.com/rest/2.0/ocr/v1/a
    OCR_URL = "https://aip.baidubce.com/rest/2.0/ocr/v1/acc


    TOKEN_URL = 'https://aip.baidubce.com/oauth/2.0/token'


    RESP_ERR_CODE_QPS_LIMIT_REACHED = 18
    RESP_ERR_TEXT_QPS_LIMIT_REACHED = "Open api qps request


    RESP_ERR_CODE_DAILY_LIMIT_REACHED = 17
    RESP_ERR_TEXT_DAILY_LIMIT_REACHED = "Open api daily req


    API_KEY = 'SOxxxxxxxxxxnu'
    SECRET_KEY = 'wlxxxxxxxxxxxxxxxxxxxpL'


    def initOcr(self):
        self.curToken = self.baiduFetchToken()


    def baiduFetchToken(self):
        """Fetch Baidu token for OCR"""
        params = {
            'grant_type': 'client_credentials',
            'client_id': self.API_KEY,
            'client_secret': self.SECRET_KEY
        }


        resp = requests.get(self.TOKEN_URL, params=params)
        respJson = resp.json()


        respToken = ""
```

```
        if ('access_token' in respJson.keys() and 'scope' 
            if not 'brain_all_scope' in respJson['scope'].s
                logging.error('please ensure has check the 
            else:
                respToken = respJson['access_token']
        else:
            logging.error('please overwrite the correct API


        # '24.8691f3c6dedd0d0d0b30a9dfec604d52.2592000.1578
        return respToken
```

百度OCR图片转文字

```
def baiduImageToWords(self, imageFullPath):
    """Detect text from image using Baidu OCR api"""

    # # Note: if using un-paid = free baidu api, need follo
    # time.sleep(0.15)

    respWordsResutJson = ""

    # 读取图片二进制数据
    imgBinData = readBinDataFromFile(imageFullPath)
    encodedImgData = base64.b64encode(imgBinData)

    paramDict = {
        "access_token": self.curToken
    }

    headerDict = {
        "Content-Type": "application/x-www-form-urlencoded"
    }

    # 参数含义: http://ai.baidu.com/ai-doc/OCR/vk3h7y58v
    dataDict = {
        "image": encodedImgData,
        "recognize_granularity": "small",
        # "vertexes_location": "true",
    }
    resp = requests.post(self.OCR_URL, params=paramDict, he
    respJson = resp.json()

    logging.debug("baidu OCR: imgage=%s -> respJson=%s", im

    if "error_code" in respJson:
        logging.warning("respJson=%s" % respJson)
        errorCode = respJson["error_code"]
        # {'error_code': 17, 'error_msg': 'Open api daily r
        # {'error_code': 18, 'error_msg': 'Open api qps req
        # the limit count can found from
        # 文字识别 - 免费额度 | 百度AI开放平台
        # https://ai.baidu.com/ai-doc/OCR/fk3h7xu7h
        # for "通用文字识别（高精度含位置版）" is "50次/天"
        if errorCode == self.RESP_ERR_CODE_QPS_LIMIT_REACHE
            # wait sometime and try again
            time.sleep(1.0)
            resp = requests.post(self.OCR_URL, params=param
            respJson = resp.json()
            logging.debug("baidu OCR: for errorCode=%s, do
        elif errorCode == self.RESP_ERR_CODE_DAILY_LIMIT_RE
            logging.error("Fail to continue using baidu OCR
            respJson = None
```

```
    """
    {
    "log_id": 6937531796498618000,
    "words_result_num": 32,
    "words_result": [
        {
        "chars": [
            ...
    """
    if "words_result" in respJson:
        respWordsResutJson = respJson

    return respWordsResutJson
```

调用：

```
wordsResultJson = self.baiduImageToWords(imgPath)

respJson = self.baiduImageToWords(screenImgPath)
```

返回结果举例

安卓游戏 暗黑觉醒 首充豪礼

图片：

返回解析后出 `json` 格式的文字信息：

```
{
  "log_id": 9009770747370640007,
  "words_result_num": 12,
  "words_result": [
    {
      "chars": [
        {
          "char": "首",
          "location": { "width": 94, "top": 105, "left": 98
        },
        {
          "char": "充",
          "location": { "width": 94, "top": 105, "left": 10
        },
        {
          "char": "豪",
          "location": { "width": 95, "top": 105, "left": 1
        },
        {
          "char": "礼",
          "location": { "width": 77, "top": 105, "left": 1
        }
      ],
      "location": { "width": 370, "top": 105, "left": 989,
      "words": "首充豪礼"
    },
    {
      "chars": [
        {
          "char": "×",
          "location": { "width": 30, "top": 161, "left": 18
        }
      ],
      "location": { "width": 60, "top": 161, "left": 1887,
      "words": "×"
    },
    {
      "chars": [
        {
          "char": "充",
          "location": { "width": 43, "top": 273, "left": 75
        },
        {
          "char": "值",
          "location": { "width": 43, "top": 273, "left": 80
        },
        {
          "char": "元",
          "location": { "width": 67, "top": 273, "left": 9
        },
```

```
        {
          "char": "可",
          "location": { "width": 44, "top": 273, "left": 97
        },
        {
          "char": "领",
          "location": { "width": 43, "top": 273, "left": 10
        },
        {
          "char": "总",
          "location": { "width": 44, "top": 273, "left": 10
        },
        {
          "char": "价",
          "location": { "width": 23, "top": 273, "left": 13
        },
        {
          "char": "值",
          "location": { "width": 89, "top": 273, "left": 13
        },
        {
          "char": "8",
          "location": { "width": 36, "top": 273, "left": 12
        },
        {
          "char": "8",
          "location": { "width": 36, "top": 273, "left": 13
        },
        {
          "char": "8",
          "location": { "width": 35, "top": 273, "left": 13
        },
        {
          "char": "钻",
          "location": { "width": 43, "top": 273, "left": 14
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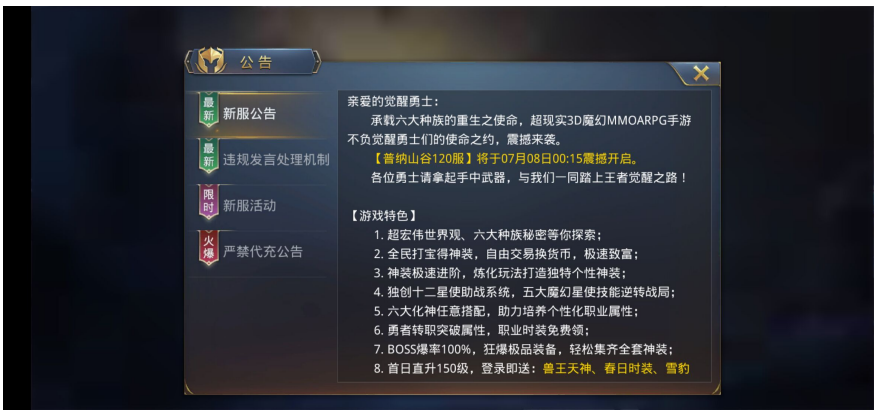
其中：

- 首充豪礼
  - 都能完整检测出来：已经是效果很不错了
  - 当然偶尔也会有失误，比如 偶尔
    - 只解析出部分内容：首充豪
    - 或个别字错了：首充豪机
      - 本身图片上 礼 也的确很像 机
        - 作为OCR犯此错误，完全可以理解

安卓游戏 暗黑觉醒 公告弹框

图片：



返回结果json：

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```

```
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```
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        }
      ],
      "location": { "width": 813, "top": 893, "left": 992,
      "words": "7.BOSS爆率100%,狂爆极品装备,轻松集齐全套神装;"
    },
    {
      "chars": [
        {
          "char": "8",
```

```
          "location": { "width": 25, "top": 945, "left": 99
        },
        {
          "char": ".",
          "location": { "width": 23, "top": 945, "left": 10
        },
        {
          "char": "首",
          "location": { "width": 44, "top": 945, "left": 10
        },
        {
          "char": "日",
          "location": { "width": 29, "top": 945, "left": 10
        },
        {
          "char": "直",
          "location": { "width": 29, "top": 945, "left": 1
        },
        {
          "char": "升",
          "location": { "width": 29, "top": 945, "left": 1
        },
        {
          "char": "1",
          "location": { "width": 23, "top": 945, "left": 1
        },
        {
          "char": "5",
          "location": { "width": 25, "top": 945, "left": 1
        },
        {
          "char": "0",
          "location": { "width": 25, "top": 945, "left": 1
        },
        {
          "char": "级",
          "location": { "width": 29, "top": 945, "left": 1
        },
        {
          "char": ",",
          "location": { "width": 25, "top": 945, "left": 1
        },
        {
          "char": "登",
          "location": { "width": 30, "top": 945, "left": 1
        },
        {
          "char": "录",
          "location": { "width": 29, "top": 945, "left": 1
        },
        {
```

```
          "char": "即",
          "location": { "width": 29, "top": 945, "left": 13
        },
        {
          "char": "送",
          "location": { "width": 29, "top": 945, "left": 13
        },
        {
          "char": ":",
          "location": { "width": 23, "top": 945, "left": 14
        },
        {
          "char": "兽",
          "location": { "width": 29, "top": 945, "left": 14
        },
        {
          "char": "王",
          "location": { "width": 29, "top": 945, "left": 14
        },
        {
          "char": "天",
          "location": { "width": 29, "top": 945, "left": 15
        },
        {
          "char": "神",
          "location": { "width": 29, "top": 945, "left": 15
        },
        {
          "char": "、",
          "location": { "width": 25, "top": 945, "left": 15
        },
        {
          "char": "春",
          "location": { "width": 29, "top": 945, "left": 16
        },
        {
          "char": "日",
          "location": { "width": 30, "top": 945, "left": 16
        },
        {
          "char": "时",
          "location": { "width": 29, "top": 945, "left": 16
        },
        {
          "char": "装",
          "location": { "width": 29, "top": 945, "left": 17
        },
        {
          "char": "、",
          "location": { "width": 25, "top": 945, "left": 17
        },
```

```
        {
          "char": "雪",
          "location": { "width": 29, "top": 945, "left": 17
        },
        {
          "char": "豹",
          "location": { "width": 28, "top": 945, "left": 18
        }
      ],
      "location": { "width": 879, "top": 945, "left": 968,
      "words": "8.首日直升150级,登录即送:兽王天神、春日时装、雪豹"
    }
  ]
}
```


计算文字的位置

背景：百度OCR返回的文字都是json字典，希望能从对应匹配到的单词，找到对应的位置坐标信息

代码：

```
def calcWordsLocation(self, wordStr, curWordsResult):
    """Calculate words location from result


    Args:
        wordStr (str): the words to check
        curWordsResult (dict): the baidu OCR result of curr
    Returns:
        location, a tuple (x, y, width, height)
    Raises:
    Examples
            wordStr="首充"
            curWordsResult= {
                    "chars": [
                        {
                        "char": "寻",
                        "location": {
                            "width": 15,
                            "top": 51,
                            "left": 725,
                            "height": 24
                        }
                        },
                        ...
                        {
                        "char": "首",
                        "location": {
                            "width": 15,
                            "top": 51,
                            "left": 971,
                            "height": 24
                        }
                        },
                        {
                        "char": "充",
                        "location": {
                            "width": 15,
                            "top": 51,
                            "left": 986,
                            "height": 24
                        }
                        }
                    ],
                    "location": {
                        "width": 280,
                        "top": 51,
                        "left": 725,
                        "height": 24
                    },
                    "words": "寻宝福利大厅商城首充"
```

```
                }
            -> (971, 51, 30, 24)
    """
    (x, y, width, height) = (0, 0, 0, 0)
    matchedStr = curWordsResult["words"]
    # Note: for special, contain multilple words, here only
    foundWords = re.search(wordStr, matchedStr)
    if foundWords:
        logging.debug("foundWords=%s" % foundWords)


        firstMatchedPos = foundWords.start()
        lastMatchedPos = foundWords.end() - 1


        matchedStrLen = len(matchedStr)
        charResultList = curWordsResult["chars"]
        charResultListLen = len(charResultList)


        firstCharResult = None
        lastCharResult = None
        if matchedStrLen == charResultListLen:
            firstCharResult = charResultList[firstMatchedPo
            lastCharResult = charResultList[lastMatchedPos]
        else:
            # Special: for 'Loading' matched ' Loading', bu
            # so using find the corresponding char, then go
            # Note: following method not work for regex str


            firtToMatchChar = wordStr[0]
            lastToMatchChar = wordStr[-1]


            for eachCharResult in charResultList:
                if firstCharResult and lastCharResult:
                    break


                eachChar = eachCharResult["char"]
                if firtToMatchChar == eachChar:
                    firstCharResult = eachCharResult
                elif lastToMatchChar == eachChar:
                    lastCharResult = eachCharResult


        # Note: follow no need check words, to support inpu
        # firstLocation = None
        # lastLocation = None
        # if firstCharResult["char"] == firtToMatchChar:
```

```
        #     firstLocation = firstCharResult["location"]
        # if lastCharResult["char"] == lastToMatchChar:
        #     lastLocation = lastCharResult["location"]
        firstLocation = firstCharResult["location"]
        lastLocation = lastCharResult["location"]


        # if firstLocation and lastLocation:


        # support both horizontal and vertical words
        firstLeft = firstLocation["left"]
        lastLeft = lastLocation["left"]
        minLeft = min(firstLeft, lastLeft)
        x = minLeft


        firstHorizontalEnd = firstLeft + firstLocation["wi
        lastHorizontalEnd = lastLeft + lastLocation["width"
        maxHorizontalEnd = max(firstHorizontalEnd, lastHor
        width = maxHorizontalEnd - x


        lastTop = lastLocation["top"]
        minTop = min(firstLocation["top"], lastTop)
        y = minTop


        lastVerticalEnd = lastTop + lastLocation["height"]
        height = lastVerticalEnd - y


    return x, y, width, height
```

调用：

```
calculatedLocation = self.calcWordsLocation(eachInputWords,
```

把坐标位置转成中间坐标值

作用：用于后续点击按钮中间坐标值

代码：

```
def locationToCenterPos(self, wordslocation):
    """Convert location of normal button to center positio


    Args:
        wordslocation (tuple): words location, (x, y, widt
            Example: (267, 567, 140, 39)
    Returns:
        tuple, (x, y), the location's center position, nor
            Example: (337.0, 586.5)
    Raises:
    """
    x, y, width, height = wordslocation
    centerX = x + width/2
    centerY = y + height/2
    centerPosition = (centerX, centerY)
    return centerPosition
```

调用：

```
curCenterX, curCenterY = self.locationToCenterPos(eachLocat
```

检测文字是否在结果中

代码：

```
def isWordsInResult(self, respJson, wordsOrWordsList, isMat
    """Check words is in result or not


    Args:
        respJson (dict): Baidu OCR responsed json
        wordsOrWordsList (str/list): single input str or st
        isMatchMultiple (bool): for each single str, to mat
    Returns:
        dict, matched result
    Raises:
    """
    # Note: use OrderedDict instead dict to keep order, for
    orderedMatchedResultDict = OrderedDict()


    inputWordsList = wordsOrWordsList
    if isinstance(wordsOrWordsList, str):
        inputWords = str(wordsOrWordsList)
        inputWordsList = [inputWords]


    wordsResultList = respJson["words_result"]
    for curInputWords in inputWordsList:
        curMatchedResultList = []
        for eachWordsResult in wordsResultList:
            eachWords = eachWordsResult["words"]
            foundCurWords = re.search(curInputWords, eachWo
            if foundCurWords:
                curMatchedResultList.append(eachWordsResult
                if not isMatchMultiple:
                    break


        orderedMatchedResultDict[curInputWords] = curMatche
    return orderedMatchedResultDict
```

调用：

```
matchedResultDict = self.isWordsInResult(wordsResultJson, w
```

检测当前屏幕中是否包含对应文字

```
def isWordsInCurScreen(self, wordsOrWordsList, imgPath=None
    """Found words in current screen


    Args:
        wordsOrWordsList (str/list): single input str or st
        imgPath (str): current screen image file path; defa
        isMatchMultiple (bool): for each single str, to mat
        isRespShortInfo (bool): return simple=short=nomarl
    Returns:
        matched result, type=bool/list[bool]/dict/tuple, de
    Raises:
    """
    retValue = None


    if not imgPath:
        # do screenshot
        imgPath = self.getCurScreenshot()


    wordsResultJson = self.baiduImageToWords(imgPath)


    isMultipleInput = False
    inputWords = None
    inputWordsList = []


    if isinstance(wordsOrWordsList, list):
        isMultipleInput = True
        inputWordsList = list(wordsOrWordsList)
    elif isinstance(wordsOrWordsList, str):
        isMultipleInput = False
        inputWords = str(wordsOrWordsList)
        inputWordsList = [inputWords]


    matchedResultDict = self.isWordsInResult(wordsResultJso


    # add caclulated location and words
    # Note: use OrderedDict instead dict to keep order, for
    processedResultDict = OrderedDict()
    for eachInputWords in inputWordsList:
        isCurFound = False
        # curLocatoinList = []
        # curWordsList = []
        curResultList = []
```

```
        curWordsMatchedResultList = matchedResultDict[eachI
        if curWordsMatchedResultList:
            isCurFound = True
            for curIdx, eachWordsMatchedResult in enumerate
                curMatchedWords = eachWordsMatchedResult["
                calculatedLocation = self.calcWordsLocatior
                # curLocatoinList.append(calculatedLocatior
                # curWordsList.append(curMatchedWords)
                curResult = (curMatchedWords, calculatedLo
                curResultList.append(curResult)


        # processedResultDict[eachInputWords] = (isCurFounc
        processedResultDict[eachInputWords] = (isCurFound,
    logging.debug("For %s, matchedResult=%s from imgPath=%s


    if isMultipleInput:
        if isRespShortInfo:
            isFoundList = []
            for eachInputWords in processedResultDict.keys(
                isCurFound, noUse = processedResultDict[eac
                isFoundList.append(isCurFound)
            # Note: no mattter isMatchMultiple, both only r
            retBoolList = isFoundList
            retValue = retBoolList
        else:
            if isMatchMultiple:
                retTuple = processedResultDict, imgPath
                retValue = retTuple
            else:
                # Note: use OrderedDict instead dict to kee
                respResultDict = OrderedDict()
                for eachInputWords in processedResultDict.k
                    # isCurFound, curLocatoinList, curWords
                    isCurFound, curResultList = processedRe
                    # singleLocation = None
                    # singleWords = None
                    singleResult = (None, None)
                    if isCurFound:
                        # singleLocation = curLocatoinList
                        # singleWords = curWordsList[0]
                        singleResult = curResultList[0]
                    # respResultDict[eachInputWords] = (isC
                    respResultDict[eachInputWords] = (isCu
                retTuple = respResultDict, imgPath
                retValue = retTuple
    else:
        singleInputResult = processedResultDict[inputWords]
        # isCurFound, curLocatoinList, curWordsList = sing
```

```
        isCurFound, curResultList = singleInputResult
        if isRespShortInfo:
            # Note: no mattter isMatchMultiple, both only
            retBool = isCurFound
            retValue = retBool
        else:
            if isMatchMultiple:
                # retTuple = isCurFound, curLocatoinList,
                retTuple = isCurFound, curResultList, imgPa
                retValue = retTuple
            else:
                singleResult = (None, None)
                # singleLocation = None
                # singleWords = None
                if isCurFound:
                    # singleLocation = curLocatoinList[0]
                    # singleWords = curWordsList[0]
                    singleResult = curResultList[0]
                # retTuple = isCurFound, singleLocation, s
                retTuple = isCurFound, singleResult, imgPat
                retValue = retTuple


    logging.debug("Input: %s, output=%s", wordsOrWordsList,
    return retValue
```

调用：

```
allResultDict, _ = self.isWordsInCurScreen(allStrList, imgP
```

获取当前屏幕中的文字

```
def getWordsInCurScreen(self):
    """get words in current screenshot"""
    screenImgPath = self.getCurScreenshot()
    wordsResultJson = self.baiduImageToWords(screenImgPath)
    return wordsResultJson
```

调用：

```
curScreenWords = self.getWordsInCurScreen()
```

检测当前屏幕中是否存在某些信息

```
def checkExistInScreen(self,
        imgPath=None,
        mandatoryStrList=[],
        mandatoryMinMatchCount=0,
        optionalStrList=[],
        # optionalMinMatchCount=2,
        optionalMinMatchCount=1,
        isRespFullInfo=False
    ):
    """Check whether mandatory and optional str list in cu


    Args:
        imgPath (str): current screen image file path; defa
        mandatoryStrList (list): mandatory str, at least ma
        mandatoryMinMatchCount (int): minimal match count
        optionalStrList (list): optional str, some may mat
        optionalMinMatchCount (int): for `optionalStrList`,
        isRespFullInfo (bool): return full info or not, fu
    Returns:
        matched result, type=bool/tuple, depends on `isResp
    Raises:
    """
    if not imgPath:
        imgPath = self.getCurScreenshot()
    logging.debug("imgPath=%s", imgPath)


    isExist = False
    # Note: use OrderedDict instead dict to keep order, fo
    respMatchLocation = OrderedDict()


    isMandatoryMatch = True
    isMandatoryShouldMatchAll = (mandatoryMinMatchCount <=
    isOptionalMatch = True


    allStrList = []
    allStrList.extend(mandatoryStrList)
    allStrList.extend(optionalStrList)


    optionalMatchCount = 0
    mandatoryMatchCount = 0
    allResultDict, _ = self.isWordsInCurScreen(allStrList,
    for eachStr, (isFoundCur, curResultList) in allResultD
        if eachStr in mandatoryStrList:
            if isFoundCur:
                mandatoryMatchCount += 1
```

```
                respMatchLocation[eachStr] = curResultList
            else:
                if isMandatoryShouldMatchAll:
                    isMandatoryMatch = False
                    break
        elif eachStr in optionalStrList:
            if isFoundCur:
                optionalMatchCount += 1
                respMatchLocation[eachStr] = curResultList


    if mandatoryStrList:
        if not isMandatoryShouldMatchAll:
            if mandatoryMatchCount >= mandatoryMinMatchCou
                isMandatoryMatch = True
            else:
                isMandatoryMatch = False


    if optionalStrList:
        if optionalMatchCount >= optionalMinMatchCount:
            isOptionalMatch = True
        else:
            isOptionalMatch = False


    isExist = isMandatoryMatch and isOptionalMatch
    logging.debug("isMandatoryMatch=%s, isOptionalMatch=%s


    if isRespFullInfo:
        logging.debug("mandatoryStrList=%s, optionalStrLis
            mandatoryStrList, optionalStrList, isExist, re
        return (isExist, respMatchLocation, imgPath)
    else:
        logging.debug("mandatoryStrList=%s, optionalStrLis
            mandatoryStrList, optionalStrList, isExist)
        return isExist
```

调用：

```
checkResult = self.checkExistInScreen(
    imgPath=imgPath,
    optionalStrList=strList,
    optionalMinMatchCount=1,
    isRespFullInfo=isRespFullInfo,
)
```

和：

```
minOptionalMatchCount = 2

mandatoryList = [
    # "公告",
    "^公告$",
    '^强力推荐$', # 王城英雄, 不规则弹框
。。。
]

possibleTitleList = [
    "^游戏公告$",
]
optionalList = []
otherOptionalList = [
    "新增(内容)?",
    "游戏特色",
    "(主要)?更新(内容)?",
。。。
    "登录即送",
]
optionalList.extend(possibleTitleList)
optionalList.extend(otherOptionalList)


checkResult = self.checkExistInScreen(
    imgPath=imgPath,
    mandatoryStrList=mandatoryList,
    mandatoryMinMatchCount=1,
    optionalStrList=optionalList,
    optionalMinMatchCount=minOptionalMatchCount,
    isRespFullInfo=isRespFullInfo,
)
```

和:

```
mandatoryList = [
    "^购买$", # 造梦西游：'购买'
    "^¥\d+元?", # 剑玲珑，至尊屠龙
    "^\d+元", # 造梦西游：'6元券3元券3'
    "^充值$", # 剑玲珑，至尊屠龙
]
optionalList = [
    # common
    "元宝",
    "月卡",
。。。
    # 剑玲珑
    "赠",
]

isRealPay, matchResult, imgPath  = self.checkExistInScreen
    mandatoryStrList=mandatoryList,
    mandatoryMinMatchCount=2,
    optionalStrList=optionalList,
    optionalMinMatchCount=2,
    isRespFullInfo=True,
)
```

和：

```
mandatoryList = [
    "^((继续)|(结束))$", # 暗黑觉醒：'继续' or '结束'
    "^\d秒$", # 暗黑觉醒：'5秒', '1秒'
]

isAutoConverstion, matchResult, imgPath  = self.checkExistI
    imgPath=imgPath,
    mandatoryStrList=mandatoryList,
    mandatoryMinMatchCount=2,
    isRespFullInfo=True,
)
```

和：

```
mandatoryList = [
    "^充值", # 造梦西游：  "充值战神榜邮件各但,挑战竞技好友"
    "首充$", # 剑玲珑，至尊屠龙
。。。
]
optionalList = [
    # common
    "组队", # 至尊屠龙，剑玲珑
    "任务", # 至尊屠龙，剑玲珑

    # "商城", # 剑玲珑
    "寻宝", # 剑玲珑
    "福利大厅", # 剑玲珑
。。。
    "背包",
]

isHome, matchResult, imgPath  = self.checkExistInScreen(
    mandatoryStrList=mandatoryList,
    mandatoryMinMatchCount=1,
    optionalStrList=optionalList,
    isRespFullInfo=True,
)
```

和：

```
mandatoryList = [
    "立即登录", # 剑玲珑，至尊屠龙
。。。
    "^登录$", # 暗黑觉醒
]
optionalList = [
    # common
    "一键((注册)|(试玩))",
    "忘记密码", # 至尊屠龙，青云诀
    "((用户)|(账号)|(手机))登录", # 剑玲珑，至尊屠龙，
    "点击选服", # 青云诀，暗黑觉醒
。。。
    # 造梦西游
    "游客登录", #更新：不能用游客登录，否则后续无法弹出支付页面
]

respUserLogin = self.checkExistInScreen(
    mandatoryStrList=mandatoryList,
    mandatoryMinMatchCount=1,
    optionalStrList=optionalList,
    isRespFullInfo=isRespFullInfo
)
```

是否存在任意一个词组

```
def isExistAnyStr(self, strList, imgPath=None, isRespFullIn
    """Is any str exist or not


    Args:
        strList (list): str list to check exist or not
        imgPath (str): current screen image file path; defa
        isRespFullInfo (bool): return full info or not, fu
    Returns:
        matched result, type=bool/tuple, depends on `isResp
    Raises:
    """
    if not imgPath:
        imgPath = self.getCurScreenshot()


    checkResult = self.checkExistInScreen(
        imgPath=imgPath,
        optionalStrList=strList,
        optionalMinMatchCount=1,
        isRespFullInfo=isRespFullInfo,
    )
    if isRespFullInfo:
        isExistAny, matchResult, imgPath = checkResult
        logging.debug("isExistAny=%s, matchResult=%s, imgPa
        return (isExistAny, matchResult, imgPath)
    else:
        isExistAny = checkResult
        logging.debug("isExistAny=%s, for %s", isExistAny,
        return isExistAny
```

调用：

```
    isExist, matchResult, imgPath = self.isExistAnyStr(butt
```

和：

```
mandatoryList = [
    # 御剑仙缘
    """^(请)?点击\s?[“”"'][^“”"',]{1,6}[“”"']?""", # '请点击'
]

respResult = self.isExistAnyStr(mandatoryList, imgPath=imgP
```

和：

```
requireManualOperationList = [
    "完成指定操作", # speical: 造梦西游 的 '(请完成指定操作)梦口'
]
isRequireManual, _, imgPath = self.isExistAnyStr(requireMar
```

和:

```
lanuchStrList = [
    "^4399手机游戏$", # 剑玲珑
    "^西瓜游戏$", # 青云诀
]
isLaunch, _, imgPath = self.isExistAnyStr(lanuchStrList, is
```

和:

```
    loadingStrList = [
        # 登录类
        "正在登录", # 正在登录
        "logging",
。。。
        "游戏资源", # 青云诀:本地游戏资源已是最新
。。。
    ]

    isLoadingSth, _, imgPath = self.isExistAnyStr(loadingSt
```

和:

```
gotoPayStrList = [
    "^前往充值$", # 剑玲珑
    "^立即充值$", # 至尊屠龙
。。。
]
respBoolOrTuple = self.isExistAnyStr(gotoPayStrList, isResp
```

判断是否所有的字符都存在

```
def isExistAllStr(self, strList, imgPath=None, isRespFullIn
    """Is all str exist or not


    Args:
        strList (list): str list to check exist or not
        imgPath (str): current screen image file path; defa
        isRespFullInfo (bool): return full info or not, fu
    Returns:
        matched result, type=bool/tuple, depends on `isResp
    Raises:
    """
    if not imgPath:
        imgPath = self.getCurScreenshot()
    checkResult = self.checkExistInScreen(imgPath=imgPath,
    if isRespFullInfo:
        isExistAll, matchResult, imgPath = checkResult
        logging.debug("isExistAll=%s, matchResult=%s, imgPa
        return (isExistAll, matchResult, imgPath)
    else:
        isExistAll = checkResult
        logging.debug("isExistAll=%s, for %s", isExistAll,
        return isExistAll
```

调用：

```
realPayStrList = [
    "^￥\d+元?", # 剑玲珑，至尊屠龙
        "^充值$", # 剑玲珑，至尊屠龙
]
return self.isExistAllStr(realPayStrList, isRespFullInfo=is
```

音频

播放音频

树莓派中用python播放音频

前提：

树莓派中，先去安装vlc：

```
sudo apt-get install vlc
```

代码：

```
import vlc
instance = vlc.Instance('--aout=alsa')
p = instance.media_player_new()
m = instance.media_new('/home/pi/Music/lizhongsheng_massif_
p.set_media(m)
p.play()
```

即可播放音频。

实现设置音量，暂停，继续播放等操作的代码是：

```
p.pause()
vlc.libvlc_audio_set_volume(p, 40)
p.play()
vlc.libvlc_audio_set_volume(p, 90)
```

Mac中调用mpv播放音频

播放音频：

```
cmdPlayer = "mpv"
cmdParaFilePath = tmpAudioFileFullPath
cmdArgList = [cmdPlayer, cmdParaFilePath]

if gCurSubProcess:
    gCurSubProcess.terminate()

gCurSubProcess = subprocess.Popen(cmdArgList)
log.debug("gCurSubProcess=%s", gCurSubProcess)
```

停止播放：

```
if audioControl == "stop":
    if gCurSubProcess:
        gCurSubProcess.terminate()

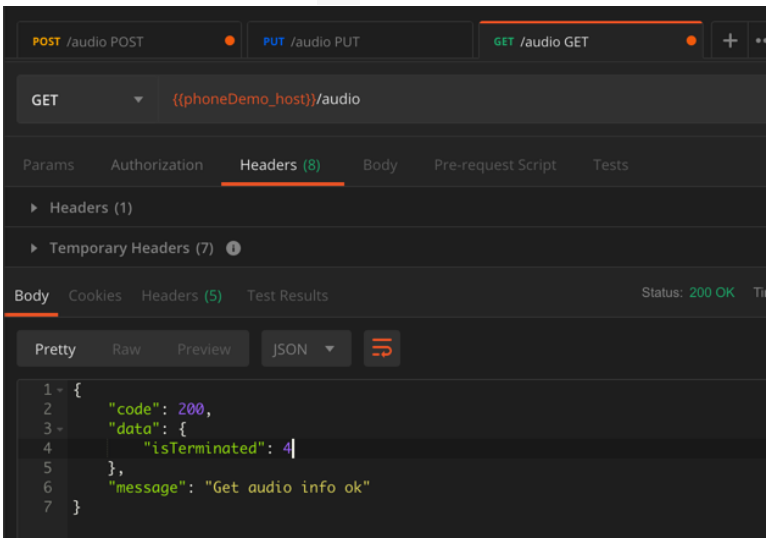
    respData = {
        audioControl: "ok"
    }

else:
    respData = {
        audioControl: "Unsupport command"
    }
```

获取播放效果：

```
if gCurSubProcess:
    isTerminated = gCurSubProcess.poll() # None
    # stdout_data, stderr_data = gCurSubProcess.communicate
    # stdoutStr = str(stdout_data)
    # stderrStr = str(stderr_data)
    respData = {
        "isTerminated": isTerminated,
        # "stdout_data": stdoutStr,
        # "stderr_data": stderrStr,
    }
```

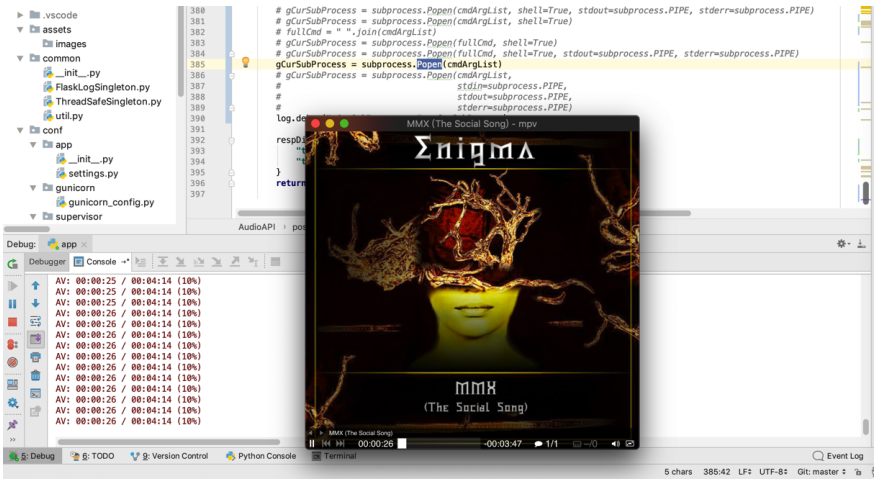
返回结果：

- 正在播放：返回isTerminated为 `null`
- 被终止后，返回isTerminated为 `4`
  - 

播放的效果：

mac系统中播放音频

PyCharm的console中输出当前播放的信息 -》 如果是mac的terminal中，则是覆盖式的，不会这么多行 同时弹框GUI窗口



mp3

解析mp3等音频文件得到时长信息

用库：

- audioread
  - GitHub
    - beetbox/audioread: cross-library (GStreamer + Core Audio + MAD + FFmpeg) audio decoding for Python

```
import audioread

try:
    audioFullFilePath = "/your/input/audio/file.mp3"

    with audioread.audio_open(audioFullFilePath) as audioFp
        audioInfo["duration"] = audioFp.duration
        audioInfo["channels"] = audioFp.channels
        audioInfo["sampleRate"] = audioFp.samplerate

except OSError as osErr:
    logging.error("OSError when open %s error %s", audioFu
except EOFError as eofErr:
    logging.error("EOFError when open %s error %s", audioFu
except audioread.DecodeError as decodeErr:
    logging.error("Decode audio %s error %s", audioFullFile
```

后经整理成函数：

```
import audioread

def detectAudioMetaInfo(audioFullPath):
    """
        detect audio meta info: duration, channels, sampleR
    """
    isOk = False
    errMsg = ""
    audioMetaInfo = {
        "duration": 0,
        "channels": 0,
        "sampleRate": 0,
    }

    try:
        with audioread.audio_open(audioFullPath) as audioFp
            audioMetaInfo["duration"] = audioFp.duration
            audioMetaInfo["channels"] = audioFp.channels
            audioMetaInfo["sampleRate"] = audioFp.samplerat

            isOk = True
    except OSError as osErr:
        errMsg = "detect audio info error: %s" % str(osErr)
    except EOFError as eofErr:
        errMsg = "detect audio info error: %s" % str(eofErr
    except audioread.DecodeError as decodeErr:
        errMsg = "detect audio info error: %s" % str(decode

    if isOk:
        return isOk, audioMetaInfo
    else:
        return isOk, errMsg
```

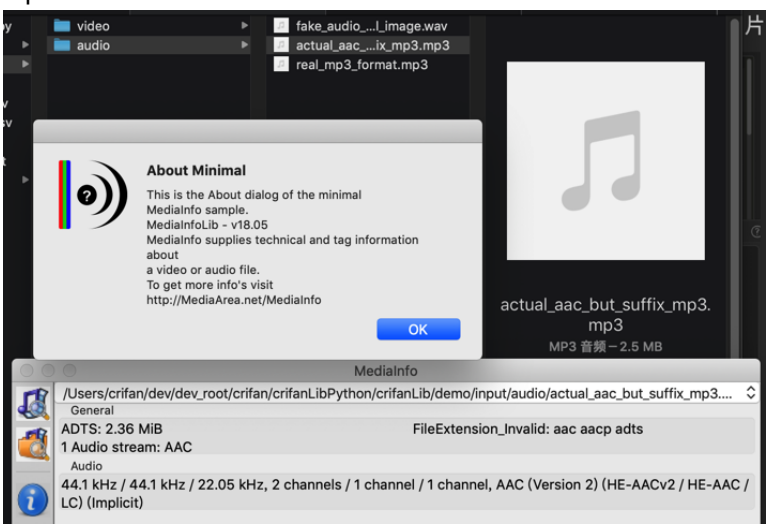
调用：

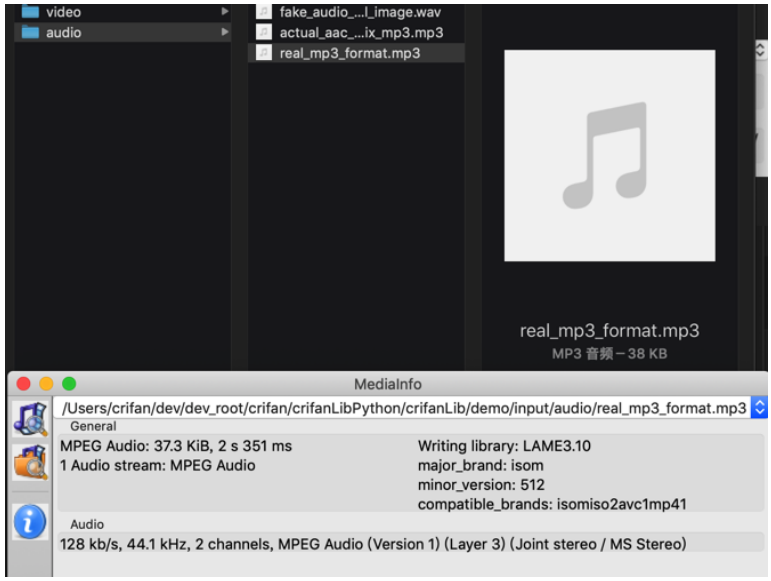
```
def demoDetectAudioMeta():
  curPath = os.path.dirname(__file__)
  inputAudioList = [
    "input/audio/actual_aac_but_suffix_mp3.mp3",
    "input/audio/real_mp3_format.mp3",
    "not_exist_audio.wav",
    "input/audio/fake_audio_actual_image.wav",
  ]


  for eachAudioPath in inputAudioList:
    eachAudioFullPath = os.path.join(curPath, eachAudioPath
    isOk, errOrInfo = detectAudioMetaInfo(eachAudioFullPath
    print("isOk=%s, errOrInfo=%s" % (isOk, errOrInfo))

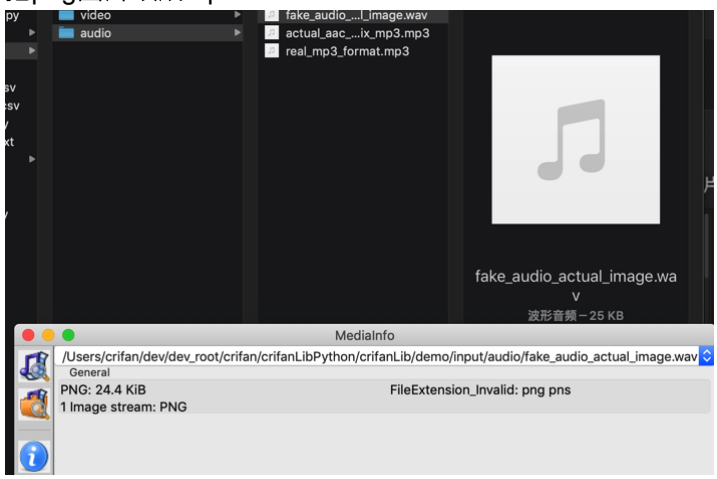

if __name__ == "__main__":
  demoDetectAudioMeta()
```

对应的音频文件，用MediaInfo检测出的信息：

- 正常mp3
  - 



- 异常mp3：
  - 故意把png图片改成mp3



输出：

```
# isOk=True, errOrInfo={'duration': 637.8, 'channels': 2,
# isOk=True, errOrInfo={'duration': 2.3510204081632655, 'ch
# isOk=False, errOrInfo=detect audio info error: [Errno 2]
# isOk=False, errOrInfo=detect audio info error:
```

视频

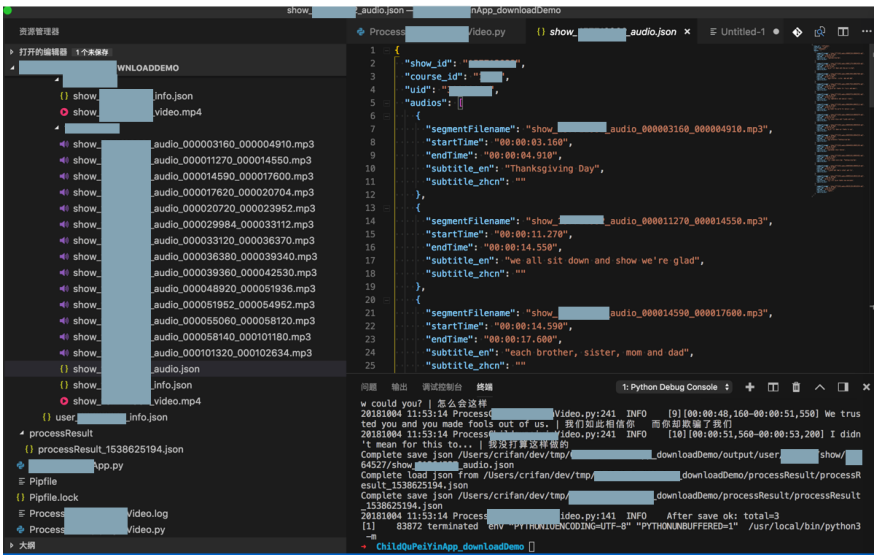
从视频中提取出音频mp3文件

```
import os
import logging
import subprocess

videoFullpath = "show_157712932_video.mp4"
startTimeStr = "00:00:11.270"
# startTimeStr = "%02d:%02d:%02d.%03d" % (startTime.hours,
endTimeStr = "00:00:14.550"
# endTimeStr = "%02d:%02d:%02d.%03d" % (endTime.hours, endT
outputAudioFullpath = "show_157712932_audio_000011270_0000

# extract audio segment from video
# ffmpeg -i show_157712932_video.mp4 -ss 00:00:11.270 -to (
if not os.path.exists(outputAudioFullpath):
    ffmpegCmd = "ffmpeg -i %s -ss %s -to %s -b:a 128k %s" %
    subprocess.call(ffmpegCmd, shell=True)
    logging.info("Complete use ffmpeg extract audio: %s", t
```

可以从mp4中提取出mp3音频：



网络相关

此处整理和网络相关的一些常用代码段。

BeautifulSoup

用网络库下载到页面源码后，就是去解析（HTML等）内容了。

Python中最常用的HTML（和XML）解析库之一就是：`BeautifulSoup`

- 最新代码详见：https://github.com/crifan/crifanLibPython/blob/master/python3/crifanLib/thirdParty/crifanBeautifulsoup.py

从html转soup

```
from bs4 import BeautifulSoup

def htmlToSoup(curHtml):
    """convert html to soup

    Args:
        curHtml (str): html str
    Returns:
        soup
    Raises:
    """
    soup = BeautifulSoup(curHtml, 'html.parser')
    return soup
```

从xml转换出soup

背景：

iOS自动化期间，常会涉及到，获取到当前页面源码，是xml字符串，需要转换为soup，才能后续操作

所以整理出通用转换逻辑

```
def xmlToSoup(xmlStr):
    """convert to xml string to soup
        Note: xml is tag case sensitive -> retain tag upper


    Args:
        xmlStr (str): xml str, normally page source
    Returns:
        soup
    Raises:
    """
    # HtmlParser = 'html.parser'
    # XmlParser = 'xml'
    XmlParser = 'lxml-xml'
    curParser = XmlParser
    soup = BeautifulSoup(xmlStr, curParser)
    return soup
```

举例：

（1）

```
    curPageXml = self.get_page_source()
    soup = CommonUtils.xmlToSoup(curPageXml)
```

获取到xml字符串后，去转换为soup

soup转html

```
def soupToHtml(soup, isFormat=True):
    """Convert soup to html string

    Args:
        soup (Soup): BeautifulSoup soup
        isFormat (bool): use prettify to format html
    Returns:
        html (str)
    Raises:
    """
    if isFormat:
        curHtml = soup.prettify() # formatted html
    else:
        curHtml = str(soup) # not formatted html
    return curHtml
```

获取soup节点所有的文字内容

```
def getAllContents(curNode, isStripped=False):
    """Get all contents of current and children nodes

    Args:
        curNode (soup node): current Beautifulsoup node
        isStripped (bool): return stripped string or not
    Returns:
        str
    Raises:
    """
    # codeSnippetStr = curNode.prettify()
    # codeSnippetStr = curNode.string
    # codeSnippetStr = curNode.contents
    codeSnippetStr = ""
    stringList = []
    if isStripped:
        stringGenerator = curNode.stripped_strings
    else:
        stringGenerator = curNode.strings

    # stringGenerator = curNode.strings
    for eachStr in stringGenerator:
        # logging.debug("eachStr=%s", eachStr)
        stringList.append(eachStr)
    codeSnippetStr = "\n".join(stringList)
    logging.debug("codeSnippetStr=%s", codeSnippetStr)
    return codeSnippetStr
```

从html中提取title值

```
def extractHtmlTitle_BeautifulSoup(htmlStr):
    """
    Extract title from html, use BeautifulSoup

    Args:
        htmlStr (str): html string
    Returns:
        str
    Raises:
    Examples:
    """
    curTitle = ""

    soup = BeautifulSoup(htmlStr, "html.parser")
    if soup:
        if soup.title and soup.title.string:
            curTitle = soup.title.string
            curTitle = curTitle.strip()
        else:
            # logging.warning("Empty title for html: %s", h
            logging.debug("Empty title for html: %s", html
            # Empty title for html: <script type="text/java

            # for debug
            if "<title>" not in htmlStr:
                logging.warning("Special not incldue <title
                # 'Illegal access address!\n'
                # <script type="text/javascript">top.locat
                #
    else:
        logging.error("Failed to convert to soup for html:
        #

    return curTitle
```

是否包含符合特定条件的soup节点

```
def isContainSpecificSoup(soupList, elementName, isSizeVali
    """
        判断BeautifulSoup的soup的list中，是否包含符合条件的特定的
            只匹配指定个数的元素才视为找到了
            元素名相同
            面积大小是否符合条件
    Args:
        elementName (str): element name
        isSizeValidCallback (function): callback function t
        matchNum (int): sould only matched specific number
    Returns:
        bool
    Raises:
    """
    isFound = False

    matchedSoupList = []

    for eachSoup in soupList:
        # if hasattr(eachSoup, "tag"):
        if hasattr(eachSoup, "name"):
            # curSoupTag = eachSoup.tag
            curSoupTag = eachSoup.name
            if curSoupTag == elementName:
                if hasattr(eachSoup, "attrs"):
                    soupAttr = eachSoup.attrs
                    soupWidth = int(soupAttr["width"])
                    soupHeight = int(soupAttr["height"])
                    curSoupSize = soupWidth * soupHeight #
                    isSizeValid = isSizeValidCallback(curSo
                    if isSizeValid:
                        matchedSoupList.append(eachSoup)

    matchedSoupNum = len(matchedSoupList)
    if matchNum == 0:
        isFound = True
    else:
        if matchedSoupNum == matchNum:
            isFound = True

    return isFound
```

说明：

判断soup内，是否有符合特定条件的soup

举例：

（1）iOS的弹框，有上角带关闭按钮时，去判断一个弹框，是否符合对应条件，以便于判断是否可能是弹框

```
nextSiblingeSoupGenerator = possibleCloseSoup.next_siblings
nextSiblingeSoupList = list(nextSiblingeSoupGenerator)

hasLargeImage = CommonUtils.isContainSpecificSoup(nextSibli
isPossibleClose = hasLargeImage
```

相关函数

```
def isPopupWindowSize(self, curSize):
    """判断一个soup的宽高大小是否是弹框类窗口(Image,Other等) 的大小
    # global FullScreenSize
    FullScreenSize = self.X * self.totalY
    curSizeRatio = curSize / FullScreenSize # 0.289
    PopupWindowSizeMinRatio = 0.25
    # PopupWindowSizeMaxRatio = 0.9
    PopupWindowSizeMaxRatio = 0.8
    # isSizeValid = curSizeRatio >= MinPopupWindowSizeRatio
    # is popup like window, size should large enough, but s
    isSizeValid = PopupWindowSizeMinRatio <= curSizeRatio <
    return isSizeValid
```

(2)

```
hasNormalButton = CommonUtils.isContainSpecificSoup(nextSib
```

相关函数:

```
def isNormalButtonSize(self, curSize):
    """判断一个soup的宽高大小是否是普通的按钮大小"""
    NormalButtonSizeMin = 30*30
    NormalButtonSizeMax = 100*100
    isNormalSize = NormalButtonSizeMin <= curSize <= Normal
    return isNormalSize
```

查找元素，限定条件是符合对应的几级的父元素的条件

背景:

很多时候，需要对于iOS的app的页面的源码，即xml中，查找符合特定情况的的元素

这些特定情况，往往是parent或者前几层级的parent中，元素符合一定条件，往往是type，以及宽度是屏幕宽度，高度是屏幕高度等等

所以提取出公共函数，用于bs的find查找元素

```
def bsChainFind(curLevelSoup, queryChainList):
    """BeautifulSoup find with query chain

    Args:
        curLevelSoup (soup): BeautifulSoup
        queryChainList (list): str list of all level query
    Returns:
        soup
    Raises:
    Examples:
        input:
            [
                {
                    "tag": "XCUIElementTypeWindow",
                    "attrs": {"visible":"true", "enabled":'
                },
                {
                    "tag": "XCUIElementTypeButton",
                    "attrs": {"visible":"true", "enabled":'
                },
                {
                    "tag": "XCUIElementTypeStaticText",
                    "attrs": {"visible":"true", "enabled":'
                },
            ]
        output:
            soup node of
                <XCUIElementTypeStaticText type="XCUIEleme
                in :
                <XCUIElementTypeWindow type="XCUIElementTyp
                    <XCUIElementTypeOther type="XCUIElement
                        <XCUIElementTypeOther type="XCUIEle
                            <XCUIElementTypeOther type="XCU
                                <XCUIElementTypeButton type
                                    <XCUIElementTypeStatic
                                    <XCUIElementTypeStatic
                                    <XCUIElementTypeStatic
                                    <XCUIElementTypeStatic
                                </XCUIElementTypeButton>
                            </XCUIElementTypeOther>
                        </XCUIElementTypeOther>
                    </XCUIElementTypeOther>
                </XCUIElementTypeWindow>
    """
    foundSoup = None
    if queryChainList:
        chainListLen = len(queryChainList)

        if chainListLen == 1:
            # last one
```

```
            curLevelFindDict = queryChainList[0]
            curTag = curLevelFindDict["tag"]
            curAttrs = curLevelFindDict["attrs"]
            foundSoup = curLevelSoup.find(curTag, attrs=cu
        else:
            highestLevelFindDict = queryChainList[0]
            curTag = highestLevelFindDict["tag"]
            curAttrs = highestLevelFindDict["attrs"]
            foundSoupList = curLevelSoup.find_all(curTag, a
            if foundSoupList:
                childrenChainList = queryChainList[1:]
                for eachSoup in foundSoupList:
                    eachSoupResult = CommonUtils.bsChainFi
                    if eachSoupResult:
                        foundSoup = eachSoupResult
                        break

    return foundSoup
```

举例：

（1）

```
"""
    微信-小程序 弹框 警告 尚未进行授权:
        <XCUIElementTypeButton type="XCUIElementTypeButton"
            <XCUIElementTypeOther type="XCUIElementTypeOthe
                <XCUIElementTypeImage type="XCUIElementType
                <XCUIElementTypeStaticText type="XCUIElemen
                <XCUIElementTypeTextView type="XCUIElement"
                <XCUIElementTypeButton type="XCUIElementTyp
                <XCUIElementTypeButton type="XCUIElementTyp
            </XCUIElementTypeOther>
        </XCUIElementTypeButton>
"""
warningChainList = [
    {
        "tag": "XCUIElementTypeButton",
        "attrs": {"visible":"true", "enabled":"true", "widt
    },
    {
        "tag": "XCUIElementTypeOther",
        "attrs": {"visible":"true", "enabled":"true"}
    },
    {
        "tag": "XCUIElementTypeStaticText",
        "attrs": {"visible":"true", "enabled":"true", "valu
    },
]
warningSoup = CommonUtils.bsChainFind(soup, warningChainLis
```

相关：

找到元素后，再去点击：

```
if warningSoup:
    parentOtherSoup = warningSoup.parent
    confirmSoup = parentOtherSoup.find(
        "XCUIElementTypeButton",
        attrs={"visible":"true", "enabled":"true", "name":
    )
    if confirmSoup:
        self.clickElementCenterPosition(confirmSoup)
        foundAndProcessedPopup = True
```

(2)

```
"""
    系统弹框 拍照或录像:
        <XCUIElementTypeOther type="XCUIElementTypeOther" e
            <XCUIElementTypeOther type="XCUIElementTypeOthe
                <XCUIElementTypeOther type="XCUIElementType
                    <XCUIElementTypeOther type="XCUIElement
                        <XCUIElementTypeOther type="XCUIEle
                            <XCUIElementTypeOther type="XCU
                                <XCUIElementTypeOther type=
                                    <XCUIElementTypeOther t
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                    </XCUIElementTypeOther>
                </XCUIElementTypeOther>
            </XCUIElementTypeOther>
        </XCUIElementTypeOther>
        <XCUIElementTypeOther type="XCUIElementTypeOther" e
            <XCUIElementTypeButton type="XCUIElementTypeBut
        </XCUIElementTypeOther>
"""
photoCameraChainList = [
    {
        "tag": "XCUIElementTypeOther",
        "attrs": {"enabled":"true", "visible":"true"}
    },
```

```
    {
        "tag": "XCUIElementTypeTable",
        "attrs": {"enabled":"true", "visible":"true", "x":"
    },
    {
        "tag": "XCUIElementTypeStaticText",
        "attrs": {"enabled":"true", "visible":"true", "valu
    },
]
photoCameraSoup = CommonUtils.bsChainFind(soup, photoCamera
```

（3）iOS 设置 无线局域网 列表页 找 当前已连接的WiFi，特征是带蓝色✅ 的：

```
"""
    设置 无线局域网 列表页:
        <XCUIElementTypeTable type="XCUIElementTypeTable" e
        。。。
            <XCUIElementTypeCell type="XCUIElementTypeCell"
                <XCUIElementTypeStaticText type="XCUIElemer
                <XCUIElementTypeOther type="XCUIElementType
                <XCUIElementTypeOther type="XCUIElementType
                    <XCUIElementTypeImage type="XCUIElement
                </XCUIElementTypeOther>
                <XCUIElementTypeOther type="XCUIElementType
                <XCUIElementTypeImage type="XCUIElementType
                <XCUIElementTypeImage type="XCUIElementType
                <XCUIElementTypeButton type="XCUIElementTyp
            </XCUIElementTypeCell>
"""
curPageXml = self.get_page_source()
soup = CommonUtils.xmlToSoup(curPageXml)
blueCheckChainList = [
    {
        "tag": "XCUIElementTypeCell",
        "attrs": {"enabled":"true", "visible":"true", "x":"
    },
    {
        "tag": "XCUIElementTypeOther",
        "attrs": {"enabled":"true", "visible":"true"}
    },
    {
        "tag": "XCUIElementTypeImage",
        # "attrs": {"enabled":"true", "visible":"true", "na
        "attrs": {"enabled":"true", "name": "UIPreferencesB
    },
]
blueCheckSoup = CommonUtils.bsChainFind(soup, blueCheckCha
if blueCheckSoup:
```

requests

下载图片，保存为二进制文件

```
import requests
resp = requests.get(pictureUrl)
with open(saveFullPath, 'wb') as saveFp:
  saveFp.write(resp.content)
```

详见：

【已解决】Python的requests中如何下载二进制数据保存为图片文件

数学

详见：

https://github.com/crifan/crifanLibPython/blob/master/crifanLib/crifanMath.py

---

md5

md5计算

- `md5`
  - `Python 3` 中已改名 `hashlib`
  - 且update参数只允许 `bytes`
    - 不允许 `str`

的md5代码：

```
from hashlib import md5 # only for python 3.x

def generateMd5(strToMd5) :
    """
    generate md5 string from input string
    eg:
        xxxxxxxx -> af0230c7fcc75b34cbb268b9bf64da79
    :param strToMd5: input string
    :return: md5 string of 32 chars
    """
    encrptedMd5 = ""
    md5Instance = md5()
    # print("type(md5Instance)=%s" % type(md5Instance)) # t
    # print("type(strToMd5)=%s" % type(strToMd5)) # type(st
    bytesToMd5 = bytes(strToMd5, "UTF-8")
    # print("type(bytesToMd5)=%s" % type(bytesToMd5)) # typ
    md5Instance.update(bytesToMd5)
    encrptedMd5 = md5Instance.hexdigest()
    # print("type(encrptedMd5)=%s" % type(encrptedMd5)) # t
    # print("encrptedMd5=%s" % encrptedMd5) # encrptedMd5=3
    return encrptedMd5
```

之前旧版本的 `Python 2` （ `<= 2.7` ）版本：

- md5还是个独立模块
  - 还没有并入 `hashlib`

    - 注：
        - 好像 `python 2.7` 中已将md5并入 `hashlib`
            - 但是 `update` 参数还允许 `str` （而不是 `bytes` ）
- update参数允许str

的md5代码：

```
try:
    import md5
except ImportError:
    from hashlib import md5

def generateMd5(strToMd5) :
    encrptedMd5 = ""
    md5Instance = md5.new()
    #md5Instance=<md5 HASH object @ 0x1062af738>
    md5Instance.update(strToMd5)
    encrptedMd5 = md5Instance.hexdigest()
    #encrptedMd5=af0230c7fcc75b34cbb268b9bf64da79
    return encrptedMd5
```

邮件

发送邮件

函数：

```
def sendEmail(  sender, senderPassword, receiverList,
                senderName="", receiverNameList= "",
                smtpServer = "", smtpPort = None, useSSL=Fa
                type = "plain", title = "", body = ""):
    """
    send email
    :param sender:
    :param senderPassword:
    :param receiverList:
    :param senderName:
    :param receiverNameList:
    :param smtpServer:
    :param smtpPort:
    :param type: html/plain
    :param title:
    :param body:
    :return:
    """
    logging.debug("sender=%s, senderName=%s, smtpServer=%s,
                  sender, senderName, smtpServer, smtpPort,
    logging.debug("receiverList=%s, receiverNameList=%s", r

    defaultPort = None
    SMTP_PORT_NO_SSL = 25
    SMTP_PORT_SSL = 465
    if useSSL:
        defaultPort = SMTP_PORT_SSL
    else:
        defaultPort = SMTP_PORT_NO_SSL

    if not smtpPort:
        smtpPort = defaultPort

    # init smtp server if necessary
    if not smtpServer:
        # extract domain from sender email
        # crifan2003@163.com -> 163.com
        atIdx = sender.index('@')
        afterAtIdx = atIdx + 1
        lastDomain = sender[afterAtIdx:]
        smtpServer = 'smtp.' + lastDomain
        # smtpServer = "smtp.163.com"
        # smtpPort = 25

    # RECEIVER_SEPERATOR = '; '
    RECEIVER_SEPERATOR = ', '

    senderNameAddr = "%s <%s>" % (senderName, sender)
    receiversAddr = RECEIVER_SEPERATOR.join(receiverList)
```

```
    receiverNameAddrList = []
    formatedReceiverNameAddrList = []
    for curIdx, eachReceiver in enumerate(receiverList):
        eachReceiverName = receiverNameList[curIdx]
        eachNameAddr = "%s <%s>" % (eachReceiverName, eachR
        eachFormatedNameAddr = formatEmailNameAddrHeader(ea
        receiverNameAddrList.append(eachNameAddr)
        formatedReceiverNameAddrList.append(eachFormatedNar

    formatedReceiversNameAddr = RECEIVER_SEPERATOR.join(for
    mergedReceiversNameAddr = RECEIVER_SEPERATOR.join(recei
    # formatedReceiversNameAddr = formatEmailHeader(mergedR
    # =?utf-8?q?dmin=40crifan=2Ecom=3E?=

    msg = MIMEText(body, _subtype=type, _charset="utf-8")
    # msg["From"] = _format_addr(senderNameAddr)
    # msg["To"] = _format_addr(receiversNameAddr)
    msg["From"] = formatEmailHeader(senderNameAddr)
    # msg["From"] = senderNameAddr
    # msg["To"] = formatEmailHeader(formatedReceiversNameAd
    # msg["To"] = formatedReceiversNameAddr
    # msg["To"] = mergedReceiversNameAddr
    # msg["To"] = formatEmailHeader(receiversAddr)
    msg["To"] = formatEmailHeader(mergedReceiversNameAddr)
    # titleHeader = Header(title, "utf-8")
    # encodedTitleHeader = titleHeader.encode()
    # msg['Subject'] = encodedTitleHeader
    msg['Subject'] = formatEmailHeader(title)
    # msg['Subject'] = title
    msgStr = msg.as_string()

    # try:
    # smtpObj = smtplib.SMTP('localhost')
    smtpObj = None
    if useSSL:
        smtpObj = smtplib.SMTP_SSL(smtpServer, smtpPort)
    else:
        smtpObj = smtplib.SMTP(smtpServer, smtpPort)
        # start TLS for security
        # smtpObj.starttls()
    # smtpObj.set_debuglevel(1)
    smtpObj.login(sender, senderPassword)
    # smtpObj.sendmail(sender, receiversAddr, msgStr)
    smtpObj.sendmail(sender, receiverList, msgStr)
    logging.info("Successfully sent email: message=%s", msg
    # except smtplib.SMTPException:
    #     logging.error("Fail to sent email: message=%s", r

    return
```

调用：

```
productName = "First 163 then crifan. Dell XPS 13 XPS9360-5
productUrl = "https://www.microsoft.com/en-us/store/d/dell-
notifType = "HighPrice"
title = "[%s] %s" % (notifType, productName)
notifContent = """
<html>
    <body>
        <h1>%s</h1>
        <p>Not buy <a href="%s">%s</a> for current price <b
        <p>So save for later process</p>
    </body>
</html>
""" % (title, productUrl, productName)
receiversDictList = gCfg["notification"]["receivers"]
receiverList = []
receiverNameList = []
for eachReceiverDict in receiversDictList:
    receiverList.append(eachReceiverDict["email"])
    receiverNameList.append(eachReceiverDict["username"])

sendEmail(
    sender = gCfg["notification"]["sender"]["email"],
    senderPassword = gCfg["notification"]["sender"]["passwo
    receiverList = receiverList,
    senderName = gCfg["notification"]["sender"]["username"]
    receiverNameList= receiverNameList,
    type = "html",
    title = title,
    body = notifContent
)
```

附录：

- 最新代码详见：
  - https://github.com/crifan/crifanLibPython/blob/master/python3/crifanLib/crifanEmail.py

csv和Excel

用Python操作 `csv` 和 `excel` ，详见独立教程：

Python表格处理：CSV和Excel

常见语法

函数参数

可变参数

之前一个用到了可变参数的函数是：

```
def multipleRetry(self, functionInfoDict, maxRetryNum=5, s
    """
    do something, retry mutiple time if fail

    Args:
        functionInfoDict (dict): function info dict contai
        maxRetryNum (int): max retry number
        sleepInterval (float): sleep time of each interval
    Returns:
        bool
    Raises:
    """
    doSuccess = False
    functionCallback = functionInfoDict["functionCallback"]
    functionParaDict = functionInfoDict.get("functionParaD

    curRetryNum = maxRetryNum
    while curRetryNum > 0:
        if functionParaDict:
            doSuccess = functionCallback(**functionParaDict
        else:
            doSuccess = functionCallback()

        if doSuccess:
            break

        time.sleep(sleepInterval)
        curRetryNum -= 1

    if not doSuccess:
        functionName = str(functionCallback)
        # '<bound method DevicesMethods.switchToAppStoreSea

        logging.error("Still fail after %d retry for %s", t
    return doSuccess
```

其中的：

`functionCallback(**functionParaDict)`

中的：

`**functionParaDict`

表示，dict类型的参数，内部包含多个key和value，用**去展开后，传入真正要执行的函数

几种调用中带参数的例子是：

```
searchInputQuery = {"type":"XCUIElementTypeSearchField", "
isInputOk = self.multipleRetry(
    {
        "functionCallback": self.wait_element_setText,
        "functionParaDict": {
            "locator": searchInputQuery,
            "text": appName,
        }
    }
)
```

之前原始写法：

```
searchInputQuery = {"type":"XCUIElementTypeSearchField", "
isInputOk = self.wait_element_setText(searchInputQuery, app
```

其中wait_element_setText的定义是：

```
    def wait_element_setText(self, locator, text):
```

对应着之前传入时的：

```
"functionParaDict": {
    "locator": searchInputQuery,
    "text": appName,
}
```

即可，给出上述细节，便于理解，传入的参数是如何用 `**` 展开的。

详见：

【已解决】Python中如何实现函数调用时多个可变数量的参数传递

dict字典

删除dict中某个键（和值）

- 常见写法：

```
del yourDict["keyToDelete"]
```

- 更加Pythonic的写法：

```
yourDict.pop("keyToDelete")
```

注意：

为了防止出现 `KeyError` ，注意确保要删除的key都是存在的，否则就要先判断存在，再去删除。

OrderedDict

想要获取OrderedDict的最后一个item（的key和value）

```
next(reversed(someOrderedDict.items()))
```

另外，只需要获取最后一个元素的key，则可以：

```
next(reversed(someOrderedDict.keys()))
```

或：

```
next(reversed(someOrderedDict))
```

详见：

【已解决】Python中获取OrderedDict中最后一个元素

合并2个dict的值

（1）如果无需保留原有（第一个dict）的值，则用update即可：

```
firstDict.update(secondDict)
```

支持：`Python >=3.5`

（2）如果要保留之前的dict的值，则用**展开

```
thirdDict = (**firstDict, **secondDict)
```

支持：`Python 2` 和 `Python <=3.4`

详见：

【已解决】Python中如何合并2个dict字典变量的值

有序字典OrderedDict的初始化

```
from collections import OrderedDict

orderedDict = OrderedDict()
```

后续正常作为普通dict使用

```
>>> from collections import OrderedDict
>>> orderedDict = OrderedDict()
>>> orderedDict["key2"] = "value2"
>>> orderedDict["key1"] = "value1"
>>> orderedDict["key3"] = "value3"

>>> orderedDict
OrderedDict([('key2', 'value2'), ('key1', 'value1'), ('key3
```

dict的递归的合并更新

```
def recursiveMergeDict(aDict, bDict):
    """
    Recursively merge dict a to b, return merged dict b
    Note: Sub dict and sub list's won't be overwritten but

    example:
(1) input and output example:
input:
{
  "keyStr": "strValueA",
  "keyInt": 1,
  "keyBool": true,
  "keyList": [
    {
      "index0Item1": "index0Item1",
      "index0Item2": "index0Item2"
    },
    {
      "index1Item1": "index1Item1"
    },
    {
      "index2Item1": "index2Item1"
    }
  ]
}

and

{
  "keyStr": "strValueB",
  "keyInt": 2,
  "keyList": [
    {
      "index0Item1": "index0Item1_b"
    },
    {
      "index1Item1": "index1Item1_b"
    }
  ]
}

output:

{
  "keyStr": "strValueB",
  "keyBool": true,
  "keyInt": 2,
  "keyList": [
    {
```

```
      "index0Item1": "index0Item1_b",
      "index0Item2": "index0Item2"
    },
    {
      "index1Item1": "index1Item1_b"
    },
    {
      "index2Item1": "index2Item1"
    }
  ]
}

(2) code usage example:
import copy
cDict = recursiveMergeDict(aDict, copy.deepcopy(bDict))

Note:
bDict should use deepcopy, otherwise will be altered after

    """
    aDictItems = None
    if (sys.version_info[0] == 2): # is python 2
      aDictItems = aDict.iteritems()
    else: # is python 3
      aDictItems = aDict.items()

    for aKey, aValue in aDictItems:
      # print("------ [%s]=%s" % (aKey, aValue))
      if aKey not in bDict:
        bDict[aKey] = aValue
      else:
        bValue = bDict[aKey]
        # print("aValue=%s" % aValue)
        # print("bValue=%s" % bValue)
        if isinstance(aValue, dict):
          recursiveMergeDict(aValue, bValue)
        elif isinstance(aValue, list):
          aValueListLen = len(aValue)
          bValueListLen = len(bValue)
          bValueListMaxIdx = bValueListLen - 1
          for aListIdx in range(aValueListLen):
            # print("---[%d]" % aListIdx)
            aListItem = aValue[aListIdx]
            # print("aListItem=%s" % aListItem)
            if aListIdx <= bValueListMaxIdx:
              bListItem = bValue[aListIdx]
              # print("bListItem=%s" % bListItem)
              recursiveMergeDict(aListItem, bListItem)
            else:
              # print("bDict=%s" % bDict)
              # print("aKey=%s" % aKey)
```

```
                # print("aListItem=%s" % aListItem)
                bDict[aKey].append(aListItem)

    return bDict
```

调用举例：

```
templateJson = {
  "author": "Crifan Li <admin@crifan.com>",
  "description": "gitbook书的描述",
  "gitbook": "3.2.3",
  "language": "zh-hans",
  "links": { "sidebar": { "主页": "http://www.crifan.com" }
  "plugins": [
    "theme-comscore",
    "anchors",
    "-lunr",
    "-search",
    "search-plus",
    "disqus",
    "-highlight",
    "prism",
    "prism-themes",
    "github-buttons",
    "splitter",
    "-sharing",
    "sharing-plus",
    "tbfed-pagefooter",
    "expandable-chapters-small",
    "ga",
    "donate",
    "sitemap-general",
    "copy-code-button",
    "callouts",
    "toolbar-button"
  ],
  "pluginsConfig": {
    "callouts": { "showTypeInHeader": false },
    "disqus": { "shortName": "crifan" },
    "donate": {
      "alipay": "https://www.crifan.com/files/res/crifan_co
      "alipayText": "支付宝打赏给Crifan",
      "button": "打赏",
      "title": "",
      "wechat": "https://www.crifan.com/files/res/crifan_co
      "wechatText": "微信打赏给Crifan"
    },
    "ga": { "token": "UA-28297199-1" },
    "github-buttons": {
      "buttons": [
        {
          "count": true,
          "repo": "gitbook_name",
          "size": "small",
          "type": "star",
          "user": "crifan"
```

```
        },
        {
          "count": false,
          "size": "small",
          "type": "follow",
          "user": "crifan",
          "width": "120"
        }
      ]
    },
    "prism": { "css": ["prism-themes/themes/prism-atom-dar
    "sharing": {
      "all": [
        "douban",
        "facebook",
        "google",
        "instapaper",
        "line",
        "linkedin",
        "messenger",
        "pocket",
        "qq",
        "qzone",
        "stumbleupon",
        "twitter",
        "viber",
        "vk",
        "weibo",
        "whatsapp"
      ],
      "douban": false,
      "facebook": true,
      "google": false,
      "hatenaBookmark": false,
      "instapaper": false,
      "line": false,
      "linkedin": false,
      "messenger": false,
      "pocket": false,
      "qq": true,
      "qzone": false,
      "stumbleupon": false,
      "twitter": true,
      "viber": false,
      "vk": false,
      "weibo": true,
      "whatsapp": false
    },
    "sitemap-general": {
      "prefix": "https://book.crifan.com/gitbook/gitbook_na
    },
```

```
    "tbfed-pagefooter": {
      "copyright": "crifan.com, 使用<a \"href=\"https://crea
      "modify_format": "YYYY-MM-DD HH:mm:ss",
      "modify_label": "最后更新: "
    },
    "theme-default": { "showLevel": true },
    "toolbar-button": {
      "icon": "fa-file-pdf-o",
      "label": "下载PDF",
      "url": "http://book.crifan.com/books/gitbook_name/pd
    }
  },
  "root": "./src",
  "title": "Gitbook的书名"
}

currentJson = {
  "description": "crifan整理的Python各个方面常用的代码段, 供需要
  "pluginsConfig": {
    "github-buttons": { "buttons": [{ "repo": "python_comm
    "sitemap-general": {
      "prefix": "https://book.crifan.com/gitbook/python_co
    },
    "toolbar-button": {
      "url": "http://book.crifan.com/books/python_common_c
    }
  },
  "title": "Python常用代码段"
}


 bookJson = recursiveMergeDict(templateJson, copy.deepcopy
```

list列表和set集合

list vs set

- set
  - 适用于检测某元素是否在集合内、对集合进行一定的数学操作
  - 不支持indexing，slicing
- list
  - 普通的数组
  - 支持indexing，slicing

把list换成set

```
someSet = set([])
for eachItem in someList:
    someSet.add(eachItem)
```

set集合转换为字符串

```
someSetStr = ", ".join(someSet)
```

把列表转为python正则中的group中可能出现的选项

```
def listToPatternGroup(curList):
    """Convert list to pattern group"""
    patternGroupList = list(map(lambda curType: "(%s)" % cu
    groupP = "|".join(patternGroupList) # '(aaa)|(bbb)|(cc
    return groupP
```

调用：

```
ValidPlatformTypeList = ["iOS", "Android"]
ValidPlatformRule = listToPatternGroup(ValidPlatformTypeLis
```

目的是用于后续的正则判断

```
TaskFilenamePattern = "(?P<taskDate>\d+)_(?P<businessType>$
```

sort排序

详见：

- https://github.com/crifan/crifanLibPython/blob/master/crifanLib/crifanDict.py
- https://github.com/crifan/crifanLibPython/blob/master/crifanLib/demo/crifanDictDemo.py

对字典根据key去排序

```
from collections import OrderedDict

def sortDictByKey(originDict):
    """
        Sort dict by key
    """
    originItems = originDict.items()
    sortedOriginItems = sorted(originItems)
    sortedOrderedDict = OrderedDict(sortedOriginItems)
    return sortedOrderedDict
```

调用：

```
def demoSortDictByKey():
  originDict = {
    "c": "abc",
    "a": 1,
    "b": 22
  }
  print("originDict=%s" % originDict)
  # originDict={'c': 'abc', 'a': 1, 'b': 22}
  sortedOrderedDict = sortDictByKey(originDict)
  print("sortedOrderedDict=%s" % sortedOrderedDict)
  # sortedOrderedDict=OrderedDict([('a', 1), ('b', 22), ('
```

sort和sorted

```python
# Function: Demo sorted
#   mainly refer official doc:
#       排序指南 — Python 3.8.2 文档
#       https://docs.python.org/zh-cn/3/howto/sorting.html
# Author: Crifan Li
# Update: 20200304


from operator import itemgetter, attrgetter


print("%s %s %s" % ('='*40, "sort", '='*40))


originIntList = [5, 2, 3, 1, 4]
originIntList.sort()
sortedSelfIntList = originIntList
print("sortedSelfIntList=%s" % sortedSelfIntList)
# sortedSelfIntList=[1, 2, 3, 4, 5]


print("%s %s %s" % ('='*40, "sorted", '='*40))


intList = [5, 2, 3, 1, 4]
sortedIntList = sorted(intList)
print("sortedIntList=%s" % sortedIntList)
# sortedIntList=[1, 2, 3, 4, 5]


reversedSortIntList = sorted(intList, reverse=True)
print("reversedSortIntList=%s" % reversedSortIntList)
# reversedSortIntList=[5, 4, 3, 2, 1]


intStrDict = {5: 'A', 1: 'D', 2: 'B',  4: 'E', 3: 'B'}
dictSortedIntList = sorted(intStrDict)
print("dictSortedIntList=%s" % dictSortedIntList)
# dictSortedIntList=[1, 2, 3, 4, 5]


normalStr = "Crifan Li best love language is Python"
strList = normalStr.split()
print("strList=%s" % strList)
sortedStrList = sorted(strList, key=str.lower)
print("sortedStrList=%s" % sortedStrList)
# strList=['Crifan', 'Li', 'best', 'love', 'language', 'is
# sortedStrList=['best', 'Crifan', 'is', 'language', 'Li',
```

```
studentTupleList = [
    # name, grade, age
    ('Cindy', 'A', 15),
    ('Crifan', 'B', 12),
    ('Tony', 'B', 10),
]
sortedTupleList_lambda = sorted(studentTupleList, key=lambd
print("sortedTupleList_lambda=%s" % sortedTupleList_lambda)
# sortedTupleList_lambda=[('Tony', 'B', 10), ('Crifan', 'B


# same as single function:
def getStudentAge(curStudentTuple):
    return curStudentTuple[2] # [2] is age
sortedTupleList_singleFunction = sorted(studentTupleList, k
print("sortedTupleList_singleFunction=%s" % sortedTupleList
# sortedTupleList_singleFunction=[('Tony', 'B', 10), ('Cri


# same as operator itemgetter:
sortedTupleList_operator = sorted(studentTupleList, key=ite
print("sortedTupleList_operator=%s" % sortedTupleList_opera
# sortedTupleList_operator=[('Tony', 'B', 10), ('Crifan',


class Student:
    def __init__(self, name, grade, age):
        self.name = name
        self.grade = grade
        self.age = age
    def __repr__(self):
        return repr((self.name, self.grade, self.age))


studentObjectList = [
    Student('john', 'A', 15),
    Student('jane', 'A', 15),
    Student('dave', 'A', 15),
]
sortedObjectList = sorted(studentObjectList, key=lambda stu
print("sortedObjectList=%s" % sortedObjectList)
# sortedObjectList=[('john', 'A', 15), ('jane', 'A', 15),


# same as operator attrgetter:
sortedObjectList_operator = sorted(sortedObjectList, key=at
print("sortedObjectList_operator=%s" % sortedObjectList_ope
# sortedObjectList_operator=[('john', 'A', 15), ('jane', 'A
```

enum枚举

枚举基本用法

枚举定义

举例1：

```
from enum import Enum

class BatteryState(Enum):
    Unknown = 0
    Unplugged = 1
    Charging = 2
    Full = 3
```

举例2：

```
import enum

class ScreenshotQuality(enum.Enum):
    Original = 0
    Medium = 1
    Low = 2
```

举例3：

```
class SentenceInvalidReason(Enum):
    NONE = "none"
    UNKNOWN = "unknown"
    EMPTY = "empty
    TOO_SHORT = "too short"
    TOO_LONG = "too long"
    TOO_MANY_INVALID_WORD = "contain too many invalid words
```

初始化创建枚举值

直接传入对应的（此处是int）值即可：

```
batteryStateInt = 2
curBattryStateEnum = BatteryState(batteryStateInt)
```

log输出是：

```
curBattryStateEnum=BatteryState.Charging
```

获取枚举的名称

```
curBattryStateName = curBattryStateEnum.name
```

输出：`'Charging'`

获取枚举的值

```
curBattryStateValue = curBattryStateEnum.value
```

输出：`2`

类似，直接从定义中获取值：

```
gScreenQuality = ScreenshotQuality.Low.value # 2
```

枚举高级用法

给枚举中添加函数

```
class TipType(enum.Enum):
    NoTip = "NoTip"
    TenPercent = "TenPercent"
    FifthPercent = "FifthPercent"
    TwentyPercent = "TwentyPercent"

    # @property
    def getTipPercent(self):
        tipPercent = 0.0
        if self == TipType.NoTip:
            tipPercent = 0.0
        elif self == TipType.TenPercent:
            tipPercent = 0.10
        elif self == TipType.FifthPercent:
            tipPercent = 0.15
        elif self == TipType.TwentyPercent:
            tipPercent = 0.20
        gLog.debug("self=%s -> tipPercent=%s", self, tipPe
        return tipPercent
```

调用：

```
tipPercent = initiatorTipType.getTipPercent()
# tipPercent=0.1
```

注意事项

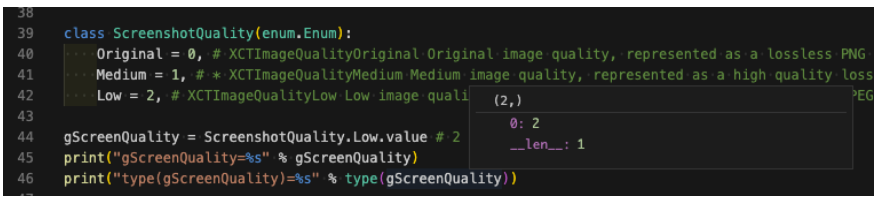
字符串枚举定义最后不要加逗号

enum定义期间不要加（多余的）逗号：

```
class ScreenshotQuality(enum.Enum):
    Original = 0,
    Medium = 1,
    Low = 2,
```

否则 `value` 就是 `tuple` **元祖**了：

```
gScreenQuality = ScreenshotQuality.Low.value # 实际上是 (2,)
print("gScreenQuality=%s" % gScreenQuality) # gScreenQuali
print("type(gScreenQuality)=%s" % type(gScreenQuality)) # t
```



collections集合

根据官网：

collections --- 容器数据类型 — Python 3.8.1 文档

介绍，集合有很多种，列出供了解：

- `namedtuple()`：创建命名元组子类的工厂函数
- `deque`：类似列表(list)的容器，实现了在两端快速添加(append)和弹出(pop)
- `ChainMap`：类似字典(dict)的容器类，将多个映射集合到一个视图里面
- `Counter`：字典的子类，提供了可哈希对象的计数功能
- `OrderedDict`：字典的子类，保存了他们被添加的顺序
- `defaultdict`：字典的子类，提供了一个工厂函数，为字典查询提供一个默认值
- `UserDict`：封装了字典对象，简化了字典子类化
- `UserList`：封装了列表对象，简化了列表子类化
- `UserString`：封装了列表对象，简化了字符串子类化

待以后用到了，再详细总结。

logging日志

彩色日志+日志初始化

自己的库：crifanLogging.py

已实现常用的功能，包括：

- 彩色日志
- 初始化

使用方式 = 典型调用代码：

先下载我的库：

- crifanLogging.py
  - https://github.com/crifan/crifanLibPython/blob/master/python3/crifanLib/crifanLogging.py

对于文件：`somePythonFile.py`

调用和初始化代码：

```
import crifanLogging

CurFilePath = os.path.abspath(__file__)
# print("CurFilePath=%s" % CurFilePath)
CurFilename = os.path.basename(CurFilePath)
# 'autoSearchGame_YingYongBao.py'
CurFileNoSuffix, pointSuffix = os.path.splitext(CurFilename

CurFolder = os.path.dirname(CurFilePath)
# print("CurFolder=%s" % CurFolder)

LogFolder = os.path.join(CurFolder, "logs")

def initLog():
    curDatetimeStr = utils.getCurDatetimeStr() # '20200316_
    utils.createFolder(LogFolder)
    curLogFile = "%s_%s.log" % (CurFileNoSuffix, curDatetir
    logFullPath = os.path.join(LogFolder, curLogFile)
    crifanLogging.loggingInit(logFullPath)

def main():
    initLog()
```

即可生成log文件：`logs/somePythonFile.log`

注：相关函数：

- `createFolder`
  - 新建文件夹
- `getCurDatetimeStr`
  - getCurDatetimeStr 生成当前日期时间字符串

附录

下面列出相关参考资料。

参考资料

- 【已解决】AppStore自动安装iOS的app：逻辑优化加等待和多试几次
- 【已解决】Python中如何实现函数调用时多个可变数量的参数传递
- 【已解决】Python中如何合并2个dict字典变量的值
- 【已解决】Python中给Mac中文件加上可执行权限
- 【已解决】Python如何从二进制数据中生成Pillow的Image
- 【已解决】Python的Pillow如何从二进制数据中读取图像数据
- 【已解决】Python的requests中如何下载二进制数据保存为图片文件
- 【已解决】Python中用Pillow去缩小分辨率以及保持画质同时最大程度压缩图片
- 【已解决】Python中实现二进制数据的图片的压缩
- 【已解决】Python中如何解析mp3等音频文件得到时长信息
- 【已解决】用Python代码从视频中提取出音频mp3文件
- 【已解决】Python 3中通过二进制生成文件类型对象
- 【已解决】用ffmpeg从mp4视频中提取出整个mp3以及根据时间段去分割mp3
- 【已解决】python中从文件名后缀推断出MIME类型
- 【已解决】Python中从int值生成Enum枚举和获取枚举值的字符串或名字
- 【未解决】python的wda中调整appium的settings参数实现功能优化
- 【已解决】Python中实现类似touch创建一个空文件
- 【已解决】Python中根据key去对字典排序
- 【已解决】Python 3中如何把字符串str转换成字节码bytes
- 【已解决】Python的md5运行出错：发生异常AttributeError builtin_function_or_method object has no attribute new
- 【已解决】Python 3中md5报错：Unicode-objects must be encoded before hashing
- 【已解决】Python 3中判断变量类型
- 【已解决】Python中删除字典dict中的键值
- 【已解决】Python中获取文件最后更新时间
- 【已解决】Python中获取OrderedDict中最后一个元素
- 【记录】python中smtp发送gmail邮箱
- 【已解决】Python中smtp如何发送多个收件人地址且带名字的且可以被格式化
- 【已解决】python中判断单个或多个单词是否是全部小写或首字母小写
- 【已解决】Python中如何让Enum的字符串输出字段的值而不带类型的前缀 – 在路上
- 【已解决】Python中给枚举添加内置函数或属性
- 【基本解决】Python中把wma、wav等格式音频转换为mp3 – 在路上

- 【已解决】Python中如何格式化大小为人类易读的效果
- 【已解决】Python中获取带毫秒的时间戳
- 【已解决】Python中实现dict的递归的合并更新
- 【已解决】Python中把list换成set
- 【整理】python中一次性创建多级文件夹，判断一个文件夹是否已经存在 – 在路上
- 【已解决】Python中如何递归的删除整个非空文件夹 – 在路上
- Python表格处理：CSV和Excel
-
- python - Correct way to write line to file? - Stack Overflow
- How do you do a simple "chmod +x" from within python? - Stack Overflow
- io.BytesIO.getvalue
- 排序指南 — Python 3.8.2 文档
- Python 常用指引 — Python 3.8.2 文档
- Built-in Functions — Python 3.8.2 documentation
- operator — Standard operators as functions — Python 3.8.2 documentation
- Python 常用指引 — Python 3.8.2 文档
- 3.8.2 Documentation
- 编程常见问题 — Python 3.8.2 文档
- 术语对照表 — Python 3.8.2 文档
- enum — Support for enumerations — Python 3.8.2 documentation
- enum --- 对枚举的支持 — Python 3.9.0a4 文档
- collections --- 容器数据类型 — Python 3.8.1 文档
- md5 not support in python 3.6 and django 1.10 - Stack Overflow
- list - Python: how to join entries in a set into one string? - Stack Overflow
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