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Python常用代码段

- 最新版本: v1.2
- 更新时间: 20210114

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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Gitbook源码

- [crifan/python_common_code_snippet](#): Python常用代码段

如何使用此Gitbook源码去生成发布为电子书

详见：[crifan/gitbook_template](#): demo how to use crifan gitbook template and demo

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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。

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[crifan/crifan_ebook_readme: Crifan的电子书的使用说明](#)

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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。

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常用代码段

下面总结各个方面的Python常用代码段。

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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, sleepInterval 0.1, isShowErrWhenFail=True):
    """
    do something, retry mutiple time if fail

    Args:
        functionInfoDict (dict): function info dict contain functionCallback and [optional]
    ] functionParaDict
        maxRetryNum (int): max retry number
        sleepInterval (float): sleep time of each interval when fail
        isShowErrWhenFail (bool): show error when fail if true
    Returns:
        bool
    Raises:
    """
    doSuccess = False
    functionCallback = functionInfoDict["functionCallback"]
    functionParaDict = functionInfoDict.get("functionParaDict", None)

    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.switchToAppStoreSearchTab of <src.AppCrawler.AppCrawler object at 0x1053abe80>'
            logging.error("Still fail after %d retry for %s", maxRetryNum, functionName)
    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({"functionCallback": self.iOSFromSettingsIntoWifiList})
```

其中：

```
def iOSFromSettingsIntoWifiList(self):
    ...
    foundAndClickedWifi = self.findAndClickElement(query wifiTextQuery, timeout 0.1)
    return foundAndClickedWifi
```

类似例子：

```
isSwitchOk = self.multipleRetry({"functionCallback": self.switchToAppStoreSearchTab})
```

对比之前原始写法：

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

其他类似例子：

```
foundAndClickedDownload = self.multipleRetry({"functionCallback": self.appStoreStartDownload})
```

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", "name": "App Store"}
isOk = CommonUtils.multipleRetry(
    {
        "functionCallback": self.wait_element_setText,
        "functionParaDict": {
            "locator": searchInputQuery,
            "text": appName,
        }
    }
)
```

对比之前原始写法：

```
searchInputQuery = {"type": "XCUIElementTypeSearchField", "name": "App Store"}  
isInputOk = self.wait_element_setText(searchInputQuery, appName)
```

其中wait_elementSetText的定义是：

```
def wait_elementSetText(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.appStoreSearchResultIntoDetail,  
        "functionParaDict": {  
            "appName": appName,  
        }  
    },  
    sleepInterval 0.5  
)
```

之前原始写法：

```
isIntoDetailOk = self.appStoreSearchResultIntoDetail(appName)
```

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.appStoreSearchResultIntoDetail,
        "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, sleepInterval=0.1, isShowErrWhenFail=True, isRespFullRetValue=False):
    """do something, retry if single call failed, retry mutiple time until max retry number

Args:
    functionInfoDict (dict): function info dict contain functionCallback and [optional]
    ] functionParaDict
    maxRetryNum (int): max retry number
    sleepInterval (float): sleep time (seconds) of each interval when fail
    isShowErrWhenFail (bool): show error when fail if true
    isRespFullRetValue (bool): whether return full return value of function call
Returns:
    isRespFullRetValue=False: bool
    isRespFullRetValue=True: bool / tuple/list/...
Raises:
"""
    finalReturnValue = None
    doSuccess = False
    functionCallback = functionInfoDict["functionCallback"]
    functionParaDict = functionInfoDict.get("functionParaDict", None)

    curRetryNum = maxRetryNum
    while curRetryNum > 0:
        if functionParaDict:
            # doSuccess = functionCallback(**functionParaDict)
            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 return value: %s" % respValue)

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.switchToAppStoreSearchTab of <src.AppCrawler.AppCrawler object at 0x1053abe80>'
        logging.error("Still fail after %d retry for %s", maxRetryNum, functionName)
# 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,
)
```

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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
```

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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 osIsWindows():
    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, shell=True) # b'C02Y3N10JHC8\n'
        try:
            resultStr = consoleOutputByte.decode("utf-8")
        except UnicodeDecodeError:
            # TODO: use chardet auto detect encoding
            # consoleOutputStr = consoleOutputByte.decode("gbk")
            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.osIsWindows():  
        # Windows  
        cmd = "wmic bios get serialnumber"  
    elif CommonUtils.osIsMacOS():  
        # macOS  
        cmd = "system_profiler SPHardwareDataType | awk '/Serial/ {print $4}'"  
    # TODO: add support other OS  
    # AIX: aix  
    # Linux: linux  
    # Windows/Cygwin: cygwin  
  
    serialNumber = ""  
    lines = CommonUtils.get_cmd_lines(cmd)  
    if CommonUtils.osIsWindows():  
        # 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 22:07:22.705101
    curDatetimeStr = curDatetime.strftime(format=outputFormat) #'20171111_220722'
    return curDatetimeStr
```

调用举例：

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

datetime转时间戳

```
import time

def datetimeToTimestamp(self, datetimeVal, withMilliseconds=False):
    """
    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) # 1531468736.0 -> 10 digits
    timestamp10DigitInt = int(timestampFloat) # 1531468736
    timestampInt = timestamp10DigitInt

    if withMilliseconds:
```

```
microsecondInt = datetimeVal.microsecond # 817762
microsecondFloat = float(microsecondInt)/float(1000000) # 0.817762
timestampFloat = timestampFloat + microsecondFloat # 1531468736.817762
timestampFloat = timestampFloat * 1000 # 1531468736817.7621 -> 13 digits
timestamp13DigitInt = int(timestampFloat) # 1531468736817
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, withMilliseconds)
```

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
```

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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, sizeUnitSeperator ""):
    """
    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
        763832854988542665 -> 678.4199PB
    """
```

```

refer:
    https://stackoverflow.com/questions/1094841/reusable-library-to-get-human-readable-version-of-file-size
"""

# https://en.wikipedia.org/wiki/Binary_prefix#Specific_units_of_IEC_60027-2_A.2_and_ISO-2IEC_80000
# K=kilo, M=mega, G=giga, T=tera, P=peta, E=exa, Z=zetta, Y=yotta
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', 'Zi']
sizeUnitList = sizeUnitListWithI

largestUnit += 'i'

suffix = "B"
decimalFormat = "." + str(decimalNum) + "f" # ".1f"
finalFormat = "%" + decimalFormat + sizeUnitSeperator + "%s%s" # "%.1f%s%s"
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 -> %s" % (kbSize, kbStr))

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

def testSeparator():
    seperatorSize = 98654
    seperatorStr = formatSize(seperatorSize, sizeUnitSeperator=" ")
    print("%s -> %s" % (seperatorSize, seperatorStr))

def testBytes():

```

```
bytesSize = 352
bytesStr = formatSize(bytesSize)
print("%s -> %s" % (bytesSize, bytesStr))

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

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

def testPb():
    pbSize = 763832854988542665
    pbStr = formatSize(pbSize, decimalNum 4)
    print("%s -> %s" % (pbSize, pbStr))

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

文件系统

详见：

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

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文件

获取文件最后更新时间

```
import os

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

    Args:
        curFilePath (str): some file or folder path
    Returns:
        int: time stamp int of 13 digit, with milliseconds
    Raises:
        """
    updateTime = None
    try:
        modifyTime = os.path.getmtime(curFilePath) # 1593748641.3270357
        updateTime = int(modifyTime * 1000) # 1593748641327
    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 -> mp4
    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 constantly writing to it
        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") as jsonFp:
    json.dump(jsonValue, jsonFp, indent=2, ensure_ascii=False)
    # 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") as jsonFp:
        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)
            newState = curState.st_mode | stat.S_IEXEC
            os.chmod(someFile, newState)
```

```
"""
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.S_IXGRP | stat.S_IXOTH
        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

```
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_drawRect_40x40.jpg'
        not exist -> 'crifanLib/demo/input/image/20201219_172616_drawRect_40x40.jpg'
    (2) 'crifanLib/demo/input/image/20191219_172616_drawRect_40x40.jpg'
        exists -> next until not exist 'crifanLib/demo/input/image/20191219_172616_draw
Rect_40x40_3.jpg'
    """
    newFilename = curFilename

    newPathRootPart, pointSuffix = os.path.splitext(newFilename)
    # 'crifanLib/demo/input/image/20191219_172616_drawRect_40x40_1'
    filenamePrefix = newPathRootPart
    while os.path.exists(newFilename):
        newTailNumberInt = 1
        foundTailNumber = re.search("^({filenamePrefix}.+)_({tailNumber}\d+)$", newPathRootPart)
        if foundTailNumber:
            tailNumberStr = foundTailNumber.group("tailNumber") # '1'
            tailNumberInt = int(tailNumberStr)
            newTailNumberInt = tailNumberInt + 1 # 2
            filenamePrefix = foundTailNumber.group("filenamePrefix") # 'crifanLib/demo/in
put/image/20191219_172616_drawRect_40x40'
            # existed previously saved, change to new name
            newPathRootPart = "%s_%s" % (filenamePrefix, newTailNumberInt)
            # 'crifanLib/demo/input/image/20191219_172616_drawRect_40x40_2'
            newFilename = newPathRootPart + pointSuffix
            # 'crifanLib/demo/input/image/20191219_172616_drawRect_40x40_2.jpg'

    return newFilename

```

调用:

```

notExistFile = "crifanLib/demo/input/image/some_not_exist_filename.jpg"
nextFilename = findNextNumberFilename(notExistFile)
print("notExistFile=%s -> nextFilename=%s" % (notExistFile, nextFilename))
# notExistFile=crifanLib/demo/input/image/some_not_exist_filename.jpg -> nextFilename=cr
ifanLib/demo/input/image/some_not_exist_filename.jpg

realExistFile = "crifanLib/demo/input/image/20191219_172616_drawRect_40x40.jpg"
nextUntilNotExistFilename = findNextNumberFilename(realExistFile)
print("realExistFile=%s -> nextUntilNotExistFilename=%s" % (realExistFile, nextUntilNotE
xistFilename))
# realExistFile=crifanLib/demo/input/image/20191219_172616_drawRect_40x40.jpg -> nextUnt
ilNotExistFilename=crifanLib/demo/input/image/20191219_172616_drawRect_40x40_2.jpg

```

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].content_type
```

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

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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=True)
```

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

```
#!/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', nodename='xxx', release='18.7
    .0', version='Darwin Kernel Version 18.7.0: Sat Oct 12 00:02:19 PDT 2019; root:xnu-4903.27
    8.12~1/RELEASE_X86_64', machine='x86_64')

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

    fullFilePath = "/Users/limao/dev/crifan/python/notEnoughUnpack/Snip20191212_113.png"
    print("fullFilePath=%s" % fullFilePath)
    # fullFilePath=/Users/limao/dev/crifan/python/notEnoughUnpack/Snip20191212_113.png

    dirname = os.path.dirname(fullFilePath)
    print("dirname=%s" % dirname)
    # dirname=/Users/limao/dev/crifan/python/notEnoughUnpack
    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/notEnoughUnpack/Snip20191212_113.png
    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, pointSuffix=.png
    head, tail = os.path.split(fullFilePath)
    print("head=%s, tail=%s" % (head, tail))
    # head=/Users/limao/dev/crifan/python/notEnoughUnpack, tail=Snip20191212_113.png
    drive, tail = os.path.splitdrive(fullFilePath)
    print("drive=%s, tail=%s" % (drive, tail))
    # drive=, tail=/Users/limao/dev/crifan/python/notEnoughUnpack/Snip20191212_113.png

    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" % isFileOrFolderRealExist)
# isFileOrFolderRealExist=True

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

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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

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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。

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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=3543x3543 at 0x1065F7A20>
# <PIL.JpegImagePlugin.JpegImageFile image mode=RGB size=1080x1920 at 0x1026D7278>
```

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 / binary bytes
:param newSize: (width, height)
:param resample: PIL.Image.NEAREST, PIL.Image.BILINEAR, PIL.Image.BICUBIC, or PIL.Image.LANCZOS
    https://pillow.readthedocs.io/en/stable/reference/Image.html#PIL.Image.Image.thumbnail
:param outputFormat: PNG/JPEG/BMP/GIF/TIFF/WebP/..., more refer:
    https://pillow.readthedocs.io/en/stable/handbook/image-file-formats.html
    if input image is filename with suffix, can omit this -> will infer from filename
suffix
:param outputImageFile: output image file filename
:return:
    input image file filename: output resized image to outputImageFile
    input image binary bytes: resized image binary bytes
"""

openableImage = None
if isinstance(inputImage, str):
    openableImage = inputImage
elif isinstance(inputImage):
    openableImage = inputImage
elif isinstance(inputImage, bytes):
    inputImageLen = len(inputImage)
    openableImage = io.BytesIO(inputImage)

imageFile = Image.open(openableImage) # <PIL.PngImagePlugin.PngImageFile image mode=RG
BA size=3543x3543 at 0x1065F7A20>
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(inputImageLen)

```

```

        print("%s -> %s, resize ratio: %d%%" % (inputImageLen, compressedImageLen, int(com-
pressRatio * 100)))
    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(parentParentFolder)
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_image_demo/hot_day.png"
    outputImageFilename = "/Users/crifan/dev/tmp/python/resize_image_demo/hot_day_300x300.pn-
g"
    print("imageFilename=%s" % imageFilename)
    beforeTime = datetime.datetime.now()
    resizeImage(imageFilename, (300, 300), outputImageFile outputImageFilename)
    afterTime = datetime.datetime.now()
    print("procesTime: %s" % (afterTime - beforeTime))

    outputImageFilename = "/Users/crifan/dev/tmp/python/resize_image_demo/hot_day_800x800.pn-
g"
    beforeTime = datetime.datetime.now()
    resizeImage(imageFilename, (800, 800), outputImageFile outputImageFilename)
    afterTime = datetime.datetime.now()
    print("procesTime: %s" % (afterTime - beforeTime))

def testFileObject():
    imageFilename = "/Users/crifan/dev/tmp/python/resize_image_demo/hot_day.png"
    imageFileObj = open(imageFilename, "rb")
    outputImageFilename = "/Users/crifan/dev/tmp/python/resize_image_demo/hot_day_600x600.pn-
g"
    beforeTime = datetime.datetime.now()
    resizeImage(imageFileObj, (600, 600), outputImageFile outputImageFilename)
    afterTime = datetime.datetime.now()
    print("procesTime: %s" % (afterTime - beforeTime))

def testBinaryBytes():
    imageFilename = "/Users/crifan/dev/tmp/python/resize_image_demo/take_tomato.png"
    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/resize_image_demo/hot_day_750x750.png"
beforeTime = datetime.datetime.now()
resizeImage(imageBytes, (750, 750), outputImageFile outputImageFilename)
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_demo/hot_day.png
# 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

```

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 show it,
    Args:

```

```

    inputImgOrImgPath (Image/str): a pillow(PIL) Image instance or image file path
    rectLocation (tuple/list/Rect): the rectangle location, (x, y, width, height)
    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 with drawn rectangle
    saveTail(str): save filename tail part. support format %x/%y/%w/%h use only when i
sAutoSave=True
    clickedPos (tuple): x,y of clicked position; default None; if None, use the center
point
    isDrawClickedPosCircle (bool): draw small circle in clicked point
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(clickedY - radius))
    endPointInt = (int(clickedX + radius), int(clickedY + radius))
    draw ellipse([startPointInt, endPointInt], outline circleOutline, width circleLine
WidthInt)

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.splitext(inputImgPath)
        imgFolderAndName = imgFolderAndName + saveTail
        newImgPath = imgFolderAndName + pointSuffix
        newImgPath = findNextNumberFilename(newImgPath)
    else:
        curDatetimeStr = getCurDatetimeStr() # '20191219_143400'
        suffix = str(inputImg.format).lower() # 'jpeg'
        newImgFilename = "%s%s.%s" % (curDatetimeStr, saveTail, suffix)
        imgPathRoot = os.getcwd()
        newImgPath = os.path.join(imgPathRoot, newImgFilename)

    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, curHeight]
curImg = CommonUtils.imageDrawRectangle(curImg, curRect, isShow=True, saveTail "_rect_%x|%y|%w|%h", isDrawClickedPosCircle False)
```

或：

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

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



20200305_145916_rect_121|
401|232|38_1.jpg
JPEG 图像 – 309 KB

标签 添加标签...

创建时间 今天 下午3:02

修改时间 今天 下午3:02

内容创建时间 2020/3/5

尺寸 1080×2340

颜色空间 RGB

其他调用：

```
imageDrawRectangle(curPillowImg, curLocation)

imageDrawRectangle(curPillowImg, calculatedLocation)

curImg = imageDrawRectangle(imgPath, firstMatchLocation, clickedPos clickedPos)
```

```
curImg = imageDrawRectangle(imgPath, firstMatchLocation)
```

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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/general_basic" # 通用文字识别
    # OCR_URL = "https://aip.baidubce.com/rest/2.0/ocr/v1/general"          # 通用文字识别（含
    # 位置信息版）
    # OCR_URL = "https://aip.baidubce.com/rest/2.0/ocr/v1/accurate_basic" # 通用文字识别（高
    # 精度版）
    OCR_URL = "https://aip.baidubce.com/rest/2.0/ocr/v1/accurate"         # 通用文字识别（高精
    # 度含位置版）

    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 limit reached"

    RESP_ERR_CODE_DAILY_LIMIT_REACHED = 17
    RESP_ERR_TEXT_DAILY_LIMIT_REACHED = "Open api daily request limit reached"

    API_KEY = 'S0xxxxxxxxxxxxnu'
    SECRET_KEY = 'wlxxxxxxxxxxxxxxxxxxxxpL'

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

    # '24.8691f3c6dedd0d0b30a9dfec604d52.2592000.1578465979.282335-17921535'
    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 following wait sometime to reduce: q
    # ps request limit
    # 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, headers headerDict, data dataDict)

    respJson = resp.json()

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

    if "error_code" in respJson:
        logging.warning("respJson=%s" % respJson)
        errorCode = respJson["error_code"]
        # {'error_code': 17, 'error_msg': 'Open api daily request limit reached'}
        # {'error_code': 18, 'error_msg': 'Open api qps request limit reached'}
        # 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_REACHED:
            # wait sometime and try again
            time.sleep(1.0)
            resp = requests.post(self.OCR_URL, params paramDict, headers=headerDict, data=
dataDict)
            respJson = resp.json()
            logging.debug("baidu OCR: for errorCode=%s, do again, imgage=%s -> respJson=%s"
, errorCode, imagePath, respJson)
        elif errorCode == self.RESP_ERR_CODE_DAILY_LIMIT_REACHED:
            logging.error("Fail to continue using baidu OCR api today !!!")
            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": 989, "height": 158 }
        },
        {
          "char": "充",
          "location": { "width": 94, "top": 105, "left": 1086, "height": 158 }
        },
        {
          "char": "豪",
          "location": { "width": 95, "top": 105, "left": 1183, "height": 158 }
        },
        {
          "char": "礼",
          "location": { "width": 77, "top": 105, "left": 1281, "height": 158 }
        }
      ],
      "location": { "width": 370, "top": 105, "left": 989, "height": 158 },
      "words": "首充豪礼"
    }
  ]
}
```

```
        "words": "首充豪礼"
    },
    {
        "chars": [
            {
                "char": "x",
                "location": { "width": 30, "top": 161, "left": 1887, "height": 61 }
            }
        ],
        "location": { "width": 60, "top": 161, "left": 1887, "height": 61 },
        "words": "x"
    },
    {
        "chars": [
            {
                "char": "充",
                "location": { "width": 43, "top": 273, "left": 758, "height": 73 }
            },
            {
                "char": "值",
                "location": { "width": 43, "top": 273, "left": 803, "height": 73 }
            },
            {
                "char": "元",
                "location": { "width": 67, "top": 273, "left": 912, "height": 73 }
            },
            {
                "char": "可",
                "location": { "width": 44, "top": 273, "left": 979, "height": 73 }
            },
            {
                "char": "领",
                "location": { "width": 43, "top": 273, "left": 1023, "height": 73 }
            },
            {
                "char": "总",
                "location": { "width": 44, "top": 273, "left": 1067, "height": 73 }
            },
            {
                "char": "价",
                "location": { "width": 23, "top": 273, "left": 1111, "height": 73 }
            },
            {
                "char": "值",
                "location": { "width": 89, "top": 273, "left": 1134, "height": 73 }
            },
            {
                "char": "8",
                "location": { "width": 36, "top": 273, "left": 1259, "height": 73 }
            },
            {
                "char": "8",
                "location": { "width": 36, "top": 273, "left": 1326, "height": 73 }
            }
        ]
    }
]
```

```
        },
        {
            "char": "8",
            "location": { "width": 35, "top": 273, "left": 1371, "height": 73 }
        },
        {
            "char": "钻",
            "location": { "width": 43, "top": 273, "left": 1444, "height": 73 }
        },
        {
            "char": "豪",
            "location": { "width": 44, "top": 273, "left": 1510, "height": 73 }
        },
        {
            "char": "华",
            "location": { "width": 43, "top": 273, "left": 1555, "height": 73 }
        },
        {
            "char": "大",
            "location": { "width": 43, "top": 273, "left": 1599, "height": 73 }
        },
        {
            "char": "礼",
            "location": { "width": 27, "top": 273, "left": 1643, "height": 73 }
        }
    ],
    "location": { "width": 911, "top": 273, "left": 758, "height": 73 },
    "words": "充值元可领总价值888钻豪华大礼"
},
{
    "chars": [
        {
            "char": "送",
            "location": { "width": 65, "top": 369, "left": 832, "height": 107 }
        }
    ],
    "location": { "width": 107, "top": 369, "left": 832, "height": 107 },
    "words": "送"
},
{
    "chars": [
        {
            "char": "绝",
            "location": { "width": 38, "top": 390, "left": 974, "height": 65 }
        },
        {
            "char": "版",
            "location": { "width": 38, "top": 390, "left": 1032, "height": 65 }
        },
        {
            "char": "萌",
            "location": { "width": 38, "top": 390, "left": 1092, "height": 65 }
        }
    ]
}
```

```
{  
    "char": "宠",  
    "location": { "width": 38, "top": 390, "left": 1150, "height": 65 }  
},  
{  
    "char": "、",  
    "location": { "width": 31, "top": 390, "left": 1184, "height": 65 }  
},  
{  
    "char": "专",  
    "location": { "width": 39, "top": 390, "left": 1230, "height": 65 }  
},  
{  
    "char": "属",  
    "location": { "width": 38, "top": 390, "left": 1289, "height": 65 }  
},  
{  
    "char": "神",  
    "location": { "width": 38, "top": 390, "left": 1368, "height": 65 }  
},  
{  
    "char": "兵",  
    "location": { "width": 39, "top": 390, "left": 1408, "height": 65 }  
}  
],  
"location": { "width": 524, "top": 390, "left": 934, "height": 65 },  
"words": "绝版萌宠、专属神兵"  
},  
{  
    "chars": [  
        {  
            "char": "绝",  
            "location": { "width": 20, "top": 515, "left": 378, "height": 33 }  
        }  
    ],  
    "location": { "width": 33, "top": 515, "left": 378, "height": 33 },  
    "words": "绝"  
},  
{  
    "chars": [  
        {  
            "char": "珍",  
            "location": { "width": 33, "top": 516, "left": 1992, "height": 42 }  
        }  
    ],  
    "location": { "width": 33, "top": 516, "left": 1992, "height": 42 },  
    "words": "珍"  
},  
{  
    "chars": [  
        {  
            "char": "版",  
            "location": { "width": 20, "top": 545, "left": 379, "height": 34 }  
        }  
    ]  
}
```

```
        },
    ],
    "location": { "width": 31, "top": 545, "left": 379, "height": 34 },
    "words": "版"
},
{
    "chars": [
        {
            "char": "額",
            "location": { "width": 26, "top": 776, "left": 1225, "height": 44 }
        },
        {
            "char": "外",
            "location": { "width": 26, "top": 776, "left": 1264, "height": 44 }
        },
        {
            "char": "礼",
            "location": { "width": 27, "top": 776, "left": 1291, "height": 44 }
        },
        {
            "char": "包",
            "location": { "width": 27, "top": 776, "left": 1317, "height": 44 }
        }
    ],
    "location": { "width": 125, "top": 776, "left": 1225, "height": 44 },
    "words": "额外礼包"
},
{
    "chars": [
        {
            "char": "首",
            "location": { "width": 38, "top": 830, "left": 935, "height": 64 }
        },
        {
            "char": "充",
            "location": { "width": 38, "top": 830, "left": 994, "height": 64 }
        },
        {
            "char": "元",
            "location": { "width": 38, "top": 830, "left": 1092, "height": 64 }
        },
        {
            "char": "充",
            "location": { "width": 38, "top": 830, "left": 1286, "height": 64 }
        },
        {
            "char": "9",
            "location": { "width": 31, "top": 830, "left": 1339, "height": 64 }
        },
        {
            "char": "8",
            "location": { "width": 31, "top": 830, "left": 1377, "height": 64 }
        }
    ]
}
```

```
{  
    "char": "元",  
    "location": { "width": 38, "top": 830, "left": 1444, "height": 64 }  
}  
],  
"location": { "width": 549, "top": 830, "left": 935, "height": 64 },  
"words": "首充元充98元"  
},  
{  
    "chars": [  
        {  
            "char": "战",  
            "location": { "width": 42, "top": 970, "left": 373, "height": 69 }  
        },  
        {  
            "char": "斗",  
            "location": { "width": 42, "top": 970, "left": 437, "height": 69 }  
        },  
        {  
            "char": "1",  
            "location": { "width": 35, "top": 970, "left": 515, "height": 69 }  
        },  
        {  
            "char": "5",  
            "location": { "width": 35, "top": 970, "left": 537, "height": 69 }  
        },  
        {  
            "char": "0",  
            "location": { "width": 34, "top": 970, "left": 580, "height": 69 }  
        },  
        {  
            "char": "0",  
            "location": { "width": 35, "top": 970, "left": 622, "height": 69 }  
        },  
        {  
            "char": "0",  
            "location": { "width": 34, "top": 970, "left": 666, "height": 69 }  
        }  
],  
"location": { "width": 327, "top": 970, "left": 373, "height": 69 },  
"words": "战斗15000"  
},  
{  
    "chars": [  
        {  
            "char": "战",  
            "location": { "width": 43, "top": 969, "left": 1648, "height": 73 }  
        },  
        {  
            "char": "斗",  
            "location": { "width": 43, "top": 969, "left": 1713, "height": 73 }  
        },  
        {  
        }
```

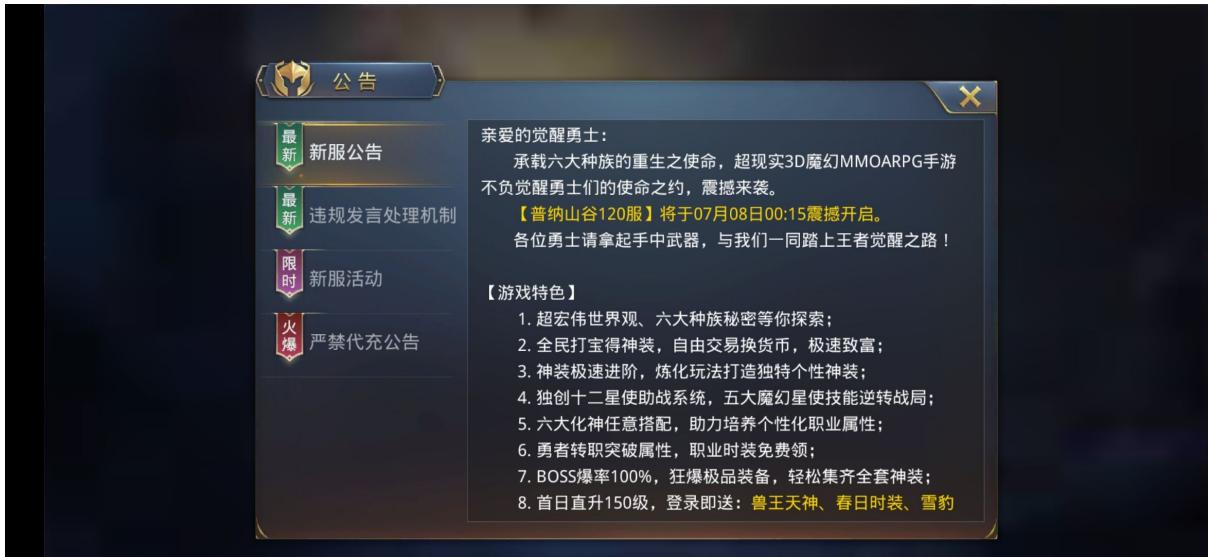
```
        "char": "1",
        "location": { "width": 36, "top": 969, "left": 1793, "height": 73 }
    },
    {
        "char": "6",
        "location": { "width": 36, "top": 969, "left": 1816, "height": 73 }
    },
    {
        "char": "0",
        "location": { "width": 35, "top": 969, "left": 1861, "height": 73 }
    },
    {
        "char": "0",
        "location": { "width": 36, "top": 969, "left": 1904, "height": 73 }
    },
    {
        "char": "0",
        "location": { "width": 29, "top": 969, "left": 1949, "height": 73 }
    }
],
"location": { "width": 330, "top": 969, "left": 1648, "height": 73 },
"words": "战斗16000"
}
]
}
```

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：

```
{
  "log_id": 2793391773289550472,
  "words_result_num": 23,
  "words_result": [
    {
      "chars": [
        {
          "char": "公",
          "location": { "width": 28, "top": 125, "left": 634, "height": 48 }
        },
        {
          "char": "告",
          "location": { "width": 29, "top": 125, "left": 691, "height": 48 }
        }
      ],
      "location": { "width": 92, "top": 125, "left": 634, "height": 48 },
      "words": "公告"
    },
    {
      "chars": [
        {
          "char": "最",
          "location": { "width": 21, "top": 240, "left": 535, "height": 36 }
        }
      ],
      "location": { "width": 33, "top": 240, "left": 535, "height": 36 },
      "words": "最"
    },
    {
      "chars": [
        {
          "char": "禁",
          "location": { "width": 26, "top": 233, "left": 922, "height": 42 }
        }
      ],
      "location": { "width": 33, "top": 233, "left": 922, "height": 42 },
      "words": "严禁"
    }
  ]
}
```

```
{  
    "char": "爱",  
    "location": { "width": 26, "top": 233, "left": 959, "height": 42 }  
},  
{  
    "char": "的",  
    "location": { "width": 26, "top": 233, "left": 986, "height": 42 }  
},  
{  
    "char": "觉",  
    "location": { "width": 26, "top": 233, "left": 1024, "height": 42 }  
},  
{  
    "char": "醒",  
    "location": { "width": 26, "top": 233, "left": 1063, "height": 42 }  
},  
{  
    "char": "勇",  
    "location": { "width": 26, "top": 233, "left": 1088, "height": 42 }  
},  
{  
    "char": "士",  
    "location": { "width": 25, "top": 233, "left": 1127, "height": 42 }  
},  
{  
    "char": ";",  
    "location": { "width": 21, "top": 233, "left": 1148, "height": 42 }  
}  
],  
"location": { "width": 253, "top": 233, "left": 922, "height": 42 },  
"words": "亲爱的觉醒勇士:"}  
},  
{  

```

```
        },
    ],
    "location": { "width": 201, "top": 266, "left": 535, "height": 44 },
    "words": "新新股公告"
},
{
    "chars": [
        {
            "char": "承",
            "location": { "width": 26, "top": 282, "left": 984, "height": 43 }
        },
        {
            "char": "载",
            "location": { "width": 26, "top": 282, "left": 1023, "height": 43 }
        },
        {
            "char": "六",
            "location": { "width": 26, "top": 282, "left": 1063, "height": 43 }
        },
        {
            "char": "大",
            "location": { "width": 26, "top": 282, "left": 1090, "height": 43 }
        },
        {
            "char": "种",
            "location": { "width": 26, "top": 282, "left": 1116, "height": 43 }
        },
        {
            "char": "族",
            "location": { "width": 26, "top": 282, "left": 1155, "height": 43 }
        },
        {
            "char": "的",
            "location": { "width": 26, "top": 282, "left": 1181, "height": 43 }
        },
        {
            "char": "重",
            "location": { "width": 26, "top": 282, "left": 1220, "height": 43 }
        },
        {
            "char": "生",
            "location": { "width": 26, "top": 282, "left": 1260, "height": 43 }
        },
        {
            "char": "之",
            "location": { "width": 26, "top": 282, "left": 1286, "height": 43 }
        },
        {
            "char": "使",
            "location": { "width": 27, "top": 282, "left": 1325, "height": 43 }
        },
        {
            "char": "命",
            "location": { "width": 26, "top": 282, "left": 1363, "height": 43 }
        }
    ]
}
```

```
"location": { "width": 26, "top": 282, "left": 1351, "height": 43 }  
},  
{  
    "char": ",",  
    "location": { "width": 21, "top": 282, "left": 1385, "height": 43 }  
},  
{  
    "char": "超",  
    "location": { "width": 26, "top": 282, "left": 1416, "height": 43 }  
},  
{  
    "char": "现",  
    "location": { "width": 26, "top": 282, "left": 1456, "height": 43 }  
},  
{  
    "char": "实",  
    "location": { "width": 26, "top": 282, "left": 1483, "height": 43 }  
},  
{  
    "char": "3",  
    "location": { "width": 22, "top": 282, "left": 1517, "height": 43 }  
},  
{  
    "char": "D",  
    "location": { "width": 21, "top": 282, "left": 1531, "height": 43 }  
},  
{  
    "char": "魔",  
    "location": { "width": 26, "top": 282, "left": 1560, "height": 43 }  
},  
{  
    "char": "M",  
    "location": { "width": 61, "top": 284, "left": 1583, "height": 40 }  
},  
{  
    "char": "M",  
    "location": { "width": 35, "top": 284, "left": 1639, "height": 40 }  
},  
{  
    "char": "O",  
    "location": { "width": 31, "top": 284, "left": 1669, "height": 40 }  
},  
{  
    "char": "A",  
    "location": { "width": 25, "top": 284, "left": 1696, "height": 40 }  
},  
{  
    "char": "R",  
    "location": { "width": 25, "top": 284, "left": 1716, "height": 40 }  
},  
{  
    "char": "P",  
    "location": { "width": 25, "top": 284, "left": 1735, "height": 40 }
```

```
},
{
  "char": "G",
  "location": { "width": 25, "top": 284, "left": 1755, "height": 40 }
},
{
  "char": "幻",
  "location": { "width": 26, "top": 282, "left": 1588, "height": 43 }
},
{
  "char": "手",
  "location": { "width": 26, "top": 282, "left": 1784, "height": 43 }
},
{
  "char": "游",
  "location": { "width": 26, "top": 282, "left": 1823, "height": 43 }
},
],
"location": { "width": 867, "top": 282, "left": 984, "height": 43 },
"words": "承载六大种族的重生之使命,超现实3D魔 MMOARPG幻手游"
},
{
  "chars": [
    {
      "char": "不",
      "location": { "width": 37, "top": 337, "left": 923, "height": 40 }
    },
    {
      "char": "负",
      "location": { "width": 23, "top": 337, "left": 959, "height": 40 }
    },
    {
      "char": "觉",
      "location": { "width": 25, "top": 337, "left": 996, "height": 40 }
    },
    {
      "char": "醒",
      "location": { "width": 23, "top": 337, "left": 1021, "height": 40 }
    },
    {
      "char": "勇",
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    },  
    {  
        "char": "打",  
        "location": { "width": 26, "top": 693, "left": 1397, "height": 42 }  
    },  
    {  
        "char": "造",  
        "location": { "width": 25, "top": 693, "left": 1436, "height": 42 }  
    },  
    {  
        "char": "独",  
        "location": { "width": 25, "top": 693, "left": 1461, "height": 42 }  
    },  
    {  
        "char": "特",  
        "location": { "width": 26, "top": 693, "left": 1497, "height": 42 }  
    }
```

```
        },
        {
            "char": "个",
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        },
        {
            "char": "性",
            "location": { "width": 25, "top": 693, "left": 1561, "height": 42 }
        },
        {
            "char": "神",
            "location": { "width": 26, "top": 693, "left": 1599, "height": 42 }
        },
        {
            "char": "装",
            "location": { "width": 26, "top": 693, "left": 1624, "height": 42 }
        },
        {
            "char": ";",
            "location": { "width": 21, "top": 693, "left": 1657, "height": 42 }
        }
    ],
    "location": { "width": 686, "top": 693, "left": 994, "height": 42 },
    "words": "3.神装极速进阶,炼化玩法打造独特个性神装;"
},
{
    "chars": [
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            "char": "4",
            "location": { "width": 19, "top": 746, "left": 996, "height": 38 }
        },
        {
            "char": ".",
            "location": { "width": 19, "top": 746, "left": 1008, "height": 38 }
        },
        {
            "char": "独",
            "location": { "width": 22, "top": 746, "left": 1036, "height": 38 }
        },
        {
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            "location": { "width": 23, "top": 746, "left": 1070, "height": 38 }
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        {
            "char": "+",
            "location": { "width": 23, "top": 746, "left": 1106, "height": 38 }
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        {
            "char": "二",
            "location": { "width": 23, "top": 746, "left": 1141, "height": 38 }
        },
        {
            "char": "星",
            "location": { "width": 23, "top": 746, "left": 1175, "height": 38 }
        }
    ]
}
```

```
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    {
        "char": "使",
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    },
    {
        "char": "助",
        "location": { "width": 23, "top": 746, "left": 1235, "height": 38 }
    },
    {
        "char": "战",
        "location": { "width": 23, "top": 746, "left": 1270, "height": 38 }
    },
    {
        "char": "系",
        "location": { "width": 23, "top": 746, "left": 1305, "height": 38 }
    },
    {
        "char": "统",
        "location": { "width": 23, "top": 746, "left": 1328, "height": 38 }
    },
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        "char": ",",
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    },
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        "char": "五",
        "location": { "width": 22, "top": 746, "left": 1400, "height": 38 }
    },
    {
        "char": "大",
        "location": { "width": 23, "top": 746, "left": 1435, "height": 38 }
    },
    {
        "char": "魔",
        "location": { "width": 23, "top": 746, "left": 1457, "height": 38 }
    },
    {
        "char": "幻",
        "location": { "width": 22, "top": 746, "left": 1494, "height": 38 }
    },
    {
        "char": "星",
        "location": { "width": 23, "top": 746, "left": 1529, "height": 38 }
    },
    {
        "char": "使",
        "location": { "width": 23, "top": 746, "left": 1564, "height": 38 }
    },
    {
        "char": "技",
        "location": { "width": 23, "top": 746, "left": 1599, "height": 38 }
    }
```

```
        },
        {
            "char": "能",
            "location": { "width": 23, "top": 746, "left": 1623, "height": 38 }
        },
        {
            "char": "逆",
            "location": { "width": 23, "top": 746, "left": 1659, "height": 38 }
        },
        {
            "char": "转",
            "location": { "width": 23, "top": 746, "left": 1693, "height": 38 }
        },
        {
            "char": "战",
            "location": { "width": 23, "top": 746, "left": 1728, "height": 38 }
        },
        {
            "char": "局",
            "location": { "width": 22, "top": 746, "left": 1765, "height": 38 }
        },
        {
            "char": ";",
            "location": { "width": 15, "top": 746, "left": 1794, "height": 38 }
        }
    ],
    "location": { "width": 821, "top": 746, "left": 989, "height": 38 },
    "words": "4.独创十二星使助战系统，五大魔幻星使技能逆转战局；"
},
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    "chars": [
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            "location": { "width": 21, "top": 795, "left": 992, "height": 41 }
        },
        {
            "char": ".",
            "location": { "width": 21, "top": 795, "left": 1013, "height": 41 }
        },
        {
            "char": "六",
            "location": { "width": 25, "top": 795, "left": 1043, "height": 41 }
        },
        {
            "char": "大",
            "location": { "width": 25, "top": 795, "left": 1067, "height": 41 }
        },
        {
            "char": "化",
            "location": { "width": 25, "top": 795, "left": 1103, "height": 41 }
        },
        {
            "char": "神",
            "location": { "width": 25, "top": 795, "left": 1127, "height": 41 }
        }
    ]
}
```

```
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},  
{  
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},  
{  
    "char": "意",  
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},  
{  
    "char": "搭",  
    "location": { "width": 25, "top": 795, "left": 1228, "height": 41 }  
},  
{  
    "char": "配",  
    "location": { "width": 25, "top": 795, "left": 1264, "height": 41 }  
},  
{  
    "char": "",  
    "location": { "width": 20, "top": 795, "left": 1297, "height": 41 }  
},  
{  
    "char": "助",  
    "location": { "width": 23, "top": 795, "left": 1327, "height": 41 }  
},  
{  
    "char": "力",  
    "location": { "width": 25, "top": 795, "left": 1364, "height": 41 }  
},  
{  
    "char": "培",  
    "location": { "width": 25, "top": 795, "left": 1400, "height": 41 }  
},  
{  
    "char": "养",  
    "location": { "width": 25, "top": 795, "left": 1438, "height": 41 }  
},  
{  
    "char": "个",  
    "location": { "width": 25, "top": 795, "left": 1463, "height": 41 }  
},  
{  
    "char": "性",  
    "location": { "width": 23, "top": 795, "left": 1501, "height": 41 }  
},  
{  
    "char": "化",  
    "location": { "width": 25, "top": 795, "left": 1525, "height": 41 }  
},  
{  
    "char": "职",  
    "location": { "width": 25, "top": 795, "left": 1563, "height": 41 }
```

```
},
{
  "char": "业",
  "location": { "width": 25, "top": 795, "left": 1599, "height": 41 }
},
{
  "char": "属",
  "location": { "width": 23, "top": 795, "left": 1624, "height": 41 }
},
{
  "char": "性",
  "location": { "width": 25, "top": 795, "left": 1661, "height": 41 }
},
{
  "char": ";",
  "location": { "width": 18, "top": 795, "left": 1694, "height": 41 }
},
],
"location": { "width": 719, "top": 795, "left": 992, "height": 41 },
"words": "5.六大化神任意搭配，助力培养个性化职业属性;"
},
{
  "chars": [
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    },
    {
      "char": ".",
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    },
    {
      "char": "勇",
      "location": { "width": 25, "top": 844, "left": 1030, "height": 42 }
    },
    {
      "char": "者",
      "location": { "width": 26, "top": 844, "left": 1068, "height": 42 }
    },
    {
      "char": "转",
      "location": { "width": 25, "top": 844, "left": 1106, "height": 42 }
    },
    {
      "char": "职",
      "location": { "width": 25, "top": 844, "left": 1131, "height": 42 }
    },
    {
      "char": "突",
      "location": { "width": 26, "top": 844, "left": 1168, "height": 42 }
    },
    {
      "char": "破",
      "location": { "width": 26, "top": 844, "left": 1205, "height": 42 }
    }
  ]
}
```

```
        "location": { "width": 26, "top": 844, "left": 1193, "height": 42 }  
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        "location": { "width": 25, "top": 844, "left": 1269, "height": 42 }  
    },  
    {  
        "char": "，",  
        "location": { "width": 21, "top": 844, "left": 1291, "height": 42 }  
    },  
    {  
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        "location": { "width": 25, "top": 844, "left": 1333, "height": 42 }  
    },  
    {  
        "char": "业",  
        "location": { "width": 25, "top": 844, "left": 1371, "height": 42 }  
    },  
    {  
        "char": "时",  
        "location": { "width": 25, "top": 844, "left": 1396, "height": 42 }  
    },  
    {  
        "char": "装",  
        "location": { "width": 25, "top": 844, "left": 1433, "height": 42 }  
    },  
    {  
        "char": "免",  
        "location": { "width": 38, "top": 844, "left": 1459, "height": 42 }  
    },  
    {  
        "char": "费",  
        "location": { "width": 25, "top": 844, "left": 1496, "height": 42 }  
    },  
    {  
        "char": "领",  
        "location": { "width": 25, "top": 844, "left": 1534, "height": 42 }  
    },  
    {  
        "char": ";",  
        "location": { "width": 21, "top": 844, "left": 1555, "height": 42 }  
    }  
],  
"location": { "width": 586, "top": 844, "left": 994, "height": 42 },  
"words": "6. 勇者转职突破属性,职业时装免费领;"  
},  
{  
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        {
```

```
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    },
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    },
    {
        "char": "B",
        "location": { "width": 23, "top": 893, "left": 1029, "height": 46 }
    },
    {
        "char": "0",
        "location": { "width": 22, "top": 893, "left": 1044, "height": 46 }
    },
    {
        "char": "S",
        "location": { "width": 23, "top": 893, "left": 1071, "height": 46 }
    },
    {
        "char": "S",
        "location": { "width": 23, "top": 893, "left": 1100, "height": 46 }
    },
    {
        "char": "爆",
        "location": { "width": 28, "top": 893, "left": 1118, "height": 46 }
    },
    {
        "char": "華",
        "location": { "width": 27, "top": 893, "left": 1147, "height": 46 }
    },
    {
        "char": "1",
        "location": { "width": 22, "top": 893, "left": 1171, "height": 46 }
    },
    {
        "char": "0",
        "location": { "width": 22, "top": 893, "left": 1184, "height": 46 }
    },
    {
        "char": "0",
        "location": { "width": 23, "top": 893, "left": 1212, "height": 46 }
    },
    {
        "char": "%",
        "location": { "width": 28, "top": 893, "left": 1231, "height": 46 }
    },
    {
        "char": ",",
        "location": { "width": 22, "top": 893, "left": 1255, "height": 46 }
    },
    {
        "char": "狂",
        "location": { "width": 23, "top": 893, "left": 1283, "height": 46 }
    }
}
```

```
"location": { "width": 28, "top": 893, "left": 1287, "height": 46 }  
},  
{  
    "char": "爆",  
    "location": { "width": 27, "top": 893, "left": 1331, "height": 46 }  
},  
{  
    "char": "极",  
    "location": { "width": 28, "top": 893, "left": 1358, "height": 46 }  
},  
{  
    "char": "品",  
    "location": { "width": 27, "top": 893, "left": 1387, "height": 46 }  
},  
{  
    "char": "裝",  
    "location": { "width": 28, "top": 893, "left": 1428, "height": 46 }  
},  
{  
    "char": "备",  
    "location": { "width": 27, "top": 893, "left": 1456, "height": 46 }  
},  
{  
    "char": "ゝ",  
    "location": { "width": 22, "top": 893, "left": 1480, "height": 46 }  
},  
{  
    "char": "轻",  
    "location": { "width": 28, "top": 893, "left": 1526, "height": 46 }  
},  
{  
    "char": "松",  
    "location": { "width": 28, "top": 893, "left": 1555, "height": 46 }  
},  
{  
    "char": "集",  
    "location": { "width": 28, "top": 893, "left": 1597, "height": 46 }  
},  
{  
    "char": "齐",  
    "location": { "width": 28, "top": 893, "left": 1625, "height": 46 }  
},  
{  
    "char": "全",  
    "location": { "width": 28, "top": 893, "left": 1653, "height": 46 }  
},  
{  
    "char": "春",  
    "location": { "width": 27, "top": 893, "left": 1696, "height": 46 }  
},  
{  
    "char": "神",  
    "location": { "width": 28, "top": 893, "left": 1724, "height": 46 }
```

```
},
{
  "char": "装",
  "location": { "width": 28, "top": 893, "left": 1752, "height": 46 }
},
{
  "char": ";",
  "location": { "width": 23, "top": 893, "left": 1775, "height": 46 }
}
],
"location": { "width": 813, "top": 893, "left": 992, "height": 46 },
"words": "7.Boss爆率100%，狂爆极品装备，轻松集齐全套神装；"
},
{
  "chars": [
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      "char": "8",
      "location": { "width": 25, "top": 945, "left": 994, "height": 49 }
    },
    {
      "char": ".",
      "location": { "width": 23, "top": 945, "left": 1008, "height": 49 }
    },
    {
      "char": "首",
      "location": { "width": 44, "top": 945, "left": 1029, "height": 49 }
    },
    {
      "char": "日",
      "location": { "width": 29, "top": 945, "left": 1072, "height": 49 }
    },
    {
      "char": "直",
      "location": { "width": 29, "top": 945, "left": 1102, "height": 49 }
    },
    {
      "char": "升",
      "location": { "width": 29, "top": 945, "left": 1132, "height": 49 }
    },
    {
      "char": "1",
      "location": { "width": 23, "top": 945, "left": 1158, "height": 49 }
    },
    {
      "char": "5",
      "location": { "width": 25, "top": 945, "left": 1172, "height": 49 }
    },
    {
      "char": "0",
      "location": { "width": 25, "top": 945, "left": 1201, "height": 49 }
    },
    {
      "char": "级",
      "location": { "width": 25, "top": 945, "left": 1231, "height": 49 }
    }
  ]
}
```

```
        "location": { "width": 29, "top": 945, "left": 1222, "height": 49 }
    },
    {
        "char": ",",
        "location": { "width": 25, "top": 945, "left": 1247, "height": 49 }
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        "char": "暨",
        "location": { "width": 30, "top": 945, "left": 1281, "height": 49 }
    },
    {
        "char": "景",
        "location": { "width": 29, "top": 945, "left": 1327, "height": 49 }
    },
    {
        "char": "即",
        "location": { "width": 29, "top": 945, "left": 1357, "height": 49 }
    },
    {
        "char": "送",
        "location": { "width": 29, "top": 945, "left": 1387, "height": 49 }
    },
    {
        "char": ";",
        "location": { "width": 23, "top": 945, "left": 1412, "height": 49 }
    },
    {
        "char": "兽",
        "location": { "width": 29, "top": 945, "left": 1446, "height": 49 }
    },
    {
        "char": "王",
        "location": { "width": 29, "top": 945, "left": 1492, "height": 49 }
    },
    {
        "char": "天",
        "location": { "width": 29, "top": 945, "left": 1521, "height": 49 }
    },
    {
        "char": "神",
        "location": { "width": 29, "top": 945, "left": 1551, "height": 49 }
    },
    {
        "char": "`",
        "location": { "width": 25, "top": 945, "left": 1575, "height": 49 }
    },
    {
        "char": "春",
        "location": { "width": 29, "top": 945, "left": 1611, "height": 49 }
    },
    {
        "char": "日",
        "location": { "width": 30, "top": 945, "left": 1655, "height": 49 }
```

```

        },
        {
            "char": "时",
            "location": { "width": 29, "top": 945, "left": 1686, "height": 49 }
        },
        {
            "char": "装",
            "location": { "width": 29, "top": 945, "left": 1716, "height": 49 }
        },
        {
            "char": ``,
            "location": { "width": 25, "top": 945, "left": 1740, "height": 49 }
        },
        {
            "char": "雪",
            "location": { "width": 29, "top": 945, "left": 1789, "height": 49 }
        },
        {
            "char": "豹",
            "location": { "width": 28, "top": 945, "left": 1820, "height": 49 }
        }
    ],
    "location": { "width": 879, "top": 945, "left": 968, "height": 49 },
    "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 current words
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": "薈",
    "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": "尋寶福利大厅商城薈充"
},
-> (971, 51, 30, 24)
"""
(x, y, width, height) = (0, 0, 0, 0)
matchedStr = curWordsResult["words"]
# Note: for special, contain multiple words, here only process first words
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[firstMatchedPos]
    lastCharResult = charResultList[lastMatchedPos]
else:
    # Special: for 'Loading' matched ' Loading', but charResultList not include first space ' ', but from first='L' to end='g'
    # so using find the corresponding char, then got its location
    # Note: following method not work for regex str, like '^游戏公告$'

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

for eachCharResult in charResultList:
    if firstCharResult and lastCharResult:
        break

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

# Note: follow no need check words, to support input ^游戏公告$ to match "游戏公告"
# firstLocation = None
# lastLocation = None
# if firstCharResult["char"] == firstToMatchChar:
#     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["width"]
lastHorizontalEnd = lastLeft + lastLocation["width"]
maxHorizontalEnd = max(firstHorizontalEnd, lastHorizontalEnd)
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, eachWordsMatchedResult)
```

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 position

    Args:
        wordslocation (tuple): words location, (x, y, width, height)
            Example: (267, 567, 140, 39)
    Returns:
        tuple, (x, y), the location's center position, normal used later to click it
            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(eachLocation)
```

检测文字是否在结果中

代码：

```

def isWordsInResult(self, respJson, wordsOrWordsList, isMatchMultiple=False):
    """Check words is in result or not

Args:
    respJson (dict): Baidu OCR responded json
    wordsOrWordsList (str/list): single input str or str list
    isMatchMultiple (bool): for each single str, to match multiple output or only match one output
Returns:
    dict, matched result
Raises:
"""

# Note: use OrderedDict instead dict to keep order, for later get first match result to process
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, eachWords)
        if foundCurWords:
            curMatchedResultList.append(eachWordsResult)
            if not isMatchMultiple:
                break

    orderedMatchedResultDict[curInputWords] = curMatchedResultList
return orderedMatchedResultDict

```

调用：

```

matchedResultDict = self.isWordsInResult(wordsResultJson, wordsOrWordsList, isMatchMultiple=False)

```

检测当前屏幕中是否包含对应文字

```

def isWordsInCurScreen(self, wordsOrWordsList, imgPath=None, isMatchMultiple=False, isRespShortInfo=False):
    """Found words in current screen

```

```

Args:
    wordsOrWordsList (str/list): single input str or str list
        imgPath (str): current screen image file path; default=None; if None, will auto get current screen image
        isMatchMultiple (bool): for each single str, to match multiple output or only match one output; default=False
        isRespShortInfo (bool): return simple=short=normally bool or list[bool] info or return full info which contain imgPath and full matched result.
    Returns:
        matched result, type=bool/list[bool]/dict/tuple, depends on diffrent condition
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(wordsResultJson, wordsOrWordsList, isMatchMultiple)

    # add caculated location and words
    # Note: use OrderedDict instead dict to keep order, for later get first match result to process
    processedResultDict = OrderedDict()
    for eachInputWords in inputWordsList:
        isCurFound = False
        # curLocatoinList = []
        # curWordsList = []
        curResultList = []

```

```

        curWordsMatchedResultList = matchedResultDict[eachInputWords]
        if curWordsMatchedResultList:
            isCurFound = True
            for curIdx, eachWordsMatchedResult in enumerate(curWordsMatchedResultList):
                curMatchedWords = eachWordsMatchedResult["words"]
                calculatedLocation = self.calcWordsLocation(eachInputWords, eachWordsMatchedResult)
                # curLocatoinList.append(calculatedLocation)
                # curWordsList.append(curMatchedWords)
                curResult = (curMatchedWords, calculatedLocation)
                curResultList.append(curResult)

        # processedResultDict[eachInputWords] = (isCurFound, curLocatoinList, curWordsList)

        processedResultDict[eachInputWords] = (isCurFound, curResultList)
        logging.debug("For %s, matchedResult=%s from imgPath=%s", wordsOrWordsList, processedResultDict, imgPath)

    if isMultipleInput:
        if isRespShortInfo:
            isFoundList = []
            for eachInputWords in processedResultDict.keys():
                isCurFound, noUse = processedResultDict[eachInputWords]
                isFoundList.append(isCurFound)
            # Note: no mattter isMatchMultiple, both only return single boolean for each input words
            retBoolList = isFoundList
            retValue = retBoolList
        else:
            if isMatchMultiple:
                retTuple = processedResultDict, imgPath
                retValue = retTuple
            else:
                # Note: use OrderedDict instead dict to keep order, for later get first match result to process
                respResultDict = OrderedDict()
                for eachInputWords in processedResultDict.keys():
                    # isCurFound, curLocatoinList, curWordsList = processedResultDict[eachInputWords]
                    isCurFound, curResultList = processedResultDict[eachInputWords]
                    # singleLocation = None
                    # singleWords = None
                    singleResult = (None, None)
                    if isCurFound:
                        # singleLocation = curLocatoinList[0]
                        # singleWords = curWordsList[0]
                        singleResult = curResultList[0]
                    # respResultDict[eachInputWords] = (isCurFound, singleLocation, singleWords)
                    respResultDict[eachInputWords] = (isCurFound, singleResult)
    
```

```

        retTuple = respResultDict, imgPath
        retValue = retTuple
    else:
        singleInputResult = processedResultDict[inputWords]
        # isCurFound, curLocatoinList, curWordsList = singleInputResult
        isCurFound, curResultList = singleInputResult
        if isRespShortInfo:
            # Note: no matter isMatchMultiple, both only return single boolean for each i
            nput words
            retBool = isCurFound
            retValue = retBool
        else:
            if isMatchMultiple:
                # retTuple = isCurFound, curLocatoinList, curWordsList, imgPath
                retTuple = isCurFound, curResultList, imgPath
                retValue = retTuple
            else:
                singleResult = (None, None)
                # singleLocation = None
                # singleWords = None
                if isCurFound:
                    # singleLocation = curLocatoinList[0]
                    # singleWords = curWordsList[0]
                    singleResult = curResultList[0]
                    # retTuple = isCurFound, singleLocation, singleWords, imgPath
                    retTuple = isCurFound, singleResult, imgPath
                    retValue = retTuple

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

```

调用：

```
allResultDict, _ = self.isWordsInCurScreen(allStrList, imgPath, isMatchMultiple=True)
```

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 current screen or not

    Args:
        imgPath (str): current screen image file path; default=None; if None, will auto get current screen image
        mandatoryStrList (list): mandatory str, at least match `mandatoryMinMatchCount`, or all must match if `mandatoryMinMatchCount`=0
        mandatoryMinMatchCount (int): minimal match count for mandatory list
        optionalStrList (list): optional str, some may match
        optionalMinMatchCount (int): for `optionalStrList`, the minimal match count, consider to match or not
        isRespFullInfo (bool): return full info or not, full info means match location result and imgPath
    Returns:
        matched result, type=bool/tuple, depends on `isRespFullInfo`
    Raises:
    """
    if not imgPath:
        imgPath = self.getCurScreenshot()
    logging.debug("imgPath=%s", imgPath)

    isExist = False
    # Note: use OrderedDict instead dict to keep order, for later get first match result to process
    respMatchLocation = OrderedDict()

    isMandatoryMatch = True
    isMandatoryShouldMatchAll = (mandatoryMinMatchCount <= 0)
    isOptionalMatch = True

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

    optionalMatchCount = 0
    mandatoryMatchCount = 0

```

```

allResultDict, _ = self.isWordsInCurScreen(allStrList, imgPath, isMatchMultiple True)
for eachStr, (isFoundCur, curResultList) in allResultDict.items():
    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 >= mandatoryMinMatchCount:
            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 -> isExist=%s", isMandatoryMatch,
, isOptionalMatch, isExist)

if isRespFullInfo:
    logging.debug("mandatoryStrList=%s, optionalStrList=%s -> isExist=%s, respMatchLoc
ation=%s, imgPath=%s",
    mandatoryStrList, optionalStrList, isExist, respMatchLocation, imgPath)
    return (isExist, respMatchLocation, imgPath)
else:
    logging.debug("mandatoryStrList=%s, optionalStrList=%s -> isExist=%s",
    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.checkExistInScreen(
    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, isRespFullInfo=False):
    """Is any str exist or not

Args:
    strList (list): str list to check exist or not
    imgPath (str): current screen image file path; default=None; if None, will auto get current screen image
    isRespFullInfo (bool): return full info or not, full info means match location result and imgPath
Returns:
    matched result, type=bool/tuple, depends on `isRespFullInfo`
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, imgPath=%s for %s", isExistAny, matchResult, imgPath, strList)
    return (isExistAny, matchResult, imgPath)
else:
    isExistAny = checkResult
    logging.debug("isExistAny=%s, for %s", isExistAny, strList)
    return isExistAny

```

调用：

```

isExist, matchResult, imgPath = self.isExistAnyStr(buttonStrList, imgPath imgPath, isRespFullInfo True)

```

和：

```

mandatoryList = [
    # 御剑仙缘
    """^(请)?点击\s?[""]{1,6}[""]{1,6}[^""]+,[{1,6}[^""]]+""", # '请点击“战骑”，'请点击“魂兽”，'请点击“人物”，'请点击“领取”，'请点击“仙盟”，'点击“+”，放入吞噬”，'点击“进阶”，提升战'，请点击“每日必做”按钮
]

respResult = self.isExistAnyStr(mandatoryList, imgPath imgPath, isRespFullInfo isRespFullInfo)

```

和：

```

requireManualOperationList = [
    "完成指定操作", # speical: 造梦西游 的 '(请完成指定操作)梦口' 的顶部弹框
]
isRequireManual, _, imgPath = self.isExistAnyStr(requireManualOperationList, isRespFullInfo True)

```

和：

```

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

```

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(loadingStrList, isRespFullInfo=True)

```

和：

```

gotoPayStrList = [
    "^前往充值$", # 剑玲珑
    "^立即充值$", # 至尊屠龙
    ...
]

respBoolOrTuple = self._isExistAnyStr(gotoPayStrList, isRespFullInfo=isRespLocation)

```

判断是否所有的字符都存在

```

def _isExistAllStr(self, strList, imgPath=None, isRespFullInfo=False):
    """Is all str exist or not

    Args:
        strList (list): str list to check exist or not
        imgPath (str): current screen image file path; default=None; if None, will auto get current screen image
        isRespFullInfo (bool): return full info or not, full info means match location result and imgPath
    Returns:
        matched result, type=bool/tuple, depends on `isRespFullInfo`
    Raises:
    """
    if not imgPath:
        imgPath = self._getCurScreenshot()
    checkResult = self._checkExistInScreen(imgPath, imgPath, mandatoryStrList=strList, isRespFullInfo=isRespFullInfo)
    if isRespFullInfo:
        isExistAll, matchResult, imgPath = checkResult
        logging.debug("isExistAll=%s, matchResult=%s, imgPath=%s for %s", isExistAll, matchResult, imgPath, strList)
        return (isExistAll, matchResult, imgPath)
    else:
        isExistAll = checkResult
        logging.debug("isExistAll=%s, for %s", isExistAll, strList)
        return isExistAll

```

调用：

```
realPayStrList = [
```

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

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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_live.mp3')
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：

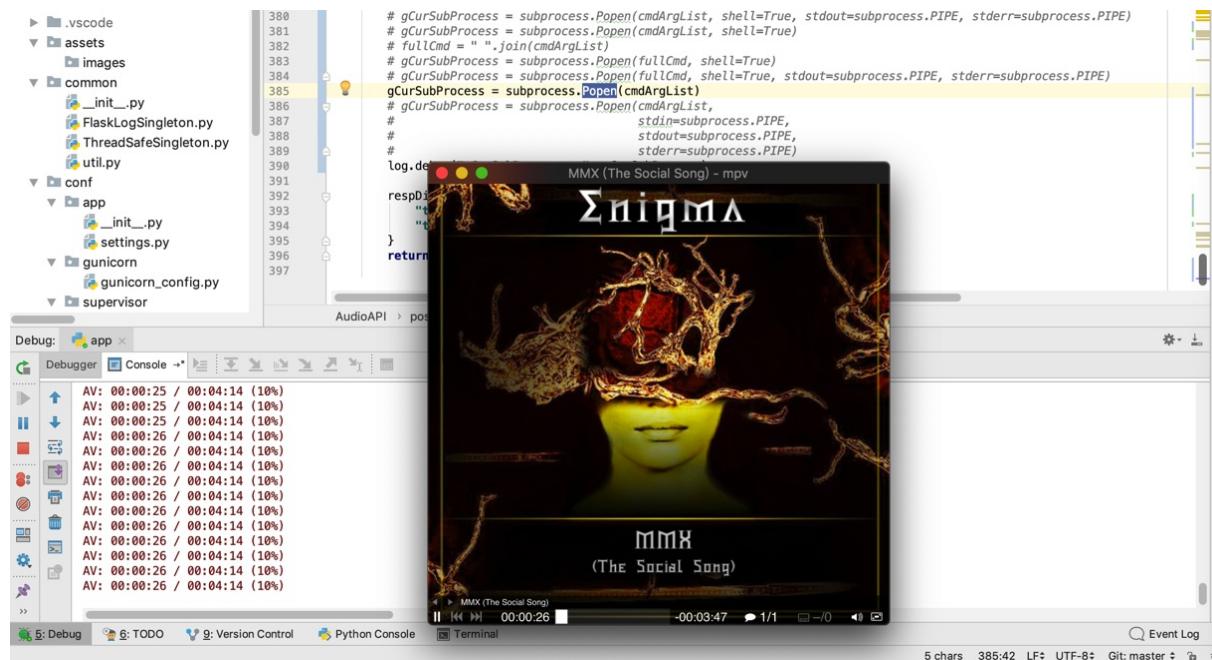
- 正在播放：返回isTerminated为 null
- 被终止后，返回isTerminated为 4

o

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:
    audioFullPath = "/your/input/audio/file.mp3"

    with audioread.audio_open(audioFullPath) 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", audioFullPath, osErr)
except EOFError as eofErr:
    logging.error("EOFError when open %s error %s", audioFullPath, eofErr)
except audioread.DecodeError as decodeErr:
    logging.error("Decode audio %s error %s", audioFullPath, decodeErr)
```

后经整理成函数：

```
import audioread

def detectAudioMetaInfo(audioFullPath):
    """
        detect audio meta info: duration, channels, sampleRate
    """
    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.samplerate

        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(decodeErr)

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()

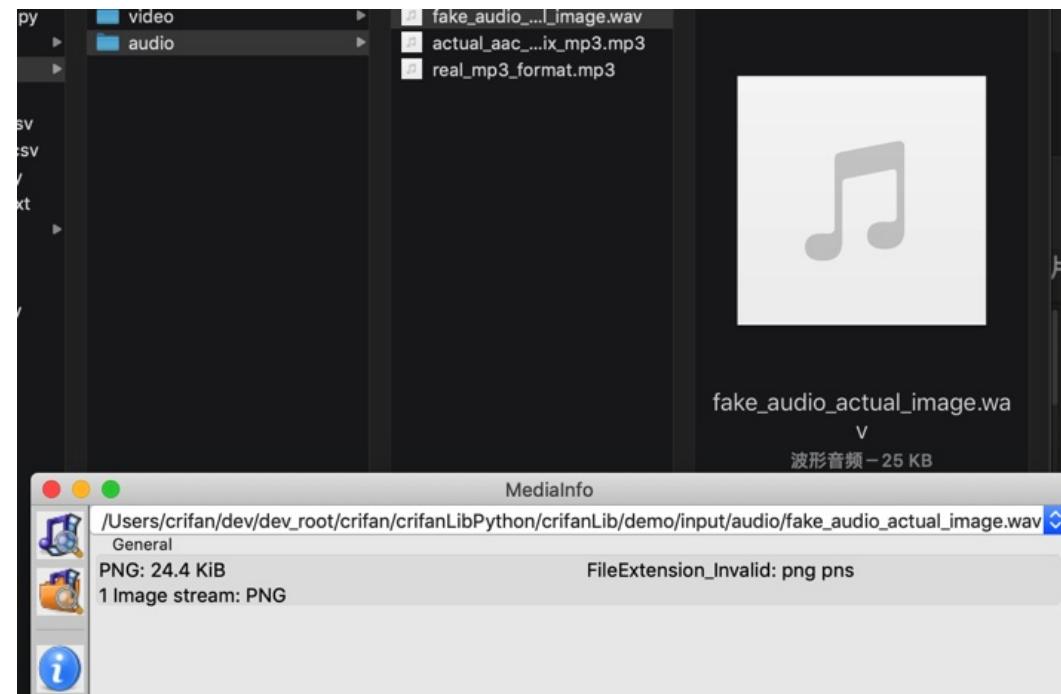
```

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, 'sampleRate': 44100}
#isOk=True, errOrInfo={'duration': 2.3510204081632655, 'channels': 2, 'sampleRate': 44100}

#isOk=False, errOrInfo=detect audio info error: [Errno 2] No such file or directory: '/Users/crifan/dev/dev_root/crifan/crifanLibPython/crifanLib/demo/not_exist_audio.wav'
#isOk=False, errOrInfo=detect audio info error:
```

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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, startTime.minutes, startTime.seconds, startTime.milliseconds)
endTimeStr = "00:00:14.550"
# endTimeStr = "%02d:%02d:%02d.%03d" % (endTime.hours, endTime.minutes, endTime.seconds, endTime.milliseconds)
outputAudioFullPath = "show_157712932_audio_000011270_000014550.mp3"

# extract audio segment from video
# ffmpeg -i show_157712932_video.mp4 -ss 00:00:11.270 -to 00:00:14.550 -b:a 128k show_157712932_audio_000011270_000014550.mp3
if not os.path.exists(outputAudioFullPath):
    ffmpegCmd = "ffmpeg -i %s -ss %s -to %s -b:a 128k %s" % (videoFullPath, startTimeStr, endTimeStr, outputAudioFullPath)
    subprocess.call(ffmpegCmd, shell=True)
    logging.info("Complete use ffmpeg extract audio: %s", ffmpegCmd)
```

可以从mp4中提取出mp3音频：

The screenshot shows a Python development environment with the following details:

- Resource Manager:** Shows files and folders like `WNLOADDEMO`, `show_`, `processResult`, `App.py`, `Pipfile`, `Pipfile.lock`, `Process`, `Video.log`, and `Video.py`.
- Code Editor:** The main editor window displays `audio.json` content, which includes segments of audio with subtitles in English and Chinese.
- Terminal:** The bottom pane shows command-line logs related to the application's execution, including file operations and process results.

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网络相关

此处整理和网络相关的一些常用代码段。

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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`

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 case -> NOT convert tag to low
    ercase

    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

是否包含符合特定条件的soup节点

```
def isContainSpecificSoup(soupList, elementName, isSizeValidCallback, matchNum 1):
    """
    判断BeautifulSoup的soup的list中，是否包含符合条件的特定的元素：
    
```

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 to check whether element size
        (width * height) is valid or not
    matchNum (int): sould only matched specific number consider as valid

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 # 326 * 270
                    isSizeValid = isSizeValidCallback(curSoupSize)
                    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(nextSiblingeSoupList, "XCUIElementTypeIm

```

```
age", self.isPopupWindowSize)
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 should not full screen
    isSizeValid = PopupWindowSizeMinRatio <= curSizeRatio <= PopupWindowSizeMaxRatio
    return isSizeValid
```

(2)

```
hasNormalButton = CommonUtils.isContainSpecificSoup(nextSiblingSoupList, "XCUIElementType
Button", self.isNormalButtonSize)
```

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 <= NormalButtonSizeMax
    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 dict
```

```

>Returns:
    soup
>Raises:
>Examples:

    [
        {
            "tag": "XCUIElementTypeWindow",
            "attrs": {"visible":"true", "enabled":"true", "width": "%s" % ScreenX, "height": "%s" % ScreenY}
        },
        {
            "tag": "XCUIElementTypeButton",
            "attrs": {"visible":"true", "enabled":"true", "width": "%s" % ScreenX, "height": "%s" % ScreenY}
        },
        {
            "tag": "XCUIElementTypeStaticText",
            "attrs": {"visible":"true", "enabled":"true", "value":"可能离开微信，打开第三方应用"}
        },
    ]

    soup node of
        <XCUIElementTypeStaticText type="XCUIElementTypeStaticText" value="可能离开微信，打开第三方应用" name="可能离开微信，打开第三方应用" label="可能离开微信，打开第三方应用" enabled="true" visible="true" x="71" y="331" width="272" height="18"/>
        in :
        <XCUIElementTypeWindow type="XCUIElementTypeWindow" enabled="true" visible="true" x="0" y="0" width="414" height="736">
            <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="true" x="0" y="0" width="414" height="736">
                <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="true" x="0" y="0" width="414" height="736">
                    <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="true" x="0" y="0" width="414" height="736">
                        <XCUIElementTypeButton type="XCUIElementTypeButton" enabled="true" visible="true" x="0" y="0" width="414" height="736">
                            <XCUIElementTypeStaticText type="XCUIElementTypeStaticText" enabled="true" visible="false" x="47" y="288" width="0" height="0"/>
                            <XCUIElementTypeStaticText type="XCUIElementTypeStaticText" value="可能离开微信，打开第三方应用" name="可能离开微信，打开第三方应用" label="可能离开微信，打开第三方应用" enabled="true" visible="true" x="71" y="331" width="272" height="18" />
                        <XCUIElementTypeStaticText type="XCUIElementTypeStaticText" value="取消" name="取消" label="取消" enabled="true" visible="true" x="109" y="409" width="36" height="22"/>
                        <XCUIElementTypeStaticText type="XCUIElementTypeStaticText" value="继续" name="继续" label="继续" enabled="true" visible="true" x="269" y="409" width="36" height="22"/>
                    </XCUIElementTypeButton>
                </XCUIElementTypeOther>
            </XCUIElementTypeOther>
        </XCUIElementTypeWindow>


```

```

        </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=curAttrs)
    else:
        highestLevelFindDict = queryChainList[0]
        curTag = highestLevelFindDict["tag"]
        curAttrs = highestLevelFindDict["attrs"]
        foundSoupList = curLevelSoup.find_all(curTag, attrs=curAttrs)
        if foundSoupList:
            childrenChainList = queryChainList[1:]
            for eachSoup in foundSoupList:
                eachSoupResult = CommonUtils.bsChainFind(eachSoup, childrenChainList)
                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" enabled="true" visible="true"
x="0" y="0" width="375" height="667">
    <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="true"
" x="32" y="240" width="311" height="187">
        <XCUIElementTypeImage type="XCUIElementTypeImage" enabled="true" visible="false"
x="32" y="240" width="311" height="187"/>
        <XCUIElementTypeStaticText type="XCUIElementTypeStaticText" value="警告" na
me="警告" label="警告" enabled="true" visible="true" x="52" y="265" width="271" height="21"
/>
        <XCUIElementTypeTextView type="XCUIElementTypeTextView" value="尚未进行授权
，请点击确定跳转到授权页面进行授权。" enabled="true" visible="true" x="60" y="300" width="255"
height="57"/>
        <XCUIElementTypeButton type="XCUIElementTypeButton" name="取消" label="取消
" enabled="true" visible="true" x="32" y="376" width="156" height="51"/>
        <XCUIElementTypeButton type="XCUIElementTypeButton" name="确定" label="确定
" enabled="true" visible="true" x="187" y="376" width="156" height="51"/>
    </XCUIElementTypeOther>

```

```

        </XCUIElementTypeButton>
    ...
warningChainList = [
    {
        "tag": "XCUIElementTypeButton",
        "attrs": {"visible": "true", "enabled": "true", "width": "%s" % self.x, "height": "%s" % self.totalY}
    },
    {
        "tag": "XCUIElementTypeOther",
        "attrs": {"visible": "true", "enabled": "true"}
    },
    {
        "tag": "XCUIElementTypeStaticText",
        "attrs": {"visible": "true", "enabled": "true", "value": "警告"}
    },
]
warningSoup = CommonUtils.bsChainFind(soup, warningChainList)

```

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": "确定"})
)
if confirmSoup:
    self.clickElementCenterPosition(confirmSoup)
    foundAndProcessedPopup = True

```

(2)

```

...
系统弹框 拍照或录像：
<XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="true" x="8" y="530" width="398" height="133">
    <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="true" x="8" y="530" width="398" height="133">
        <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="true" x="8" y="530" width="398" height="133">
            <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="false" x="0" y="0" width="398" height="133">
                <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="true" x="0" y="0" width="398" height="133">
                    <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="true" x="0" y="0" width="398" height="133">
                        <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="true" x="0" y="0" width="398" height="133">
                            <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="true" x="0" y="0" width="398" height="133">

```

```

led="true" visible="true" x="0" y="0" width="398" height="133">
    <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="true" x="0" y="0" width="398" height="133">
        <XCUIElementTypeTable type="XCUIElementTypeTable" enabled="true" visible="true" x="0" y="0" width="398" height="133">
            <XCUIElementTypeCell type="XCUIElementTypeCell" enabled="true" visible="true" x="0" y="0" width="398" height="45">
                <XCUIElementTypeImage type="XCUIElementTypeImage" enabled="true" visible="true" x="0" y="43" width="398" height="2"/>
                <XCUIElementTypeImage type="XCUIElementTypeImage" enabled="true" visible="false" x="13" y="6" width="1" height="32"/>
                <XCUIElementTypeStaticText type="XCUIElementTypeStaticText" value="拍照或录像" name="拍照或录像" label="拍照或录像" enabled="true" visible="true" x="15" y="11" width="87" height="22"/>
                <XCUIElementTypeImage type="XCUIElementTypeImage" enabled="true" visible="false" x="351" y="6" width="32" height="32"/>
            </XCUIElementTypeCell>
            <XCUIElementTypeCell type="XCUIElementTypeCell" enabled="true" visible="true" x="0" y="44" width="398" height="45">
                <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="true" x="0" y="88" width="398" height="1"/>
                <XCUIElementTypeImage type="XCUIElementTypeImage" enabled="true" visible="false" x="13" y="50" width="1" height="33"/>
                <XCUIElementTypeStaticText type="XCUIElementTypeStaticText" value="照片圖庫" name="照片圖庫" label="照片圖庫" enabled="true" visible="true" x="15" y="56" width="70" height="21"/>
                <XCUIElementTypeImage type="XCUIElementTypeImage" enabled="true" visible="false" x="351" y="50" width="32" height="33"/>
            </XCUIElementTypeCell>
            <XCUIElementTypeCell type="XCUIElementTypeCell" enabled="true" visible="true" x="0" y="88" width="398" height="45">
                <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="false" x="0" y="132" width="398" height="1"/>
                <XCUIElementTypeImage type="XCUIElementTypeImage" enabled="true" visible="false" x="13" y="94" width="1" height="33"/>
                <XCUIElementTypeStaticText type="XCUIElementTypeStaticText" value="浏览" name="浏览" label="浏览" enabled="true" visible="true" x="14" y="100" width="36" height="21"/>
                <XCUIElementTypeImage type="XCUIElementTypeImage" enabled="true" visible="false" x="351" y="94" width="32" height="33"/>
            </XCUIElementTypeCell>
            <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="true" x="0" y="132" width="398" height="1"/>
        </XCUIElementTypeTable>
    </XCUIElementTypeOther>
</XCUIElementTypeOther>
</XCUIElementTypeOther>
</XCUIElementTypeOther>
</XCUIElementTypeOther>
</XCUIElementTypeOther>
</XCUIElementTypeOther>

```

```

        </XCUIElementTypeOther>
        <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="true" x=
"8" y="671" width="398" height="57">
            <XCUIElementTypeButton type="XCUIElementTypeButton" name="取消" label="取消" en
abled="true" visible="true" x="8" y="671" width="398" height="57"/>
        </XCUIElementTypeOther>
    ...
photoCameraChainList = [
{
    "tag": "XCUIElementTypeOther",
    "attrs": {"enabled": "true", "visible": "true"}
},
{
    "tag": "XCUIElementTypeTable",
    "attrs": {"enabled": "true", "visible": "true", "x": "0", "y": "0"}
},
{
    "tag": "XCUIElementTypeStaticText",
    "attrs": {"enabled": "true", "visible": "true", "value": "拍照或录像"}
},
]
photoCameraSoup = CommonUtils.bsChainFind(soup, photoCameraChainList)

```



(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" enabled="true" visible="true" x=
"0" y="0" width="414" height="736">
            ...
                <XCUIElementTypeCell type="XCUIElementTypeCell" name="xxx_guest_5G, 安全网络,
信号强度 3 格, 共 3 格" label="xxx_guest_5G, 安全网络, 信号强度 3 格, 共 3 格" enabled="true"
visible="true" x="0" y="144" width="414" height="43">
                    <XCUIElementTypeStaticText type="XCUIElementTypeStaticText" value="xxx_gue
st_5G" name="xxx_guest_5G" label="xxx_guest_5G" enabled="true" visible="true" x="40" y="15
5" width="278" height="21"/>
                    <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="
true" x="0" y="186" width="414" height="1"/>
                    <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="
true" x="8" y="151" width="28" height="29">
                        <XCUIElementTypeImage type="XCUIElementTypeImage" name="UIPreferencesB
lueCheck" enabled="true" visible="false" x="8" y="151" width="28" height="29"/>
                    </XCUIElementTypeOther>
                    <XCUIElementTypeOther type="XCUIElementTypeOther" enabled="true" visible="
false" x="15" y="187" width="245" height="1"/>
                    <XCUIElementTypeImage type="XCUIElementTypeImage" name="Lock" enabled="tr
ue" visible="false" x="326" y="159" width="8" height="12"/>
                    <XCUIElementTypeImage type="XCUIElementTypeImage" name="WifiBars3" enabled
="true" visible="false" x="346" y="153" width="16" height="25"/>
                    <XCUIElementTypeButton type="XCUIElementTypeButton" name="更多信息" label="
更多信息" enabled="true" visible="true" x="372" y="154" width="22" height="22"/>
                </XCUIElementTypeCell>

```

```
    curPageXml = self.get_page_source()
    soup = CommonUtils.xmlToSoup(curPageXml)
    blueCheckChainList = [
        {
            "tag": "XCUIElementTypeCell",
            "attrs": {"enabled": "true", "visible": "true", "x": "0", "width": "%s" % self.X}
        },
        {
            "tag": "XCUIElementTypeOther",
            "attrs": {"enabled": "true", "visible": "true"}
        },
        {
            "tag": "XCUIElementTypeImage",
            # "attrs": {"enabled": "true", "visible": "true", "name": "UIPreferencesBlueCheck"}
            "attrs": {"enabled": "true", "name": "UIPreferencesBlueCheck"}
        },
    ]
    blueCheckSoup = CommonUtils.bsChainFind(soup, blueCheckChainList)
    if blueCheckSoup:
```

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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

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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
    """
    encryptedMd5 = ""
    md5Instance = md5()
    # print("type(md5Instance)=%s" % type(md5Instance)) # type(md5Instance)=<class '_hashlib.HASH'>
    # print("type(strToMd5)=%s" % type(strToMd5)) # type(strToMd5)=<class 'str'>
    bytesToMd5 = bytes(strToMd5, "UTF-8")
    # print("type(bytesToMd5)=%s" % type(bytesToMd5)) # type(bytesToMd5)=<class 'bytes'>
    md5Instance.update(bytesToMd5)
    encryptedMd5 = md5Instance.hexdigest()
    # print("type(encryptedMd5)=%s" % type(encryptedMd5)) # type(encryptedMd5)=<class 'str'>
    # print("encryptedMd5=%s" % encryptedMd5) # encryptedMd5=3a821616bec2e86e3e232d0c7f392cf5
    return encryptedMd5
```

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) :  
    encryptedMd5 = ""  
    md5Instance = md5.new()  
    #md5Instance=<md5 HASH object @ 0x1062af738>  
    md5Instance.update(strToMd5)  
    encryptedMd5 = md5Instance.hexdigest()  
    #encryptedMd5=af0230c7fcc75b34cbb268b9bf64da79  
    return encryptedMd5
```

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常见语法

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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, sleepInterval 0.1):
    """
    do something, retry mutiple time if fail

    Args:
        functionInfoDict (dict): function info dict contain functionCallback and [optional]
    ] functionParaDict
        maxRetryNum (int): max retry number
        sleepInterval (float): sleep time of each interval when fail
    Returns:
        bool
    Raises:
    """
    doSuccess = False
    functionCallback = functionInfoDict["functionCallback"]
    functionParaDict = functionInfoDict.get("functionParaDict", None)

    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.switchToAppStoreSearchTab of <src.AppCrawler.AppCr
        awler object at 0x1053abe80>'
        logging.error("Still fail after %d retry for %s", functionName)
    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", "name": "App Store"}
isInputOk = self.multipleRetry(
    {
        "functionCallback": self.wait_element_setText,
        "functionParaDict": {
            "locator": searchInputQuery,
            "text": appName,
        }
    }
)
```

之前原始写法：

```
searchInputQuery = {"type": "XCUIElementTypeSearchField", "name": "App Store"}
isInputOk = self.wait_element_setText(searchInputQuery, appName)
```

其中wait_elementSetText的定义是：

```
def wait_elementSetText(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](#)

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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', 'value3')])
```

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 also updated/merged

    example:
    (1) input and output example:
    input:
    {
        "keyStr": "strValueA",
        "keyInt": 1,
        "keyBool": true,
        "keyList": [
            {
                "index0Item1": "index0Item1",
                "index0Item2": "index0Item2"
            },
            {
                "index1Item1": "index1Item1"
            }
        ]
    }
    output:
    {
        "keyStr": "strValueB",
        "keyInt": 2,
        "keyBool": false,
        "keyList": [
            {
                "index0Item1": "index0Item2",
                "index0Item2": "index0Item3"
            },
            {
                "index1Item1": "index1Item2"
            }
        ]
    }
```

```

        "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 call this function !!!
"""

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_com/crifan_alipay_pay.jpg",
"alipayText": "支付宝打赏给Crifan",
"button": "打赏",
"title": "",
"wechat": "https://www.crifan.com/files/res/crifan_com/crifan_wechat_pay.jpg",
"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-dark.css"] },
"sharing": {
"all": [
"douban",
"facebook",
"google",
"instapaper",
"line",
"linkedin",
"messenger",
"pocket",
"qq",
"tencent",
"weibo",
"weixin"
]
}
```

```

    "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_name/website/"
},
"tbfed-pagefooter": {
  "copyright": "crifan.com, 使用署名4.0国际\(CC BY 4.0\)协议发布",
  "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/pdf/gitbook_name.pdf"
},
"root": "./src",
"title": "Gitbook的书名"
}

currentJson = {
  "description": "crifan整理的Python各个方面常用的代码段，供需要的参考。",
  "pluginsConfig": {
    "github-buttons": { "buttons": [{ "repo": "python_common_code_snippet" }] },
    "sitemap-general": {
      "prefix": "https://book.crifan.com/gitbook/python_common_code_snippet/website/"
    }
}

```

```
    "toolbar-button": {
        "url": "http://book.crifan.com/books/python_common_code_snippet/pdf/python_common_code_snippet.pdf"
    },
    "title": "Python常用代码段"
}

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

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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)" % curType, curList)) # ['(aaa)', '(bbb)', '(ccc)', '(zzz)', '(eee)', '(yyy)', '(ddd)', '(xxx)']
    groupP = "|".join(patternGroupList) # '(aaa)|(bbb)|(ccc)|(zzz)|(eee)|(yyy)|(ddd)|(xxx)'

    return groupP
```

调用：

```
ValidPlatformTypeList = ["iOS", "Android"]
ValidPlatformRule = listToPatternGroup(ValidPlatformTypeList) # '(iOS)|(Android)'
```

目的是用于后续的正则判断

```
TaskFilenamePattern = "(?P<taskDate>\d+)_(?P<businessType>%s)_(?P<taskName>[a-zA-Z\d]+)_(?P<crawlerType>%s)(_(?P<platform>%s))?" % (ValidBusinessTypeRule, ValidCrawlerTypeRule, Val
```

```
idPlatformRule)
```

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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), ('c', 'abc')])
```

sort和sorted

```
# 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', 'Python']
# sortedStrList=['best', 'Crifan', 'is', 'language', 'Li', 'love', 'Python']

studentTupleList = [
    # name, grade, age
    ('Cindy', 'A', 15),
    ('Crifan', 'B', 12),
    ('Tony', 'B', 10),
]
sortedTupleList_lambda = sorted(studentTupleList, key=lambda student: student[2]) # [2] is
age
print("sortedTupleList_lambda=%s" % sortedTupleList_lambda)
# sortedTupleList_lambda=[('Tony', 'B', 10), ('Crifan', 'B', 12), ('Cindy', 'A', 15)]

# same as single function:

```

```

def getStudentAge(curStudentTuple):
    return curStudentTuple[2] # [2] is age
sortedTupleList_singleFunction = sorted(studentTupleList, key getStudentAge)
print("sortedTupleList_singleFunction=%s" % sortedTupleList_singleFunction)
# sortedTupleList_singleFunction=[('Tony', 'B', 10), ('Crifan', 'B', 12), ('Cindy', 'A', 15)]


# same as operator itemgetter:
sortedTupleList_operator = sorted(studentTupleList, key itemgetter(2))
print("sortedTupleList_operator=%s" % sortedTupleList_operator)
# sortedTupleList_operator=[('Tony', 'B', 10), ('Crifan', 'B', 12), ('Cindy', 'A', 15)]


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 student: student.age)
print("sortedObjectList=%s" % sortedObjectList)
# sortedObjectList=[('john', 'A', 15), ('jane', 'A', 15), ('dave', 'A', 15)]


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

```

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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, tipPercent)
        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) # gScreenQuality=2
print("type(gScreenQuality)=%s" % type(gScreenQuality)) # type(gScreenQuality)=<class 'tuple'>
```

```
38
39 class ScreenshotQuality(enum.Enum):
40     Original = 0, # XCTImageQualityOriginal·Original·image·quality, represented as a lossless·PNG·
41     Medium = 1, # * XCTImageQualityMedium·Medium·image·quality, represented as a high quality·lossy·JPEG
42     Low = 2, # XCTImageQualityLow·Low·image·quality, represented as a very low quality·lossy·
43
44 gScreenQuality = ScreenshotQuality.Low.value # 2
45 print("gScreenQuality=%s" % gScreenQuality)
46 print("type(gScreenQuality)=%s" % type(gScreenQuality))
47
```

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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`：封装了字符串对象，简化了字符串子类化

待以后用到了，再详细总结。

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附录

下面列出相关参考资料。

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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
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- 【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
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- [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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