



Homework1 Hello World

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Question

选择自己喜欢的开发平台，安装并配置opencv 开发环境，并运行hello world 程序.

要求：

- (1) 打开视频设备，并显示视频；
- (2) 打开视频或图像文件，并显示；
- (3) 在视频（或图像）上叠加自己的学号和姓名；

Answer

安装

- 参考：[OpenCV Windows C++安装](<https://zhuanlan.zhihu.com/p/34630117>)

代码实现

- 实验过程中发现C++使用Opencv无法显示中文，中文在图片上显示只有“？”，为了解决这个问题需要先实现中文的显示函数
- putText.h文件，显示中文头文件:

```
#ifndef PUTTEXT_H_
#define PUTTEXT_H_

#include <windows.h>
#include <string>
#include <opencv2/opencv.hpp>

using namespace cv;

void GetStringSize(HDC hDC, const char* str, int* w, int* h);
void putTextZH(Mat& dst, const char* str, Point org, Scalar color, int fontSize,
               const char* fn = "Arial", bool italic = false, bool underline = false);

#endif // PUTTEXT_H_
```

- putText.cpp文件，显示中文头文件:

```
#include "putText.h"
void GetStringSize(HDC hDC, const char* str, int* w, int* h)
{
    SIZE size;
    GetTextExtentPoint32A(hDC, str, strlen(str), &size);
    if (w != 0) *w = size.cx;
    if (h != 0) *h = size.cy;
```

```

}

void putTextZH(Mat& dst, const char* str, Point org, Scalar color, int fontSize, const char* fn, bool italic, bool underline)
{
    CV_Assert(dst.data != 0 && (dst.channels() == 1 || dst.channels() == 3));

    int x, y, r, b;
    if (org.x > dst.cols || org.y > dst.rows) return;
    x = org.x < 0 ? -org.x : 0;
    y = org.y < 0 ? -org.y : 0;

    LOGFONTA lf;
    lf.lfHeight = -fontSize;
    lf.lfWidth = 0;
    lf.lfEscapement = 0;
    lf.lfOrientation = 0;
    lf.lfWeight = 5;
    lf.lfItalic = italic; //斜体
    lf.lfUnderline = underline; //下划线
    lf.lfStrikeOut = 0;
    lf.lfCharSet = DEFAULT_CHARSET;
    lf.lfOutPrecision = 0;
    lf.lfClipPrecision = 0;
    lf.lfQuality = PROOF_QUALITY;
    lf.lfPitchAndFamily = 0;
    strcpy_s(lf.lfFaceName, fn);

    HFONT hf = CreateFontIndirectA(&lf);
    HDC hDC = CreateCompatibleDC(0);
    HFONT hOldFont = (HFONT)SelectObject(hDC, hf);

    int strBaseW = 0, strBaseH = 0;
    int singleRow = 0;
    char buf[1 << 12];
    strcpy_s(buf, str);
    char* bufT[1 << 12]; // 这个用于分隔字符串后剩余的字符,可能会超出。
    //处理多行
    {
        int nnh = 0;
        int cw, ch;

        const char* ln = strtok_s(buf, "\n", bufT);
        while (ln != 0)
        {
            GetStringSize(hDC, ln, &cw, &ch);
            strBaseW = max(strBaseW, cw);
            strBaseH = max(strBaseH, ch);

            ln = strtok_s(0, "\n", bufT);
            nnh++;
        }
        singleRow = strBaseH;
        strBaseH *= nnh;
    }

    if (org.x + strBaseW < 0 || org.y + strBaseH < 0)
    {
        SelectObject(hDC, hOldFont);
        DeleteObject(hf);
        DeleteObject(hDC);
        return;
    }

    r = org.x + strBaseW > dst.cols ? dst.cols - org.x - 1 : strBaseW - 1;
    b = org.y + strBaseH > dst.rows ? dst.rows - org.y - 1 : strBaseH - 1;
    org.x = org.x < 0 ? 0 : org.x;
    org.y = org.y < 0 ? 0 : org.y;

    BITMAPINFO bmp = { 0 };
    BITMAPINFOHEADER& bih = bmp.bmiHeader;
    int strDrawLineStep = strBaseW * 3 % 4 == 0 ? strBaseW * 3 : (strBaseW * 3 + 4 - ((strBaseW * 3) % 4));

```

```

bih.biSize = sizeof(BITMAPINFOHEADER);
bih.biWidth = strBaseW;
bih.biHeight = strBaseH;
bih.biPlanes = 1;
bih.biBitCount = 24;
bih.biCompression = BI_RGB;
bih.biSizeImage = strBaseH * strDrawLineStep;
bih.biClrUsed = 0;
bih.biClrImportant = 0;

void* pDibData = 0;
HBITMAP hBmp = CreateDIBSection(hDC, &bmp, DIB_RGB_COLORS, &pDibData, 0, 0);

CV_Assert(pDibData != 0);
HBITMAP hOldBmp = (HBITMAP)SelectObject(hDC, hBmp);

//color.val[2], color.val[1], color.val[0]
SetTextColor(hDC, RGB(255, 255, 255));
SetBkColor(hDC, 0);
//SetStretchBltMode(hDC, COLORONCOLOR);

strcpy_s(buf, str);
const char* ln = strtok_s(buf, "\n", bufT);
int outTextY = 0;
while (ln != 0)
{
    TextOutA(hDC, 0, outTextY, ln, strlen(ln));
    outTextY += singleRow;
    ln = strtok_s(0, "\n", bufT);
}
uchar* dstData = (uchar*)dst.data;
int dstStep = dst.step / sizeof(dstData[0]);
unsigned char* pImg = (unsigned char*)dst.data + org.x * dst.channels() + org.y * dstStep;
unsigned char* pStr = (unsigned char*)pDibData + x * 3;
for (int tty = y; tty <= b; ++tty)
{
    unsigned char* subImg = pImg + (tty - y) * dstStep;
    unsigned char* subStr = pStr + (strBaseH - tty - 1) * strDrawLineStep;
    for (int ttx = x; ttx <= r; ++ttx)
    {
        for (int n = 0; n < dst.channels(); ++n) {
            double vtxt = subStr[n] / 255.0;
            int cvv = vtxt * color.val[n] + (1 - vtxt) * subImg[n];
            subImg[n] = cvv > 255 ? 255 : (cvv < 0 ? 0 : cvv);
        }

        subStr += 3;
        subImg += dst.channels();
    }
}

SelectObject(hDC, hOldBmp);
SelectObject(hDC, hOldFont);
DeleteObject(hf);
DeleteObject(hBmp);
DeleteDC(hDC);
}

```

- main.cpp主函数

```

#include <opencv2/opencv.hpp>
#include <iostream>
#include <math.h>
#include <time.h>
#include "putText.h"

using namespace std;
using namespace cv;

int main() {

```

```

Mat src = imread("test.jpg");

putText(src, "Huchengcheng-2101210578", Point(200, 200), FONT_HERSHEY_SCRIPT_SIMPLEX, 2, Scalar(0, 0, 255));
putTextZH(src, "胡成成-2101210578", Point(200, 600), Scalar(255, 0, 0), 100, "楷体");

imshow("src", src);

imwrite("test_opencv.jpg", src);

waitKey(0); //延时30毫秒

VideoCapture cap(0);
if (!cap.isOpened()) {
    return -1;
}

//循环显示每一帧
while (1)
{
    Mat frame; //存储每一帧图像
    cap >> frame; //读取当前帧
    putTextZH(frame, "胡成成-2101210578", Point(100, 200), Scalar(0, 255, 0), 30, "微软雅黑");

    putText(frame, "Huchengcheng-2101210578", Point(100, 100), FONT_HERSHEY_SCRIPT_SIMPLEX, 1, Scalar(255, 0, 0));
    imshow("读取视频", frame);
    waitKey(30); //延时30毫秒
}
return 0;
}

```

测试

- 测试图片：



- 输出图片：



- 打开视频：



遇到问题

- 中文无法显示问题