计算机视觉和模式识别 作业3

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一、使用说明

MAC OSX 系统: 通过 sh execute. sh 直接编译运行即可(需要安装opency), 默认对第 1 张图片进行处理。要对其他图片进行测试, 执行. /a. out . /Dataset/X. jpg 即可。

Windows 系统, 在 cmd 中输入 execute. exe ./Dataset/X. jpg。

二、实验过程

这次对 A4 纸的矫正大部分是基于上次的边缘和边缘点的检测。因此上次作业的正确性会大大影响这次作业的成功率。

一开始的时候,我就发现了上次作业中的几个 Bug。对于竖直的直线来说,theta 可能的值可能接近 0,也可能接近 PI,这就对直线去重那段程序带来了很多麻烦。由于我是先将所有直线大致按照 theta 进行排序,当 theta 比较接近时,则按照 rho 进行排序。这样,theta 为 0 的线段会被排在前面,而theta 接近 PI 的线段会排到后面。因此我就在去重之前,先将 theta 接近 PI 的线段移动到前面。但这里需要注意的是,在把直线移到前面的时候,要考虑rho 的大小。一开始没有考虑的这个问题,所以 Dataset2/10. jpg 一直不能成功去重。

还有一个问题就是,对于缺了角的 A4 纸,很容易在 Hough 变换中会把缺角的边检测到。因此要进行错误线段的排查。这里我用的方法是:如果一条线段与他前面和后面的线段的 theta 值相差都过大时,则认为这条线段是错误检测的线段,因此要删去。

将上次作业中的 Bug 改正后,才进入到这次作业的编程之中。

首先,我的目标是将所有的 A4 纸都旋转到正的方向。因此考虑使用排序后的第一条线段的 theta 值所对应的角度进行旋转。但这样会产生一个问题,对于 Dataset 中的第二张和第四张图片,他们旋转后都会呈水平方向,因此还要对他们顺时针旋转 90 度。而对于那些本身就是横着放的图片,则也要顺时针旋转 90 度,但这样做的话,有些图片的会超出原来的边界,因此我考虑将它们缩小一定的倍数。以上的旋转都是调用 opency 中的

rotationMatrix = getRotationMatrix2D(center, rotationAngle, 1);
warpAffine(srcImg, rotatedImg, rotationMatrix, rotatedImg.size());
函数来实现的。其中还要注意的是旋转的中心是 A4 纸的中心,不然也很容易在

旋转的过程中图片超出边界。对图像旋转完成后,也需要对四个坐标点进行相应的变换,这里利用了

transform(pts, pts, rotationMatrix);

之后,对转换后的点进行排序,这样可以得到一个稳定的顺序,即左上,右上,左下,右下。然后设定四个与之对应的标准点,然后调用

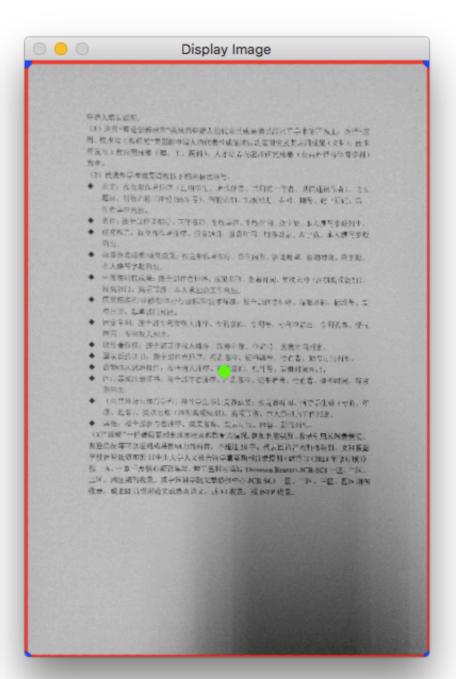
```
Mat perspectiveMatrix;
perspectiveMatrix = getPerspectiveTransform(pts, standardPoints);

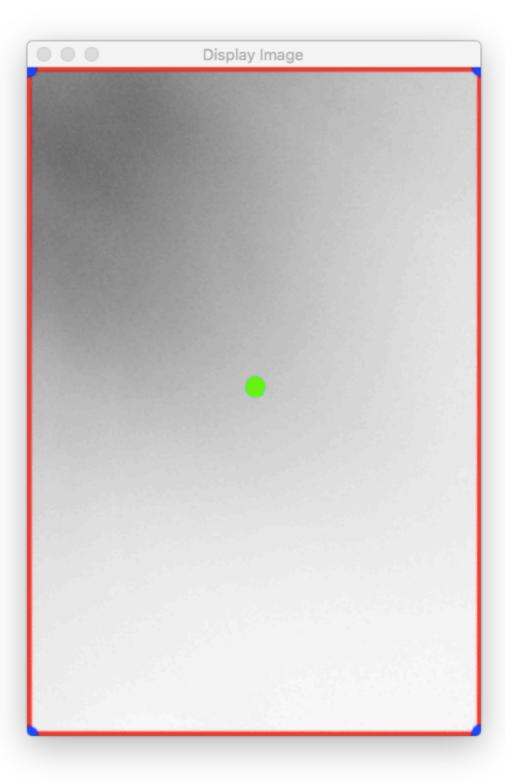
Mat perspectiveImg(800, 800, rotatedImg.type());
warpPerspective(rotatedImg, perspectiveImg, perspectiveMatrix, perspectiveImg.size());
```

完成矫正。

最后定义一个 Rect, 将图片裁剪出来并显示。

三、实验结果 Dataset/1.jpg





Display Image



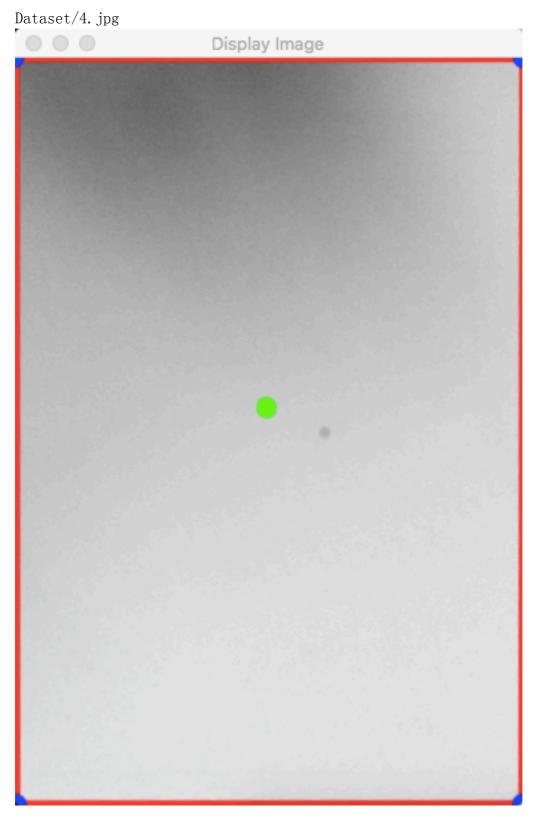
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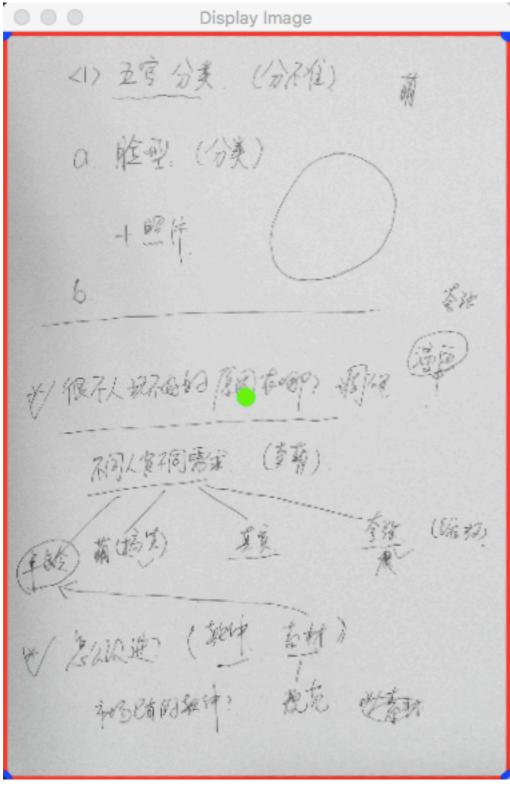
W=h(f(I))

min | I - f(I) | + x | w |, f, w (hehr) s.t. w = k f(x)

e (f, w, y)
= |I-f|+ + x |w|,
+ = |W-h(f)|+

京 茂









中山大学软件学院本科学业论文

指导协议

- 。 导致负责全直指导学生本科学业论文(以下获得论文)的撰写过初。但论之外、导致还会负责指导等全线定论文的研究方向。由写这位专业次纪、不为学生部首专业方式发展等和关码度。
- 二、 导流应及时与学生内容、帮助学生确定证金的进程、指导学生最短用近要点、热影实态在发 蒙上现代用上第产生一定在支运价值。
- 12. 母海疾及时、以真物的学生解决论文值写中的印题。对学生论文可能等直的问题特别发生。 有独控似乎生深趣研究和论文值写的采制论句。
- 四、每用以产品投资等生能支充的目标或《具体编度另行差知》。指导学生股集对意义工作有描写 养期的异类文献。但使学生被计划实现意义工作的表。
- 至。 型工具身与特殊更好变流,或导致基础上。但它研究工作计划,能工度等工作计划和研罗器 据,数为扩充或的环境损害,以用中方、同意思学品。但文学和专用。
- 為、专生在每月的指导下从其它是有关部门。指挥工作,在成工企工的定路中。 专生有及时指导 图4 有工作进程、通讯有限及时在显示语程、
- 七. 學生在戶籍上分字用再进入企文中即检查的設定是文字和批查要求。母母用用等生位文工作中每点的多点检查是是。今生母亲等类的哲學、自由下述之文也有些数量は、自立文章也文值等。
- 人。學生與數數學與重求物別、強立定 政治企業的模式用語明。每此為參加《中心人學本科生學和企業的主义歷史(或否》》與形式是可以與此 物《本科學連定文》模成。強好意文的形式形容,於此等國意某和物理查述、學和學問可能文的形式形 表制質關工作。
- 九. 草种还要保存生物特别的企品。 成于生态的时间时中间已经在它场面也也在形形成主。 当然宁 车辆的支撑企业等等。
- 中期在指导、结局学生完成企工的表现、模写及外面设置中、均学生自身只能或交换事件不 情報期完成的实现未成者过度文学阅读资料、导导外保健设定该对学生企工的标号16。
- 十一、 每时间工作或身体等原因不能创导学生的证据研究和论文类写工者时。而及时外院包等要 重导集特徵的语素。当职根据会享获物色、并否合施入成员代导用、使过量适工者的变性、不得和急、 转数中断特徵。所谓主学生不得提出更改导用入途。

· 本籍设一式三套、导作、导发、学生各队一位。其轮至尽多自由观方为首相关。

AURINE TO

WHEEPS.

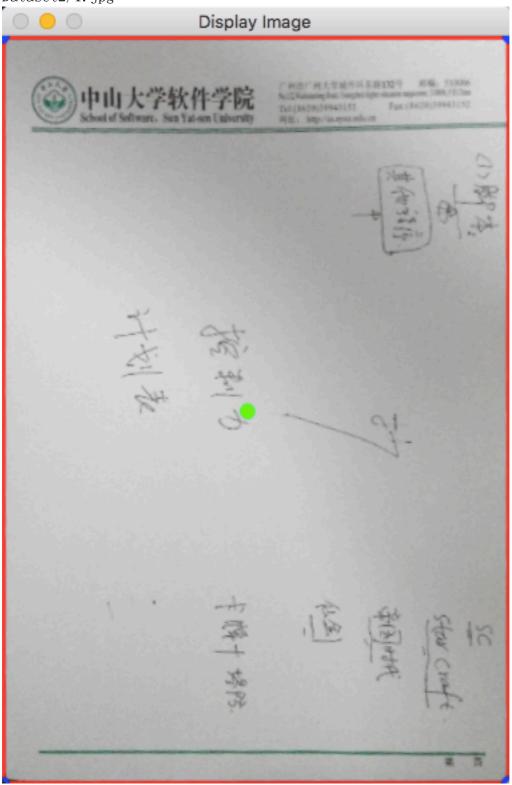
图出目形。

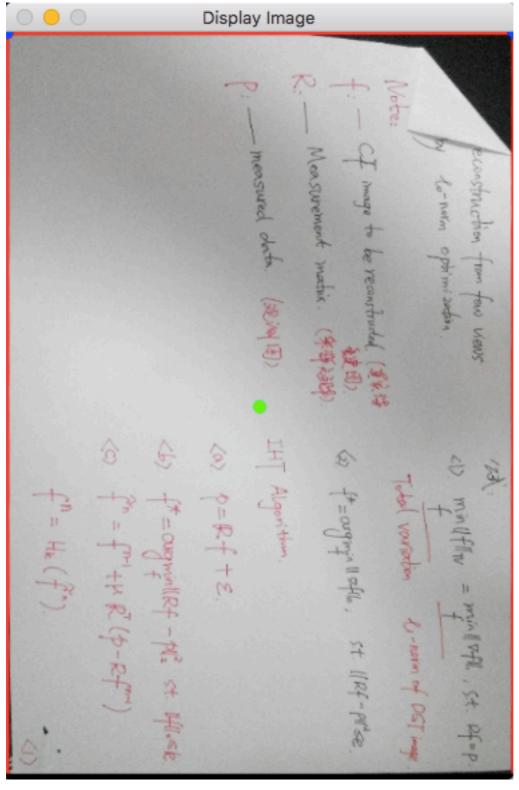
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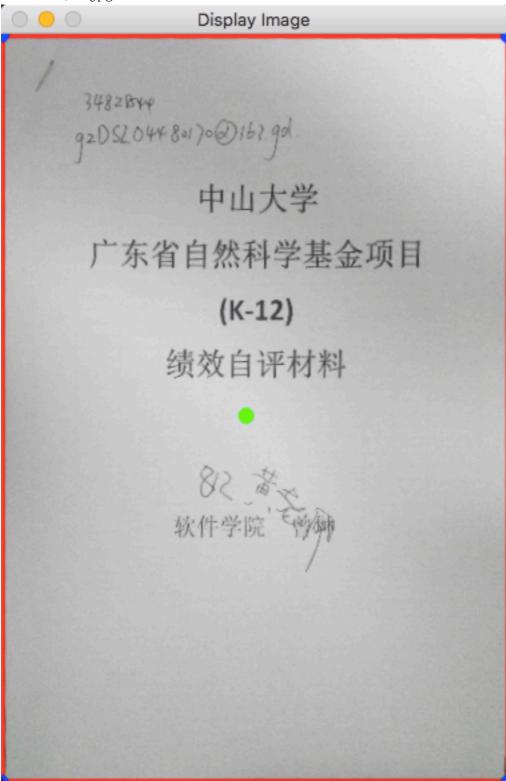
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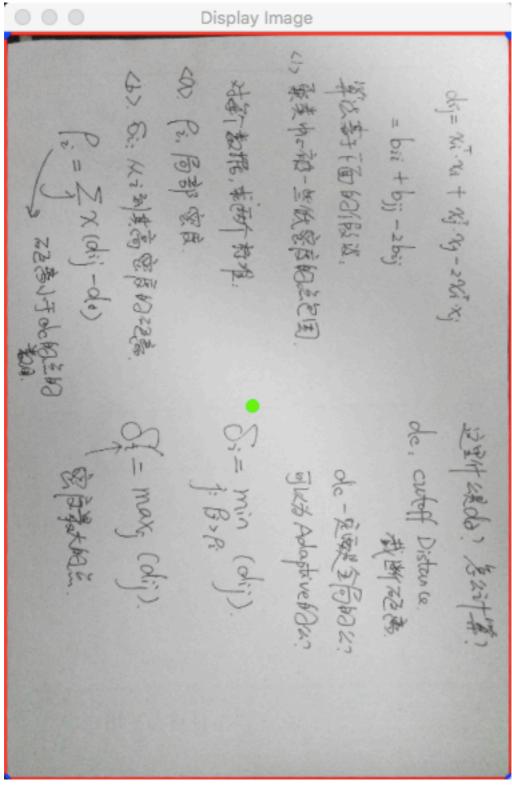
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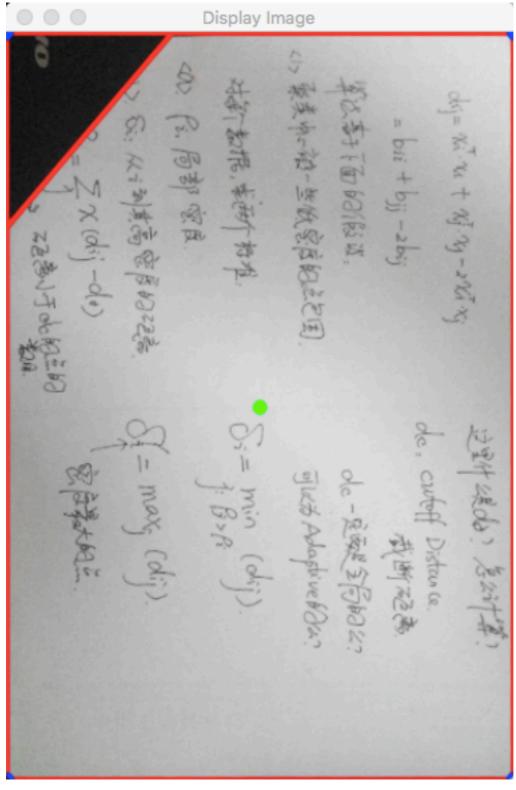
Dataset2/1.jpg



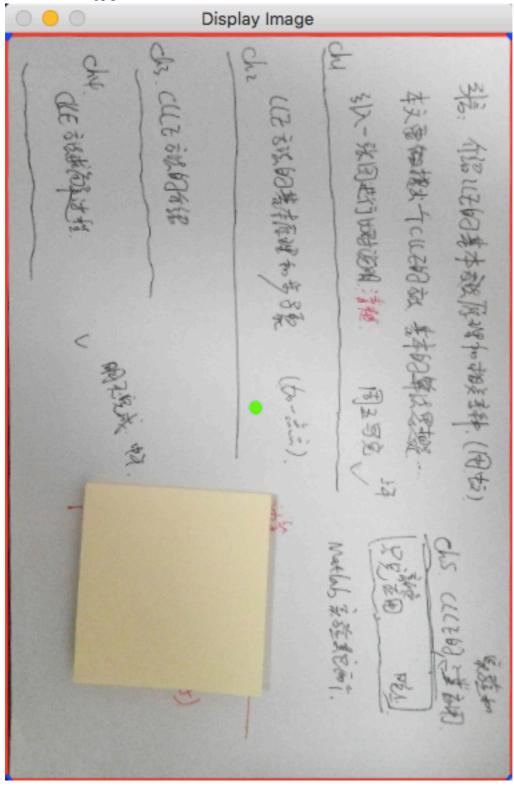








Dataset2/6. jpg



Display Image

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$$(21) \quad -4 \pi g a - 4 \overline{q} = g \overline{d} \cdot \frac{4 \overline{q} \, \mu a - (2 \overline{A}) \, \mu a + 2 \overline{Q} \, \frac{1}{16}}{2 + 4 \, \mu a} = \mu$$

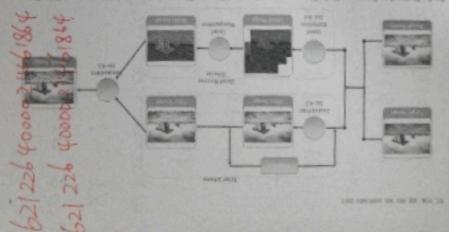
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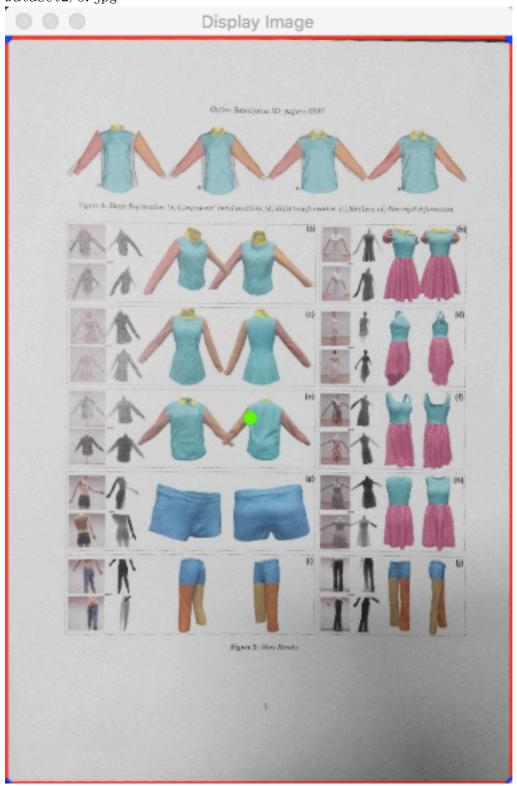
$$E(a_1, b_1) = \sum_{a \in A_1} (\|a_1 L_a + b_2 - R_1\|^2 + i a_2)^2$$
 (44. 45)

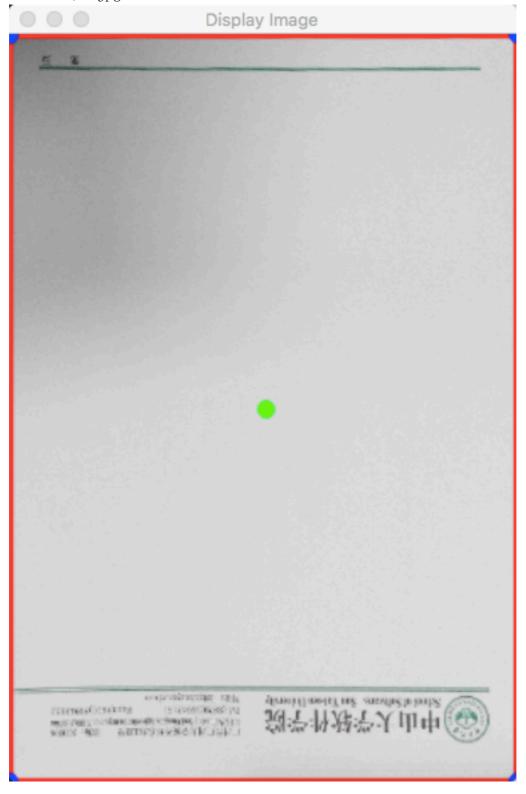
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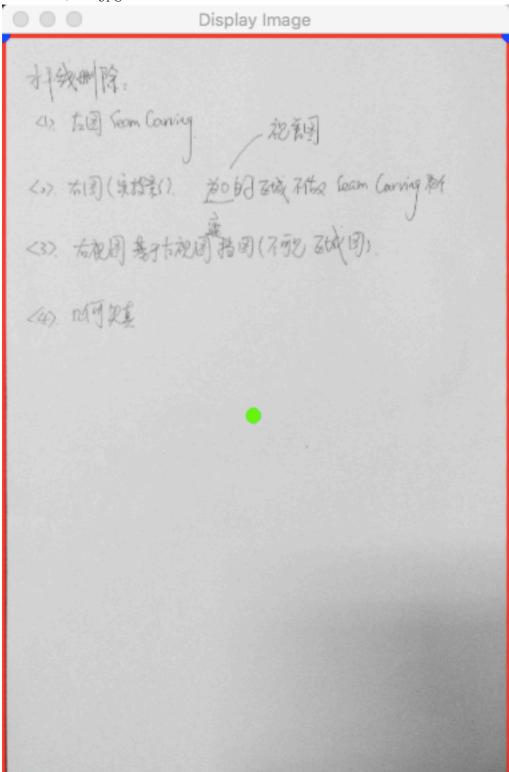
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参考资料:

[1] warpAffine

http://docs.opencv.org/2.4/doc/tutorials/imgproc/imgtrans/warp_affine/warp_affine.html

[2] transform

http://docs.opencv.org/2.4/modules/imgproc/doc/geometric_transformati
ons.html

[3] transform 函数中的 Assertion failed 解决办法

https://groups.google.com/forum/?fromgroups=#!topic/android-opencv/CPDMJsmYVBI

[4] 图像裁剪

http://stackoverflow.com/questions/8267191/how-to-crop-a-cvmat-in-opency

[5] perspective transform 原理

http://math.stackexchange.com/questions/296794/finding-the-transform-matrix-from-4-projected-points-with-javascript