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UNIVERSITY OF AUCKLAND ASSIGNMENT SUBMISSION DOCUMENT

COURSE : [COMPSCI 373] (First Semester, 2021)

FILE : Assignment Extension Explaination

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Rotated QR Codes

Currently, the function simply returns the minimum and maximum of x and y and draws a box from (x_min, y_min) to (x_max, y_max). The result is always an upright bound box. This method does not work on rotated QR codes.

Solution 1

Find the coordinates of the 4 corners that intersect the bound box, one on top, bottom, left and right each. Draw a polygon with these 4 points as vertices.

```
if j <   left: left   = j
if j >  right: right  = j
if i <    top: top    = i
if i > bottom: bottom = i
```

```
if j <   left[0]: left   = (j, i)
if j >  right[0]: right  = (j, i)
if i <    top[1]: top    = (j, i)
if i > bottom[1]: bottom = (j, i)
```

Issue 1

The new method fails on non-rotated squares

The issue was if the QR code is a non-rotated square, there are two corners on the left rather than one. So both `top` and `left` would settle on the first corner they come across. Doing so results in `top` and `left` overlapping each other on the same point. creating a triangle.

Solution 2

I changed `<` to `<=` for `left` and `>` to `>=` for `bottom` so they would settle on the last point and not overlap with `right` and `top` that settles on the first point.

```
if j <   left[0]: left   = (j, i)
if j >  right[0]: right  = (j, i)
if i <    top[1]: top    = (j, i)
if i > bottom[1]: bottom = (j, i)
```

```
if j <=   left[0]: left   = (j, i)
if j >   right[0]: right  = (j, i)
if i <     top[1]: top    = (j, i)
if i >= bottom[1]: bottom = (j, i)
```

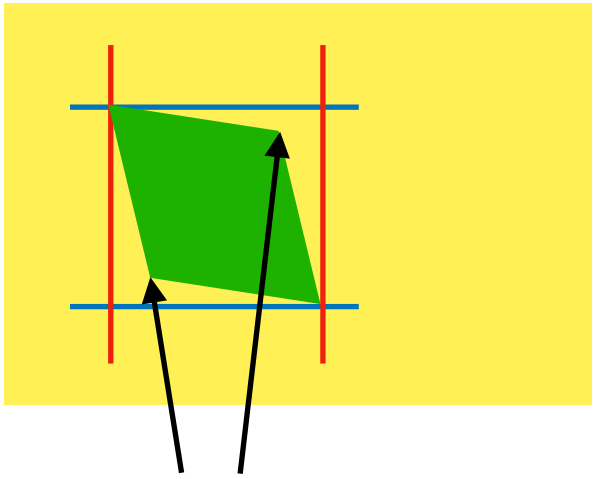
Issue 2

The improved method fails on *bloomfield.png*

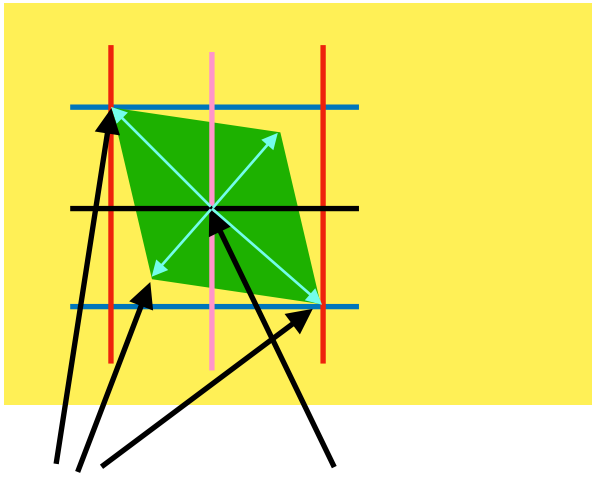
Observation: the QR code in this image is actually a rhombus. The improved method requires 4 corners that are significant in either the x or y axis, constraining the workable shape to rectangles (squares) only. In a rhombus, there may be up to 2 corners that does not show this significant and thus we cannot identify those corners.

Solution 3

Observation: the centre of the shape is always determinable, for either squares, rectangles and rhombi. It is always halfway between x_min and x_min and halfway between y_min and y_max.



Not currently detectable



Corners Centre

From there you can divide the shape up into four quarters, in a cross shape, and only one corner will be in one quarter. The corner is the point furthest away from the centre. And there we have our four corners.