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Convert two points to line eq (Ax + By +C = 0)

Asked 8 years, 8 months ago Active 2 years, 11 months ago Viewed 9k times

5

3

Say one has two points in the x,y plane. How would one convert those two points to a line? Of course I know you could use the slope-point formula & derive the line as following:

$$y - y_0 = \frac{y_1 - y_0}{x_1 - x_0}(x - x_0)$$

However this manner obviously doesn't hold when $x_1 - x_0 = 0$ (vertical line). The more generic approach should however be capable of define every line (vertical line would simply mean B = 0);

$$Ax + By + C = 0$$

But how to deduce A, B, C given two points?

algebra-precalculus analytic-geometry

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edited Jun 17 2013 at 11:06
Martin Sleziak
50.8k 18 166 335

asked Jun 17 2013 at 9:01
paul23
985 3 11 23

Divide $Ax + By + C = 0$ by one of A, B, C whichever is non-zero to eliminate one variable – lab bhattacharjee Jun 17 2013 at 9:06

1 Answer

Active Oldest Score

5

Let $P_1 : (x_1, y_1)$ and $P_2 : (x_2, y_2)$. Then a point $P : (x, y)$ lies on the line connecting P_1 and P_2 if and only if the area of the parallellogram with sides P_1P_2 and P_1P is zero. This can be expressed using the determinant as

$$\begin{vmatrix} x_2 - x_1 & x - x_1 \\ y_2 - y_1 & y - y_1 \end{vmatrix} = 0 \iff (y_1 - y_2)x + (x_2 - x_1)y + x_1y_2 - x_2y_1 = 0,$$

so you get (up to scale) $A = y_1 - y_2$, $B = x_2 - x_1$ and $C = x_1y_2 - x_2y_1$.

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edited Mar 3 2019 at 12:30

answered Jun 17 2013 at 9:09

Mårten W

3,259 4 23 38

Thanks.... Even though I hoped for a more direct way.... As mostly I don't have to solve simple integrals, but double/line integrals possibly using green's theorem & conversion to polar/sphere/other coordinate systems to make an integral easier. Not looking forward to what my profs will throw at me to be frank. – paul23 Jun 18 2013 at 21:03

So `(y1 - y2) * x + (x2 - x1) * y + (x1 * y2 - x2 * y1) = 0` ? – Aaron Franke Oct 29 2020 at 1:28

1 @AaronFranke: Yes, isn't that precisely what I have written? – Mårten W Oct 30 2020 at 8:35