

# 1 Rendering Thick Lines

Rendering thick lines means that we want to render rectangles rotated in a specific way. We can calculate what four points we need to accurately represent a 'thick line' (quad making it).

Given two points  $A$  and  $B$  we make a vector  $\vec{AB}$  representing our desired line. In order to achieve thickness however we have to do a little more. Thick lines are nothing more than rectangles (as stated before) so in order to get those four points we can do the following.

First let's rotate our  $\vec{AB}$  vector by ninety degrees ( $90^\circ = \frac{\pi}{2} = \frac{\tau}{4}$ ). You can of course use the rotation matrix, but from the same rotation matrix you can also realize that rotating a point by ninety degrees is just:

$$(x, y) \Rightarrow (-y, x) \quad (1)$$

After that simple rotation we can move from our origin points ( $A$  and  $B$  respectively) in the direction of our rotated vector  $\vec{AC}$  scaled by half of the thickness ( $\frac{1}{2}t$ ).

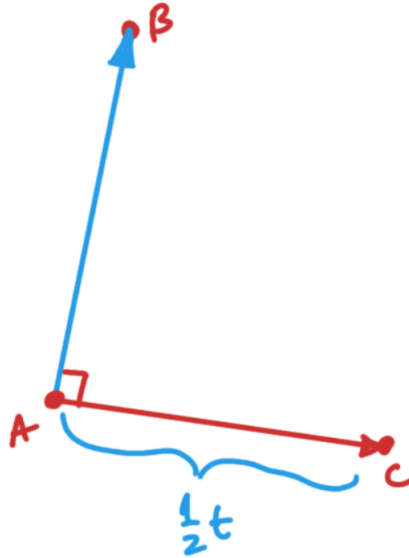


Figure 1: Line vector and its rotation by ninety degrees

## 2 Calculating All Four Points

All four points can be obtained through the following formulas:

$$\vec{AC} = [-AB_y, AB_x] \quad \hat{n} = \frac{\vec{AC}}{\|\vec{AC}\|} \quad (2)$$

$$P_0 = A + \hat{n} \cdot \frac{1}{2}t \quad P_1 = A - \hat{n} \cdot \frac{1}{2}t \quad (3)$$

$$P_2 = B + \hat{n} \cdot \frac{1}{2}t \quad P_3 = B - \hat{n} \cdot \frac{1}{2}t \quad (4)$$