

# Chromogeometry

<http://arxiv.org/pdf/0806.3617.pdf>

The pdf file above is where I first encountered Chromogeometry which uses the identity below:

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$$(\text{red geometry})^2 + (\text{green geometry})^2 = (\text{blue geometry})^2$$

$$(x^2 - y^2)^2 + (2xy)^2 = (x^2 + y^2)^2$$

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A triangle has coordinates  $u(2,6)$ ,  $v(6,9)$ ,  $w(14,1)$ .



Q is the quadrance = the length of a line squared.

b is blue geometry = Euclidean geometry ( $x^2 + y^2$ )

r is red geometry = Hyperbolic geometry ( $x^2 - y^2$ )

g is green geometry = Hyperbolic geometry  $2(xy)$

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Using blue geometry:

$$\begin{aligned} Q_b(u,v) &= (x_2 - x_1)^2 + (y_2 - y_1)^2 \\ &= (6 - 2)^2 + (9 - 6)^2 \\ &= 25 \end{aligned}$$

$$\begin{aligned} Q_b(v,w) &= (x_2 - x_1)^2 + (y_2 - y_1)^2 \\ &= (14 - 6)^2 + (1 - 9)^2 \\ &= 128 \end{aligned}$$

$$\begin{aligned} Q_b(w,u) &= (x_2 - x_1)^2 + (y_2 - y_1)^2 \\ &= (2 - 14)^2 + (6 - 1)^2 \\ &= 169 \end{aligned}$$

So the line lengths of the triangle are the square roots of the

above results: 5, 11.31370850 and 13

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Using red geometry:

$$\begin{aligned}Q_r(u,v) &= (x_2 - x_1)^2 - (y_2 - y_1)^2 \\ &= (6 - 2)^2 - (9 - 6)^2 \\ &= 7\end{aligned}$$

$$\begin{aligned}Q_r(v,w) &= (x_2 - x_1)^2 - (y_2 - y_1)^2 \\ &= (14 - 6)^2 - (1 - 9)^2 \\ &= 0\end{aligned}$$

$$\begin{aligned}Q_r(w,u) &= (x_2 - x_1)^2 - (y_2 - y_1)^2 \\ &= (2 - 14)^2 - (6 - 1)^2 \\ &= 119\end{aligned}$$

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Using green geometry:

$$\begin{aligned}Q_g(u,v) &= 2(x_2 - x_1)(y_2 - y_1) \\ &= 2(6 - 2)(9 - 6) \\ &= 24\end{aligned}$$

$$Qg(v,w)=2(x_2-x_1)(y_2-y_1)$$

$$=2(14-6)(1-9)$$

$$=-128$$

$$Qg(w,u)=2(x_2-x_1)(y_2-y_1)$$

$$=2(2-14)(6-1)$$

$$=-120$$

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$$Qr(u,v)^2 + Qg(u,v)^2 = Qb(u,v)^2$$

$$49 + 576 = 625$$

$$Qr(u,v)^2 + Qg(u,v)^2 = Qb(u,v)^2$$

$$0 + 16384 = 16384$$

$$Qr(u,v)^2 + Qg(u,v)^2 = Qb(u,v)^2$$

$$14161 + 14400 = 28561$$