CPSC 578: Assignment #7

Due on Fri, Nov 20, 2015

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Contents

Problem 1

Express the point (0,2,0) as a quaternion. Following the steps shown in class for computing the result of a rotation using quaternions, find the result of rotating this point 30 degrees around the line that passes through the origin and the point.

$\because (0,2,0)$ can be represented as a quaternion: $p = (0;(0,2,0))$
the rotation can be represented as $q = (\cos(15°);\sin(15°)(1,1,1))$

$\therefore$ the resulting point can be represented as $p' = qpq^{-1}$

$\because q^{-1} = \frac{1}{|q|}(s,-v) = \frac{1}{\cos(15°)^2+3\sin(15°)^2}(s,-v) = \frac{1}{2-\cos(30°)}(s,-v) = (2-\frac{\sqrt{3}}{2})(s,-v)$

$\therefore q^{-1} = \frac{2}{3}(\cos(15°);-\sin(15°)(1,1,1))$

$\therefore$the resulting point is $p' = qpq^{-1} = (-2\sin 15°;(2\sin(15°),2\cos 15°,-2\sin(15°)))q^{-1}$

$\therefore p' = (0;(\frac{2-2\sqrt{3}}{3},\frac{2+2\sqrt{3}}{3},\frac{2}{3}))$