

Finding α for the Euler top

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Consider a system with Hamiltonian $H = J_x x^2 + J_y y^2$. We seek to analytically find the K-complexity growth rate α .

First consider the Hamiltonian. Rewriting the equation we get $y^2 = \frac{H - J_x x^2}{J_y}$

We know (from the 'Euler Top' paper) that $z'(t) = 2(J_x - J_y)xy$. Since $x^2 + y^2 + z^2 = 1$, we can use our equation for y^2 to get

$$z'(t) = 2(J_x - J_y) \frac{J_y - H - J_y z^2}{J_y - J_x} \sqrt{\frac{H - J_x}{J_y}}.$$