$U_{max} = 3\,J$

$U = mgh$

$K = \frac{1}{2}mv^2$

measurements & constants:

mass $m = 0.08\,kg$

gravity $g = 9.81\ m/s^2$

launch $\theta = 80°$

assuming 1/2 goes into rotation,

$U_{translation} = 1.5\,J$

$U_0 + K_0 = U + K$

$1.5 + 0 = 0 + \frac{1}{2}mv^2 = \frac{1}{2} \cdot 0.08 \cdot v^2$

$v = \sqrt{\frac{1.5 \cdot 2}{0.08}} = \sqrt{\frac{300}{8}} = 6.12\ m/s$

solving for max Δy:

$V_y = v \cdot \sin\theta = 6.03\,m/s$

$v_f^2 = v_0^2 + 2ad$ where $v_0 = 0$ & $a = g$

$y_{max} = \frac{V_y^2}{2g} = \boxed{1.85\,m}$

solving for Δx max:

$v_f = v_0 + at$ where $v_0 = 0$ & $a = g$

$t = \frac{V_y}{g} = 0.61\ sec$

$x_{max} = V_x \cdot t = v \cdot \cos(\theta) \cdot t = \boxed{0.65\,m}$

Overall, there is a fair amount of energy that is lost to heat, as well as rotation, which is important to the theatrical performance

I'd guess that my final hopper will jump about $\boxed{1.0\,m}$ upwards and $\boxed{0.5\,m}$ sideways.

recalculating w/ my prototype, which stores 2 J energy:

$v = \sqrt{\frac{2}{0.08}} = 5\ m/s$

$V_y = v \cdot \sin\theta = 4.92\ m/s$

$y_{max} = \frac{V_y^2}{2g} = \boxed{1.23\,m}$

$t = \frac{V_y}{g} = 0.50\ sec$

$x_{max} = v \cdot \cos\theta \cdot t = \boxed{0.43\,m}$

this estimate makes sense, comparing to my slomo video where my hopper travelled about 1 foot sideways, 2 feet upwards $(0.\overline{3}, 0.\overline{6})$ as compared to $(0.43, 1.23)$. This shows that I have overestimated by a bit, but not too much