FRC 2012: Rebound Rumble Shooter Projectile Calculation

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\begin{split} d &= V^* cos(\beta)^* t \\ &=> V = d/(cos(\beta)^* t) \\ h &= V^* sin(\beta)^* t - 0.5^* g^* t^2 \\ &=> h = (d/(cos(\beta)^* t))^* sin(\beta)^* t - 0.5^* g^* t^2 \\ &=> h = d^* tan(\beta) - 0.5^* g^* t^2 \\ &=> 0.5^* g^* t^2 = d^* tan(\beta) - h \\ &=> t^2 = (d^* tan(\beta) - h)^* 2/g \\ &=> t = sqrt((d^* tan(\beta) - h)^* 2/g) \\ d &= V^* cos(\beta)^* t \\ &=> d = V^* cos(\beta)^* sqrt((d^* tan(\beta) - h)^* 2/g) \\ &=> V = d/(cos(\beta)^* sqrt((d^* tan(\beta) - h)^* 2/g)) \end{split}
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V: Shooter wheel velocity β: Shooter wheel angle

d: Target distance

h: Target height

t: Time to reach target

g: Gravitational acceleration

