# 1 Problem

The output current and mass of the solar panel are both assumed to be dependent on it's area.

$$I(x_s, y_s) = Iconst * x_s * y_s \tag{1}$$

$$m_s(x_s, y_s) = mconst_s * x_s * y_s \tag{2}$$

The capacity and mass of the Supercap are both assumed to be dependent on it's volume.

$$C(x_c, y_c, z_c) = Cconst * x_c * y_c * z_c \tag{3}$$

$$m_c(x_c, y_c, z_c) = mconst_c * x_c * y_c * z_c \tag{4}$$

And let's say the mass of the pcb is also dependent on it's area

$$m_p(x_p, y_p) = mconst_p * x_p * y_p \tag{5}$$

Assuming the current from the solar panel is directly used to increase the voltage in the Supercap:

$$V(I, t) = \frac{1}{C} It \tag{6}$$

$$V(x_s, y_s, t) = \frac{1}{C} * (Iconst * x_s * y_s) * t \tag{7}$$

Substituting the equation found for the capacity and voltage of the Supercap gives it's energy:

$$E(V, C) = \frac{1}{2} CV^2 \tag{8}$$

$$E(x_c, y_c, z_c, x_s, y_s, t) = \frac{1}{2} * \frac{1}{Cconst * x_c * y_c * z_c} * (Iconst * x_s * y_s)^2 * t^2 \tag{9}$$

Let's assume that all the electrical energy in the supercap is converted to kinetic energy.

$$E_{elec} = E_{kin} \tag{10}$$

$$E_{kin}(m, v) = \frac{1}{2} mv^2 \tag{11}$$

Without any losses the speed is estimated to be:

$$v(E, m) = \sqrt{\frac{2E}{m}} \tag{12}$$

$$m_{tot} = m_s + m_c + m_p \tag{13}$$

$$v(E, m_{tot}) = \sqrt{\frac{\frac{(Iconst * x_s * y_s)^2 * t^2}{Cconst * x_c * y_c * z_c}}{(mconst_s * x_s * y_s) + (mconst_c * x_c * y_c * z_c) + (mconst_p * x_p * y_p)}} \tag{14}$$