$$signal\ s(dB) \overset{e^{-s/40}}{\rightarrow} l(length) \overset{c_0}{\rightarrow} r(cm)$$

$$give\ (x_i, y_i, z_i, l_i), i = 1 \sim n$$

$$find\ (x_0, y_0, z_0, c_0)$$

$$tmp\_d_i = \sqrt{(x_i - x_0)^2 + (y_i - y_0)^2 + (z_i - z_0)^2}$$

$$error_i = (tmp\_d_i - c_0 l_i)^2$$

$$\frac{\partial tmp\_d_i}{\partial \alpha_0} = \frac{(\alpha_0 - \alpha)}{tmp\_d_i}, \alpha = x, y, z$$

$$\frac{\partial error_i}{\partial tmp\_d} = 2(tmp\_d_i - c_0 l_i)$$

$$\frac{\partial error_i}{\partial c_0} = l_i(c_0 l_i - tmp\_d_i)$$

$$\frac{\partial error_i}{\partial \alpha_0} = \frac{\partial tmp\_d_i}{\partial \alpha_0} \frac{\partial error_i}{\partial tmp\_d_i}$$

by gradient descent

$$grad\_\alpha, grad\_c = \frac{1}{n}\sum_{i=1}^{n} \frac{\partial error_i}{\partial \alpha_0}, \frac{1}{n}\sum_{i=1}^{n} \frac{\partial error_i}{\partial c_0}$$

$$\alpha_0 \leftarrow \alpha_0 - lr \times grad\_\alpha, \alpha = x, y, z$$

$$c_0 \leftarrow c_0 = lr \times grad\_c$$