Dipole equations

μ : the permeability of free space
$\mu = 4\pi 10^{-7}$

$\vec{p}$: the 3d point in space to measure the field at

$\vec{h}$: a 3d point in space that represents the center of a permanent magnet

$\vec{g}$: a 3d vector pointing from $\vec{h}$ to $\vec{p}$
(from the magnet to the point in space to measure the field)

$$\vec{g} = \vec{p} - \vec{h}$$

d : the distance between $\vec{p}$ and $\vec{h}$
$d = ||g||_2$

L : the side length of the cube magnet

$\vec{r}$: the unit direction vector pointing in the direction of the magnet's north pole

$(bRem)$: ? mystery number related
to the strength of the magnet

$\vec{m}$: the dipole moment of the magnet

$$\vec{m} = \frac{\vec{r}L^3(bRem)}{\mu}$$

$\vec{B}(\vec{h}, \vec{p})$: the field stength at
the point $\vec{p}$ from the magnet at point $\vec{h}$

$$\vec{B}(\vec{h}, \vec{p}) = \frac{\mu}{4\pi}[\frac{3\vec{g}(\vec{m} \cdot \vec{g})}{d^5} - \frac{\vec{m}}{d^3}]$$

if there are several magnets at different points $h_1, h_2, \cdots, h_n$, assuming they are all the same size with the same field strength, the total field strength at point $\vec{p}$ is

$$\vec{B}_{total}(\vec{p}) = \sum_{i=1}^{n} \vec{B}(\vec{h}_i, \vec{p})$$

for a set of points in space $P = \{p_1, p_2, \cdots, p_m\}$, and field strengths $S = \{\vec{B}_{total}(p_1), \vec{B}_{total}(p_2), \cdots, \vec{B}_{total}(p_m)\} = \{\vec{s}_1, \vec{s}_2, \cdots, \vec{s}_m\}$ and the scalar values of S are $||S|| = \{||\vec{s}_1||_2, ||\vec{s}_2||_2, \cdots, ||\vec{s}_m||_2\}$

the homogeneity of the field is defined as

$$W = 10^6 \frac{max(||S||) - min(||S||)}{mean(||S||)}$$