

Field Model

Source charges "distort" space

Target charges react to distortion

This "distortion" = field

Sources don't "see" targets

Targets don't "see" sources,
just the distortion

All charges are sources & targets
but don't "see" their own
distortion.

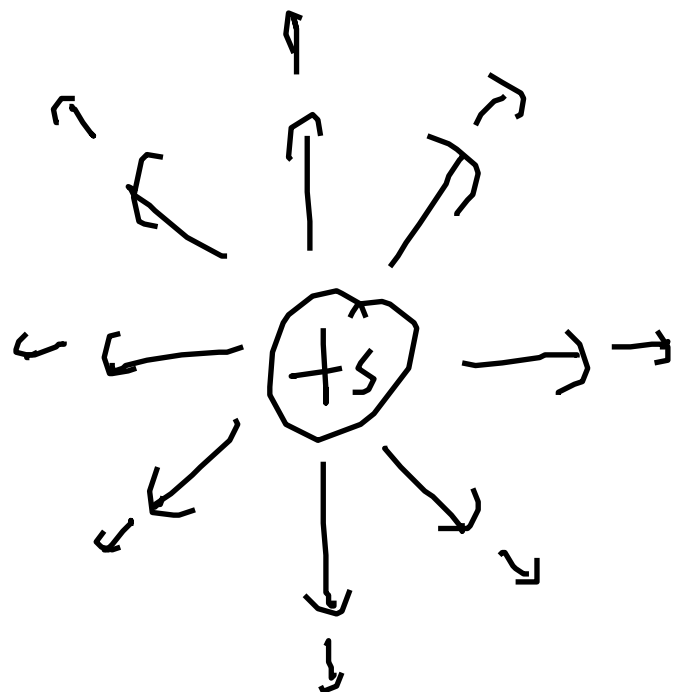
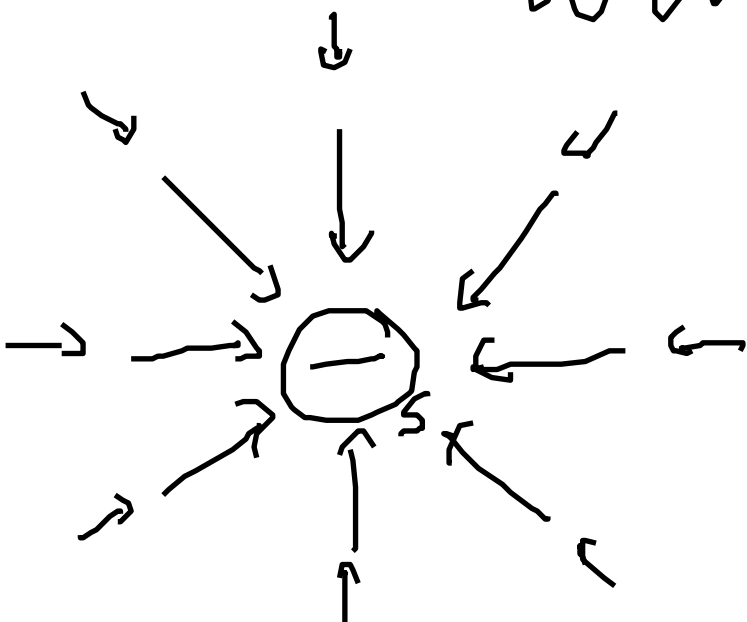
Represent electric field
with a vector at every point
in space

$$\vec{E}(x, y, z)$$

Direction of field:

direction a positive charge
would feel a force in

WWPD



$-1 \mu C$

$\overline{T}$

$F = 5 N$

What $\hat{E}$ does this target feel?

$$E = \frac{5N}{-1\mu C}$$

$$= \frac{5 \text{ N}}{10^{-6} \text{ C}} \quad (- \rightarrow)$$

$$= 5 \times 10^6 \frac{N}{C}$$

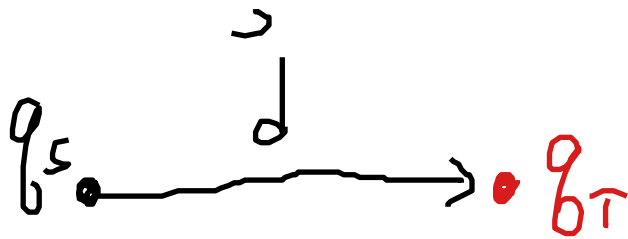
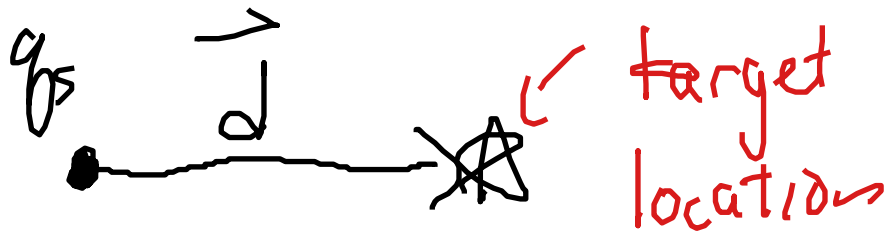
Units
for
Electric
field

$$\vec{F} = q_T \vec{E}$$

if $q_T > 0$, $\vec{F}$ & $\vec{E}$ are in same direction

if $q_T < 0$, $\vec{F}$ & $\vec{E}$ are in opposite direction

Electric Field of a Point Source Charge



$$\vec{F} = k \frac{q_s q_t}{d^2} \hat{d}$$

$$\vec{E} = \frac{\vec{F}}{q_t} = \frac{k \frac{q_s \cancel{q_t}}{d^2} \hat{d}}{\cancel{q_t}}$$

$$\vec{E}_{pt} = k \frac{q_s}{d^2} \hat{d} = k \frac{q_s}{d^3} \vec{d}$$



$$\vec{E} = (9 \times 10^9) \frac{(-2 \times 10^{-6})}{(3m)^2} \rightarrow$$

d

d^2

$$= 2000 \frac{N}{C} (- \rightarrow)$$

$$= \boxed{2000 \frac{N}{C} \leftarrow}$$

$$= (9 \times 10^9 \frac{Nm^2}{C^2}) \frac{(-2 \times 10^{-6} C)}{(\cancel{3m})^3} (\cancel{3m} \hat{x})$$

d

d^3

$$= 2000 \frac{N}{C} \leftarrow$$