



Electromagnetics:
Electromagnetic Field Theory

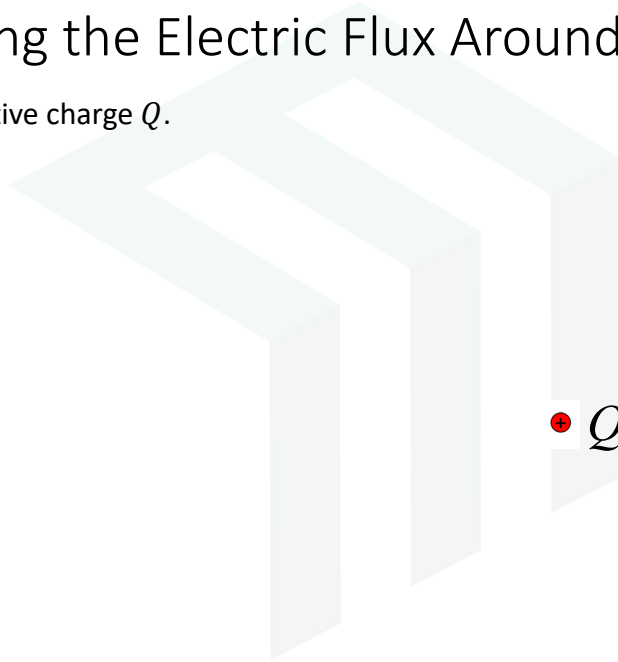
Visualizing Electric Flux Around Point Charges



1

Visualizing the Electric Flux Around Point Charges

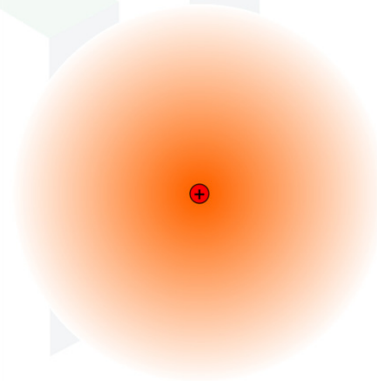
Start with a positive charge Q .



2

Visualizing the Electric Flux Around Point Charges

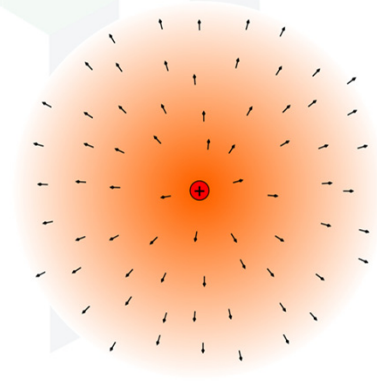
The electric field around the charge is a smooth and continuous phenomenon, like a cloud or fog.



3

Visualizing the Electric Flux Around Point Charges

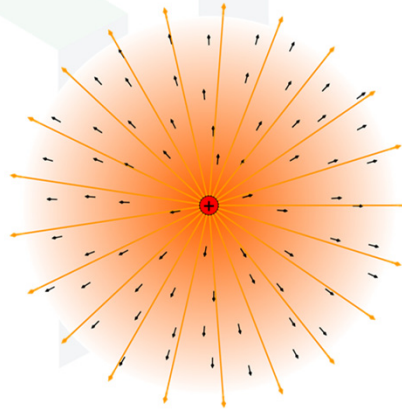
The electric field is also a vector and has a different direction associated with every position. The directions at only a few discrete points are visualized here.



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Visualizing the Electric Flux Around Point Charges

If the direction of the electric flux is traced, continuous lines can be drawn. These are called electric field lines.



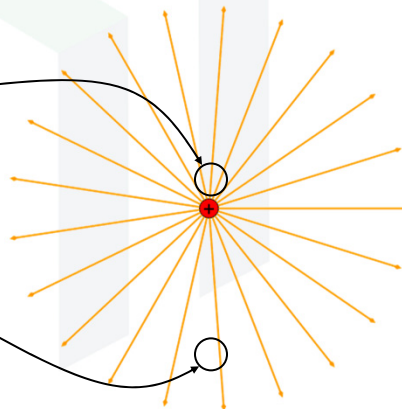
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Visualizing the Electric Flux Around Point Charges

Typically, the field around a charge is visualized using only the electric field lines.

Higher density of electric field lines.
More intense electric flux.

Lower density of electric field lines.
Less intense electric flux.



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Visualizing the Electric Flux Around Point Charges

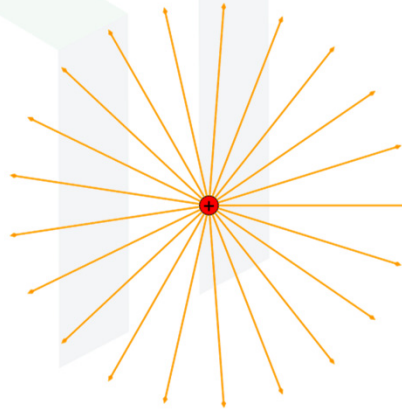
Typically, the field around a charge is visualized using only the electric field lines.

CAUTION: The concept of field lines might imply to some people that the electric field only exists on the lines.

This is completely not true!

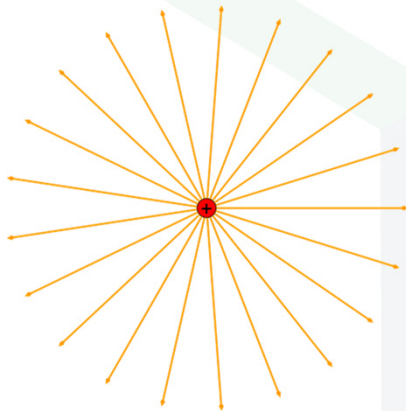
The lines do not exist. They are simply a mathematical tool to help us keep track of the direction and intensity of the fields.

Density of the lines is proportional to the magnitude of the field.

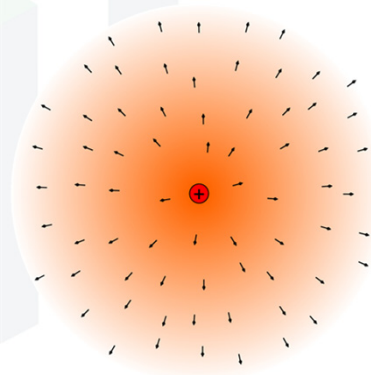


Visualizing the Electric Flux Around Point Charges

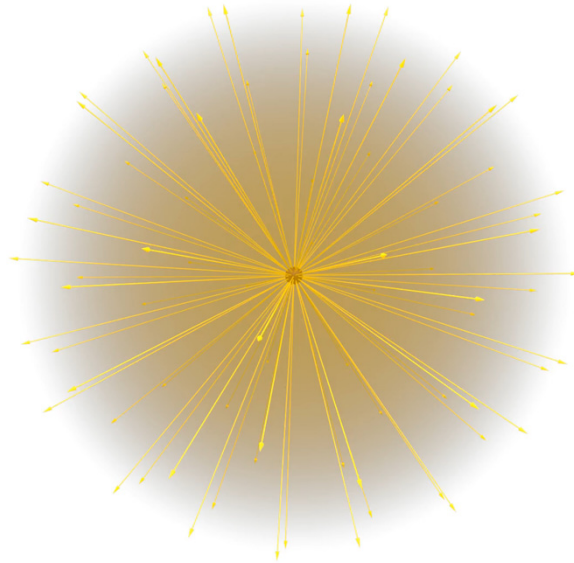
Typical way electric flux is visualized.



Less misleading way to visualize electric flux?

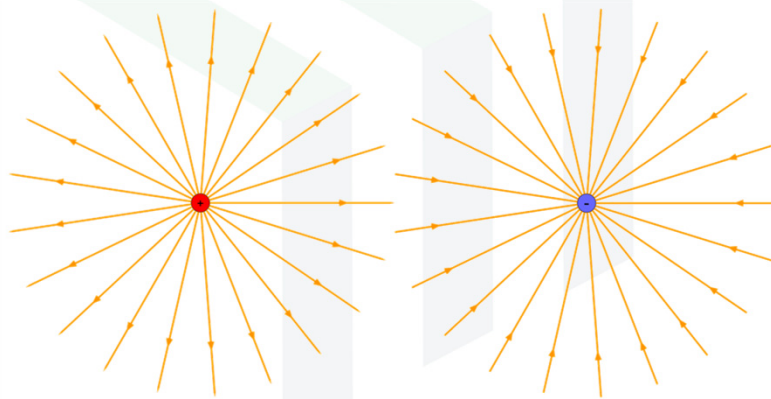


Electric Flux in 3D



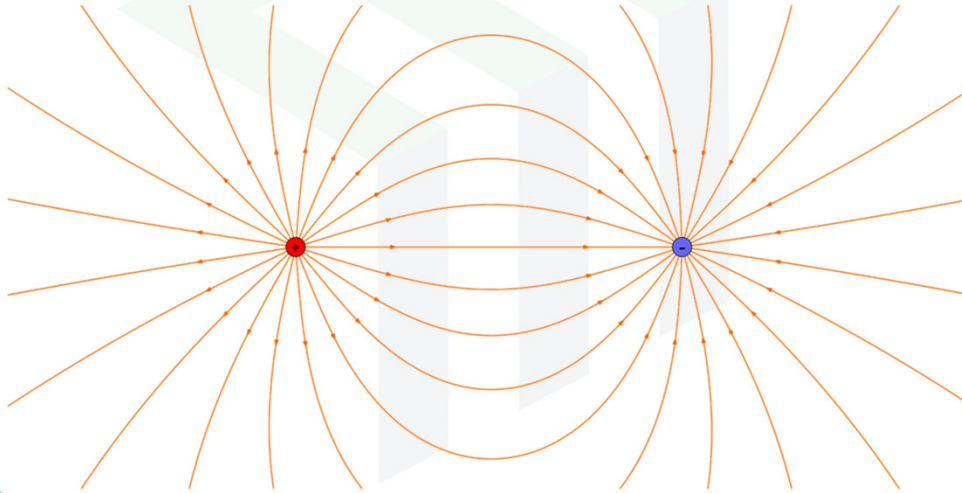
Direction of Electric Flux \vec{D}

The electric flux points away from positive charge and toward negative charge.



Direction of Electric Flux \vec{D}

When both types of charges are present, the flux bends or fringes.



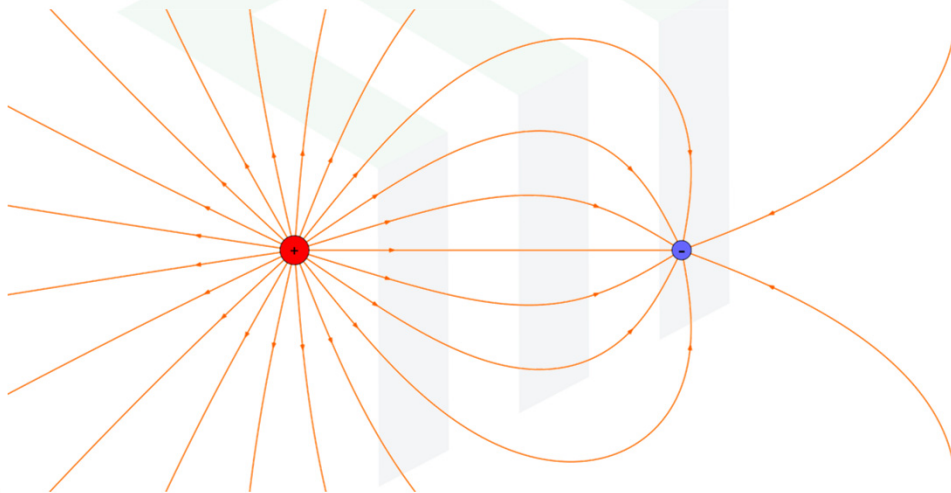
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Direction of Electric Flux \vec{D}

The fringing changes shape depending on the magnitude and location of the charges.



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