Dipole Electric Field

The plot shows the electric field vector ***E*** (**green arrows**) for a set of grid points (the black dots) for an electric dipole. The field is due to two equal and opposite charges of strength q. Successive plots show the x and y components of ***E*** for values of z from $z = 0$ (the plane of the charges) to a faraway distance, $z = 0.2$. (We are using arbitrary units.) These components are given by the (vector) equation

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where $i = 1, 2, 3$ stands for components of ***E*** along x, y, and z. The charges are located at

$\mathbf{r}_1 = (x_1=0.42, y_1=0.47, z_1=0)$, $q_1 = +.1$, **red** dot
$\mathbf{r}_2 = (x_2=0.58, y_2=0.53, z_2=0)$, $q_2 = -.1$, **blue** dot

near the middle of the unit square in which we are plotting.

Note the curious effect that the electric field vectors, as projected in the *x*-*y* plane at various values of *z*, rotate slightly as one moves away from the $z = 0$ plane of the charges. [Homework problem: *why*?]

What are actually plotted are not the E_i themselves, but scaled values:

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Without the scaling, the vectors near the charges become very large (E_{max}/E_{min} is about 60 for this example) and are hard to grasp visually.

The C-program which calculates the vector components, `dipoleElectricField.c`, is included and can be modified at your pleasure. To display the changed field vectors, use the Open Panel to select the output file you create, `dipoleElectricField.data`, in the directory that you executed the code.

Have fun!

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