Documentation on the java$^{TM}$ packet

# 3D Magnetostatic

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**Abstract**

This documentation describes the usage and functionality of a Java[1] applet for the representation of the vector field around different current through flowing conductors. The source code is based completely on the 3D mognetostatic fields[2] version of Paul Falstad and will be provided within the "OWL" project "e-Module zur Veranscheulichung der Theoretischen Physik".[3]

[1] Java and all Java-based trademarks are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.
[2] http://www.falstad.com/vector3dm/
[3] Translated to english by Stanislav Ax 01.04.2014

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# Imprint

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Project: “Offensive Wissen durch Lernen”
“e-Module zur Veranschaulichung der Theoretischen Physik”
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# 1 Introduction

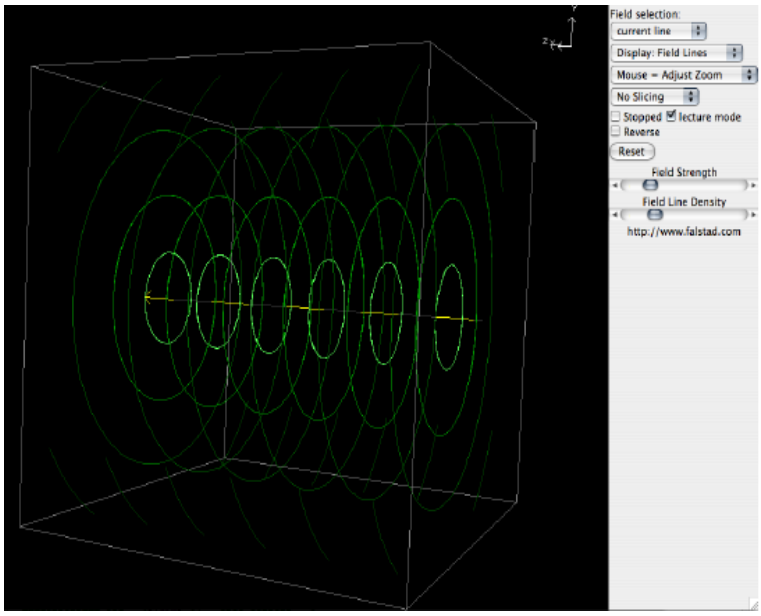


**Figure 2:** applet after the first call

The Java applet illustrates the field around constantly moved electrical charged particles in a rotatable cube or if wished in it's 2D slices. 7 possible visualisation kinds are available (see drop down menu "Display")

**What this applet may provide:**

- Field vectors (electric and magnetic fields)
- Field lines
- Trajectories of electric or magnetic test particles.
- Conductor loops (one above the other and one within the other)
- 2D slices of the field

**What this applet may not provide:**

- Time dependend fields
- Ferro magnetic fields
- Movement of different particle kinds at the same time

# 2 Usage

Right after the start of the applet (will be initialized in the browser if calling the related web page) a window will appear within that a cube lattice with a straight current through flown conductor is visualized.

## 2.1 Visualization in the field window

In dependence of the mouse choice one may manipulate the distance to the cubes center and it's rotation here. If using the "Adjust Angle" mode then it is possible to let the cube rotate permanently. For this one has to keep the mouse button pressed while moving it. If one stops pressing the button before one has stopped to move the mouse then the cube will begin to rotate permanently. This may be helpfull for the search for symmetries. In the "Slices" mode the two dimensional slices may be shifted to the edge of the third dimension by clicking.

## 2.2 Explanation of the controls

**Drop down menu (from above)**

**Field selection:** with deactivated "lecture mode" 24 setups are available

**Display:** determines which particles, field vectors or field lines will be indicated.

**Mouse:** Shifts between rotation and zoom while clicking into the field square.

**Show Slice:** Shows one out of the three side parallel slices through the cube centre.

**Manipulation**

• **Check boxes**
-**Stopped:** stops the current flow, the particle movement and the cube rotation.

-**lecture mode:** limits "Field Selection" to 5 for the lecture relevant configurations

-**Reverse:** reverses the current flow direction.

• **slider**
-**Field Strength:** sets the field strength

-**Number of Particles:** number of test particles (appears if chosing the corresponding display.)

-**Field Line/Vector Density:** Sets the field line and vector arrow density.

-**Size/Separation/Offset:** provides "Field Selection" specific parameters (like for example the distance and offset of two conductor loops) for variation.

## 2.3 Color encoding

### Field lines

The field strength is growing with increasing brightness beginning with dark green and ending with white.

### Vectors

The vector length is normalized and hence indepentend of the field strength. It grows like with the field lines if the color becomes brighter.

### Particles

For the magnetic particles the orientation is indicated by arrows.

## 2.4 Recommendations for presentations

The “lecture mode” provides classical arrangements.

## 2.5 Stand alone Version

There are different possibilities to run the applet. One of them is to open it within the browser. Another is to run it with the Java Appletviewer. For this one has to type in the following command into the console.

appletviewer <address or path of the HTML file of the applet>

Two files are necessary to run the applet without internet connection. The first is the applet within a Jar file “emstatic.jar” and the HTML file for the call of the applet out of the Jar file. Both files have to be copied into a local directory and to be ran with the Java Appletviewer under specification of the directories path.