

Documentation on the javaTM packet
Vector Fields

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Abstract

This documentation describes the usage of a Java applet¹ with that different vector fields can be visualised. The applet is based on the vector² version of Paul Falstad and has been created within the “OWL-project e-Module zur Veranschaulichung der Theoretischen Physik”. For a better understanding of a vector fields curl and divergence an integral function and a formatted output of the generating field function has been added.³

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²<http://www.falstad.com/vector/>

³Translated to english by Stanislav Ax 31.03.2014

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Imprint

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1 Introduction

Vector fields play a main role in physics since many problems are only solveable by the formulation of the corresponding field function. Fields, their curls and their divergences can be illustrated in different ways with the vector field applet.

Visualizatons that this applet may provide

- Conservative gradient fields(central potential).
- simulation for six different kinds of pulses and adjustable amplitude and pulse width
- vortex fields

Visualizatons that this applet may not provide

- Three dimensional vector fields
- Dynamical fields

2 Usage

After the initialization of the applet (it initializes in the browser by calling the side that contains it) a window with the preseted central field and a control menu for controlling the applet on the right edge of the window appears on the monitor.

2.1 Field window

In dependence of the mode(sight or mouse) line integrals, surface integrals or perspective changes may be generated. The animation of a high number of test particles may cause much calculational effort. Hence it is recomandable to turn this options off in this case.

2.2 Explanation of the controls

Pop up menus

- **First popup menu field:** many functions may be chosen here that may generate a vortex field for example.
- **Second dropdown menu color:** with this the curl-, divergence-, the field- and the potential strength may be marked with colors(The more intense the color the higher the absolute value is, grey means 0).
- **Third dropdown menu surface:** the grid squares, streamlines and equipotential lines may be displayed on the field area.

- **Fourth dropdown menu display:** selects a particle kind, that illustrates gradients(particles), curls(Curl detector) or illustrates particles that are accelerated and inert.
- **Fifth dropdown menu mouse:** the mouse can adjust the zoom of a 3D potential illustration(if they like for the $\frac{1}{r}$ potential do exist) or the viewing angle in the field and it can span integration regions for a line integral, for calculation of curls in certain areas of the field or area integrals(divergence)(keep mouse pressed while pulling). The absolute value of the integral is shown to any position in the lower left edge of the image.

Check boxes, slider

- **Checkbox 2D view:** puts the point of view back to the perpendicular view
- **Checkbox lecture mode:** reduced choice of field functions for the lectures
- **Checkbox stopped:** stops continous calculations (particle movement)
- **Checkbox backwards:** inverts the field direction
- **Button Reset:** reinitializes all adjustments
- **slider field Feldstärke/(Teilchenzahl):** For a fast regulating of this parameters it is recommended to stop the simulation
- **Formulas:** Here the Green function is shown with $g(h)$ for the respective field, ϕ is pointing at the belonging potential(if existing).

2.3 Recommendations for presentation

7 classical functions are provided in the *Pull Down Menu Setup*. Usually the window may be enlarged by pulling on the bottoms edge.

2.4 Stand alone version

The applet may be started in different ways. It can be ran by opening it in the browser. Another possibility is to start it with the Java Appletviewer. For this one may type the following command into the command terminal:

```
appletviewer <address or path of the applets HTML file>
```

Two files are required to use the applet without internet connection. The first is the applet within a Jar file “emstatic.jar”. The second is a HTML file for calling the applet out of the Jar file. Both files have to be copied into a local folder and have to be started with the Appletviewer under specification of the HTML files path.