

Projekt Baza pojęć

Narzędzia pracownika naukowego

Projektowanie obliczeń i algorytmów, przetwarzanie danych:

- **Matlab** (obliczenia numeryczne)
- **Octave** (binarna kompatybilność z Matlabem, ale projekt opensource)
- **Mathematica** (obliczenia symboliczne)

Wolfram Mathematica | STUDENT EDITION

Demonstrations | MathWorld | Wolfram Community

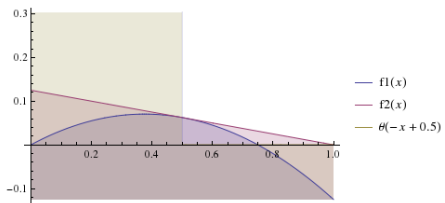
The exact solution can be found easily, here we look for function of C^1 continuity.
 μ_1 is function of temperature distribution in the left half of the rod and μ_2 in the right half.
We use DSolve function to get exact solution of equation system:

```
In[9]:= s1 = DSolve[{1 +  $\rho_1$ '[x] == 0,  $\rho_2$ '[x] == 0,  $\rho_1$ [0] == 0,  $\rho_1$ [0.5] ==  $\rho_2$ [0.5],  $\rho_1$ '[0.5] ==  $\rho_2$ '[0.5],  $\rho_2$ [1] == 0}, { $\rho_1$ [x],  $\rho_2$ [x]}, x];
```

The solution s1 calculated by mathematica of functions μ_1 and μ_2 is now assigned to functions f1 and f2 respectively. Finally functions are plotted f1 (blueish) f2 (reddish) and Q (grey).
Functions are depicted in the whole domain just to have better insight.

```
In[10]:= f1[x_] :=  $\rho_1$ [x] /. s1;  
f2[x_] :=  $\rho_2$ [x] /. s1;  
Plot[{f1[x], f2[x], HeavisideTheta[-x + 0.5]}, {x, 0, 1}, PlotLegends -> "Expressions", Filling -> Bottom]
```

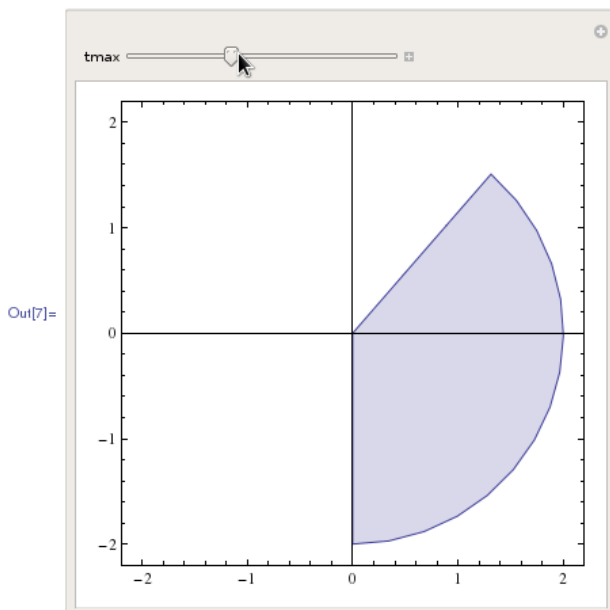
Out[12]=



The full solution of the above equation was depicted below. Here f describes both solution stick together in the middle of the rod. With light background was showed Q function.

```
In[13]:= f[x_] := f1[x] HeavisideTheta[-x + 0.5] + f2[x] HeavisideTheta[x - 0.5];  
In[14]:= Show[Plot[HeavisideTheta[-x + 0.5], {x, 0, 1}, Filling -> Bottom],
```

```
In[7]:= Manipulate[ParametricPlot[{ $\{rr\} x[t]$ ,  $\{rr\} y[t]$ }, {t, 0, tmax}, {rr, 0, 1}, PlotRange -> 1.1 r, Mesh -> False],  
{tmax, 0.0001, 0.5}]
```



- **Python**

- SciPy:

- <http://conference.scipy.org/>,
 - <http://www.scipy.org/getting-started.html>
 - <http://scipy-lectures.github.io/index.html>
 - <http://docs.scipy.org/doc/scipy/reference/tutorial/index.html>

- NumPy

- AstroPy (zestaw narzędzi do astronomii-fizyki)

- http://docs.astropy.org/en/stable/getting_started.html

- Pandas (data structures, connectors CSV, Excell, DB) <http://pandas.pydata.org/>

- Cython (statyczny kompilator dla Pythona) <http://cython.org/> Numba

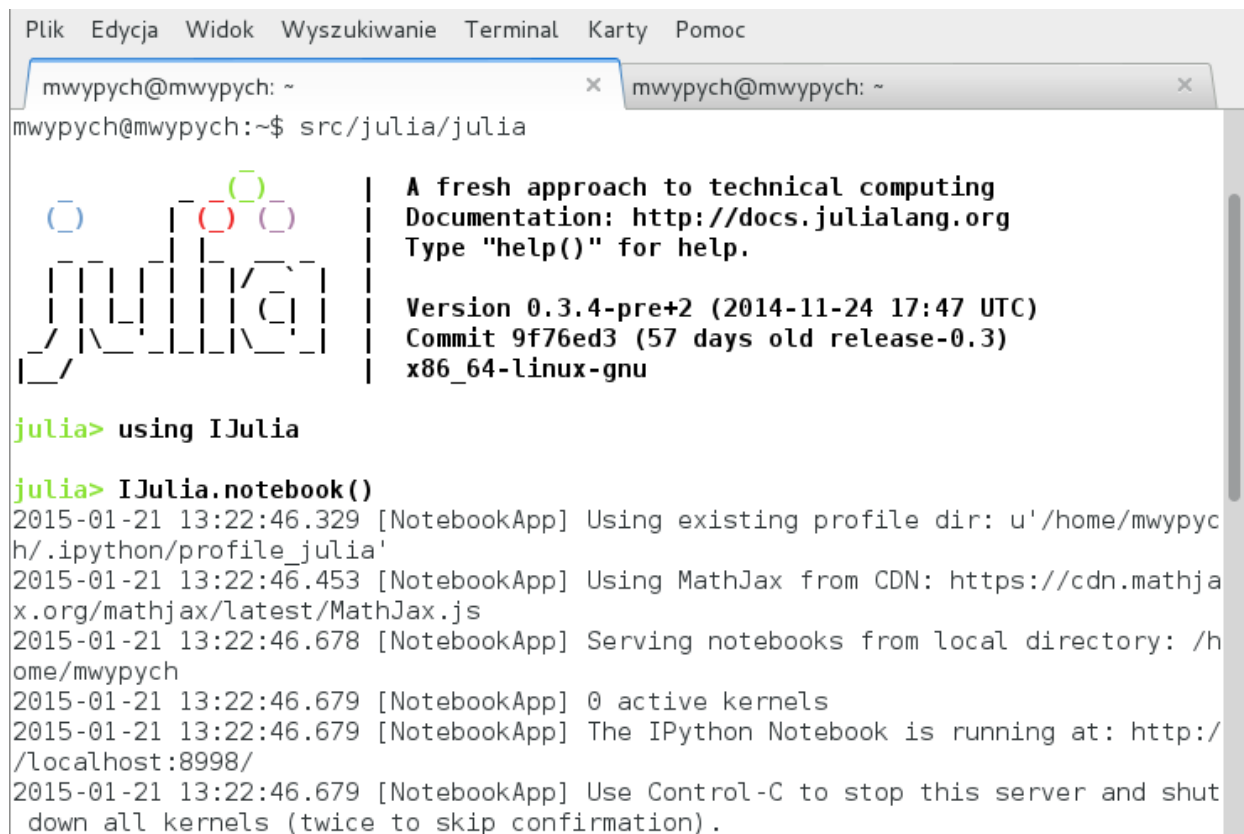
- <http://numba.pydata.org/>

- Blaze (API przetwarzania danych rozszerzenie Pandas(DataFrame) lub NumPy(ND-Array) <http://blaze.pydata.org/docs/dev/index.html>

- Scikit-learn (ML) <http://scikit-learn.org/stable/>

- **R**

- **Julia** (<http://julialang.org/>)



```
Plik  Edycja  Widok  Wyszukiwanie  Terminal  Karty  Pomoc
mwypych@mwypych: ~
mwypych@mwypych:~$ src/julia/julia

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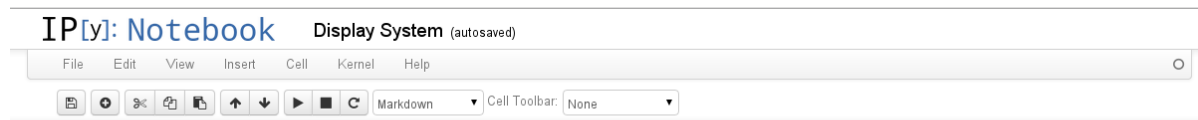
A fresh approach to technical computing
Documentation: http://docs.julialang.org
Type "help()" for help.

Version 0.3.4-pre+2 (2014-11-24 17:47 UTC)
Commit 9f76ed3 (57 days old release-0.3)
x86_64-linux-gnu

julia> using IJulia

julia> IJulia.notebook()
2015-01-21 13:22:46.329 [NotebookApp] Using existing profile dir: u'/home/mwypych/.ipython/profile_julia'
2015-01-21 13:22:46.453 [NotebookApp] Using MathJax from CDN: https://cdn.mathjax.org/mathjax/latest/MathJax.js
2015-01-21 13:22:46.678 [NotebookApp] Serving notebooks from local directory: /home/mwypych
2015-01-21 13:22:46.679 [NotebookApp] 0 active kernels
2015-01-21 13:22:46.679 [NotebookApp] The IPython Notebook is running at: http://localhost:8998/
2015-01-21 13:22:46.679 [NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
```

- **Ipython / Jupyter** (Środowisko do łatwej wizualizacji danych wraz z ich opisami, wykonywania obliczeń i wizualizacji) (<http://nbviewer.ipython.org/>, <http://jupyter.org/>)
 - http://nbviewer.ipython.org/url/jakevdp.github.com/downloads/notebooks/XKCD_plots.ipynb
 - <http://nbviewer.ipython.org/github/ptwobrussell/Mining-the-Social-Web-2nd-Edition/tree/master/ipynb/>



LaTeX

And we also support the display of mathematical expressions typeset in LaTeX, which is rendered in the browser thanks to the [MathJax library](#).

In [27]: `from IPython.display import Math
Math(r'F(k) = \int_{-\infty}^{\infty} f(x) e^{2\pi i k x} dx')`

Out[27]:
$$F(k) = \int_{-\infty}^{\infty} f(x) e^{2\pi i k x} dx$$

With the Latex class, you have to include the delimiters yourself. This allows you to use other LaTeX modes such as eqnarray:

In [28]: `from IPython.display import Latex
Latex(r"""\begin{eqnarray}
\nabla \times \vec{\mathbf{B}} - \frac{1}{c} \frac{\partial \vec{\mathbf{E}}}{\partial t} &= \frac{4\pi}{c} \vec{\mathbf{j}} \\
\nabla \cdot \vec{\mathbf{E}} &= 4\pi \rho \\
\nabla \times \vec{\mathbf{E}} + \frac{1}{c} \frac{\partial \vec{\mathbf{B}}}{\partial t} &= \vec{0}
\end{eqnarray}""")`

Out[28]:
$$\begin{aligned} \nabla \times \vec{\mathbf{B}} - \frac{1}{c} \frac{\partial \vec{\mathbf{E}}}{\partial t} &= \frac{4\pi}{c} \vec{\mathbf{j}} \\ \nabla \cdot \vec{\mathbf{E}} &= 4\pi \rho \\ \nabla \times \vec{\mathbf{E}} + \frac{1}{c} \frac{\partial \vec{\mathbf{B}}}{\partial t} &= \vec{0} \end{aligned}$$

- oct2py (Octave plugin) (http://nbviewer.ipython.org/github/blink1073/oct2py/blob/master/example/octavemagic_extension.ipynb?create=1)
- ihaskell (Haskell plugin) (<https://github.com/gibiansky/IHaskell>)
- IJulia (Julia env) (<http://julialang.org/images/ijulia.png>)
- **Root C++**
<http://indico.cern.ch/event/149557/session/0/contribution/587/material/slides/0.pdf>

Wizualizacja danych:

- **GnuPlot** http://www.gnuplot.info/docs_5.0/gnuplot.pdf
- Gadfly (biblioteka z wykresami dla Julii) <https://github.com/dcjones/Gadfly.jl>
- Winston (biblioteka z wykresami dla Julii) <https://github.com/nolta/Winston.jl> (matlab syntax + GnuPlot)
- matplotlib (Python) <http://matplotlib.org/users/beginner.html>
- R <http://www.statmethods.net/graphs/creating.html>

Biblioteka narzędzi:

- (Zbiór przydatnych narzędzi z dopisanymi tagami i linkami do repozytoriów)
<http://sciencetoolbox.org/>
 - quickscrape (CLI website scraping) <https://github.com/ContentMine/quickscrape>

Publikacje:

- **LaTeX** (składanie tekstu)
 - narzędzia:
 - pdflatex
 - lualatex
 - online <https://www.overleaf.com/2133542bqtgsm#/5435152/>
 - (Symulator łożnika marsjańskiego) <http://sdh33b.blogspot.com/2008/07/icfp-contest-2008.html>, <http://pages.physics.cornell.edu/~shicks/icfp08/random.pdf>
 - (automatyczne dodawanie plam po kubku kawy) <http://hanno-rein.de/archives/349>
 - tikz <http://www.texample.net/tikz/examples/>, <http://www.gnuplotting.org/installing-the-tikz-terminal/>
 - algorithmicx <http://en.wikibooks.org/wiki/LaTeX/Algorithms>
 - listing http://en.wikibooks.org/wiki/LaTeX/Source_Code_Listings
 - MusiXTeX <http://en.wikipedia.org/wiki/MusiXTeX>
- TeXlive (dystrybucja LaTeXa i innych narzędzi)
- MikTeX (j.w.)
- bibtex (zbiór pozycji bibliograficznych)
- beamer (prezentacje w LaTeXu)
- latexdiff (porównywanie dwóch dokumentów)

Przetwarzanie dokumentów

- PDF Editor: <http://code-industry.net/free-pdf-editor.php>
- pandoc konwersje między językami znaczników (LaTeX, DocuWiki, docx, odt, html)
<http://johnmacfarlane.net/pandoc/>

Live-long learning:

- <http://cstheory.stackexchange.com/>
- ML: <https://www.coursera.org/course/ml>
- Data Science: https://www.coursera.org/specialization/jhudatascience/1?utm_medium=listingPage
- Algorithms: <https://www.coursera.org/course/aofa>
- edX: <https://www.edx.org/course>