Interactive 3D Visualization in Jupyter Notebooks

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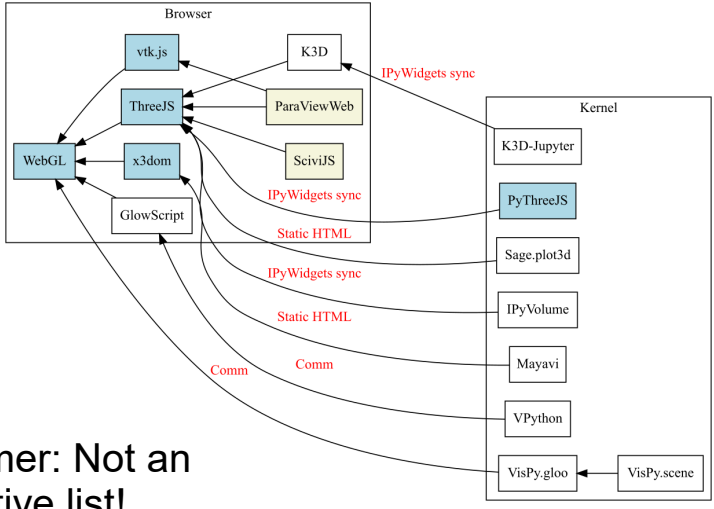
simula

3D Plotting Wishlist

- Powerful set of plotting functionality
- Extensibility
- Interactivity in Notebook
- Inspection tools (clip planes, tresholding, camera control, etc.)
- Easy to share with others
- Works also without Notebook

Background (state in early 2017)

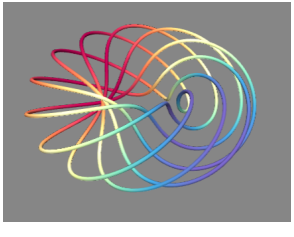


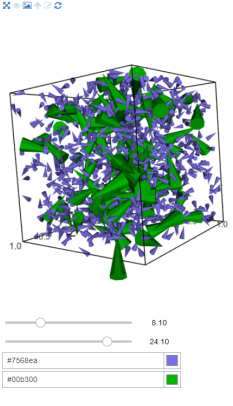
Disclaimer: Not an exhaustive list!

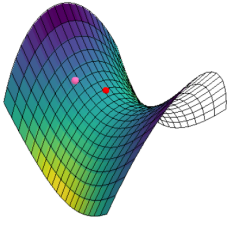
Jupyter Widgets

- Kernel and frontend share state (JSON serialized)
- Means that the frontend (browser) can pass back data or trigger events in kernel.
- Basic examples:
  - Button
  - Number slider
  - Text input

Examples: Mayavi, ipyvolume, pythreejs



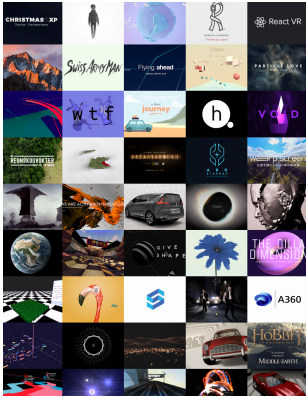




Three.js

- Popular Javascript library for generic 3D
- Scene-graph implementation
- ParaViewWeb used to be based on it
- Used by several existing efforts:
  Pythreejs, Sage, ipyvolume, SciviJS, K3D

A possibility to reduce fragmentation?



threejs.org frontpage 2017

Our plan

1) Create / expand / extract common reusable infrastructure for interactive 3D plotting in Notebooks (with three.js).

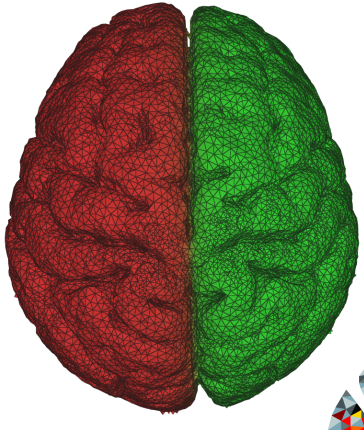
2) Help create missing plotting capabilities based on such a common infrastructure.

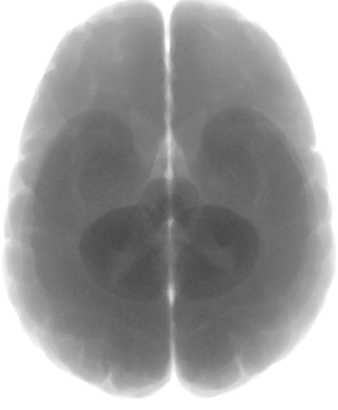
Infrastructure

- An ipywidgets library for getting your plotting data efficiently to the frontend.
- An ipywidgets library for plotting-scales.
- A set of base plotting utilities like 3D axes / grids that integrate with the scales and can auto-resize.
- Expanding pythreejs to mirror most of its API to the kernel side.
  - Camera controls, animation, composition
- etc.

Adding functionality

- Unray: Volume rendering of unstructured meshes.

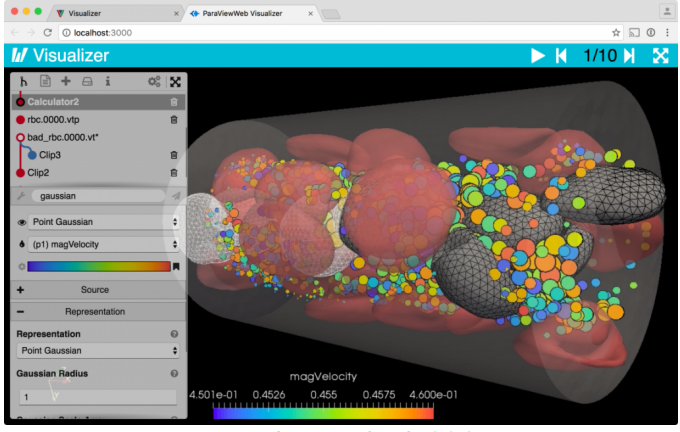




FENICS PROJECT

What about VTK/ParaViewWeb?

KitWare is working on vtk.js



paraview.org/web 2017

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Thanks for listening!

- three.js: https://threejs.org
- ipyvolume: https://github.com/maartenbreddels/ipyvolume
- pythreejs: https://github.com/jovyan/pythreejs
- ipydatawidgets: https://github.com/vidartf/ipydatawidgets
- ipyscales: https://github.com/vidartf/ipyscales
- threeplot: https://github.com/vidartf/threeplot

www.opendreamkit.org