ABV-Visualisierung-Projekte (Stand 2016-07-20)

Die Projektvorschläge werden am **15.08.2016** morgens in der Vorlesung vorgestellt. Die Projekte sollen in 2er Gruppen bearbeitet werden. Bitte stimmen Sie sich mit Ihrem Projektpartner ab und schicken Sie gemeinsam bis **13 Uhr am 16.08.2016** zwei Projektwünsche (1. + 2.) an Thomas Gust (thomas.gust@fu-berlin.de). Am späteren Nachmittag werden die Projektverteilungen ausgegeben.

Durchführung eines Projektes

- **Projektauswahl:** Bis um 13 Uhr am Dienstag, 16. August, zwei Projektwünsche (1 Hauptwunsch + 1 Alternative) an Thomas Gust (thomas.gust@fu-berlin.de).
- **Präsentation:** Am Donnerstag, 25. August, werden im Nachmittagsbereich, ab 14 Uhr, die Projekte präsentiert. Jede Projektpräsentation soll einen Überblick über das Problem (10 Min), die Lösung und Resultate mit Bildern, etc. (10 Min), sowie 10 Min Zeit für Fragen bieten. Die Präsentation soll an Hand von ca. 10 Folien (insbesondere nicht anhand der Projektdokumentation) erfolgen.
- **Dokumentation:** Die schriftliche Dokumentation/Ausarbeitung soll das theoretische Problem und dessen praktische Lösung beschreiben, sowie den Quellcode bzw. die Benutzung des Programms. Die Dokumentation sollte einen Umfang von 8-10 Seiten haben und als PDF vorliegen. Abgabe bis 2. September an Thomas Gust (thomas.gust@fu-berlin.de).
- **Bewertung:** Die Präsentation (ca. 10 inhaltliche Folien) und die Dokumentation (ca. 8-10 Seiten PDF) gehen je zu 50% in die Bewertung ein.

Software/Hardware

Sämtliche nötige Software wird am Montagnachmittag, 15. August, eingerichtet. JavaView kann hier heruntergeladen werden: http://javaview.de/download/index.html. Maya kann in einer studentischen Lizenz gratis genutzt werden (http://www.autodesk.com/education/free-software/maya), oder auf einem der FU-Rechner, an denen Maya installiert ist. Die Geomagic Software liegt auf einem der FU Rechner.

Projects

01 – Lorenz Attractor Camera Ride

Abstract: The Lorenz Attractor was derived from a simplified model of convection in the earth's atmosphere. It also arises naturally in models of lasers and dynamos. The movement of a particle is described by a system of non-linear differential equations. The behavior of the particle is chaotic and its path depends on the initial position.

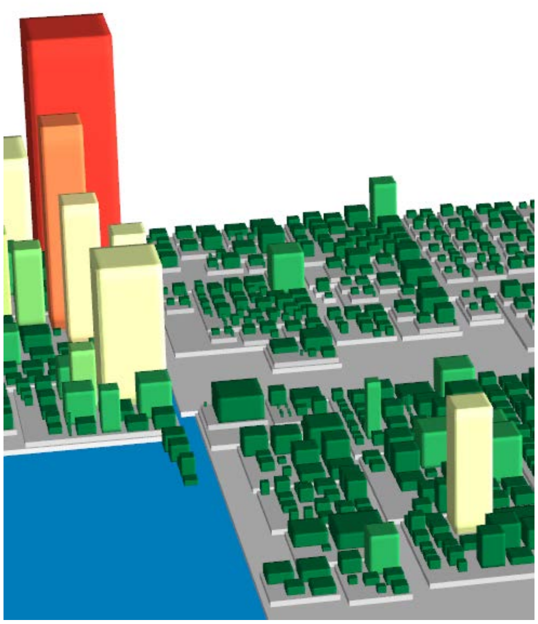
Software, Literature:

- JavaView or Maya
- Peitgen: "Chaos and Fractals"

Expectation:

- Calculate and visualize the Lorentz attractor as a curve in 3D.
- Attach a camera to the curve and visualize a ride along the curve.

02 – Tree Maps



Abstract: Tree maps display hierarchical (tree-structured) data as a set of nested rectangles. Each branch of the tree is given a rectangle, which is then tiled with smaller rectangles representing sub-branches. A leaf node's rectangle has an area proportional to a specified dimension of the data. Often the leaf nodes are colored to show a separate dimension of the data.

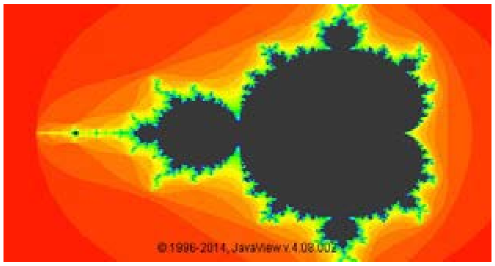
Software, Literature:

- JavaView
- Shneiderman, "Tree visualization with Tree-maps: A 2d space-filling approach"

Expectation:

- Implement Tree maps for Java code in JavaView
- Advanced: Implement McCape and other complexity metrics

03 – Mandelbrot



Abstract: The Mandelbrot set has become popular outside mathematics both for its aesthetic appeal and as an example of a complex structure arising from the application of simple rules, and is one of the best-known examples of mathematical visualization.

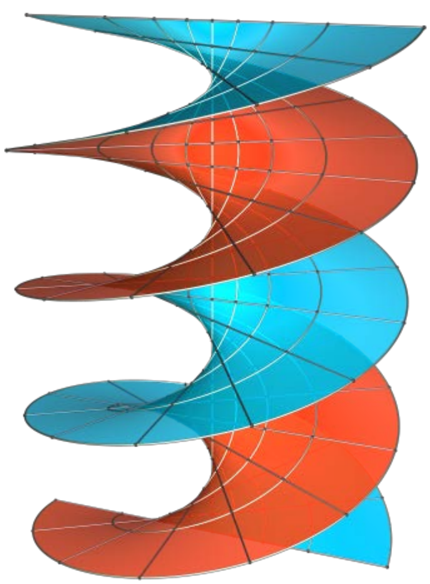
Software, Literature:

- JavaView or Python
- Mandelbrot Applet

Expectation:

- Implement the Mandelbrot fractal with various color schemes in JavaView or Python

04 – Maya Modelling and Animation



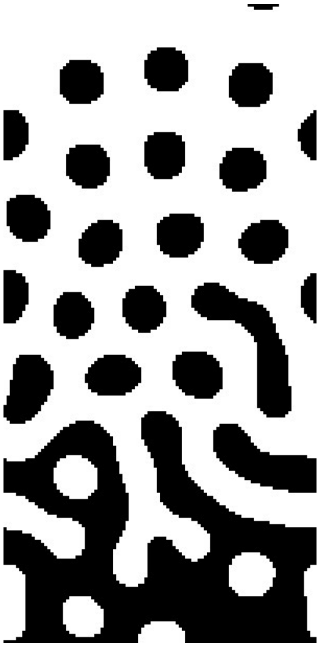
Abstract: Maya is a 3D computer graphics software used for 3D-animation, modelling, simulation and rendering. It contains a range of sophisticated tools for creating characters and effects, allowing higher productivity in modelling, texturing and creating shaders. This project is to learn modelling and animation with Maya. Therefore generate a model of the helicoid, create a nice visualization of it, and animate a slide of an object of your choice along the helicoid.

Software, Literature:

- Maya
- Optional: JavaView to generate the model

Expectation:

- Calculate and visualize a helicoid
- Animate a slide of an object along the helicoid
- Optional: Render the animation.



05 – Turing-like patterns from cellular automata

Abstract: Turing, Young, and McCabe all explored the formation of skin-patterns of animals. The pattern formation can be modelled according to Young (1984) as a cellular automaton. Several parameters of the automaton can be varied, as well as the stencil / neighborhood they act on. For larger numbers of cells, parallelization is necessary to quickly arrive at an equilibrium point (if such exists for the given settings).

Sftware, Literature:

- JavaView (or any other to model and visualize the automaton)
- https://the-biologist-is-in.blogspot.de/2015/12/biological-patterns-turing-and-young.html
- http://archive.bridgesmathart.org/2016/bridges2016-151.pdf

Expectation:

- Implement a basic version of the cellular automaton
- Explore the parameter space, implement different stencils and colors

06 – Scanning and Printing

Abstract: Scan a model with our 3D scanner and perform some post-processing on the output data. This includes merging several partial scans together using the GeoMagic software. The point cloud should then be thinned out, discarding unnecessary points.

Software, Literature:

- Geomagic and corresponding handbook

Expectation:

- Scan a shape and perform postprocessing on the point cloud
- Advanced: print the model in 3D