Faculty of Science

Bachelor Project

Visualizing Chan-Vese segmentation results through the DSC framework in Autodesk Maya

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Introduction

Designing a cross-platform solution to visualize the result of the given Chan-Vese simulation using the DSC framework via a plugin for Autodesk Maya.

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Deformable Simplical Complexes

Theory

- Simplical Complexes
- Criteria
- Domains
- Quality measure

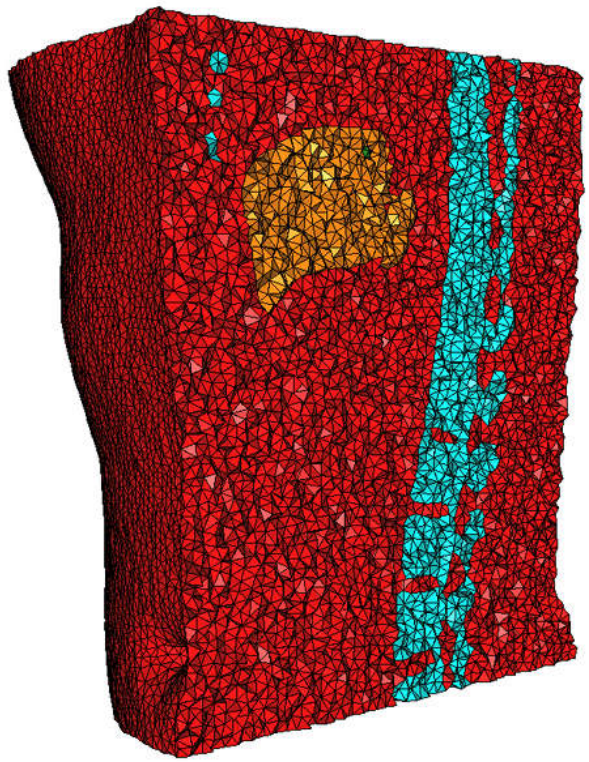

Figure : Image from
`http://doc.cgal.org/`

Chan-Vese Segmentation

Theory

- Level-Set Method
- Adapted Chan-Vese Method

$$\begin{aligned}\hat{E}(C) =& \mu \sum_{\alpha \in C} A_\alpha \\ &+ \nu \sum_{\beta \in \Omega_{in}} V_\beta \\ &+ \alpha_{in} \sum_{\beta \in \Omega_{in}} \left(\hat{U}(p_\beta) - c_{in}\right)^2 V_\beta \\ &+ \alpha_{out} \sum_{\gamma \in \Omega_{out}} \left(\hat{U}(p_\gamma) - c_{out}\right)^2 V_\gamma\end{aligned}$$

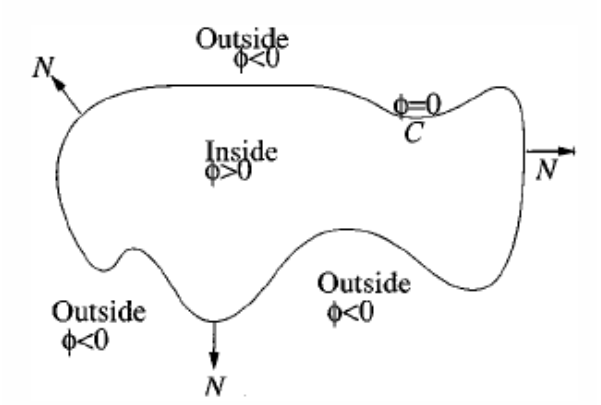

Figure : Image from: Chan & Vese - Active Contours without Edges.

Autodesk Maya

Theory

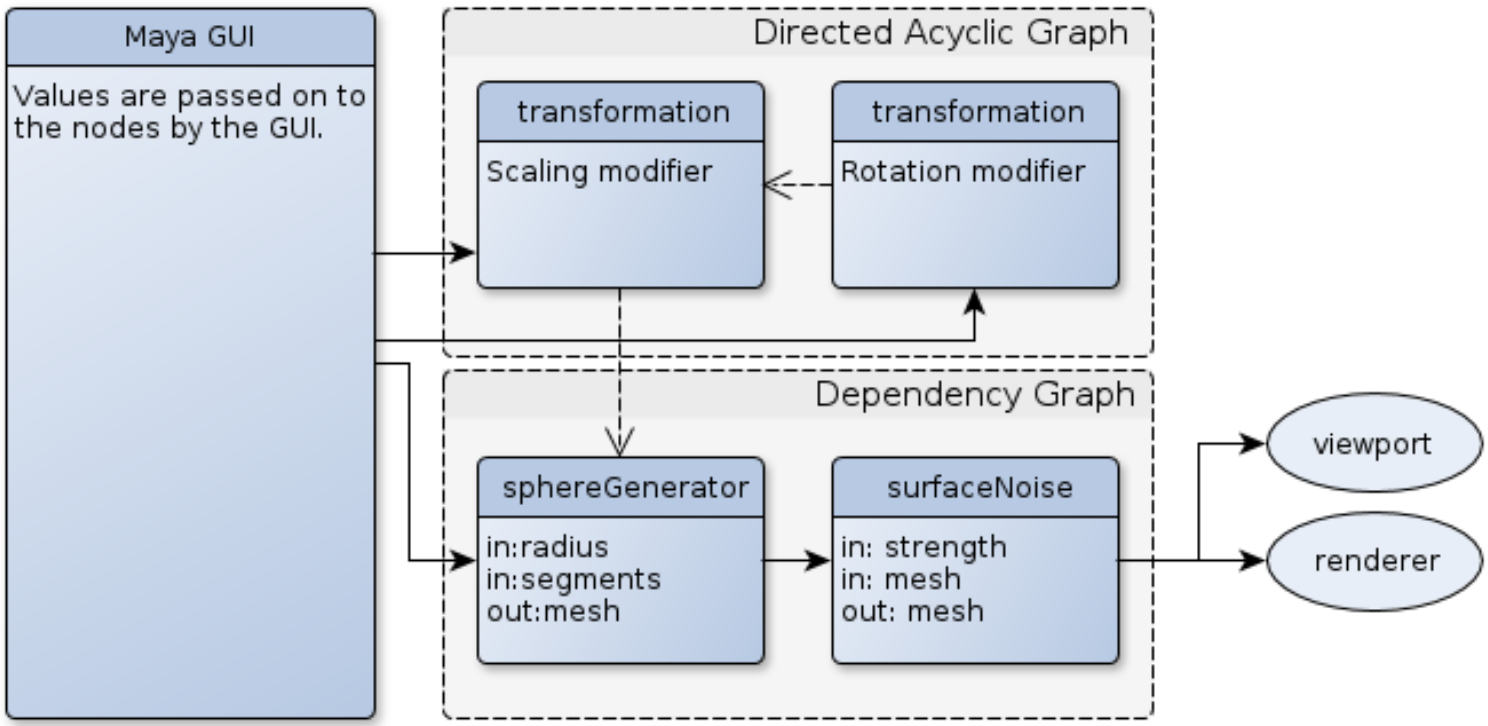

Figure : Example DAG and DG graph

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Mesh

Analysis, Design & Implementation

- Uniform Interface
- Design
- Maya-like mesh storage
- Integrating DSC

Simulator

Analysis, Design & Implementation

- Uniform Interface
- Design
- Integrating Chan-Vese with DSC

Plugin

Analysis, Design & Implementation

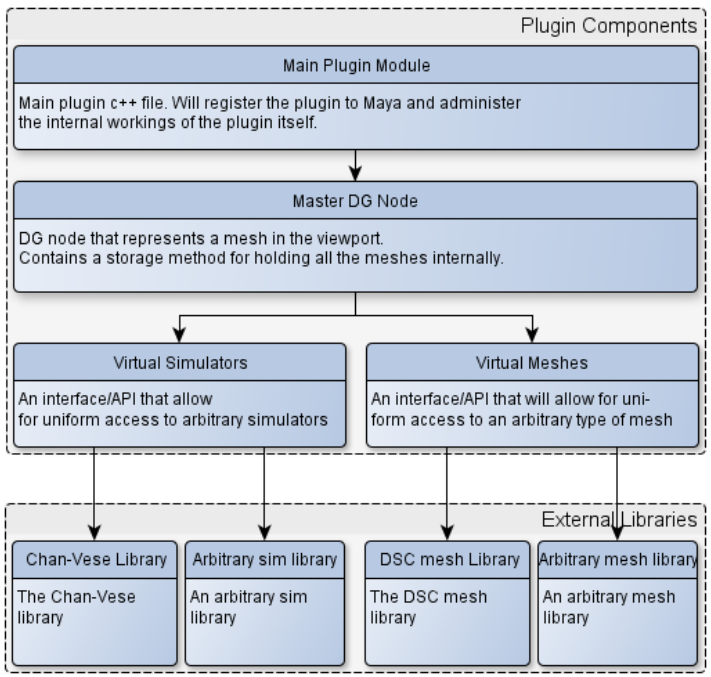

Figure : Designed solution.

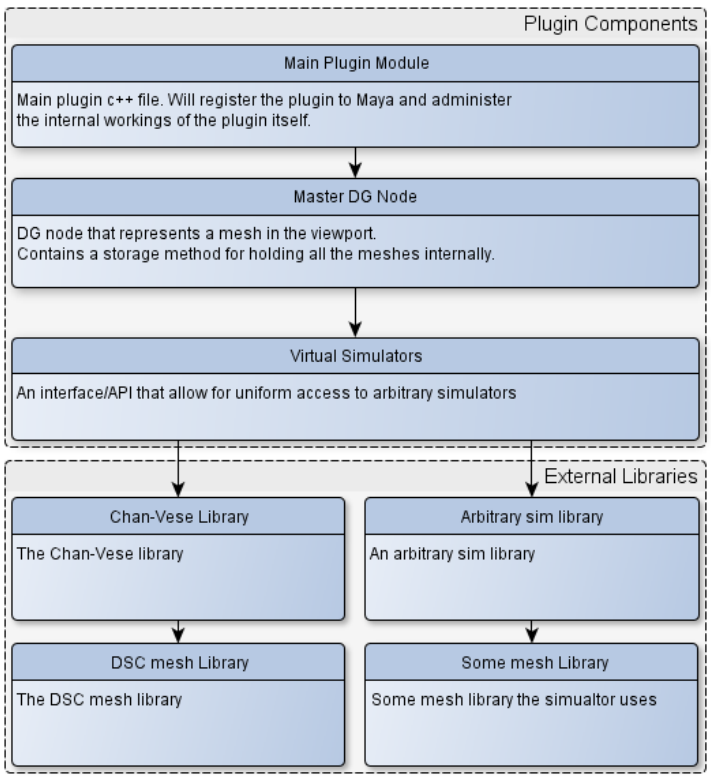

Figure : Implemented solution.

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UI

Results & Future

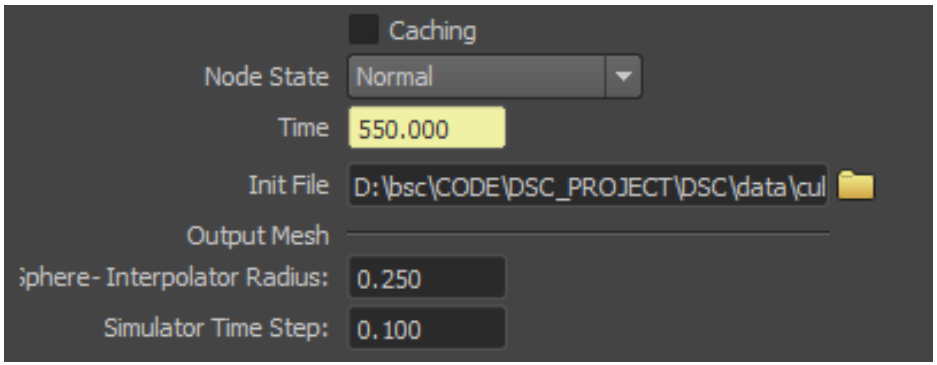

Figure : Arguments for the Chan-Vese simulator.

Mesh loading and surface inspection

Results & Future

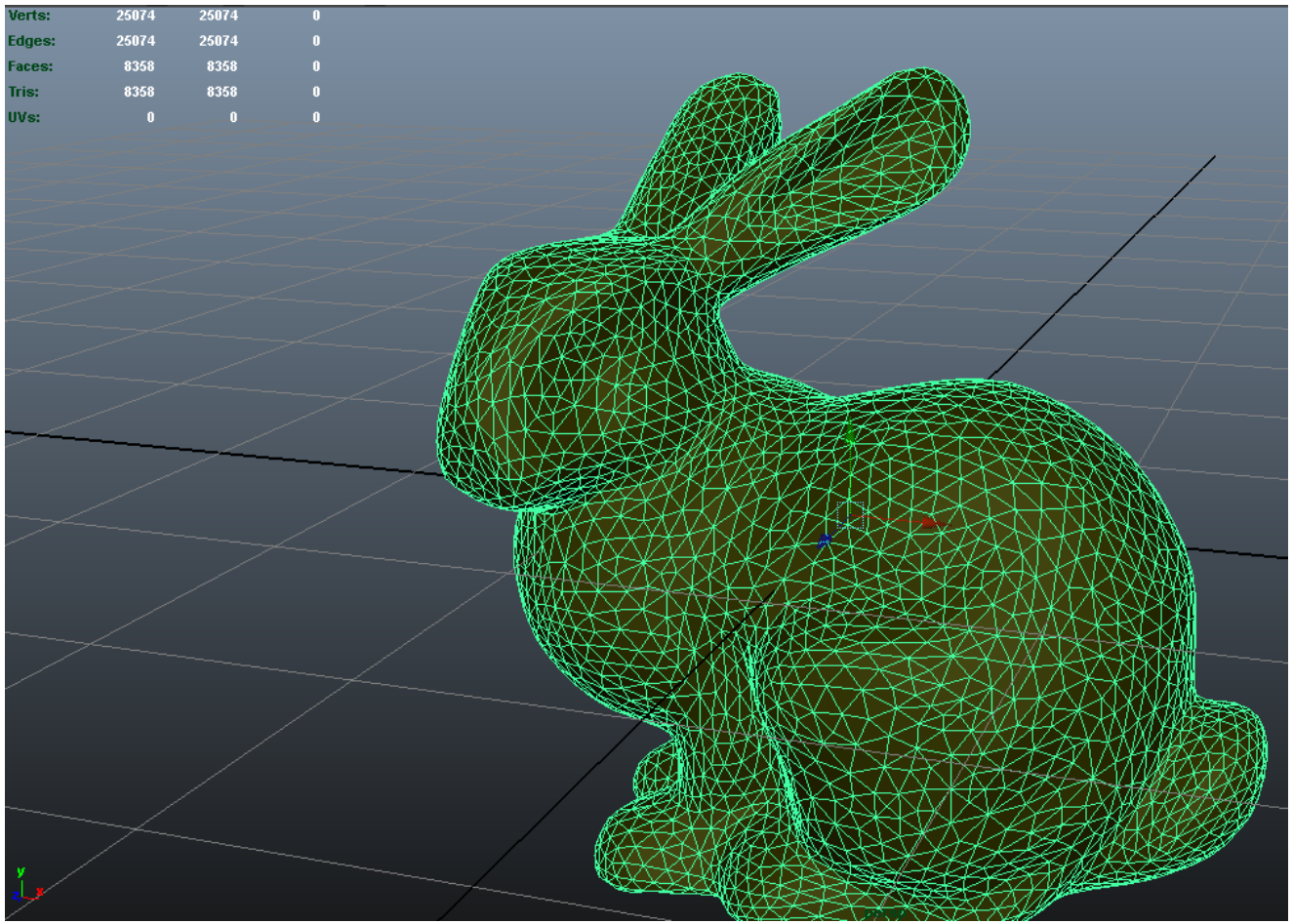

Figure : Mesh loaded with shader+wireframe and mesh stats.

Simulation

Results & Future

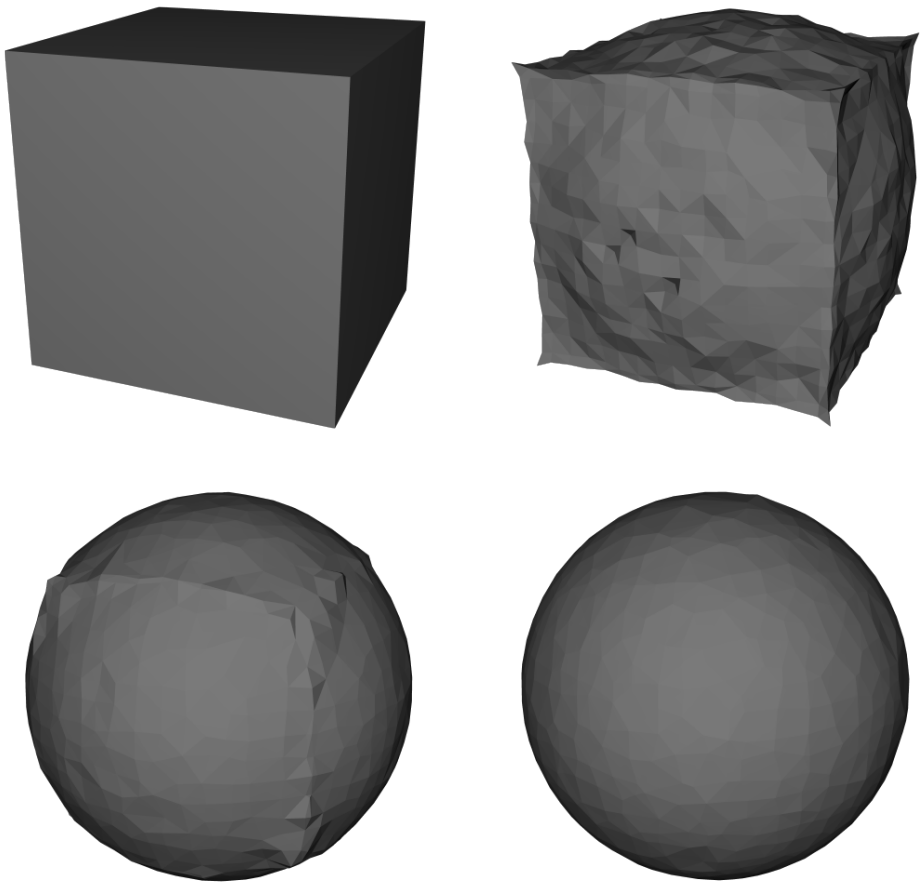

Figure : Pictures of four different stages in the simulation process using the visMesh plugin.

Textures & Renderes

Results & Future

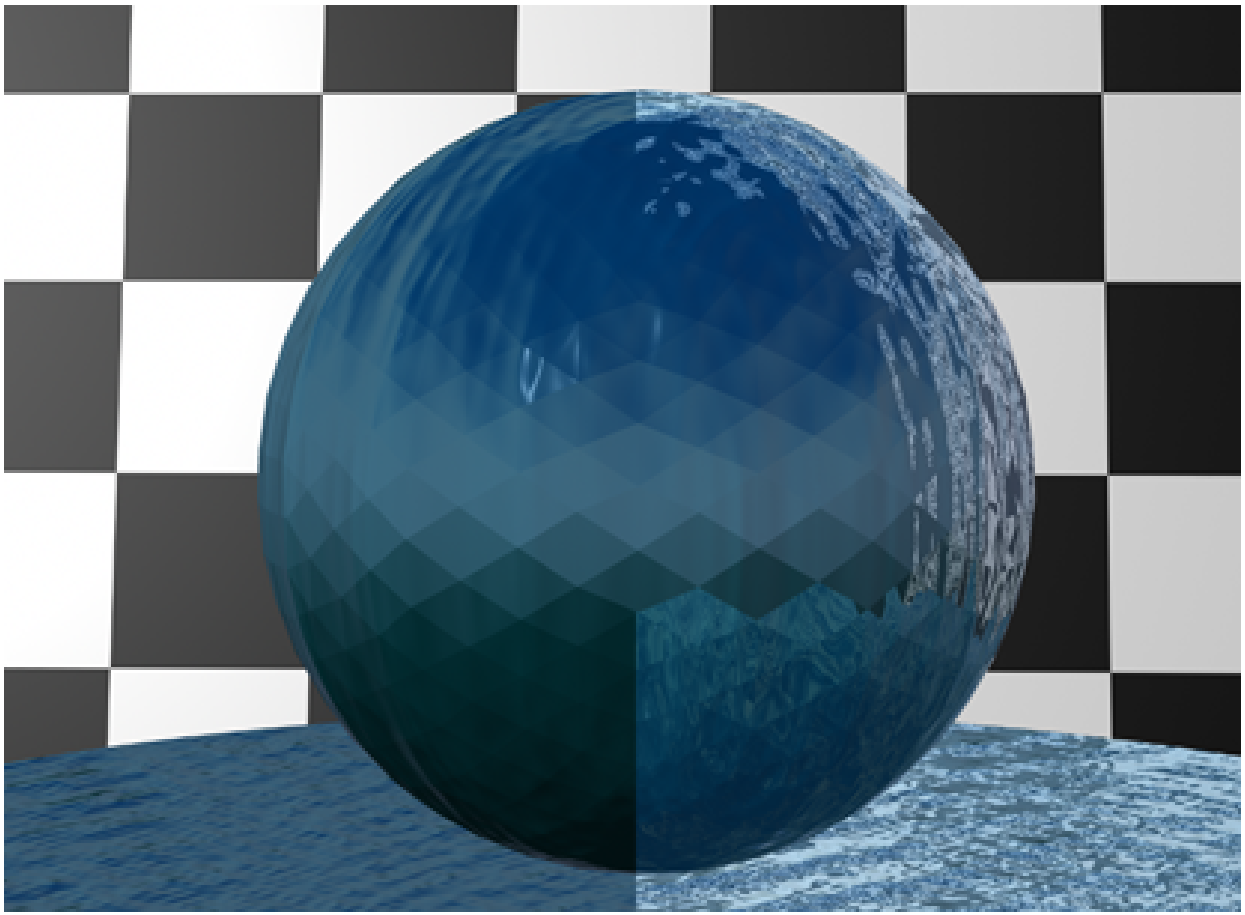

Figure : An advanced texture applied to a multi body mesh.

Performance & Memory Load

Results & Future

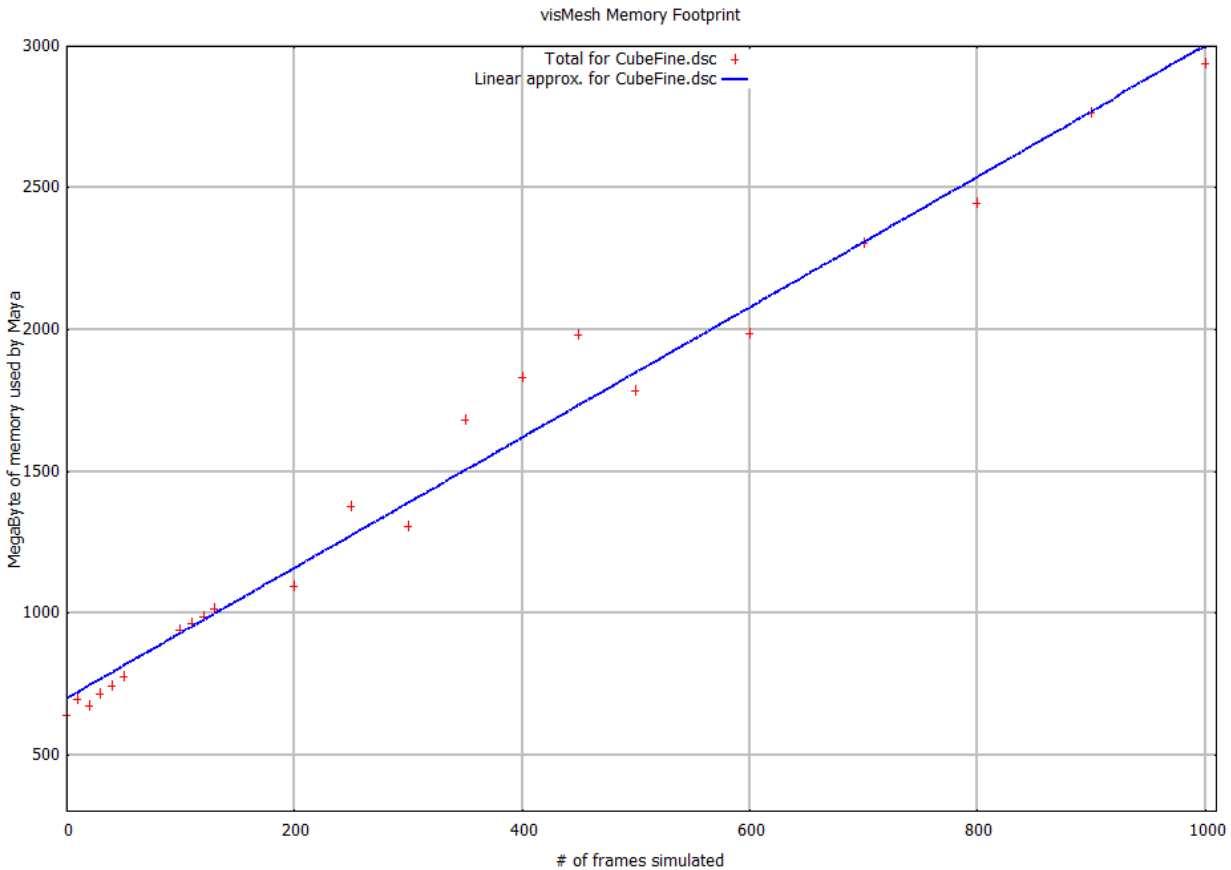

Figure : The memory load of the plugin during simulation

What's next?

Results & Future

- Implement uniform mesh storage
- Easier usage
- New parametertypes
- Saveability

Demonstration & Questions

If there is time: Demo video.

Else: Questions.