

Menger Marcher

Bare-bones Ray Marching of Shaded Fractal Signed Distance Functions

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Project Description

In this project, I shall implement the ray-marching rendering method from scratch and create interesting patterns with signed distance functions. The goal is to explore implicit geometry representations, and the facility of describing recursive structures with them. Another central aim is to understand more fundamentally the systems side of these implementations. Thus I will additionally attempt to implement all classes used (e.g. Vec3, Mat3, Light), and avoid using abstractions such as OpenGL APIs.

The best examples of scenes I shall try to render are Inigo Quilez, available at <http://www.iquilezles.org/www/articles/raymarchingdf/raymarchingdf.htm>. The inspiration for this bare-bones approach is TinyKaboom (<https://github.com/ssloy/tinykaboom/wiki/KABOOM!-in-180-lines-of-code>).

Deliverables

- Documented ray marching source code
- Capable of general-purpose primitive rendering
- Phong Reflectance
- Soft shadows and penumbra
- Complex fractal structure SDF demo
- Final video exemplifying work

Sources

- Ray Marching and SDFs: <http://jamie-wong.com/2016/07/15/ray-marching-signed-distance-functions/>
- TinyKaboom: <https://github.com/ssloy/tinykaboom/wiki/KABOOM!-in-180-lines-of-code>
- Fractal SDFs: <http://blog.hvidtfeldts.net/index.php/2011/06/distance-estimated-3d-fractals-part-i/>
- Inigo Quilez Ray Marching: <https://www.iquilezles.org/www/articles/raymarchingdf/raymarchingdf.htm>