The curvature and dimension of 2-surfaces

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December 25, 2018

Abstract

The curvature of 2-surfaces can lead to fractional dimension.

1 Core C++ code

```
if(false == mesh.load_from_binary_stereo_lithography_file(argv[1]))
        return 2;

tri_neighbours.resize(mesh.triangles.size());
tri_normals.resize(mesh.triangles.size());

for(size_t i = 0; i < mesh.triangles.size(); i++)
{
        mesh.get_tri_neighbours(i, tri_neighbours[i]);
        tri_normals[i] = mesh.get_tri_normal(i);
}

float final_measure = 0;

for (size_t i = 0; i < mesh.triangles.size(); i++)
{
        vertex_3 n0 = tri_normals[i];
        vertex_3 n1 = tri_normals[tri_neighbours[i][0]];
        vertex_3 n2 = tri_normals[tri_neighbours[i][1]];
        vertex_3 n3 = tri_normals[tri_neighbours[i][2]];

        float dot1 = n0.dot(n1);
        float dot2 = n0.dot(n2);
        float dot3 = n0.dot(n3);

        float d = (dot1 + dot2 + dot3) / 3.0f;
        float measure = (1.0f - d) / 2.0f;
        final_measure += measure;
}

cout << "Dim:" << 2.0 + final_measure/mesh.triangles.size() << endl;
```

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References

[1] Halayka S. *Some visually interesting non-standard quaternion fractal sets* Chaos, Solitons & Fractals

[2] Halayka S. *Approximating the connectedness of 3D quaternion Julia sets via isosurface polygonization* Chaos, Solitons & Fractals