



VISUALITZANT FRACTALS 3D

ÍNDEX

INTRODUCCIÓ

GRADIENT FRACTAL
NOISE AND CHUNKS

3D IFS FRACTALS W/
RAY MARCHING

QUATERNION JULIA
SETS

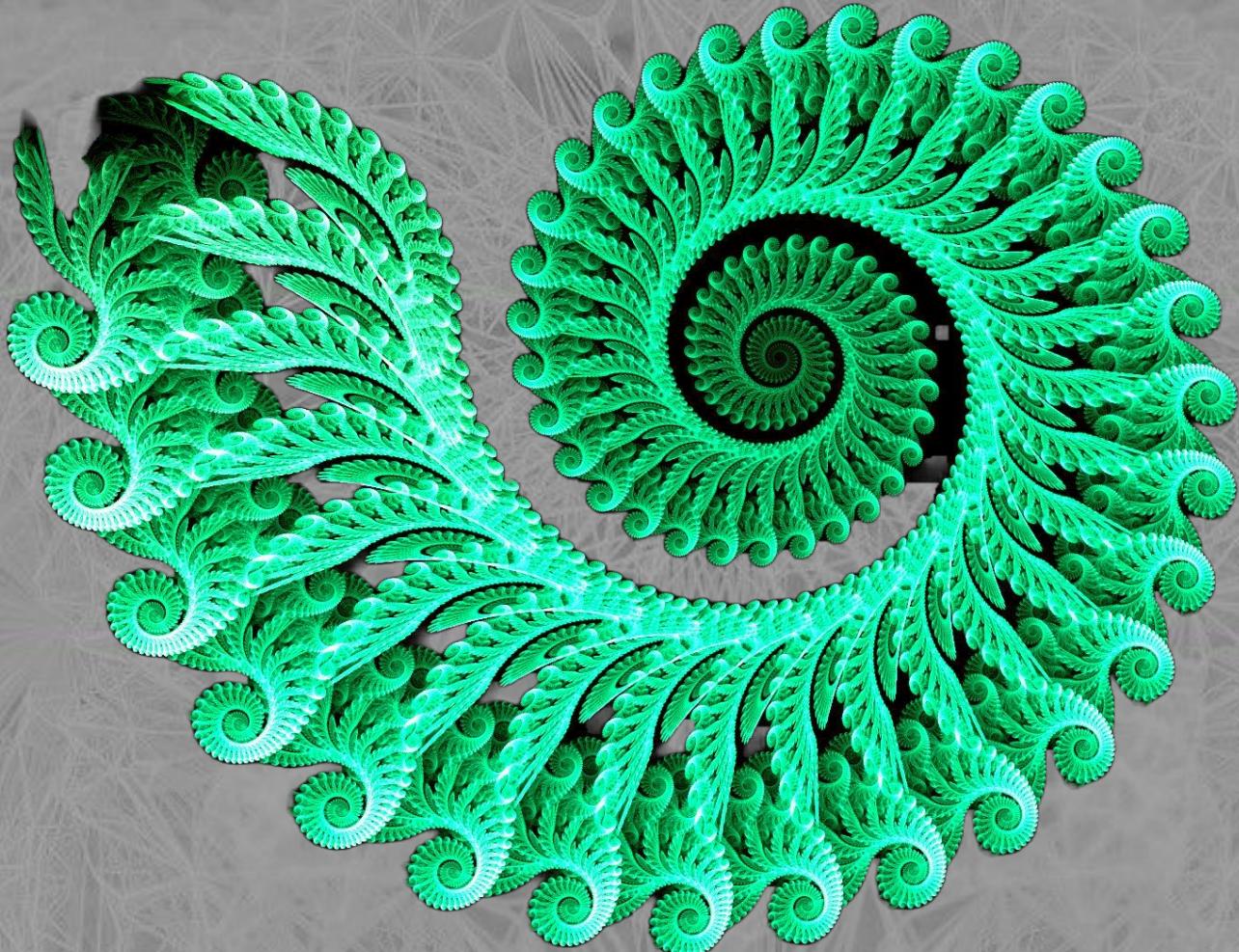
L-SYSTEMS

CONCLUSIONS

TORN DE
PREGUNTES

THANKS

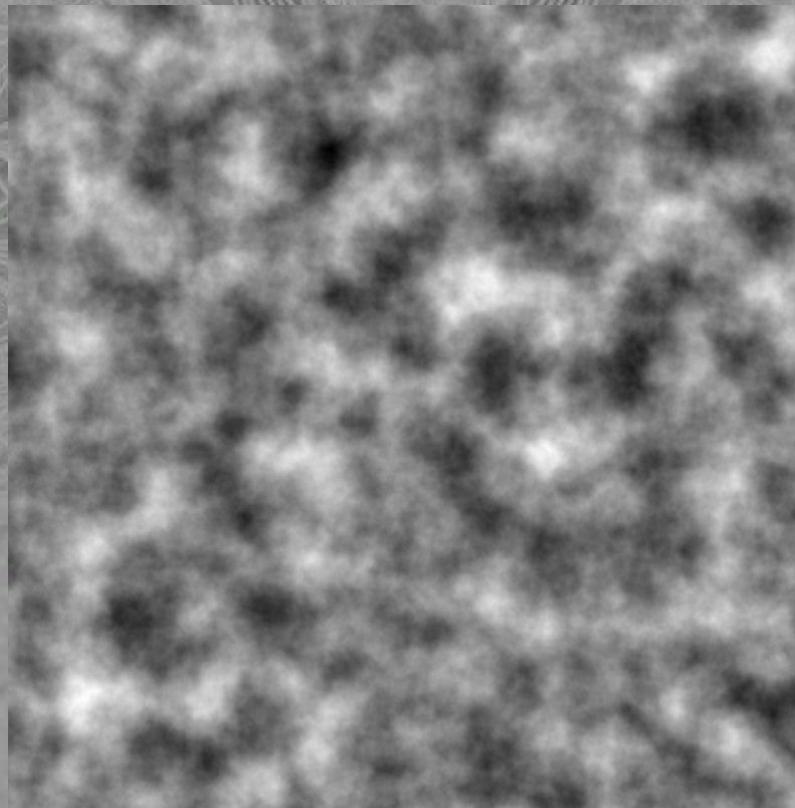
INTRODUCCIÓ



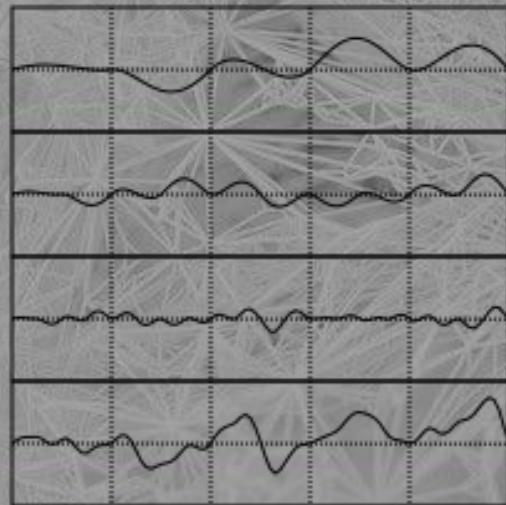
CHUNKS



GENERAL FRACTAL NOISE



OCTAVE LAYERING

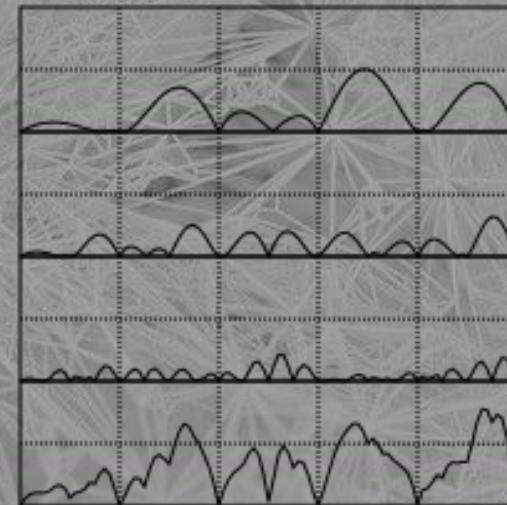


1st Octave

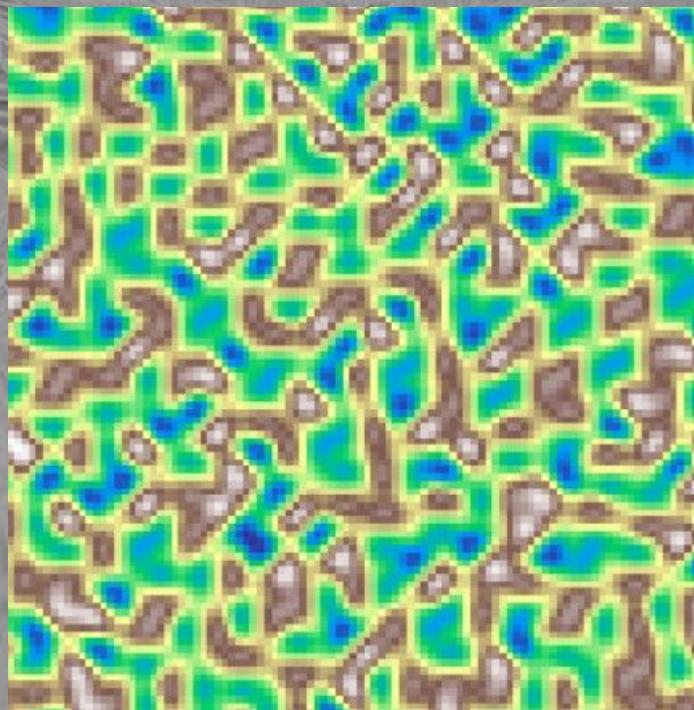
2nd Octave

3rd Octave

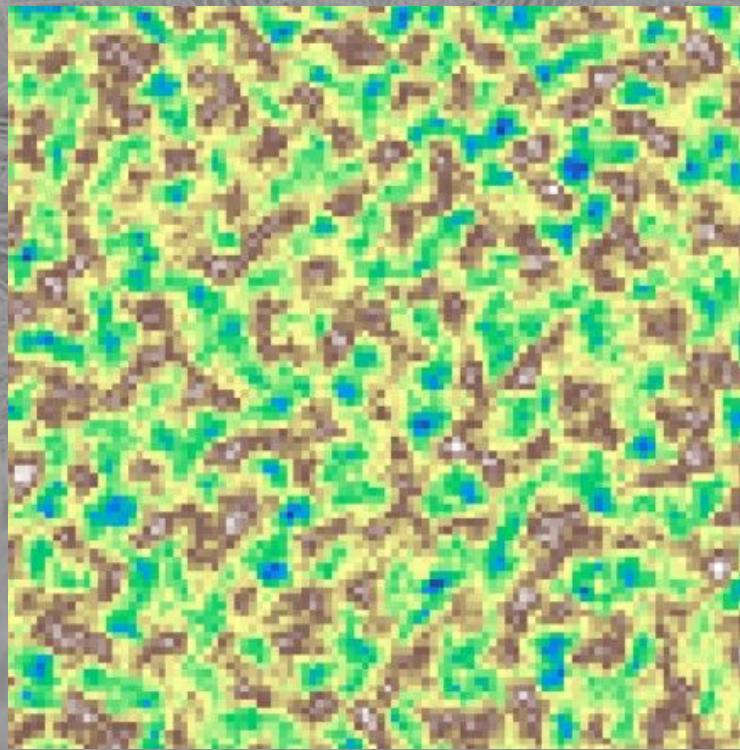
Sum



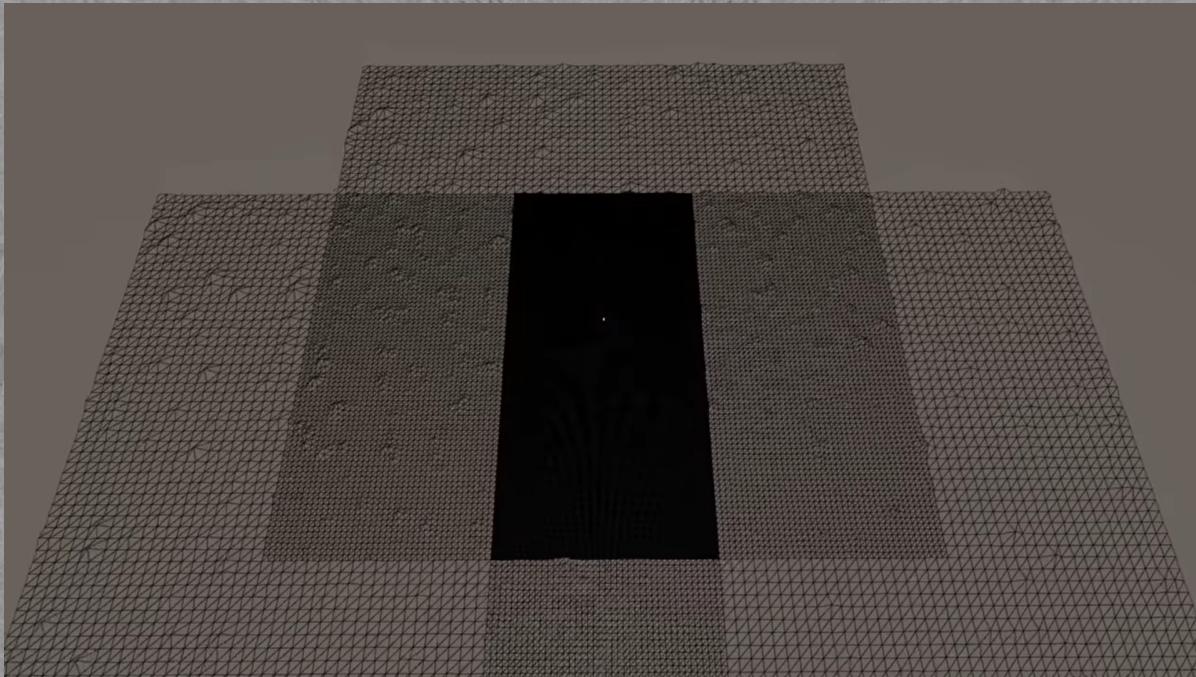
NON-FRACTAL PERLIN NOISE



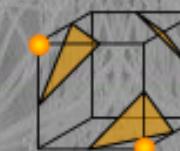
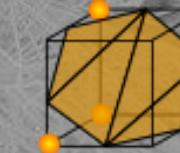
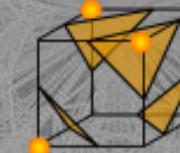
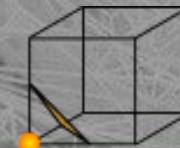
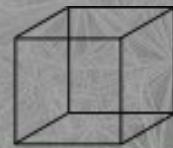
FRACTAL PERLIN NOISE

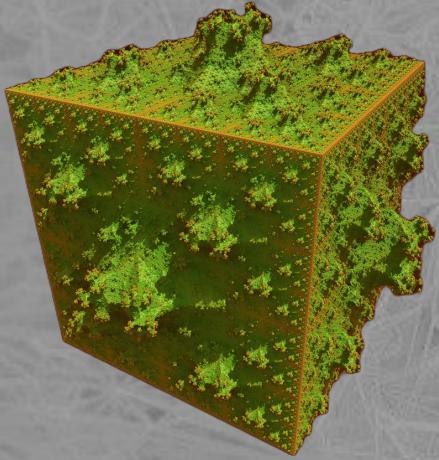


CHUNK GENERATION

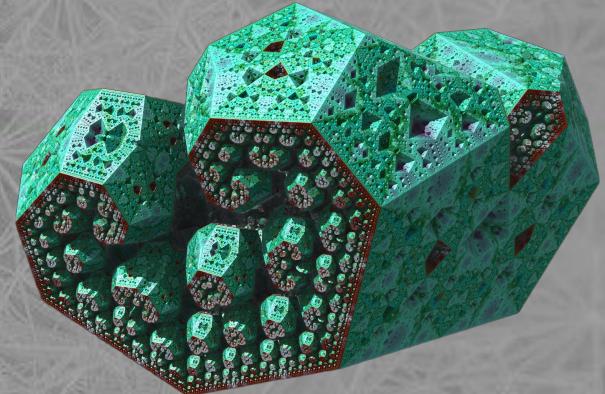


MARCHING CUBES





ITERATE FUNCTION SYSTEMS



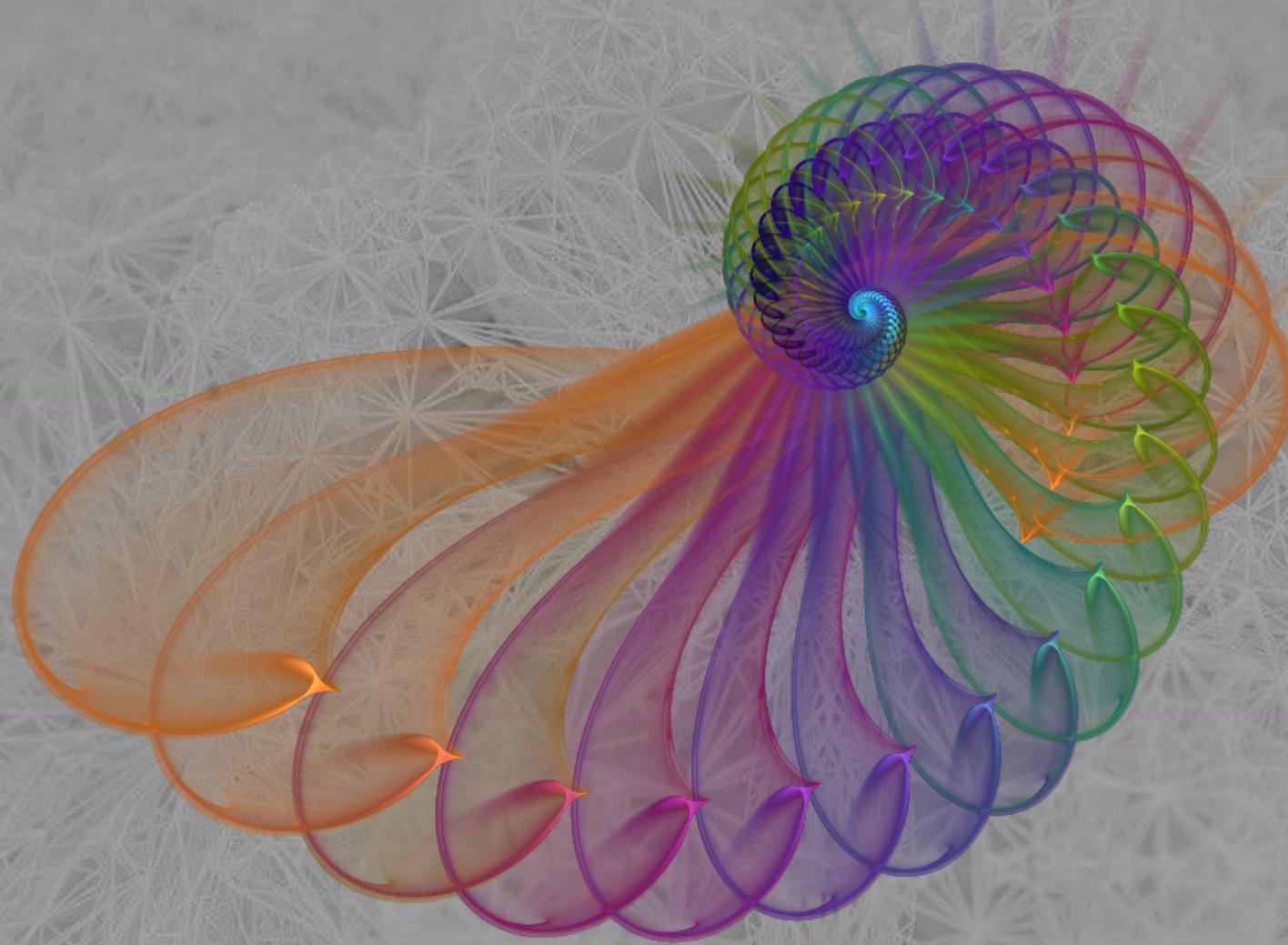
CONTEXT TEÒRIC DELS IFS

$$\mathcal{F} = \{f_i\}_{i=1}^n$$

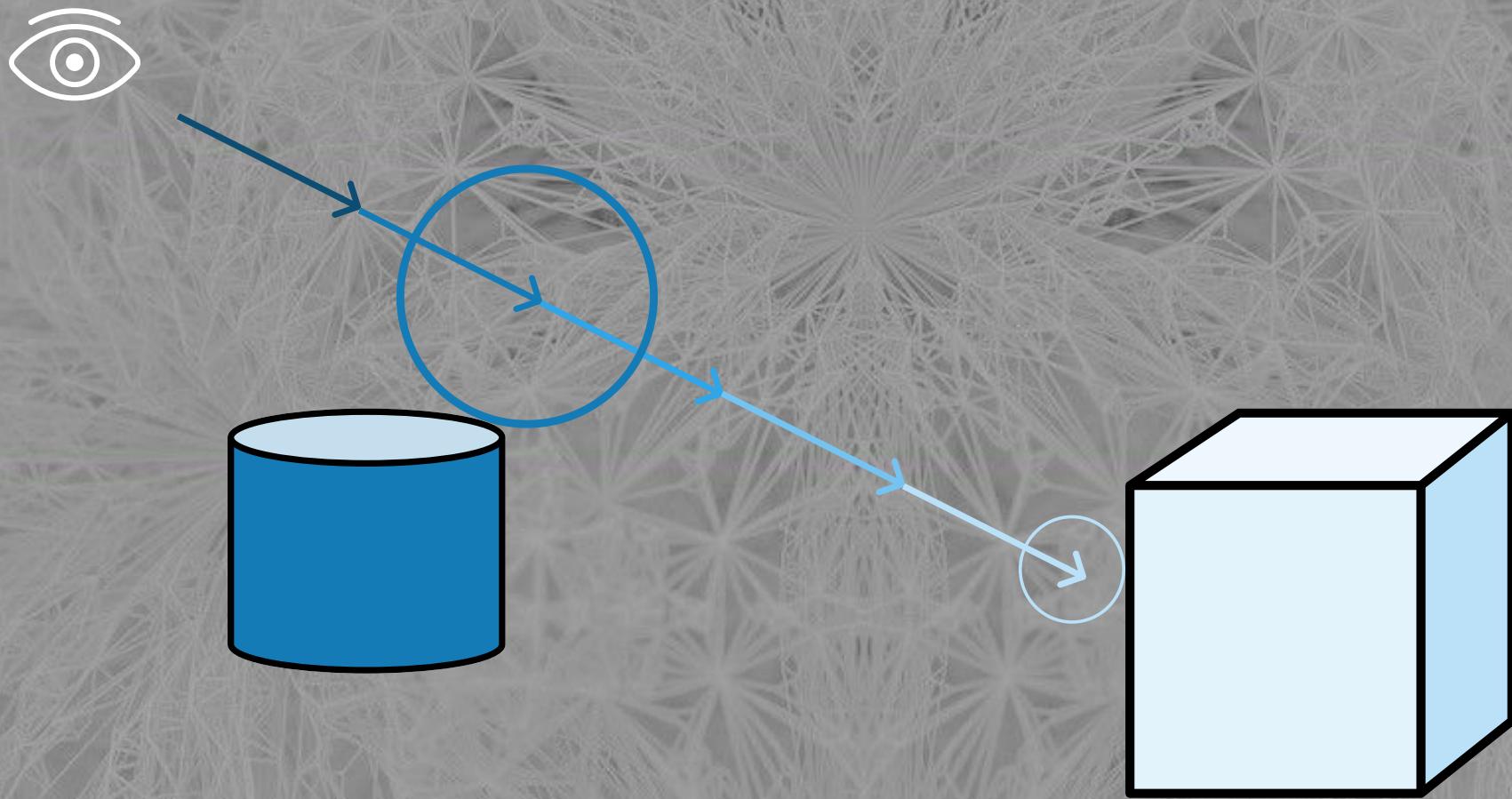
$$f_i : X \rightarrow X$$

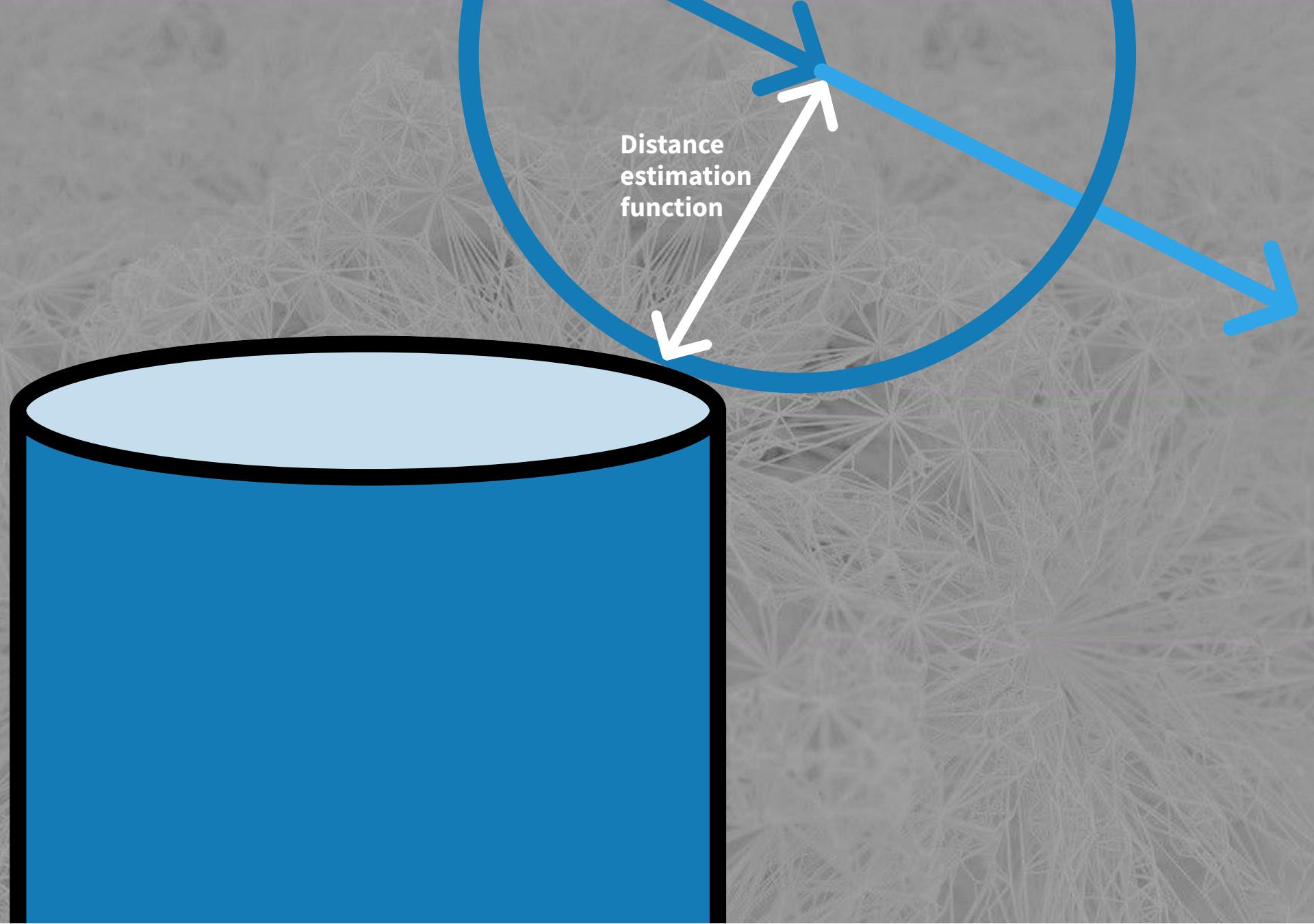
$$d(f(x), f(y)) \leq s \cdot d(x, y)$$

THE COLLAGE THEOREM



RAYMARCHING



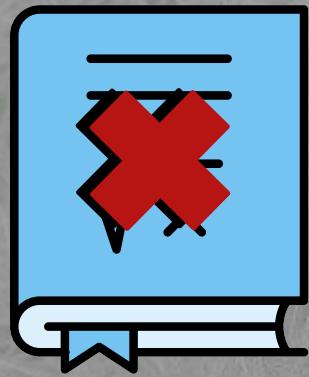


RAYMARCHING

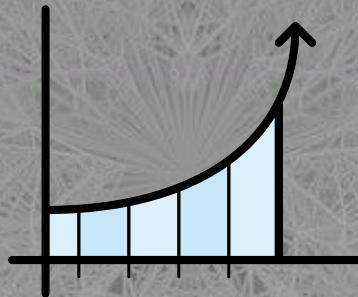


RAYTRACING?

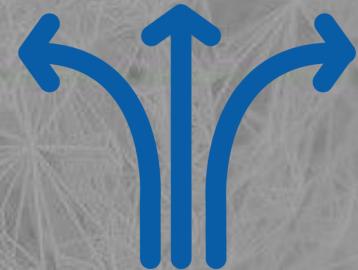
RAYMARCHING > RAYTRACING



SENSE CÀLCULS
GEOMÈTRICS COMPLEXES



EFICIÈNCIA



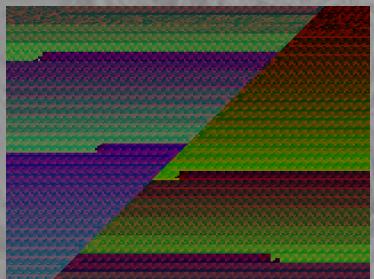
FLEXIBILITAT

RAYMARCHING



Z-BUFFER?

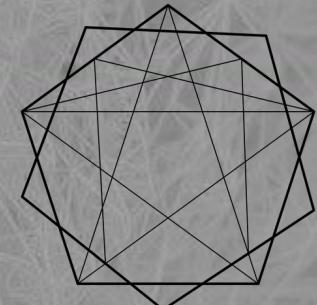
RAYMARCHING > Z-BUFFER



EFICIÈNCIA
(RASTERITZACIÓ)



ABSÈNCIA DE
POLÍGONS DEFINITS

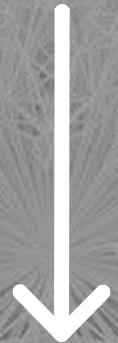


COMPLEXITAT
PROFUNDA



MILLORES EN EL
RAYMARCHING

CÀRREGA COMPUTACIONAL
ELEVADA

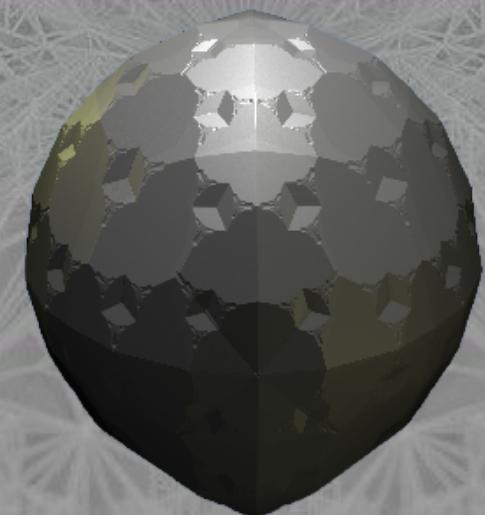


MÚLTIPLES GPUs

=

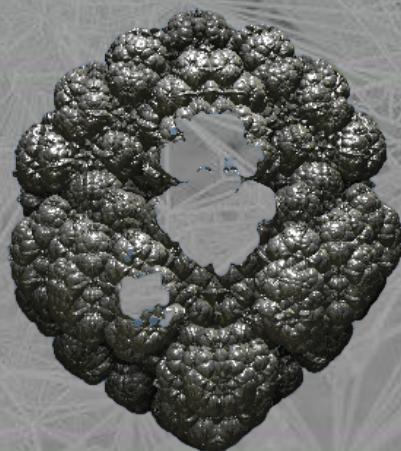
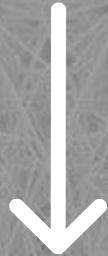
MÚLTIPLES RAYS

EFFECTES VISUALS REALISTES

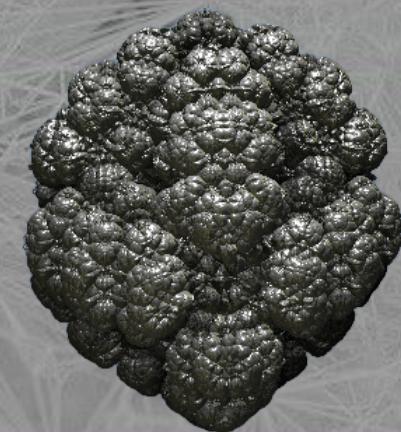


Blinn-Phong shading

PARÀMETRES ÒPTIMS

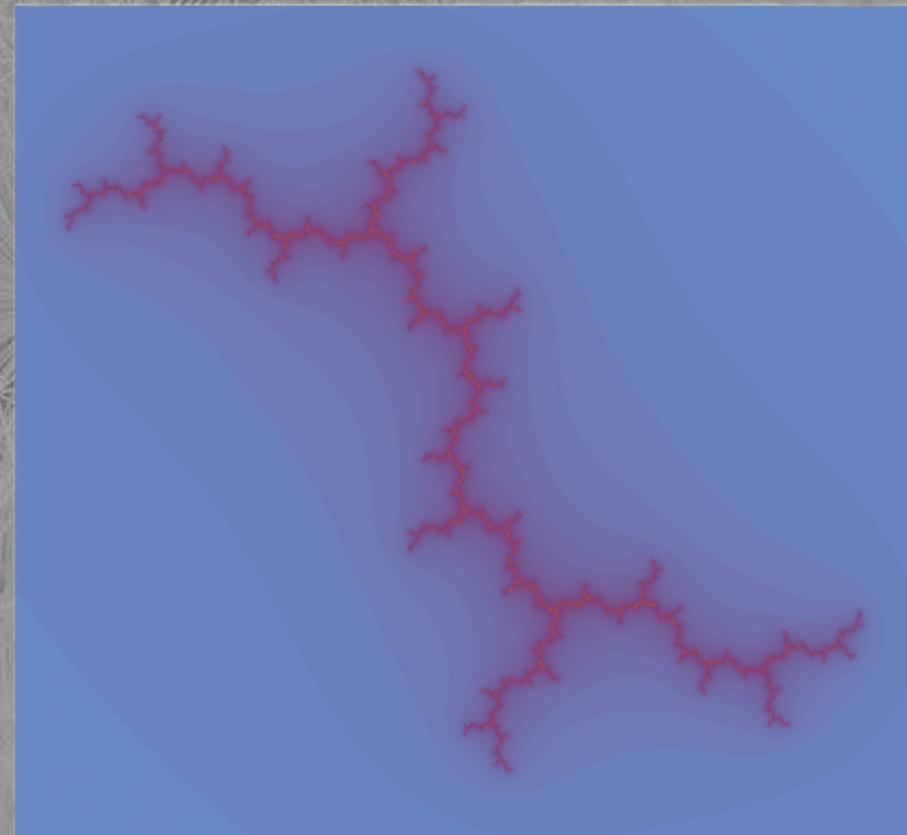


Overly high threshold



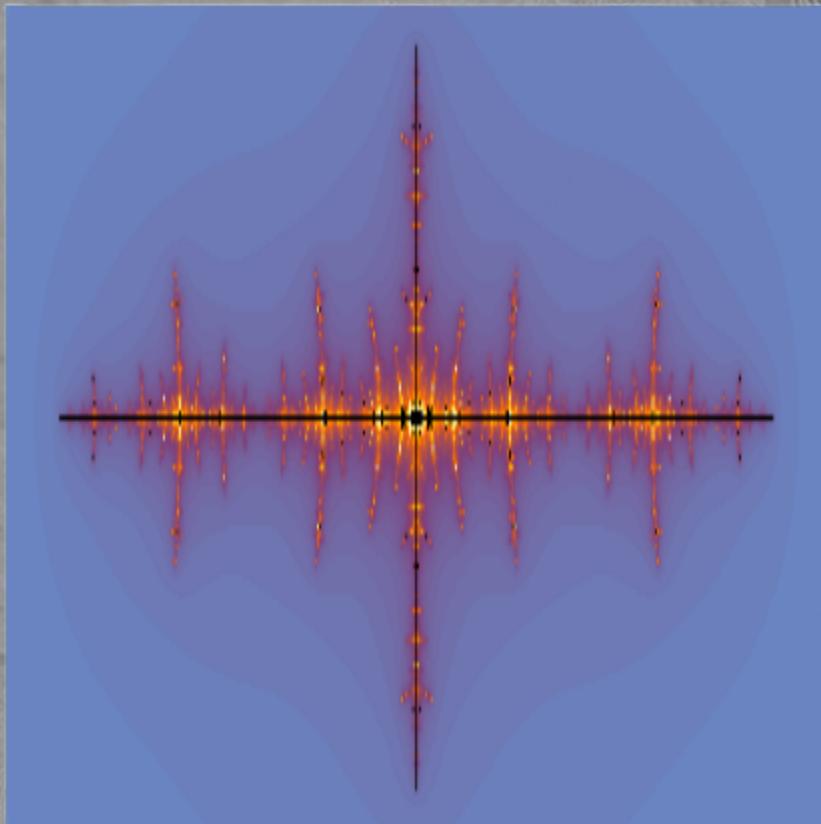
Optimal threshold

JULIA SETS

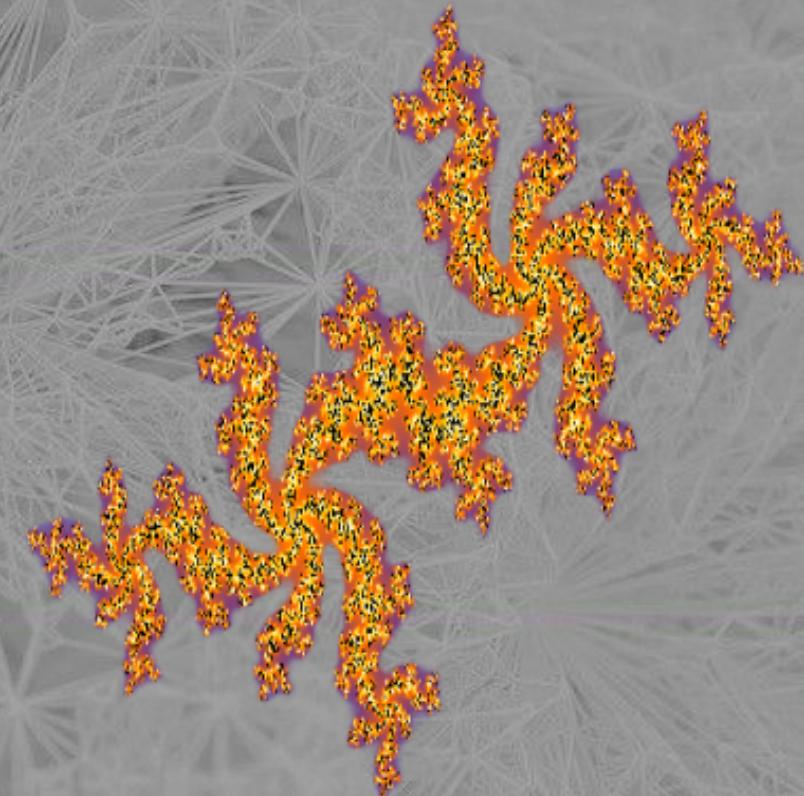


Julia set for $c = 0 + i$

JULIA SETS

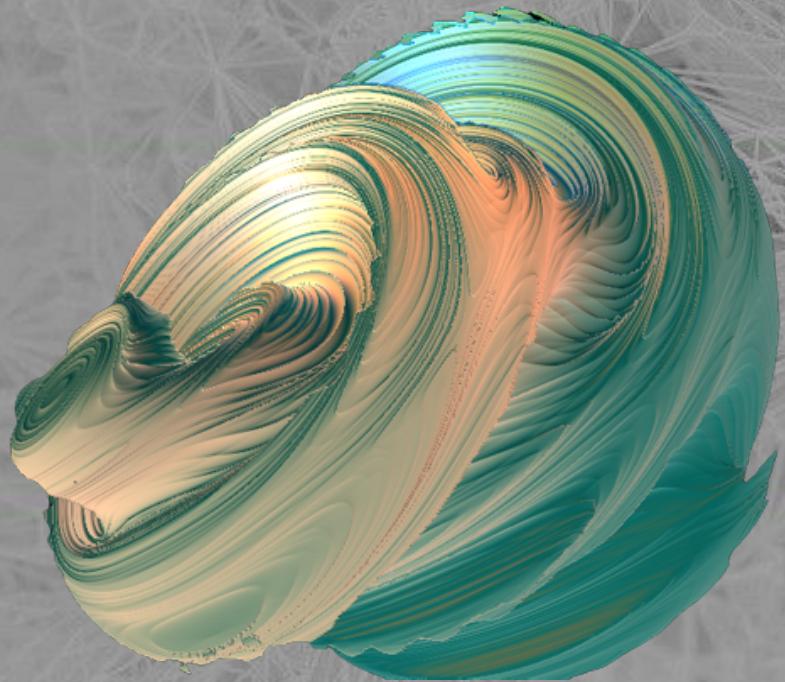


Julia set for $c = -1.4 + 0i$

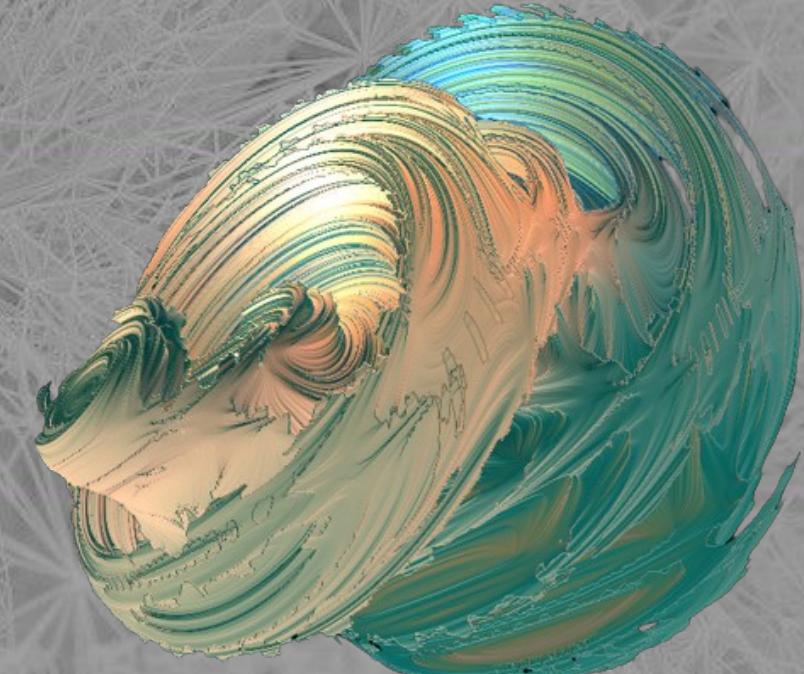


Julia set for $c = -0.55 - 0.55i$

QUATERNION JULIA FRACTALS

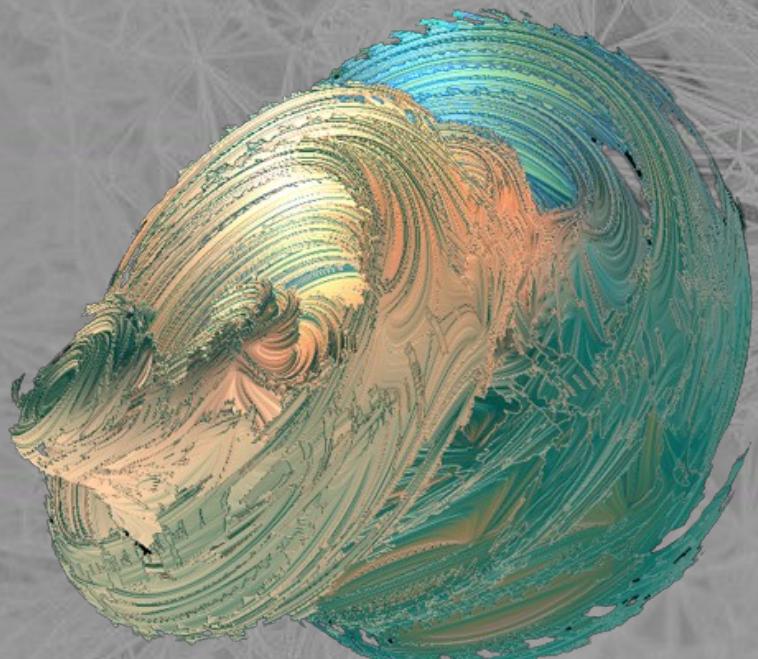


10 iterations

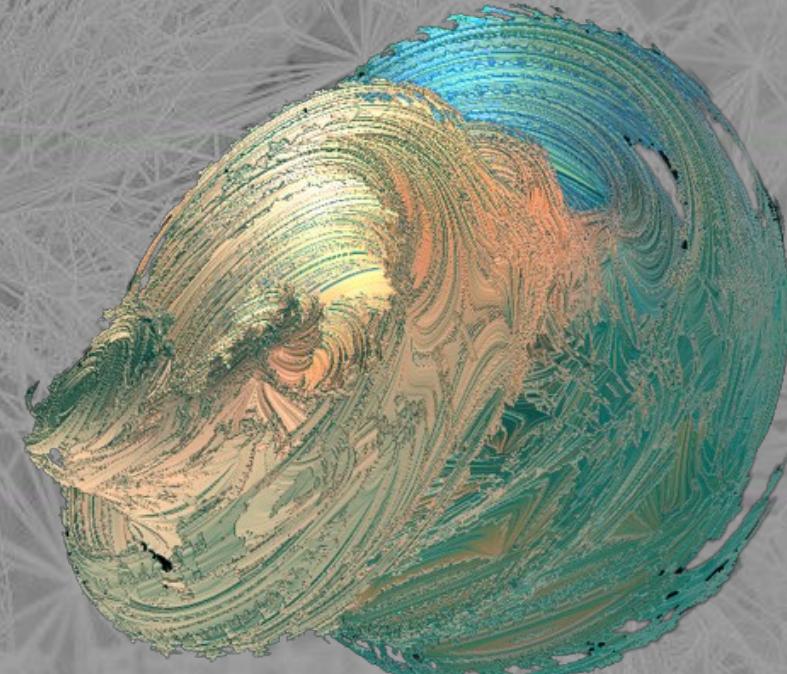


15 iterations

QUATERNION JULIA FRACTALS

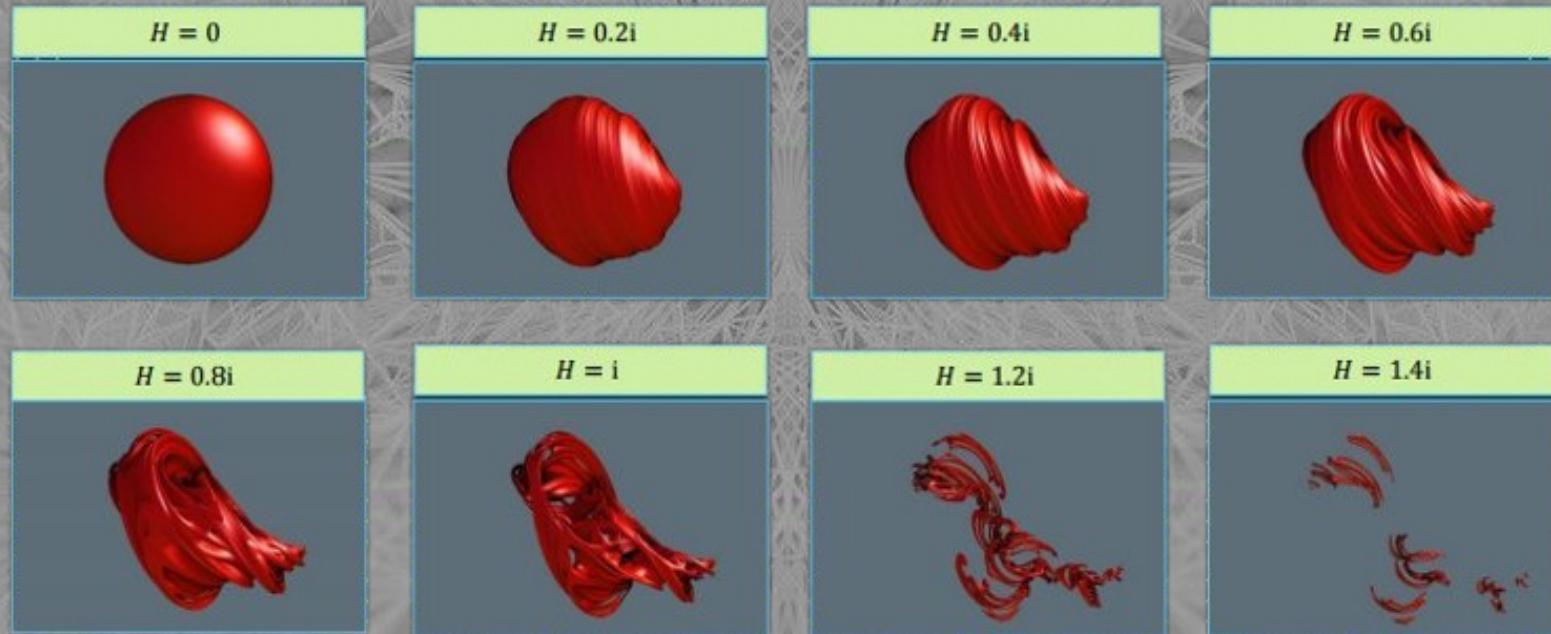


20 iterations

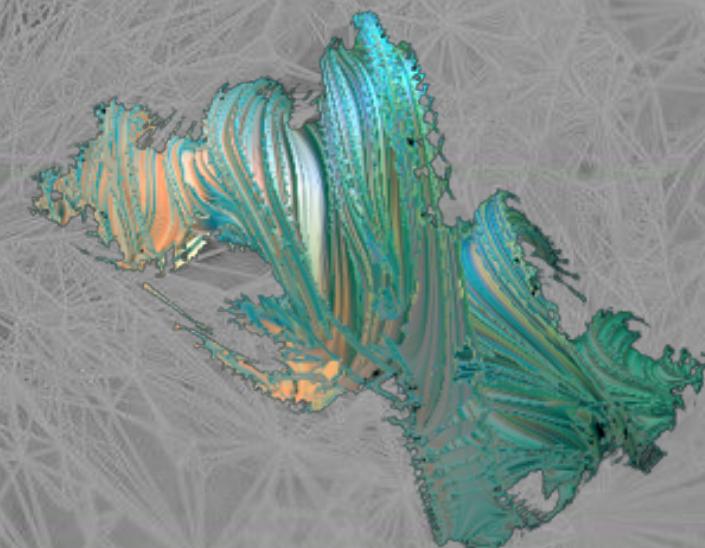
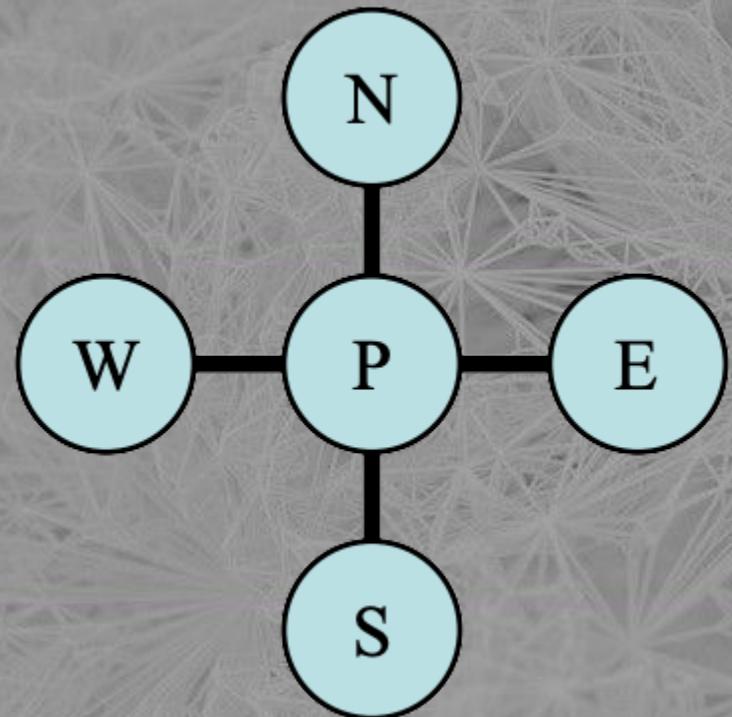


25 iterations

SLICES OF QUATERNION JULIA FRACTALS

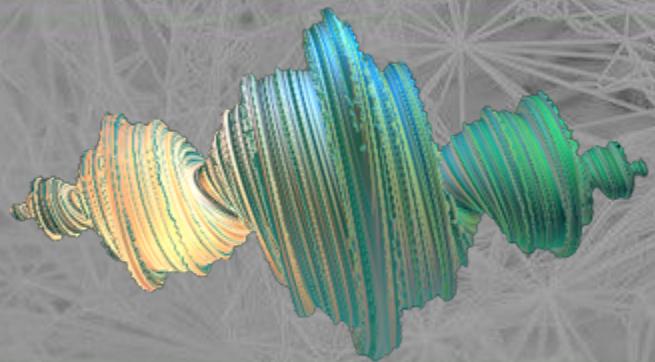


LIGHTNING MODEL -> PHONG

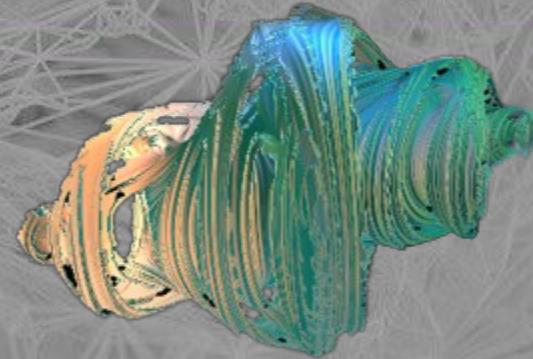


$$c = (-0.138, 0.864, 0.0, 0.0)$$

EXEMPLES



$c = (-0.8, 0.156, 0.0, 0.0)$



$c = (-0.55, -0.15, 0.45, -0.25)$

PROS, CONS I APLICACIONS

Avantatges

- Contingut visual ric
- Renderització en temps real
- Versàtil

Aplicacions

- Computer Graphics
- Visualització matemàtica
- Recerca

Desavantatges

- Complexitat
- Resource Intensive



L-SYSTEMS

Variables:

A, B

Axioma:

A

**Regles de
Producció:**

[A, AB], [B, A]

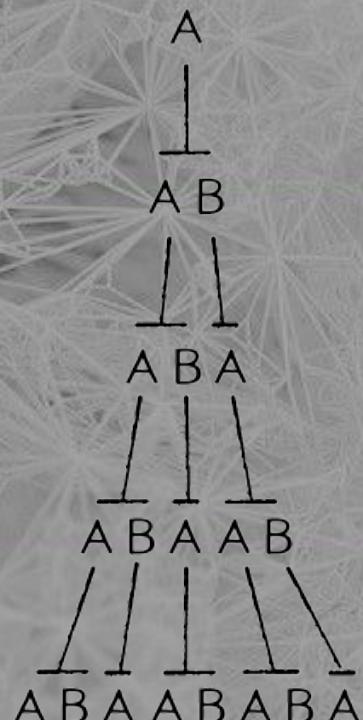
GENERACIÓ 0:

GENERACIÓ 1:

GENERACIÓ 2:

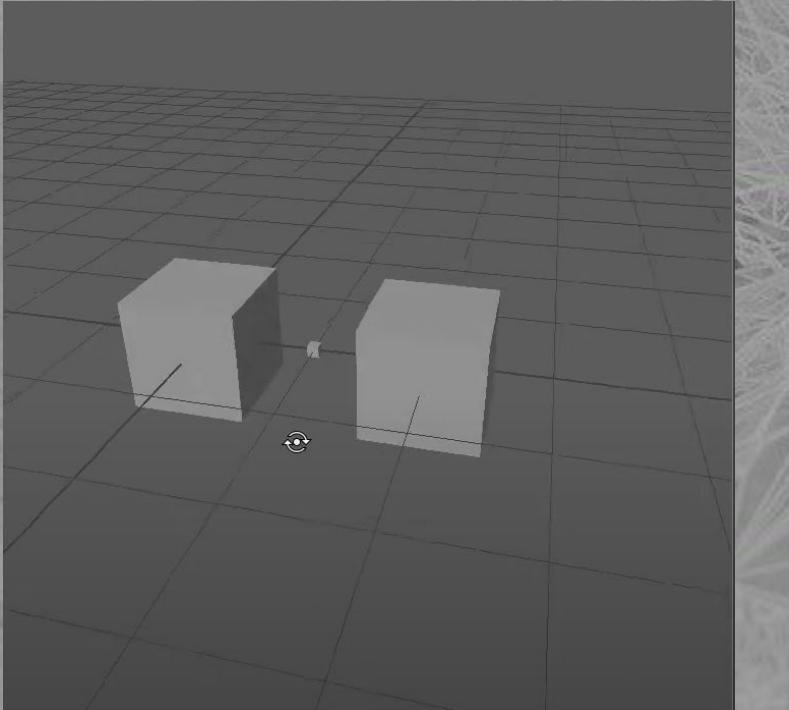
GENERACIÓ 4:

GENERACIÓ 5:

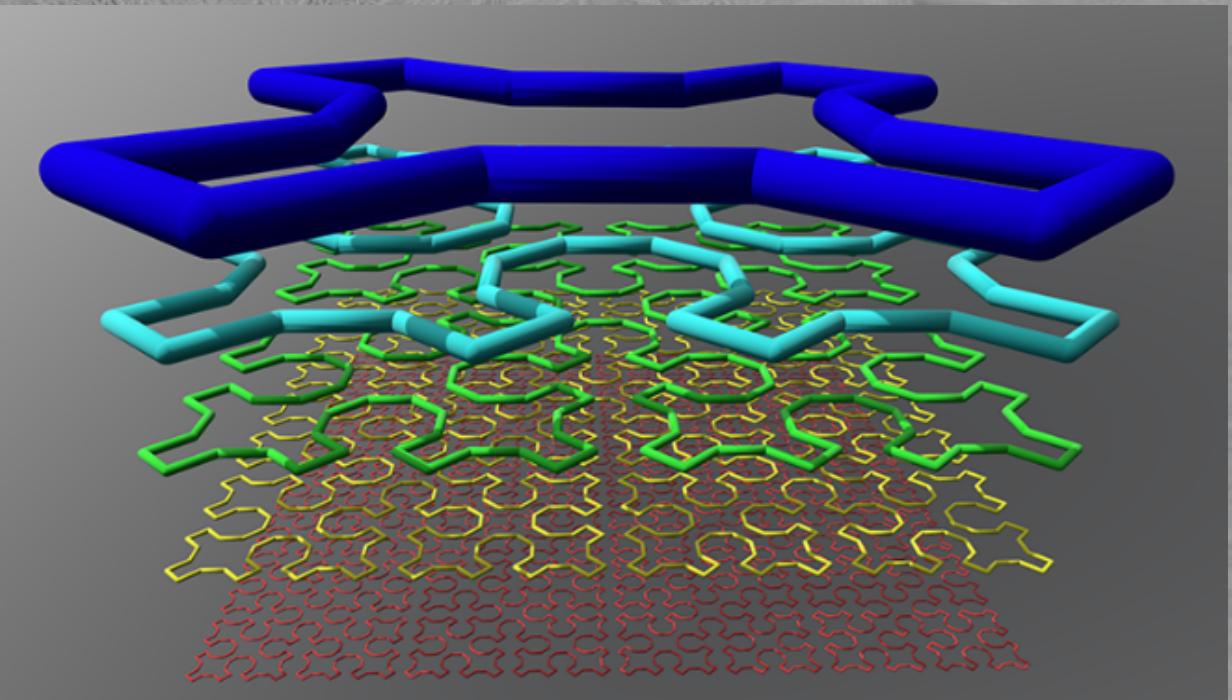


Resultat en 4 iteracions

TRADUCCIÓ A GRÀFICS 3D

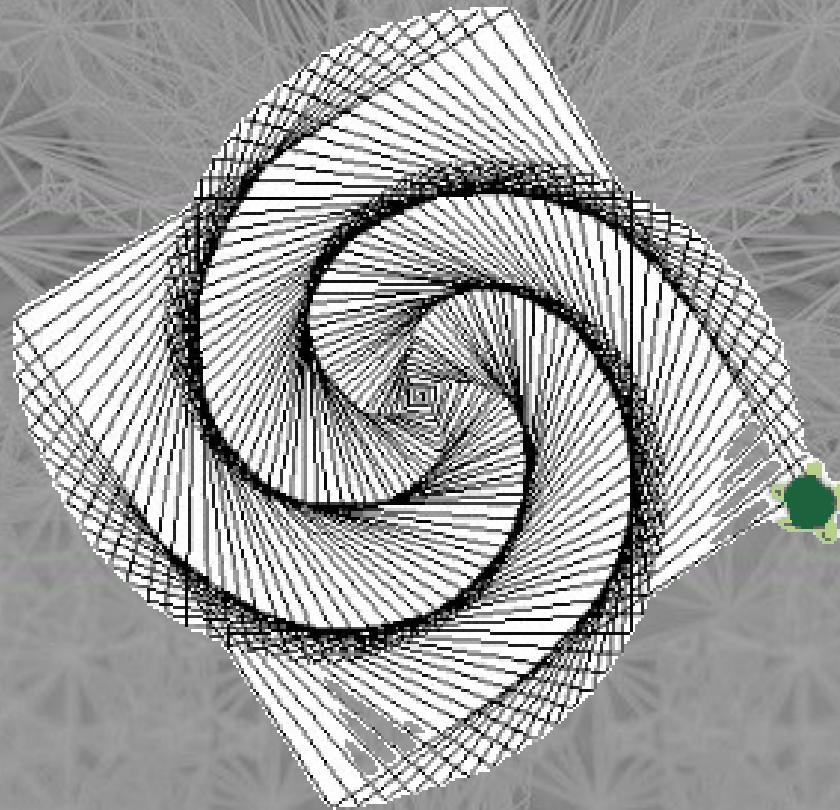


Seqüència ABA amb cubs

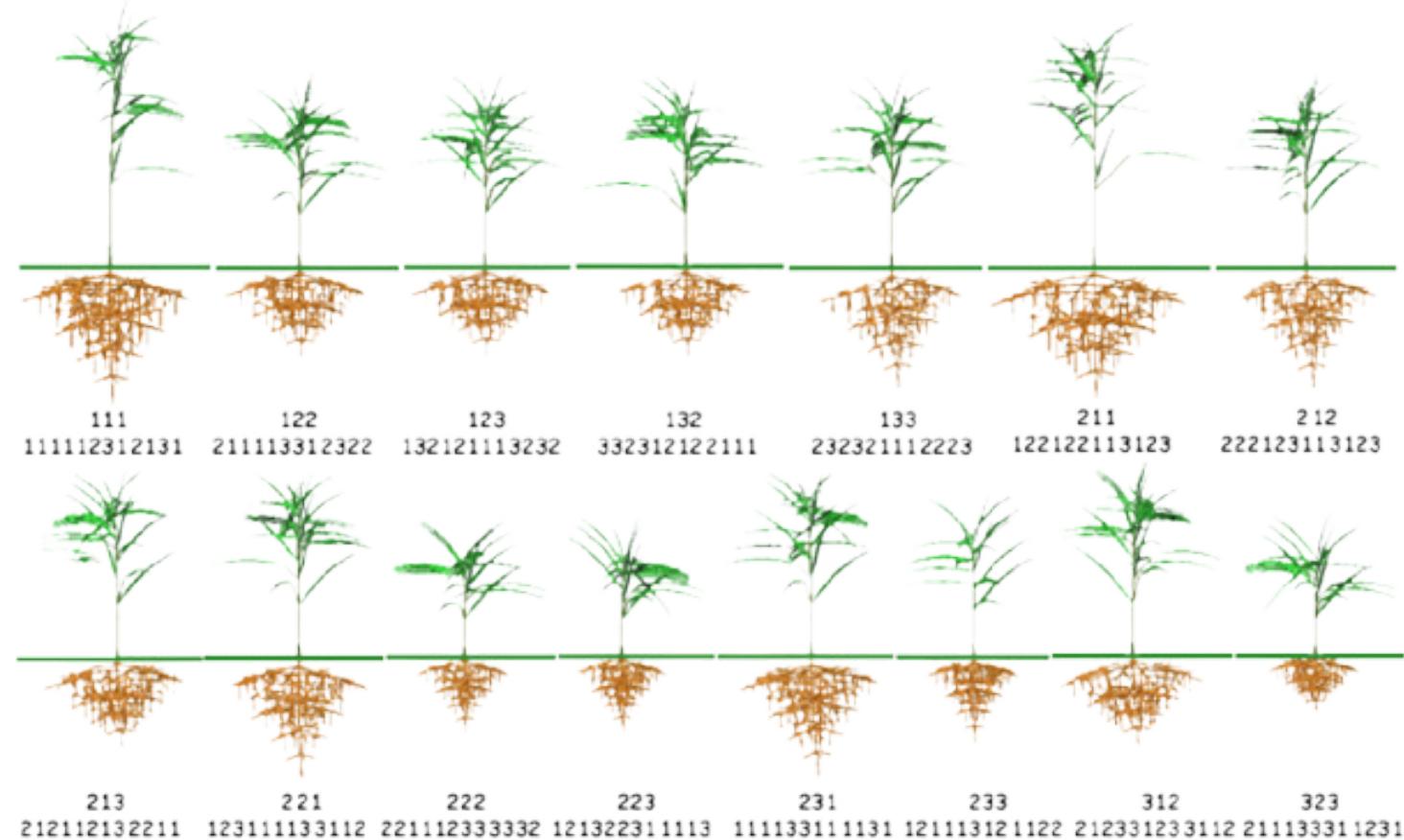


Seqüència amb altres formes geomètriques

TURTLE GRAPHICS EN L-SYSTEMS



STOCHASTIC L-SYSTEMS



BRANCHING L-SYSTEMS

Variables:

0, 1

constants:

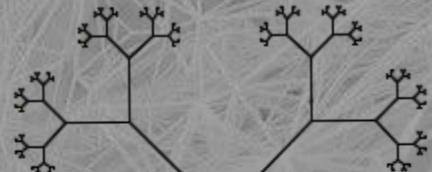
[,]

Axioma:

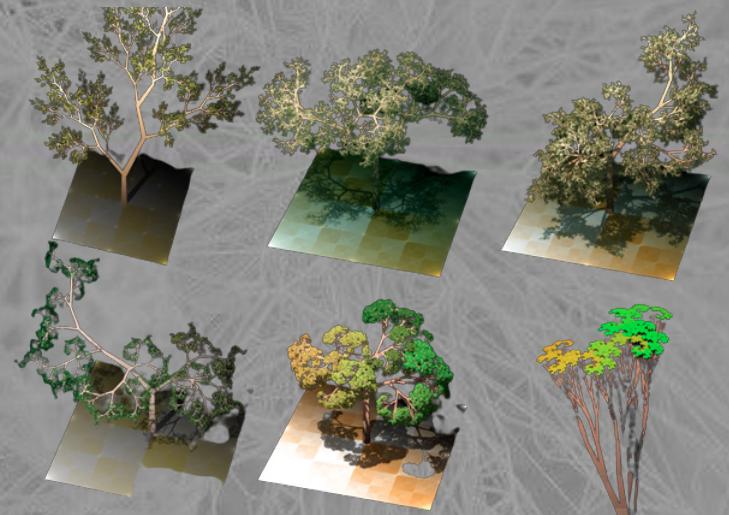
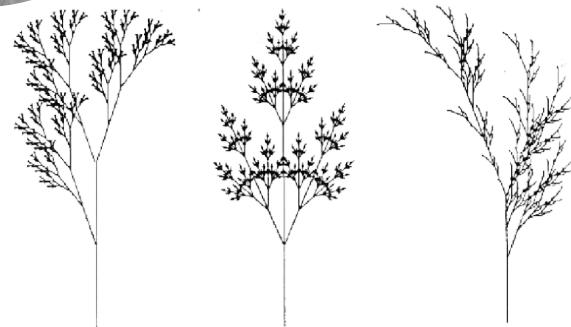
0

Regles de Producció:

[1, 11], [0, 1[0]0]



Resultat en 7 iteracions



ALTRES APLICACIONS



Computer Animation



Video games



Procedural Content Generation

CONCLUSIONS

TORN DE PREGUNTES

**GRÀCIES PER LA VOSTRA
ATENCIÓ**