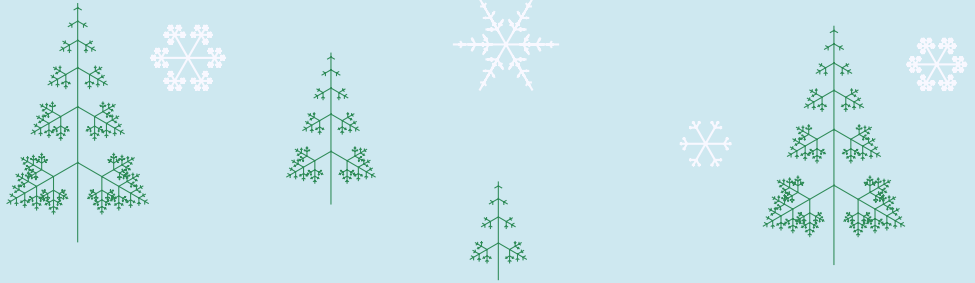


You are cordially invited to the

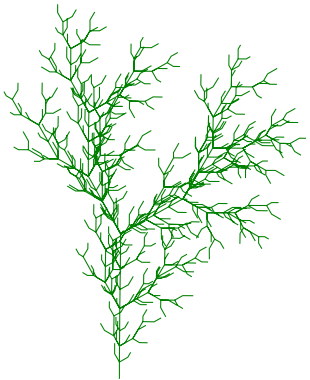
# Object-Oriented Programming 2: Christmas Lecture on the 18.12, 15:00

We will have: Lindenmayer Systems, Minecraft Programming, and Snacks!

Have you ever played Minecraft?

$\Longrightarrow$ Noticed any problems?

# It is missing fractals (obviously)![1]



[1] https://tikz.dev/library-lsystems

# Fractals
## Quick Introduction

- Self-similar structures
- Appear in many areas: finance, science[1]
- Examples:
  - Mandelbrot[1]
  - Lindenmayer Systems[2]

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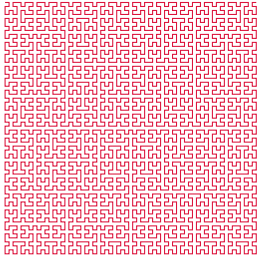

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# The Dimensionality

## “Normal” Cases

### Dimension $D$

$$N = \epsilon^{-D} \qquad N \ldots \text{units when scaling}$$
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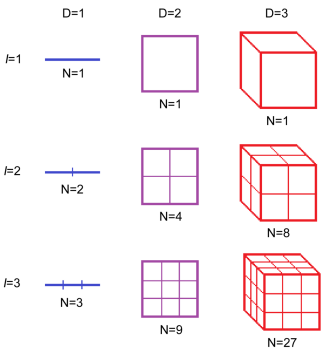

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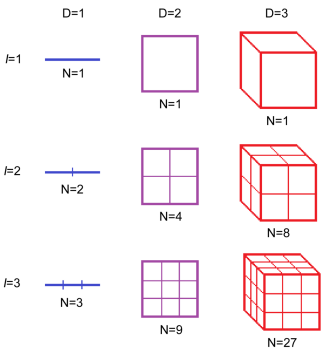


- line: for $\epsilon = \frac{1}{3} \implies N = 3 \implies D = 1$
- square: for $\epsilon = \frac{1}{3} \implies N = 9 \implies D = 2$

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## Fractal Cases: Koch Curve [1]

- Rule set: $F \to F + F - -F + F$
  - $F$: forward,
  - $+/-$: angles
- for $\epsilon = \frac{1}{3}$

$\Longrightarrow N = 4$

$\Longrightarrow D = -\log_{\frac{1}{3}} 4 = 1.2618\ldots$

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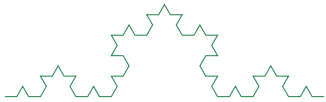

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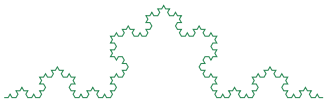

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# Some History

## (Technical) Overview

- Engine: Lightweight Java Game Library (LWJGL)
- Java Version: “main version”
- Early modding: placing files in directories, nowadays: Mod Loaders


Figure: Cover Art[1]

[1] https://en.wikipedia.org/wiki/File:Minecraft_2024_cover_art.png

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## Modding

- Modding: Client/Server/Both (?)
  - Early mods: server management (Bukkit!)
  - **Minecraft Forge**: stable moddding toolkit, good documentation
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# Snack/Minecraft time :)

Address: `oop2-demo.tugraz.at:18020`

# Bibliography I

## References

[1] B. B. Mandelbrot, **The fractal geometry of nature**, de. New York, NY: W.H. Freeman, Nov. 1982.

[2] A. Lindenmayer, **Mathematical models for cellular interactions in development ii. simple and branching filaments with two-sided inputs,** *Journal of Theoretical Biology*, vol. 18, no. 3, pp. 300–315, Mar. 1968, ISSN: 0022-5193. DOI: 10.1016/0022-5193(68)90080-5. [Online]. Available: http://dx.doi.org/10.1016/0022-5193(68)90080-5.