



# Grammar for fractals

Team 16: Botnari Ciprian, Guzun Grigore,  
Cucoş Emanuel, Mirovskki Artiom

---

# Presentation

---

01

## Goal

The ultimate objective of DSL

02

## Grammar

The structure of the language

03

## Program

A sneak peek of how to create a fractal

04

## Fractal

What we strive for to achieve

05

## Language

Future of our DSL

06

## Conclusions

Final acknowledgements

# Goal

---

- **Fractals** are complex mathematical objects that can be used to teach various mathematical and computer science concepts.
- However, building them can be a challenging task, especially for **educators** and **students** who are not familiar with complex programming languages.
- The goal of this DSL is to provide an **easy-to-use** and **intuitive** language for educators and students to build and explore fractals without the need for extensive programming knowledge.



# Grammar (Work in Progress)

---

$G = (V_N, V_T, P, S)$

$V_N = \{\text{REPEAT, TIMES, START, WITH, SHAPE, CIRCLE, SQUARE, TRIANGLE, COLOR, BACKGROUND, SCALE, ROTATE, SAVE, AS, PNG, JPG, [A-Z], [a-z], [0-9], =, ., ,, [, ]}\}$

$V_T = \{ \langle \text{start} \rangle, \langle \text{command} \rangle, \langle \text{shape} \rangle, \langle \text{transformation} \rangle, \langle \text{color} \rangle, \langle \text{repeat} \rangle, \langle \text{save} \rangle, \langle \text{lowercase} \rangle, \langle \text{uppercase} \rangle, \langle \text{number} \rangle \}$

$P = \{ \begin{aligned} \langle \text{start} \rangle &\rightarrow \text{command} \\ \langle \text{command} \rangle &\rightarrow \text{shape} \mid \text{transformation} \mid \text{color} \mid \text{repeat} \mid \text{save} \\ \langle \text{shape} \rangle &\rightarrow \text{circle}(\text{value}) \mid \text{square}(\text{value}) \mid \text{triangle}(\text{value}) \mid \text{polygon}(\text{sides}, \text{value}) \\ \langle \text{transformation} \rangle &\rightarrow \text{scale}(\text{value}) \mid \text{rotate}(\text{value}) \\ \langle \text{color} \rangle &\rightarrow \text{red} \mid \text{blue} \mid \text{green} \mid \text{yellow} \mid \text{black} \mid \text{white} \\ \langle \text{repeat} \rangle &\rightarrow \text{repeat}(\text{value}) \{ \text{command} \} \\ \langle \text{save} \rangle &\rightarrow \text{save as file\_type}(\text{filename}) \\ \langle \text{lowercase} \rangle &\rightarrow \text{a} - \text{z}; \langle \text{uppercase} \rangle \rightarrow \text{A} - \text{Z}; \langle \text{number} \rangle \rightarrow 0 - 9 \end{aligned}$

$S = \langle \text{start} \rangle$

# Program

```
// This is a comment

// Define the initial shape and settings
start with shape circle(100);
color blue;
background white;

// Apply transformations
repeat 5 times {
  scale(0.5);
  rotate(60);
  color red;
  shape square(50);
}

// Apply more transformations
repeat 10 times {
  scale(0.8);
  rotate(30);
  color green;
  shape triangle(50);
}

// Save the fractal as an image
save as PNG("my_fractal.png");
```

The image features a dark blue background with decorative, glowing blue fractal-like shapes in the corners. These shapes are complex, self-similar patterns that resemble stylized waves or organic forms. The word "Fractal" is written in a large, white, sans-serif font. To its right are three small, solid blue circles. Below the word and circles is a thin white horizontal line that ends in an arrowhead pointing to the right.

# Fractal...







# Next steps

---

## Lexical Analyzer

A software component that reads and analyzes the characters of a program's source code and generates a sequence of tokens that the compiler or interpreter can use

## Symbol Table

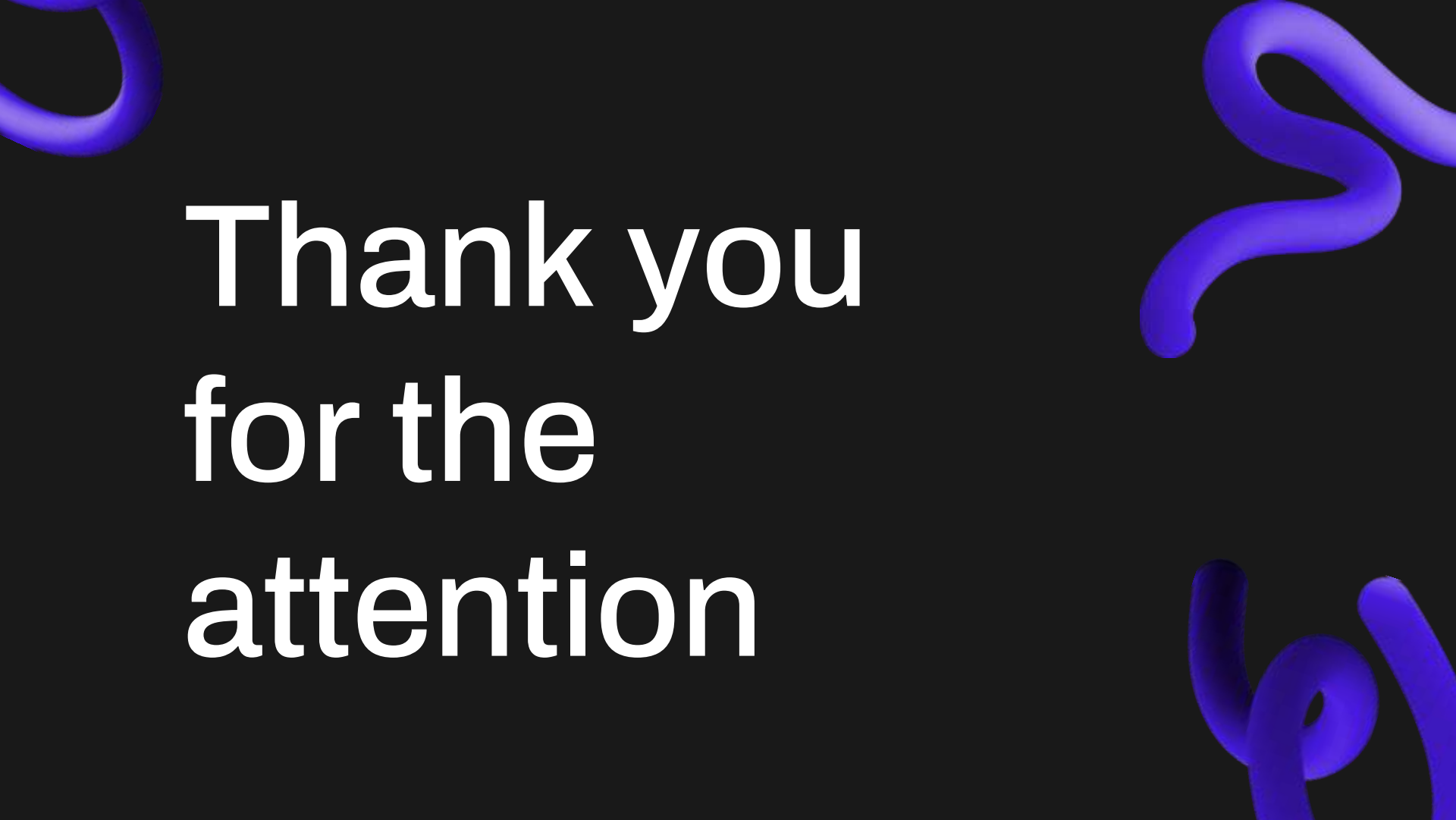
A data structure that stores information about the identifiers used in a program, such as their name, type, and scope.

## Scientific paper

In our scientific paper, we propose a domain-specific language (DSL) for building fractals that is specifically designed for educators and students.





The image features a dark navy blue background. In the corners, there are decorative elements made of thick, vibrant blue wavy lines. A single loop is in the top-left corner. A long, flowing wavy line starts from the top-right and extends towards the center. Another wavy line is in the bottom-right corner, appearing to be part of a larger, more complex shape.

Thank you  
for the  
attention