



# CrochetScript

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Computar science III



# What is the project based on?

Crochet pattern design is often manual and error-prone.

Objective: To create a declarative language that generates patterns automatically. The output is a PDF file with the structured pattern, color and other features.



# Process for creating a compiler

A compiler translates source code into machine-understandable instructions. The following process must be followed

## Lexical analysis

Lexical analysis is the first stage of compilation, where the input string is divided into lexemes and tokens

## Syntactical analysis

syntactic analyzer is taking the tokens from the lexical analysis and checking that the structure of the code is valid according to the grammar of the language

## Semantic analysis

Ensure that the instructions make logical sense.

# Lexical analysis

| LEXEMES     | TOKENS       | MEANING  |
|-------------|--------------|--|
| START       | keyword      | Starts the pattern description – starts the code |
| addCircle   | Figure       | Add a circle to crochet pattern                  |
| addSquare   | Figure       | Add a square to crochet pattern                  |
| addTriangle | Figure       | Add a triangle to crochet pattern                |
| addHeart    | Figure       | Add a heart to crochet pattern                   |
| RED         | Color        | Option for figure color                          |
| PINK        | Color        | Option for figure color                          |
| BLUE        | Color        | Option for figure color                          |
| BLACK       | Color        | Option for figure color                          |
|             | Size         | Option for figure size                           |
| (           | Special char | Opening parenthesis                              |
| )           | Special char | Closing parenthesis                              |
| END         | keyword      | Ends the pattern description – ends the code     |

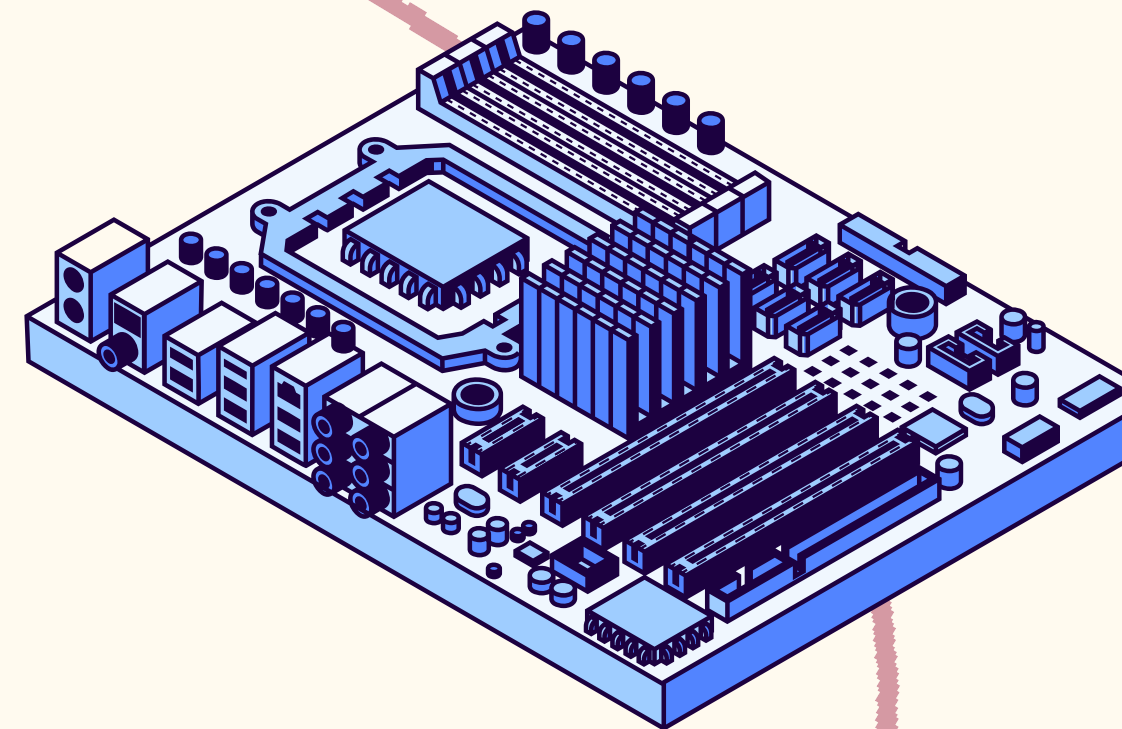
It divides the code into units called lexemes and tokens.

It is used to validate that the language elements are correctly recognized.

# Lexical analysis

```
token_specification = [  
    ("FIGURE", r"addCircle|addSquare|addTriangle|addHeart"),  
    ("COLOR", r"RED|PINK|BLUE|BLACK"),  
    ("KEYWORDS", r"START|END"),  
    ("SIZE", r"[1-5]"),  
    ("SPECIALCHAR", r"\(|\|\\|\""),  
    ("SKIP", r"[ \t]+"),  
    ("MISMATCH", r"."),  
]
```

For this section, regular expressions were used to correctly identify each of the tokens.



# Syntactical analysis

Verifies that tokens follow the correct language structure.  
A generative grammar is used to define the allowed syntax.

## Generativa grammar

```
<S>  -> "START" <FIGURE_SEQUENCE> "END"
```

```
<FIGURE_SEQUENCE>  -> <FIGURE> "(" <SIZE> <COLOR> ")" <FIGURE_SEQUENCE>  
                    | <FIGURE> "(" <SIZE> <COLOR> ")"
```

```
<FIGURE>  -> "addCircle" | "addSquare" | "addTriangle" | "addHeart"
```

```
<SIZE>    -> "1" | "2" | "3" | "4" | "5"
```

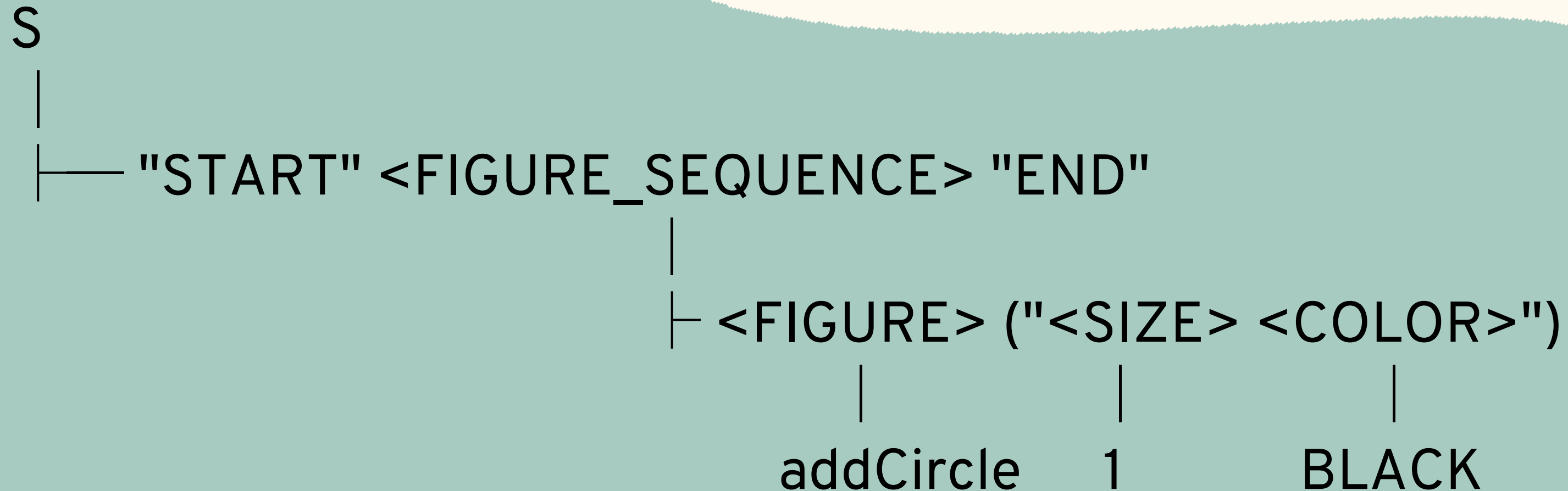
```
<COLOR>   -> "RED" | "PINK" | "BLUE" | "BLACK"
```

# Derivation tree

To verify that the parser part is correct, decision trees of different sentences were made, which showed a correct validation.

## Example:

Figure = addCircle( 1 BLACK)





# Semantic analysis

In this phase of the compiler, the semantic analyzer seeks to ensure that there is consistency in the syntax and to verify that the operations make logical sense.

To achieve this, functions are created that allow the detection of semantic errors, such as incorrect operations or incorrect assignments.



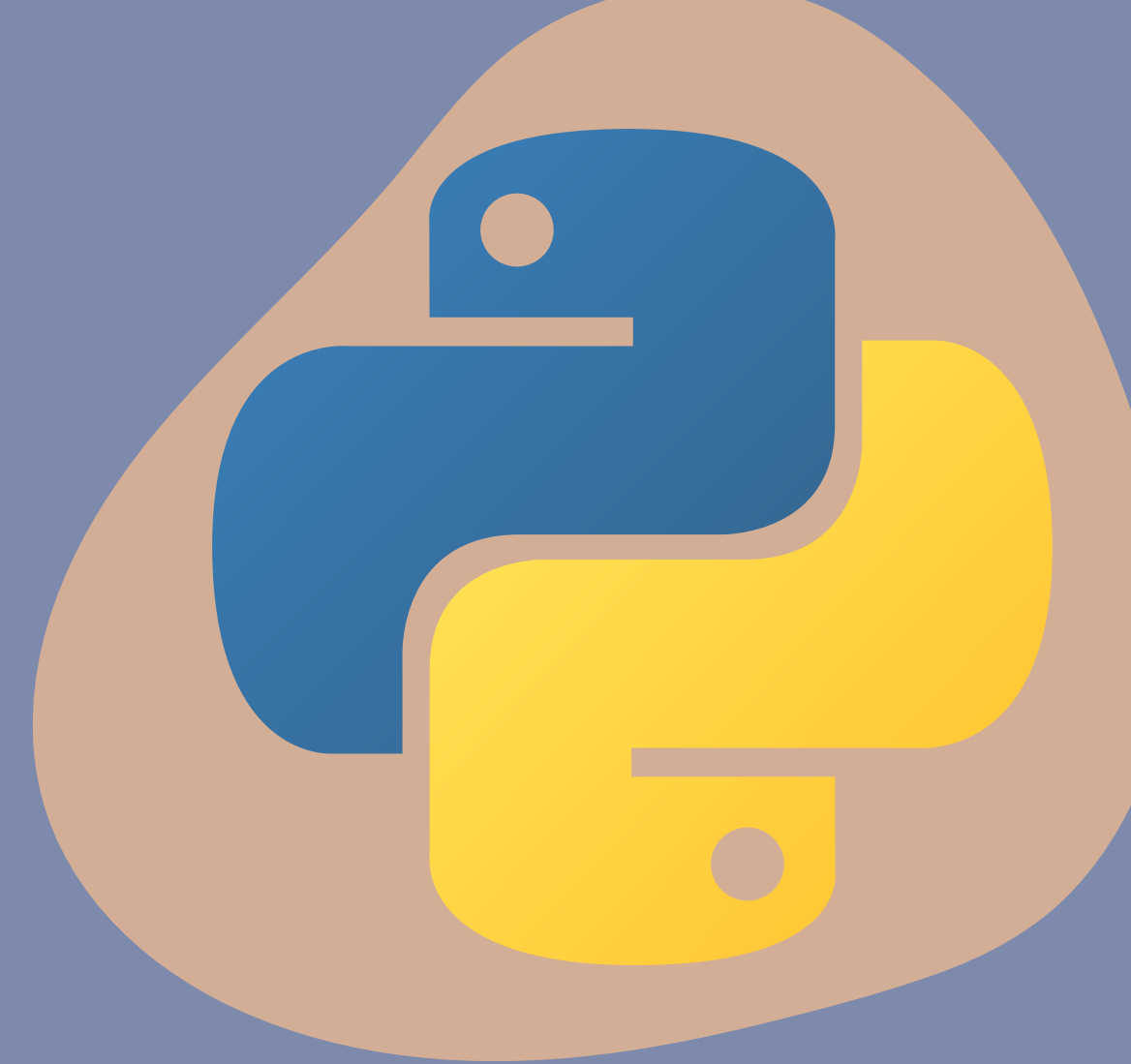


# tools and libraries

Language: Python

Libraries used:

1. re (regular expressions): Token identification.
2. reportlab: Export of patterns in PDF.



# Results and conclusion

Several tests were carried out on the code to verify that it printed the crochet patterns correctly, taking into account size and color.  
Let's prove it!



# Repository on GitHub

To access the documentation and code of the project visit the link of our repository

<https://github.com/LauraDanielaa/CrochetScript>



**¡Muchas gracias!**