

BABEȘ-BOLYAI UNIVERSITY CLUJ-NAPOCA
FACULTY OF MATHEMATICS AND COMPUTER
SCIENCE
ENGLISH SPECIALIZATION

DIPLOMA THESIS

**Design, implementation and
comparision of different software
emulating methods**

Supervisor
Lect. dr. Mihai Andrei

Author
Oniga Andrei-Mihai

2025

ABSTRACT

Abstract: un rezumat în limba engleză cu prezentarea, pe scurt, a conținutului pe capitole, punând accent pe contribuțiile proprii și originalitate

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1 Introduction

1.1 About

Introducere: obiectivele lucrării și descrierea succintă a capitolelor, prezentarea temei, prezentarea contribuției proprii, respectiv a rezultatelor originale și menționarea (dacă este cazul) a sesiunii de comunicări unde a fost prezentată sau a revistei unde a fost publicată.

1.2 Related work

CHIP8 Applications in engineering [1]. Brainfuck in reinforcement learning [6]. Esoteric languages list with BF in it [3]. Brainfuck conceptual [5]. Brainfuck hardware [4]. Brainfuck self interpreter [2].

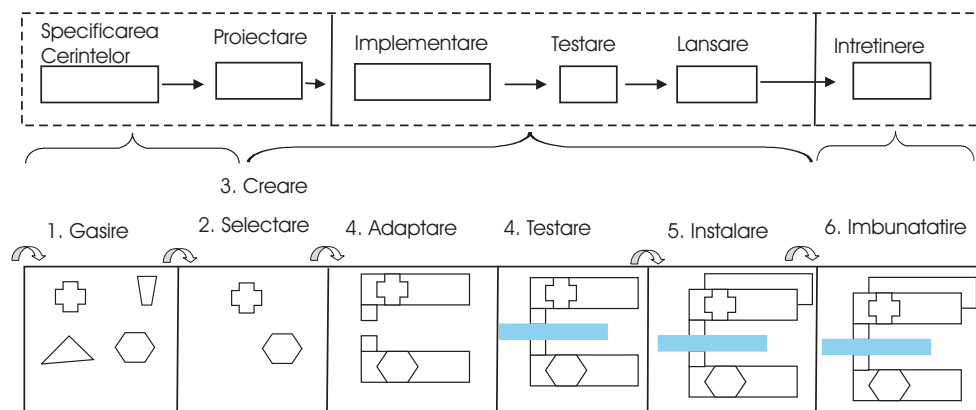


Figure 1.1: Ciclul de dezvoltare al sistemelor bazate pe componente adaptat modelului cascadă

Inserarea și Referirea la Tabelul 1.1.

Nume algoritm	Toate soluțiile	Soluția optimă
Nume 1	20	5
Nume 2	20	2

Table 1.1: Soluții obținute

Adaugarea și Referirea la o Ecuatie 1.1.

$$ws_N4 = w_{14} * N1 + W_{24} + N2 + w_{34} * N3 \quad (1.1)$$

2 BF

Brainfuck, or as it is usually shortened for academical purposes, BF, is an esoteric programming language designed to be minimalistic and intentionally difficult to program in.

It was created in 1993 by Swiss student Urban Müller, primarily as a challenge for programmers.

Despite its simplicity, Brainfuck is Turing-complete, meaning it has the computational power to perform any calculation that can be computed by a modern computer, given sufficient resources.

The language operates on an array of memory cells, each initially set to zero, and uses a series of eight commands to manipulate the data and control program flow.

Brainfuck's syntax consists of only eight commands, these being instructions to move the data pointer, modify the value of the current memory cell, input or output data, and control loops.

The language's simplicity—combined with its deliberately difficult syntax—forces programmers to think creatively about how to implement basic operations like arithmetic or data manipulation.

As a result, Brainfuck is more often used in programming challenges and competitions rather than for practical software development.

The language has been made intentionally difficult to use for practical application, which has made it a popular subject of study within the community of esoteric programming languages (esolangs).

Brainfuck often serves as an example of the power of minimalism in programming, demonstrating that even with extremely limited resources, a fully functional computational system can be constructed.

It challenges conventional programming paradigms, as the programmer is forced to manage memory and control flow manually, akin to working in assembly or machine code.

2.1 Machine specification

2.1.1 Programming in the language

+	Increments the value at the current position that the machine points to.
-	Decrements the value at the current position that the machine points to.
<	Moves the pointer one cell to the left.
>	Moves the pointer one cell to the right.
[Jumps after the corresponding closed bracket when the value at the current cell is 0.
]	Jumps after the corresponding open bracket when the value at the current cell is not 0.
.	Outputs the value at the current cell.
,	Read a value to be placed at the current cell.

Table 2.1: BF commands and their descriptions

Well known sample that prints 'Hello World!' to the screen, with a newline at the end:

```
1  ++++++++
2  [
3      >+++++++>+++++++>+++>+<<<<-
4      lol that's funny
5  ]
6  >++.>+.+++++++..+++.>+.<<+++++++>+.+++.-----.-----.>+.>.
```

2.2 Emulator implementation

The BF language is designed to be minimalistic, and as such, it has a very small set of commands, represented in the table below.

2.2.1 Interpreter

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2.2.2 Static compilation

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2.3 Applying optimizations

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2.3.1 Precalculating jumps

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2.3.2 Condensing operations

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2.3.3 Sequence matching

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2.4 Testing

3 CHIP8

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3.1 About

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3.2 Emulator implementation

3.2.1 Interpreter

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3.2.2 Just-in-time compiler

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3.3 Quirks and extensions

3.3.1 Super CHIP8 1.1

3.4 Testing

4 The application

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4.1 Design

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4.2 Implementation

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4.3 Usage

4.3.1 Command line

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4.3.2 GUI

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5 Conclusions

Concluzii ...

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