BINARY BREAKERS

FALL 2025

PROJECT REPORT CCP

CODEBREAKER

NUMBER GUESSING GAME

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TABLE OF CONTENTS

INTRODUCTION TO CODEBREAKER

Week # 6 - Week # 12

CODEBREAKER is a logical and engaging Number Guessing Game built in C language. It allows users to test their intuition, deduction, and quick thinking by guessing a randomly generated secret number within limited attempts. The game combines simplicity with strategy, offering hints after each guess to guide the player. Its design emphasizes real-time interaction, modular coding, and the practical use of loops, conditionals, and random number generation.

CODEBREAKER

A MIND BENDING GAME

Binary Breakers

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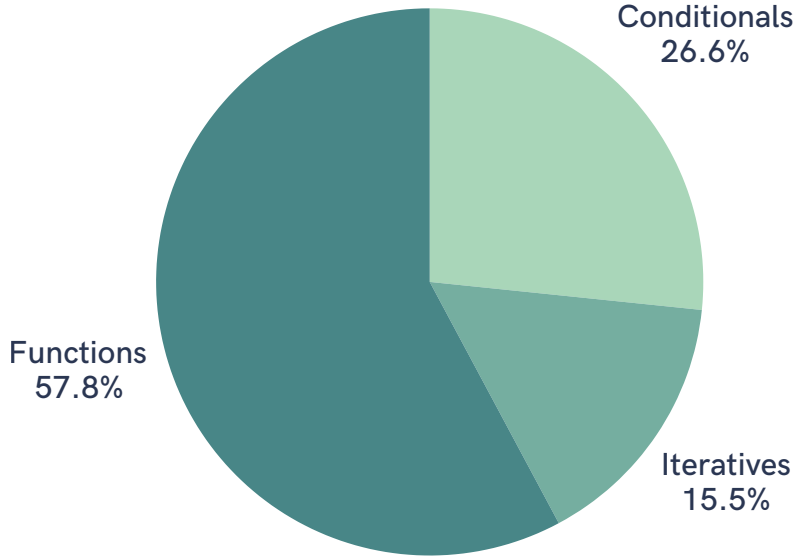
Key Features

The primary objective was to create a fully functional console-based game using core programming fundamentals.

The system supports both Single Player and VS. mode, ensuring a competitive yet educational environment for users



GAME OVERVIEW & OBJECTIVES

The game begins with a welcome screen and prompts the user to choose between two modes — Single Player and VS mode.

SINGLE PLAYER MODE

In **Single Player Mode**, the player selects a difficulty level (Easy, Medium, or Hard). Each level increases the number of digits in the secret code (3, 4, or 5 digits respectively). The player has five attempts to guess the secret code correctly.The score depletes as the number of attempts increase.

VS. MODE

In *VS. Mode**, two players compete head-to-head. Each player receives their own randomly generated 4-digit number. Players take turns guessing their secret codes, and their completion times are recorded. The player who guesses correctly in the least time wins

After each attempt, feedback is given using symbols:

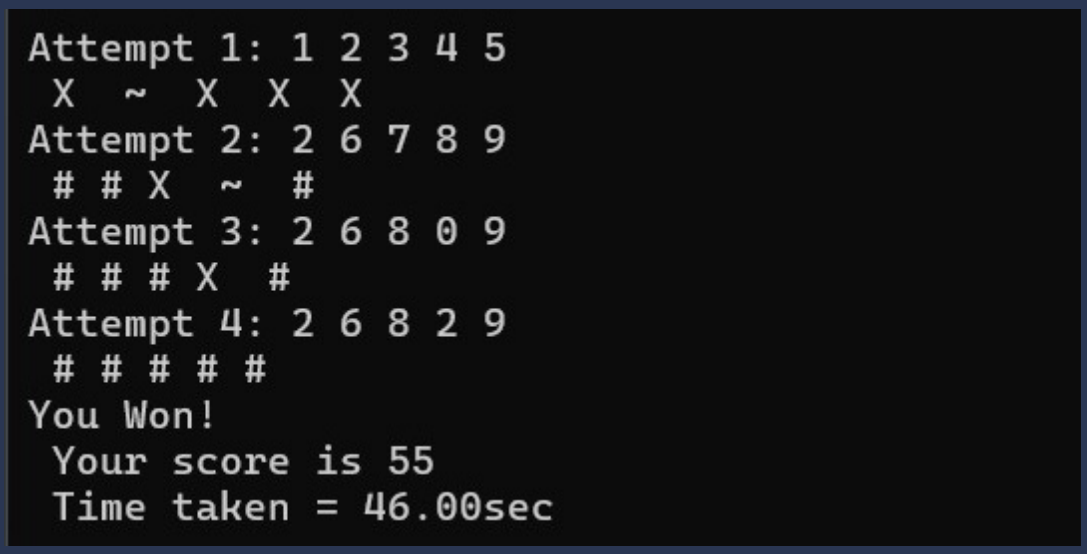
# indicates the digit and position are correct.
~ means the digit exists but is in the wrong position.
X signifies the digit does not exist in the secret code.

IMPLEMENTATION BREAKDOWN

Single Player Mode

- The random number generator (rand()) & srand(time(0)) creates secret numbers with a digit count based on the chosen difficulty.
- The player has five attempts to guess the number.
- Each guess is compared digit-by-digit to the secret code.
- Feedback is displayed for every digit based on correctness.
- The score starts at 115 and decreases by 15 with every wrong attempt.
- Time is tracked using time_t start and end variables.

If the player correctly guesses all digits, the game ends with a congratulatory message and the total score is displayed.



CODE EXPLAINATION

Single Player Mode

Mode Selection and System Initialization:

The program begins by displaying a mode selection menu, controlled through a ***switch(mode)***, that directs program flow into Single Player or Multiplayer routines. It initializes core variables, sets up ***time_t*** timers, and prepares the execution context for gameplay through structured control logic.

Random Code Generation Algorithm

Using ***srand(time(0))*** as a random seed initializer, the program invokes ***rand()*** to generate the secret numeric array. The digit count dynamically adapts to the chosen difficulty level (3, 4, or 5 digits)

User Input Parsing:

Employs ***scanf()*** for multi-digit parsing, followed by indexed array comparison using nested for loops.Each element is checked for positional correctness, establishing a deterministic validation system that maps user input to logic outcomes.

Iterative Attempt Control and Scoring Mechanism

The core game loop ***for(attempt = 1; attempt <= 5; attempt++)*** enforces attempt limits while managing score updates in real time. Each failed iteration triggers a ***score -= 15*** operation, and success activates a termination flag. The ***difftime(end, start***) function computes player performance, merging iteration control, timing, and evaluation metrics into a cohesive loop structure.

```
printf("Choose Mode:\n1.Single Player Mode\n2.Multiplayer Mode\n");
scanf("%d",&mode);
switch(mode){
case 1: {
    srand(time(0));
    int i, j, k=0, z=0, attempt, score=115, level, lower=0, upper=9, y, l, m;
    time_t start, end;
```

Mode Selection & Initialization

```
int randomNum2[4];
    for(l=0;l<4;l++){
        randomNum2[l]=(rand()%(upper-lower+1))+lower;
    }
```

Random Number Generation

```
if (level == 1 && z == 3) printf("\nYou Won!");
else if (level == 2 && z == 4) printf("\nYou Won!");
else if (level == 3 && z == 5) printf("\nYou Won!");
else {
    printf("\nYou Lost!");
    score = 0;
```

Output Validation

```
int num[3];
scanf("%d%d%d",&num[0],&num[1],&num[2]);
z=0;
    for(i=0;i<3;i++){
            if(num[i]==randomNum1[i]){
                printf( " #");
                z++;
                if(z==3)
                    break;
                continue;
            }
            for(j=0;j<3;j++){
                if(num[i]==randomNum1[j]){
                    k=1;
                    break;
                }
            }
            if(k!=0)
                printf(" ~ ");
            else
                printf(" X ");
            k=0;
    }
    score-=15;
    if(z==3){
        break;
        break;
```

Attempt Loop

IMPLEMENTATION BREAKDOWN

VS. Mode

The VS. mode introduces competition by timing both players separately.

- Player 1 and Player 2 each have unique secret numbers.
- Both begin by typing 'start' to initiate their turn.
- The program tracks their time using time(&start) and time(&end).
- Each player continues guessing until they correctly identify all four digits.
- The player with the lesser completion time wins.

This section highlights the use of loops, time functions, and string handling to ensure accurate timing and fair play

```
Player one's turn:
Type 'start' to Begin: start

Attempt 1: 1 2 3 4
 X  X  ~  ~
Attempt 2: 1 2 4 3
 X  X  ~  #
Attempt 3: 4 5 6 3
 ~  ~  X  #
Attempt 4: 5 4 7 3
 ~  #  X  #
Attempt 5: 8 4 5 3
 #  #  #  #
Time taken by 1st player: 57.00 seconds
```

```
Player two's turn:
Type 'start' to Begin: start

Attempt 1: 1 2 3 4
 X  X  X  #
Attempt 2: 5 6 7 4
 #  X  X  #
Attempt 3: 5 8 9 4
 #  X  X  #
Attempt 4: 5 0 5 4
 #  X  ~  #
Attempt 5: 5 5 4 4
 #  #  #  #
Time taken by 2nd player: 38.00 seconds
2ND PLAYER WON!
```

CODE EXPLAINATION

VS. Mode

Dual-Instance Initialization and Mode Activation

Upon selecting VS. Mode, the program initializes two independent player instances, each with unique secret arrays generated via ***rand()***.
Timers, variables, and input buffers are declared separately to maintain state isolation and ensure fair concurrent gameplay simulation.

Random Code Generation Algorithm

Using ***srand(time(0))***, the program generates unique 4-digit codes for both players. This ensures equitable randomness and prevents code duplication.

Turn-Based Execution and Timing Logic

Each player types ***"start"*** to trigger ***time(&startX)***, beginning their timer.
A do–while loop manages guesses until all digits match, ensuring accurate time tracking.

Comparative Evaluation and Winner Declaration

After both iterations conclude, the program calculates ***difftime(end1, start1)*** and ***difftime(end2, start2)*** to determine individual performance.
A simple conditional check identifies the player with the shorter completion time and declares the winner, ensuring an objective and time-based victory condition.

```
printf("\t========== WELCOME TO TWO PLAYER MODE ============");
```

```
int randomNum1[4];
        for(i=0;i<4;i++){
            randomNum1[i]=(rand()%(upper-lower+1))+lower;
        }
int randomNum2[4];
        for(i=0;i<4;i++){
            randomNum2[i]=(rand()%(upper-lower+1))+lower;
        }
```

Random Number Generation

```
time(&end2);
double time_taken2=difftime(end2, start2);

printf("\nTime taken by 2nd player: %.2f seconds", time_taken2);

if(time_taken1<time_taken2)
printf("\n1ST PLAYER WON!");
else
printf("\n2ND PLAYER WON!");
break;
}
```

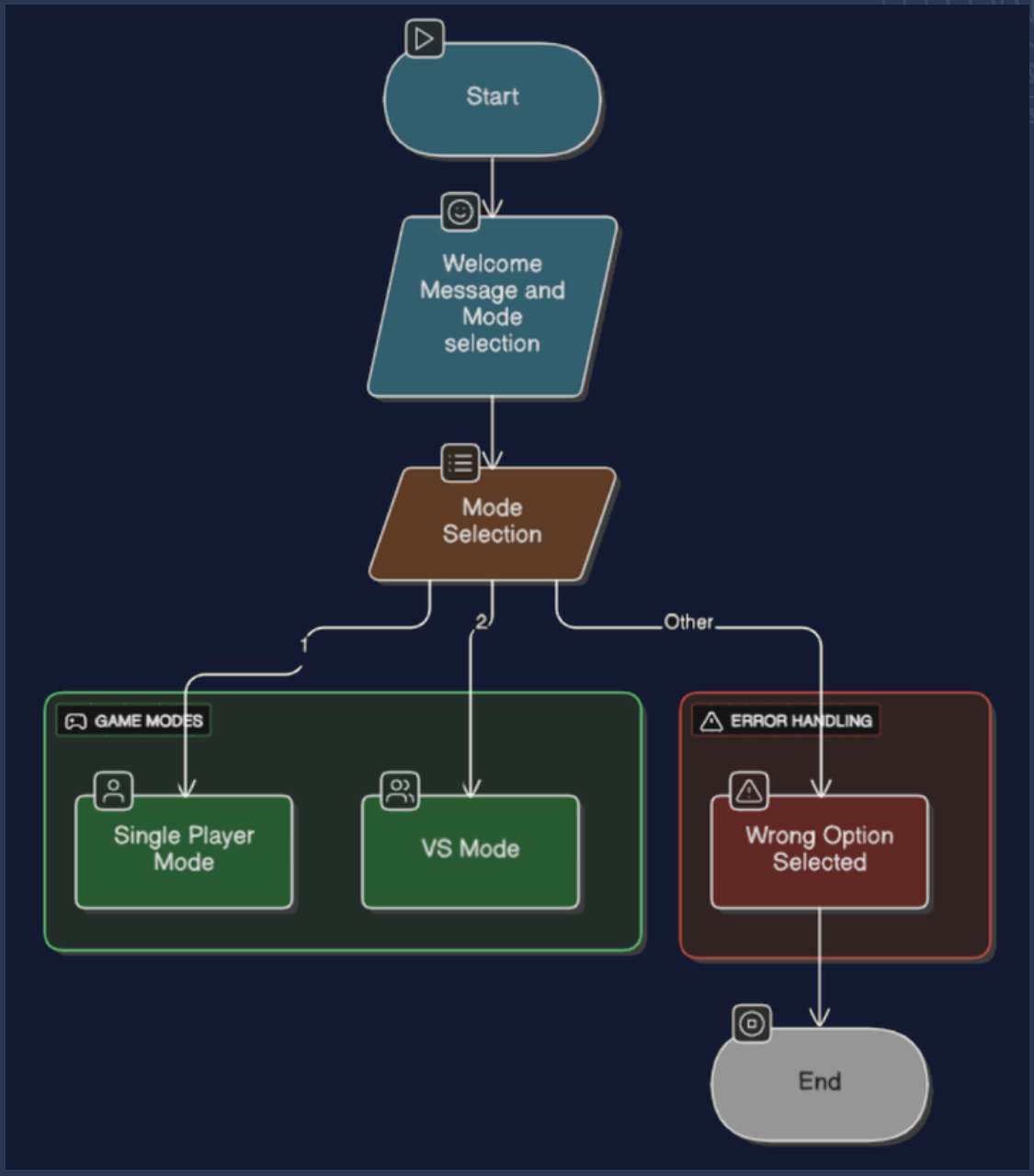
Comparative Evaluation

```
do{
    printf("\nAttempt %d: ", attempt);
    scanf("%d%d%d%d",&num1[0],&num1[1],&num1[2],&num1[3]);
        z=0;
            for(i=0;i<4;i++){
                    if(num1[i]==randomNum1[i]){
                        printf( " # ");
                        z++;
                        if(z==4)
                            break;
                        continue;
                    }
                    for(j=0;j<4;j++){
                        if(num1[i]==randomNum1[j]){
                            k=1;
                            break;
                        }
                    }
                    if(k!=0)
                        printf(" ~ ");
                    else
                        printf(" X ");
                    k=0;
}
attempt++;
```

Attempt Loop

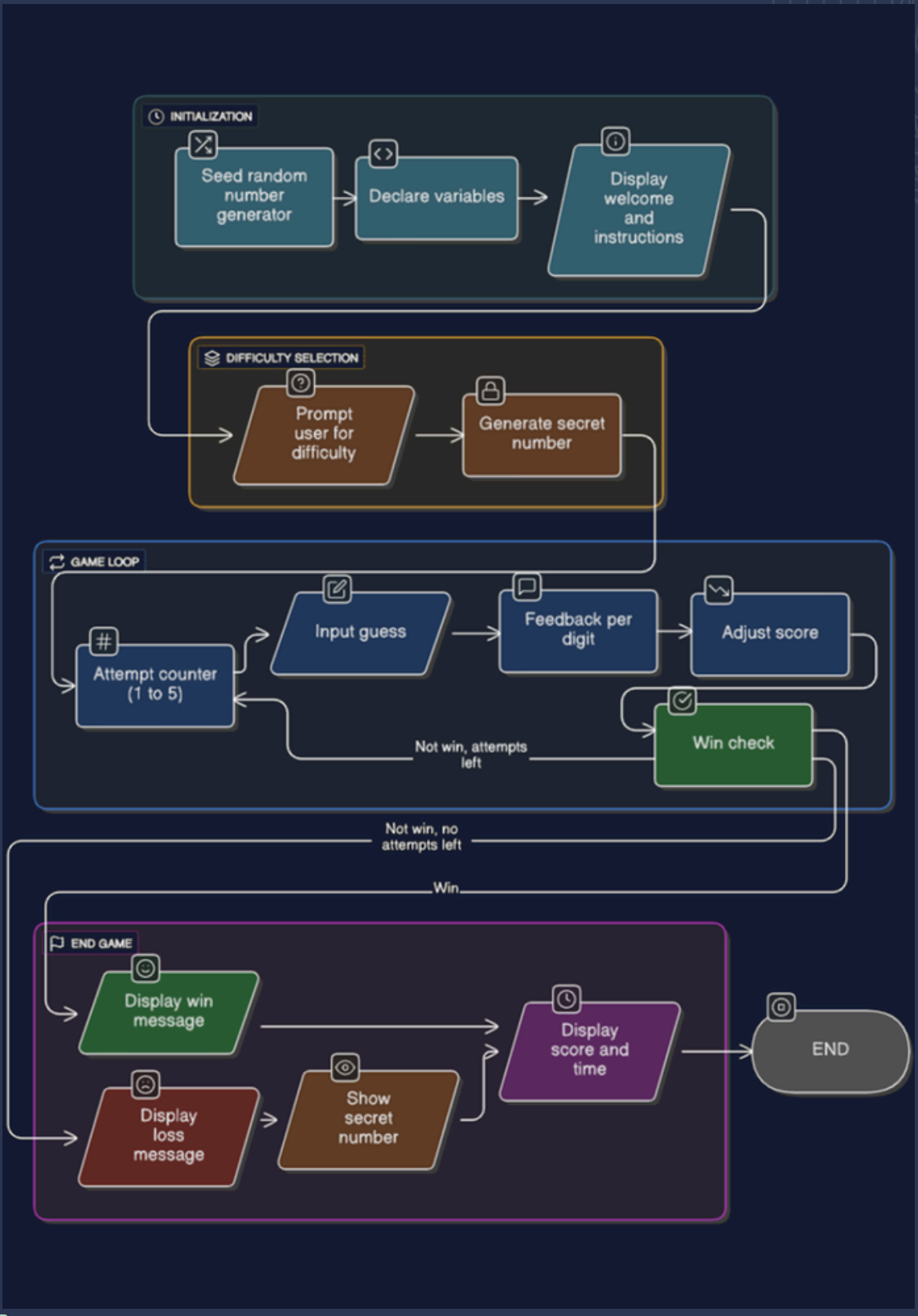
FLOWCHART AND CONTROL FLOW

Represents the game's overall logic and execution flow.

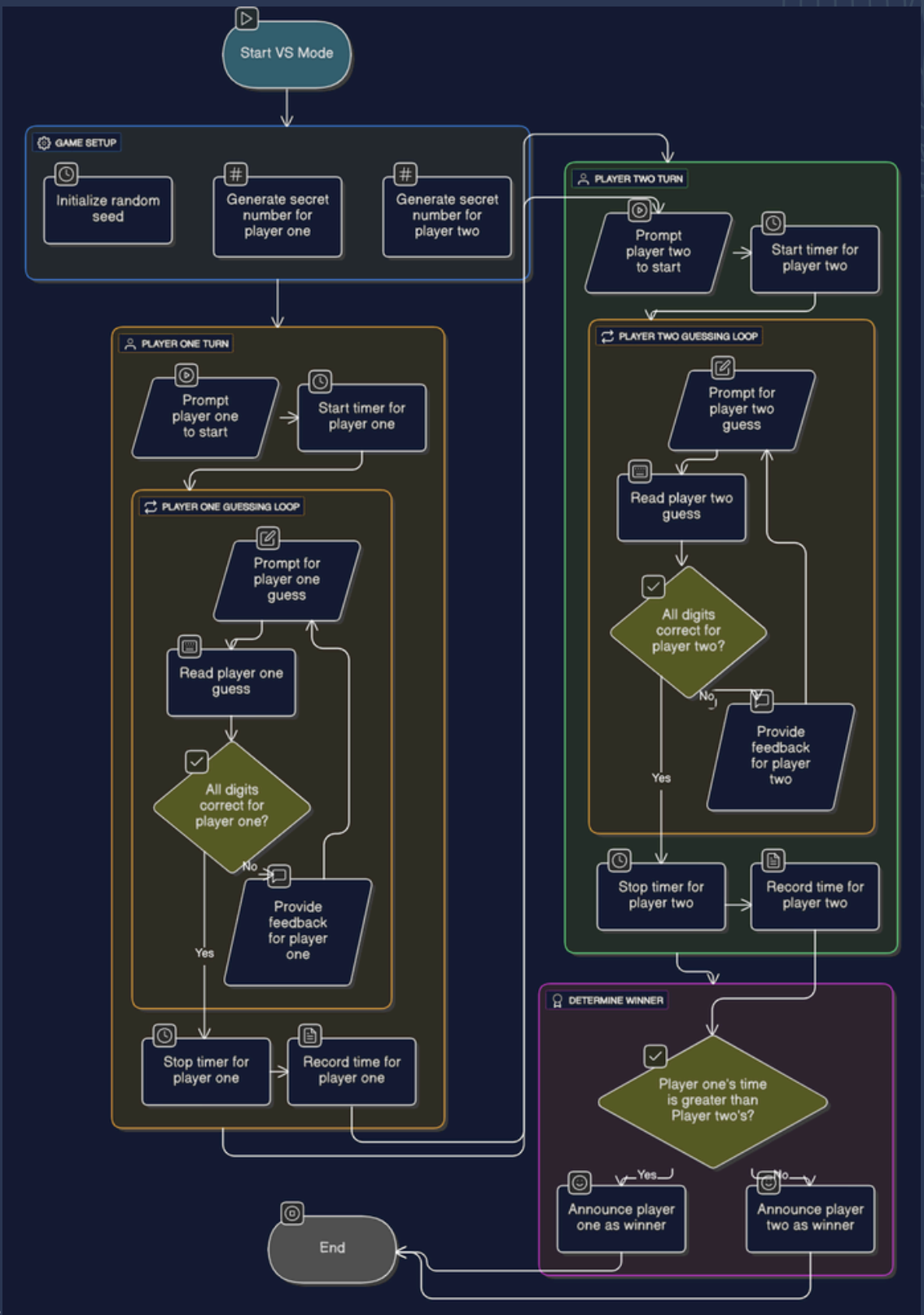


THE FLOWCHART OUTLINES THE COMPLETE LOGIC AND PROGRESSION OF THE CODEBREAKER GAME, STARTING FROM THE WELCOME SCREEN, THEN BRANCHING INTO DISTINCT SINGLE PLAYER AND MULTIPLAYER PATHS.

SINGLE PLAYER MODE FLOWCHART



VS. MODE FLOWCHART



CHALLENGES & SOLUTIONS

Encountered During Development of CCP

During the development of CODEBREAKER, several technical challenges were addressed to improve performance and user experience. Input overlap from multiple scanf() calls was fixed by properly separating integer and string inputs. Random number repetition was resolved by seeding srand() once per mode for better randomness. Timing issues in multiplayer mode were corrected so the timer started only after the player's input, ensuring accuracy and fairness.

The scoring system was standardized across all difficulty levels to maintain balanced gameplay, and output formatting was refined with better spacing and symbol separation for clearer feedback. These improvements made the game smoother, more reliable, and enjoyable to play.

01 Input Handling

02 Logical Errors

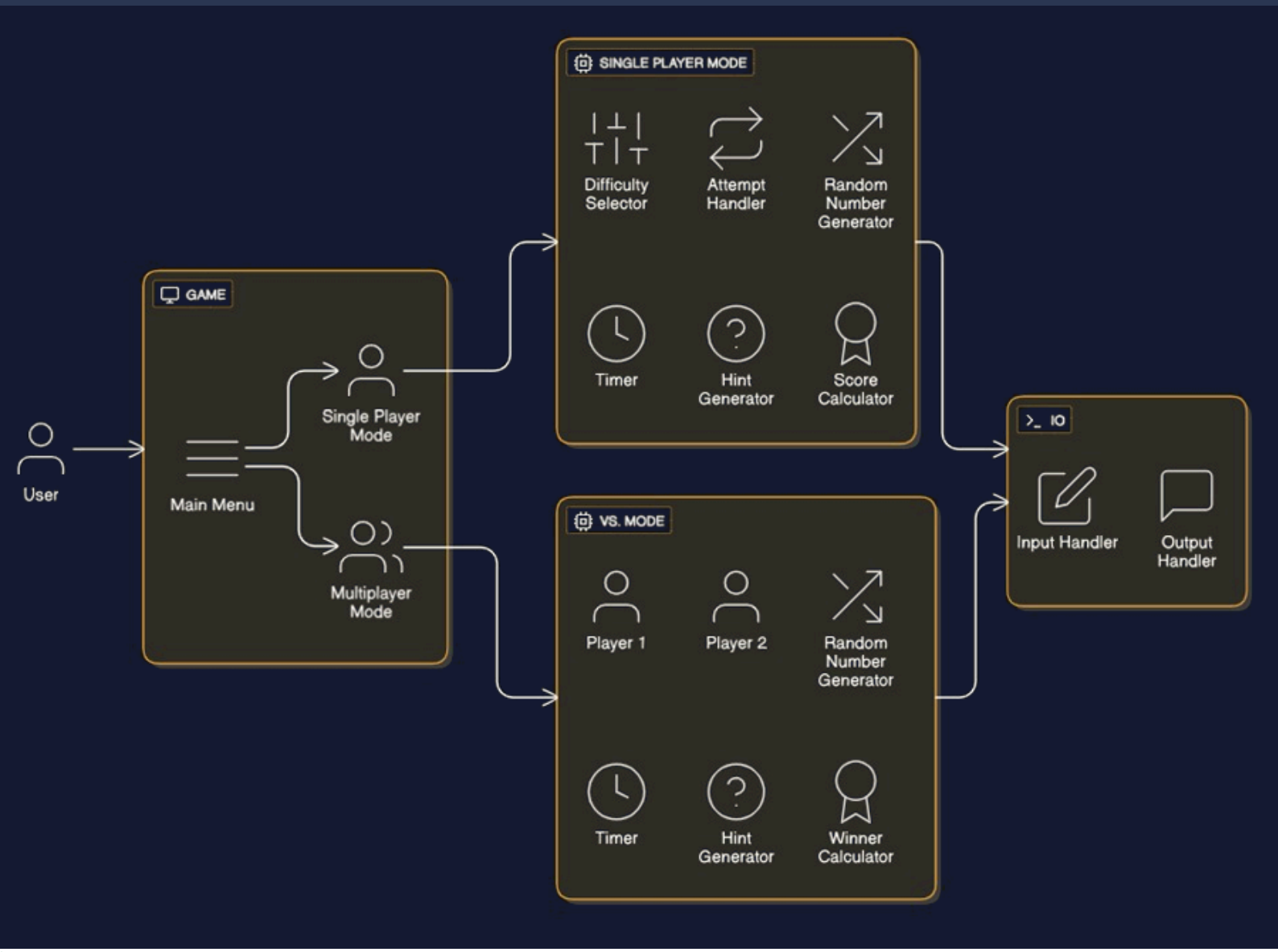
03 Scoring Balance

04 Random Number Repetition

05 Output Formatting

ARCHITECTURE DIAGRAM

Program Structure Overview



SINGLE PLAYER MODE

```
        ========== WELCOME TO CODEBREAKER ============
Choose Mode:
1.Single Player Mode
2.VS. Mode
1
        ==========WELCOME TO SINGLE PLAYER MODE============

Guess the secret number within 5 attempts!
Choose a mode: Easy (3 digits), Normal (4 digits), or Hard (5 digits).
After each guess, you will see hints

Don't forget to add space in-between digits

  # for correct digit & position
  ~ for correct digit wrong position
  X for wrong digit.

Choose difficulty Level:
1. Easy
2. Medium
3. Hard
```

VS. MODE

```
        ========== WELCOME TO CODEBREAKER ============
Choose Mode:
1.Single Player Mode
2.VS. Mode
2
        ========== WELCOME TO VS. MODE ============
Both players take turns guessing a 4-digit secret number.
Unlimited attempts , faster player wins!

# = correct digit & position
~ = correct digit, wrong position
X = wrong digit

Player one's turn:
Type 'start' to Begin:
```

CONCLUSION

The CODEBREAKER project demonstrates how fundamental programming principles can be used to create an entertaining and educational application. The modular structure, dynamic gameplay, and logical design reinforce the importance of well-organized code. Future improvements may include adding a GUI, sound effects, and adaptive difficulty to make the game even more engaging.

Overall, the project achieved its goals by combining core programming concepts with teamwork, creativity, and strong problem-solving skills.