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SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

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MASTERMIND GAME

A Project Report

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INTRODUCTION

The goal for our project is to prepare a working prototype for an electronic version of a classic board game called Mastermind. The secondary goal is to implement an algorithm that plays the game on its own, possibly better than how human would. Lastly a third objective is to extend the platform be able to run other games such as Tetris or Snake.

ABSTRACT

The Mastermind Game Platform is a multi-use arcade electronic platform designed and built during a study week organized by the Swiss Youth in Science Foundation. The goal of the project is to design both a hardware and a software for an electronic version of the classic board game Mastermind, to then extend by adding an algorithm that plays on its own. The software is implemented in Python 3 running on a MicroPython compatible microcontroller ESP32 by Espressif while the hardware is connected with a PCB (Printed Circuit Board) or a VeroBoard for prototyping. Many technical challenges were encountered such as limited dynamic memory and hardware failures but the final prototype was complete with all of the previously mentioned features.

OBJECTIVE OF THE GAME

In this game, there are six color pegs to choose from. The object of the game is to get the exact positions of the colors in the computer sequence in as few guesses as possible. After each guess, the computer gives you a score of exact and partial matches.

RULES OF THE GAME

- 1) The sequence can contain pegs of colors: red, yellow, green, blue, white, black.
- 2) A color can be used any number of times in the sequence.
- 3) All four pegs of the secret sequence will contain a color-no blanks/empties are allowed.
- 4) Each guess must consist of 4 peg colors-no blanks.
- 5) The player has twelve guesses to find the secret sequence.

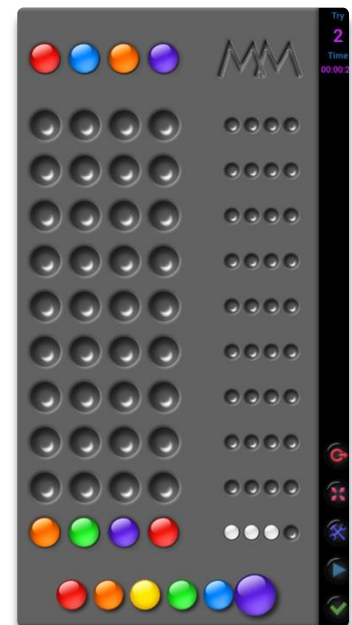
SCORING

For each of the pegs in the guess that is the correct color and the correct position, the computer will give you one small black peg to the right of that move. For each of the pegs in your guess that is a correct color in an incorrect position, the computer will give you one small white peg to the right of that move. Together, there will be no more than four small black and white pegs for each move. If none of the pegs in your guess is of a correct color, you will see no small pegs to the right of that move. If you score four small black pegs on a guess, you have guessed the secret sequence.

DIFFERENT CASES IN THE GAME

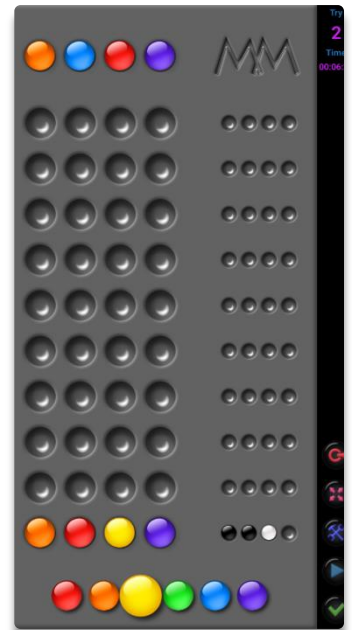
CASE: I

In this case three of the colors (red, orange and purple) in our guess is correct but the position is not correct, as we can see from the correct sequence, hence three white pegs appeared.



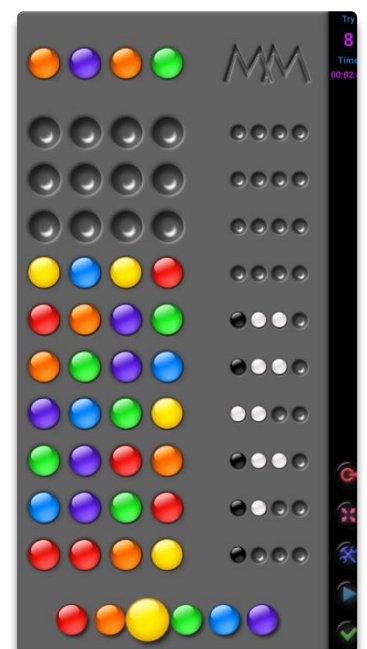
CASE: II

In this case two of the colors (orange and purple) in our guess is correct and their position is also correct, as we can see from the correct sequence, hence two black pegs appeared. Other than this one more color (red) in our guess is correct but its position is not correct, hence one white peg appeared.



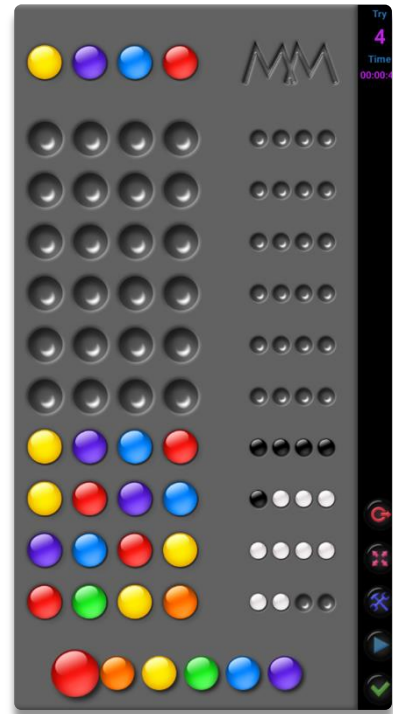
CASE: III

In this case none of the colors (yellow, blue and red) of our guess matches with the actual sequence as we can see and hence no pegs appeared.



CASE: IV

In this case all the colors (yellow, purple, blue, red) are matching with the actual sequence and their position is also correct and hence four black pegs appeared.



REQUIREMENTS OF THE GAME

- 1) The players should be able to enter four colors as their guess. When they enter their guess, then your program should display their guess and next to the guess it should display the score.
- 2) After the player completes playing the game once (after either they win or they had twelve guesses), your program should ask the user if they would like to continue if they do then your program should generate a new code.



WORKING OF THE GAME

```
#include<stdio.h>
```

```
#include<stdlib.h>
```

```
#include<string.h>
```

```
#include<time.h>
```

```
void makeCode(char secretCode[4][10])
```

```
{
```

```
    int i, randColor;
```

```
    for(i=0; i<4; i++)
```

```
    {
```

```
        randColor = 1 + rand() % 6;    //creates a number
```

```
        switch(randColor)    //converts number created to a string
```

```
        {
```

```
            case 1: strcpy(secretCode[i], "red");    break;
```

```
            case 2: strcpy(secretCode[i], "yellow"); break;
```

```
            case 3: strcpy(secretCode[i], "green");  break;
```

```
            case 4: strcpy(secretCode[i], "blue");   break;
```

```
            case 5: strcpy(secretCode[i], "white");  break;
```

```
            case 6: strcpy(secretCode[i], "black");  break;
```

```
        }
```

```

    }
}

void guess(char guessCode[4][10])
{
    int i;
    printf("\nEnter your guess:\n");
    for(i=0; i<4; i++)
        scanf("%s", guessCode[i]);
}

void codeCheck(char secretCode[4][10], char guessCode[4][10], int
*blackPeg, int *whitePeg)
{
    int i, j, checkSecret[4] = {1,1,1,1}, checkGuess[4] = {1,1,1,1};
    *blackPeg = *whitePeg = 0;

    for(i=0; i<4; i++)    //if secret and guess's position and color are
same, blackpeg increases and mark "check"
        if(strcmp(guessCode[i], secretCode[i]) == 0)
        {
            ++*blackPeg;
            checkSecret[i] = checkGuess[i] = 0;
        }
}

```

```

    for(i=0; i<4; i++)
        for(j=0; j<4; j++)
            if(strcmp(secretCode[i],guessCode[j]) == 0 && checkGuess[i]
&& checkSecret[j] && i != j)
                {
                    // determines crushes and eliminates extra whitePegs
                    ++*whitePeg;
                    checkSecret[j] = checkGuess[i] = 0;
                }
    }

void displayGuess(char guessCode[4][10], int blackPeg, int whitePeg)
{
    int i;
    printf("\nYour Guess\t\t\t\tYour Score\n");
    for(i=0; i<4; i++)
        printf("%s ", guessCode[i]);
    printf("\t\t");
    for(i=0; i<blackPeg; i++)
        printf("black ");
    for(i=0; i<whitePeg; i++)
        printf("white ");
    printf("\n\n");
}

```



```
int main()
{
    srand(time(NULL));

    int i, option=1, blackPeg, whitePeg, wrongGuess;
    char secretCode[4][10], guessCode[4][10];

    while(1)
    {
        printf("MASTER MIND! \nPress 1 to start game \nPress any number  
to exit\n\n");

        scanf("%d", &option);

        if(option == 1)
        {
            makeCode(secretCode);

            for(wrongGuess=1; wrongGuess<=12; wrongGuess++)    //gives
12 rights to guess
            {
                guess(guessCode);

                codeCheck(secretCode, guessCode, &blackPeg, &whitePeg);

                displayGuess(guessCode, blackPeg, whitePeg);

                if(blackPeg == 4)    //if player guess correct all, than the
game finishes
                {
                    printf("You Win!\n\n\n\n"); break;
                }
            }
        }
    }
}
```

```

    }
}

if(wrongGuess == 13)    //if player cannot guess correct colors in
12 rounds, he loses

    printf("\nYou Lost!\nSecret Code: %s %s %s %s\n\n\n\n\n",
secretCode[0], secretCode[1], secretCode[2], secretCode[3]);

}

else

    exit(1);

}

}

```

OUTPUT-

CASE1-

```

"C:\Users\Akansha\Desktop\DATA STRUCTURE\mastermindproj\mastermind.exe"
MASTER MIND!
Press 1 to start game
Press any number to exit
1
Enter your guess:
red yellow green blue
Your Guess      Your Score
red yellow green blue    white white

Enter your guess:
yellow black blue white
Your Guess      Your Score
yellow black blue white    black white white white

Enter your guess:
yellow blue black white
Your Guess      Your Score
yellow blue black white    white white white

Enter your guess:
yellow blue black white

```

```
"C:\Users\Akansha\Desktop\DATA STRUCTURE\mastermindproj\mastermind.exe"

Your Guess          Your Score
yellow blue black white
white white white white

Enter your guess:
white yellow blue black

Your Guess          Your Score
white yellow blue black
white white white white

Enter your guess:
yellow white black blue

Your Guess          Your Score
yellow white black blue
white white white white

Enter your guess:
blue black white yellow

Your Guess          Your Score
blue black white yellow
black black black black

You Win!

MASTER MIND!
```

CASE2-

```
"C:\Users\Akansha\Desktop\DATA STRUCTURE\mastermindproj\mastermind.exe"

MASTER MIND!
Press 1 to start game
Press any number to exit

yellow green blue black

Enter your guess:

Your Guess          Your Score
yellow green blue black
white white white

Enter your guess:
red blue black white

Your Guess          Your Score
red blue black white
white white white

Enter your guess:
red blue blue blue

Your Guess          Your Score
red blue blue blue
black white

Enter your guess:
red white red white
```

```
"C:\Users\Akansha\Desktop\DATA STRUCTURE\mastermindproj\mastermind.exe"

Your Guess          Your Score
red white red white  black

Enter your guess:
black black black black

Your Guess          Your Score
black black black black  black

Enter your guess:
red black red blue

Your Guess          Your Score
red black red blue  black black black

Enter your guess:
blue black green white

Your Guess          Your Score
blue black green white  black white white

Enter your guess:
green white red black

Your Guess          Your Score
green white red black  black black white
```

```
"C:\Users\Akansha\Desktop\DATA STRUCTURE\mastermindproj\mastermind.exe"

Enter your guess:
yellow red white blue

Your Guess          Your Score
yellow red white blue  black white

Enter your guess:
red black red white

Your Guess          Your Score
red black red white  black black

Enter your guess:
red red red white

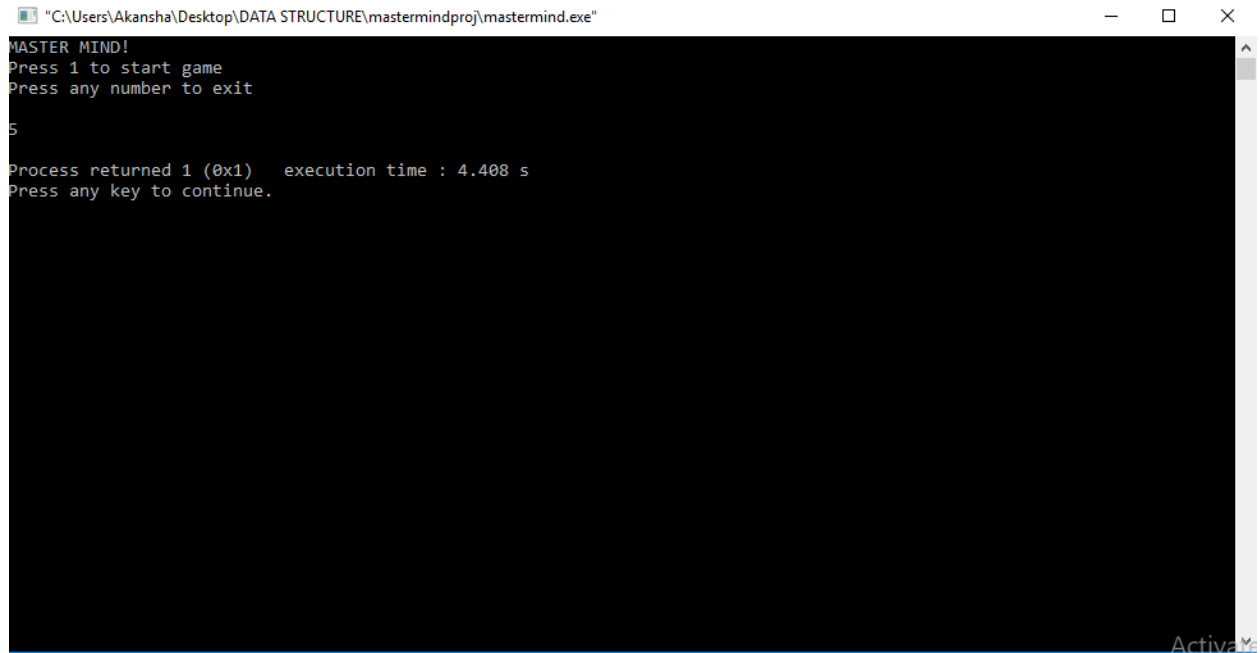
Your Guess          Your Score
red red red white  black

Enter your guess:
white blue black white

Your Guess          Your Score
white blue black white  white white

You Lost!
Secret Code: green black red blue
```

CASE3-



```
"C:\Users\Akansha\Desktop\DATA STRUCTURE\mastermindproj\mastermind.exe"
MASTER MIND!
Press 1 to start game
Press any number to exit
5
Process returned 1 (0x1) execution time : 4.408 s
Press any key to continue.
```

REFERENCES

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 4. www.wikipedia.com
 5. **CLASS-12 SUMITA ARORA**
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