Mastermind

User Manual

Content

1. Introduction

This game was created for LinkedIn REACH Coding Challenge. The aim was to gain practical experience in programming and to tighten and improve the programming skills.

The requirement was to implement a mastermind game, which can be played by a user "against" the computer. This is a game where a player tries to guess the number combinations. At the end of each attempt to guess the 4 number combinations, the computer will provide feedback whether the player had guess a number correctly, or/and a number and digit correctly. A player must guess the right number combinations within 10 attempts to win the game. Additionally, it gives the user some options to vary the gameplay and provides a form of an AI that solves games and/or gives the user hints and some support.

2. Mastermind in general

Mastermind is a code-breaking game originally designed for two players (user and the computer). One player has to choose a secret code which the other player has to guess. The one choosing the secret code is called “codemaker”, the one who tries to guess the code is called “codebreaker“. In this game you can choose whether you want to be the codemaker or the codebreaker. The computer will take the other role.

The codes consist of color-coded numbers in a specified order. The length of the code (the number of digits) and the quantity of numbers used can be specified before the game begins. Also, the allowance of using the same number several times can be specified. At the beginning of the game the codemaker has to define a secret code. Then the codebreaker makes guesses either till he guesses the correct code or till the maximum number of attempts has exceeded. Every guess of the codebreaker results in a response of black and white pins.

2. Mastermind in general

The white pins indicate the number of correct numbers in the given guess. For example, if the secret code is **0** **4** **7** **2** and the guess was **7** **1** **0** **5** the result will contain two white pins because numbers **0** and **7** are in the secret code. The black pins indicate the number of correct numbers at the correct position in the given guess. For example, if the secret code is **3** **5** **2** **4** and the guess was **3** **1** **7** **2** the result of the guess will contain one black pin because **3** is used in the secret code and it is at the correct position. There would also be a white pin because **2** is used in the secret code, but at a different position.

Response Pins	Meaning
white	number of correct numbers in the given guess
black	number of correct numbers at the correct position in the given guess

3.1 The main window

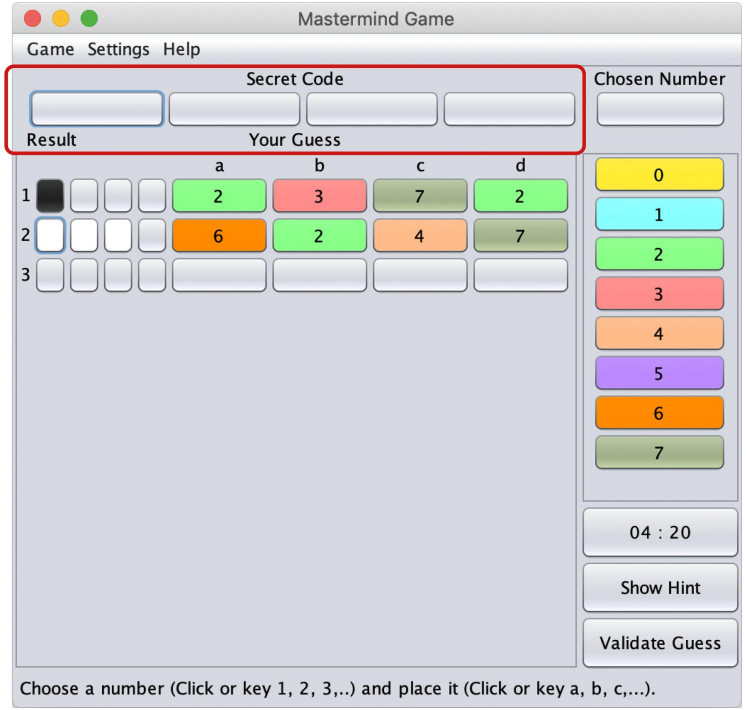
When you start a new game this is how the game looks. At this point the computer has already set a secret code and you are in the role of the codebreaker.
Game rules:

- At the start of the game the computer will randomly select a pattern of four different numbers from a total of 8 different numbers.
- You will have 10 attempts to guess the number combinations
- At the end of each guess, computer will provide one of the following response as feedback: you had guess a correct number, you had guessed a correct number and its correct location, or your guess was incorrect

3.1.1 Secret code

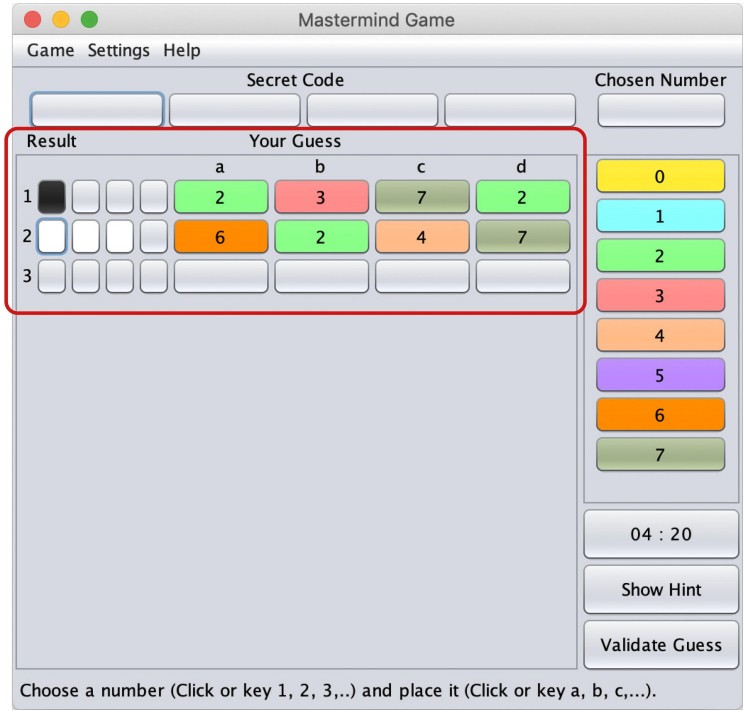
This is the secret code field. When you play as the codebreaker it looks like the picture below, showing only blank fields. If you manage to solve the game or if the number of maximum tries exceeded it will show you what the secret code was.

When you play as the codemaker you will be able to set the secret code by choosing a number in the number field (see chapter 3.1.3) and clicking into the field in which you want to set the chosen number. You are also able to use the keyboard controls (see chapter 3.3) to set the code.



3.1.2 Guessing field

This is the guessing field. It shows the guesses that were already tried and the corresponding results. When you play as the codebreaker you can guess by placing numbers into the placeholders (labeled a, b, c,...) and afterwards clicking on the result fields. When clicking the result fields, the game will evaluate your guess and show you the according to result. Then a new line will show up for the next guess. (See chapters 3.2 and 3.3 for setting numbers/controls.) When you play as the codemaker it will show you the guesses (and corresponding results) the computer makes. Note: You do not have to set the results by hand, the game will do it for you. Also, the whole program is locked while the computer solves the game.

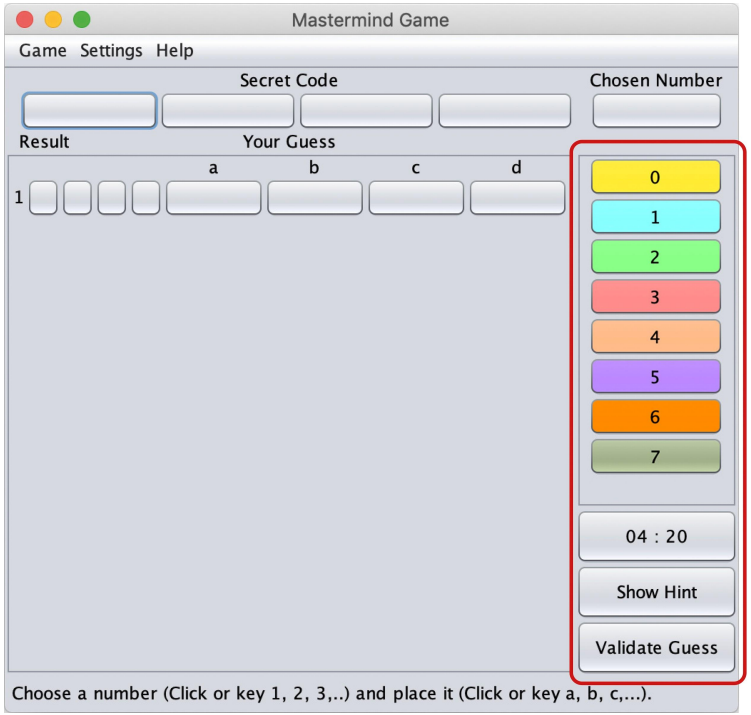


3.1.3 Numbers field

The numbers field contains all available numbers of the running game. Each number associated with its own unique color. Numbers field allows you to choose the number you want to set either in the guessing field or in the secret code field depending on which game mode you have chosen. (See chapters 3.1.4 for chosen number, and chapter 5 for the game mode.) Additionally, you can use keyboard controls to choose or place the number (see chapter 3.3).

Below the numbers panel there are three buttons available for your convenience:

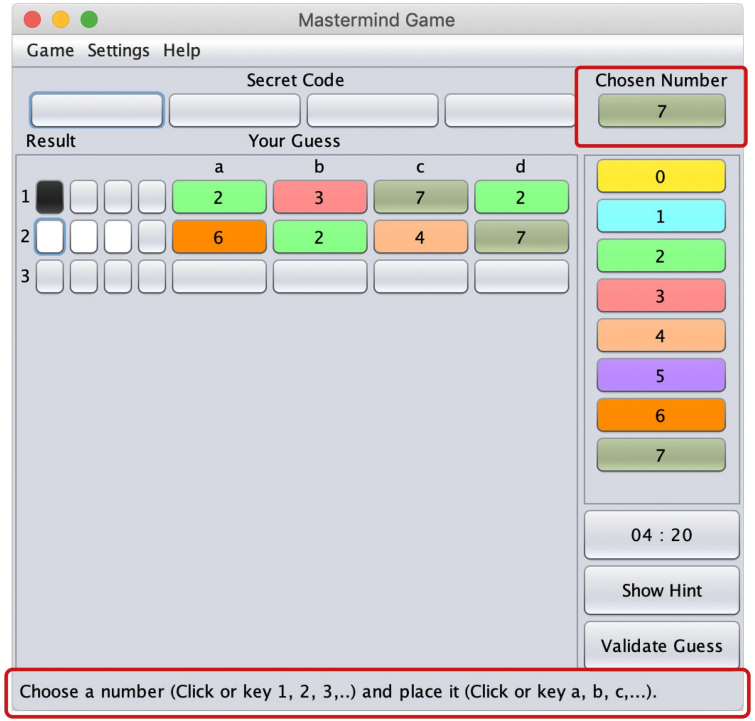
- Timer countdown - 3 minutes allowed for one game, but you can stop it if you do not want to time your game,
- Show the hint - you have an option to use AI to set the row for you, using its algorithms,
- Validate guess, before checking the result of your guess you can ask AI to validate it (was it good or bad).



3.1.4 Chosen number and Info bar

The chosen number field shows you the number selected at the moment. Setting a number in the guessing or the secret code field will use this number The number with which the field is labeled is the number used for keyboard controls (see 3.3).

The info bar at the bottom of the main window shows you information about the game state and gives you instructions/tips on how to proceed with the game.



3.2 Keyboard controls

Key / Shortcut	Action
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	Choose the corresponding number from the numbers field.
a, b, c, d, e, f, g, h	Set the chosen number in the guessing or secret code field at the corresponding position.
Space	Make a guess and therewith request the according result.
Ctrl + H	Hint - let the game compute a next possible guess if you do not know how to go on.
Ctrl + V	Checks if the guess you have in the guessing field at the moment is valid or makes no sense in context of previous guesses and results.
Ctrl + S	Open a save dialog that allows you to define a file in which the running game is saved.
Ctrl + O	Open a open dialog that allows you to define a file from which a game is loaded.
Ctrl + N	Initiates a new game. The running game will be lost if not saved before.
Ctrl + Q	Quit the game. The running game will be lost if not saved before.

3.3 Save a game

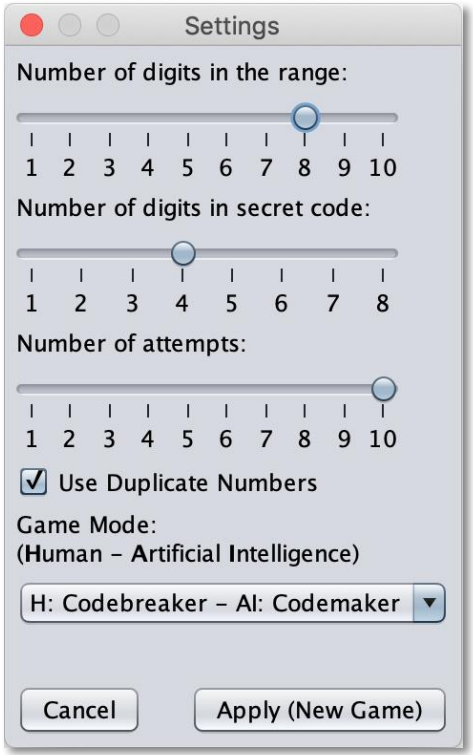
The save dialog allows you to save the whole running game into a file. You can open the dialog using the menu bar: Game → Save… Alternatively, you can use the keyboard shortcut “Ctrl + S”. You can specify a filename typing in File Name field. You also can click an existing file to choose its name and overwrite it.

3.4 Load a game

The open dialog allows you to open a saved game from a file. You can open the dialog using the menu bar: Game → Open… Alternatively, you can use the keyboard shortcut “Ctrl + O”.
You can specify the game/file you want to load by clicking its filename, or type a filename into File Name field. Note: If you load a game, the game you play at the moment will be lost.

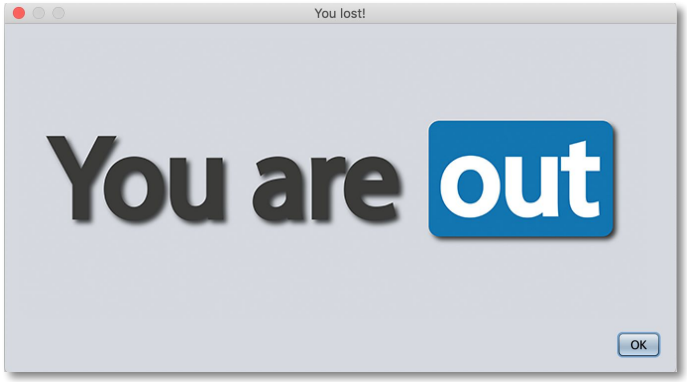
4. Settings

Setting	Meaning
Number of digits in the range	Allows you to assign the range of different numbers to be used in the game. Set to 8 by default (as per requirements)
Number of digits in secret code	This is the number of digits in the secret code. Set to 4 by default (as per requirements)
Number of attempts	The max number of attempts. If the codebreaker was not able to guess the code in number of attempts specified here he loses the game. Set to 10 by default (as per requirements)
Use duplicate numbers	If this option is checked it is allowed to use a number several times in a code. If unchecked you can use every number just once in a code.
Game mode	Game Mode lets you decide if you want to be the codemaker or the codebreaker. The computer will take the other role.

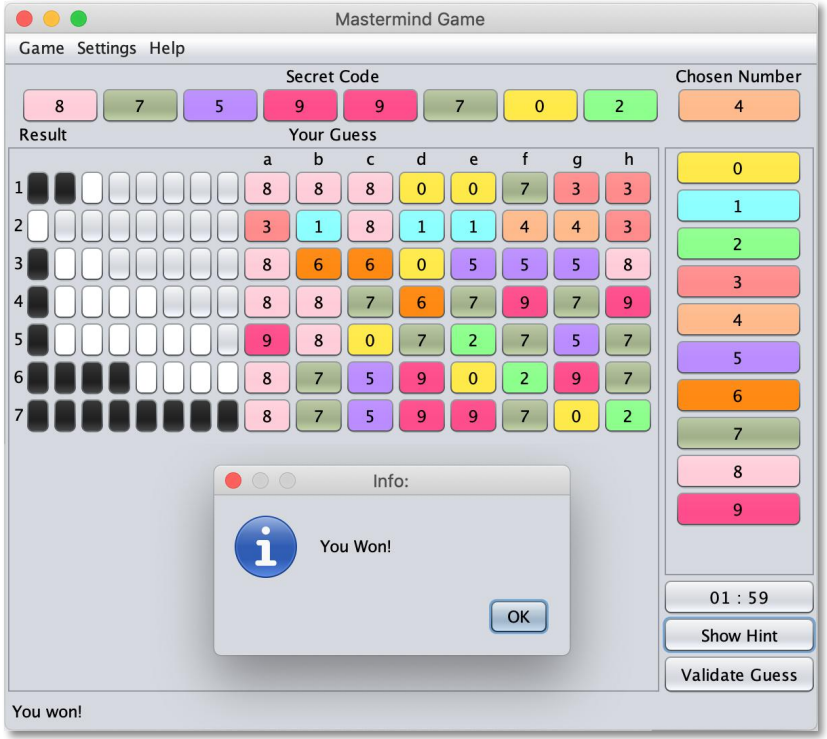


5. Dialog boxes

The dialog boxes (a graphical control element in the form of a small window) communicates information about the game events to the player and prompts them for a response. For example, when a player won or lost the game because he used all allowed attempts to guess the code or because he ran out of time allowed for one game.



Have fun!


Mastermind Game
Game Settings Help
Secret Code
8 7 5 9 9 7 0 2
Chosen Number
4
Result
Your Guess
a b c d e f g h
1 8 8 8 0 0 7 3 3
2 3 1 8 1 1 4 4 3
3 8 6 6 0 5 5 5 8
4 8 8 7 6 7 9 7 9
5 9 8 0 7 2 7 5 7
6 8 7 5 9 0 2 9 7
7 8 7 5 9 9 7 0 2
0 1 2 3 4 5 6 7 8 9
Info:
You Won!
OK
01 : 59
Show Hint
Validate Guess
You won!