**Documentation**

**General description**

**Description of the game**

**Requirements**

|  |  |
| --- | --- |
| **Functional** | |
| **Name** | **Description** |
| Basic game logic | Dashboard generation**\*** |
| User enters values into cells |
| If desired, the user can delete values ​​from the cells |
| The result is sent for processing and processed according to the rules of the game |
| Depending on the processed result, the user is notified of success or failure |
| Difficulty levels | Dashboard size - level:  6x6 – Easy  10x10 – Normal  16x16 - Hard |
| Notes in cells | Mode in which you can enter the numbers 1-9 together into the cell. For example: |
| Dashboard cleaning | All values ​​entered by the user are deleted |
| «New game» | Clearing the dashboard + dashboard generation |
| Save points | The ability to repeatedly save the state of the dashboard for real-time use directly during a game session**\*\*** |
| The ability to open one of the saved states of the dashboard directly during the game session |
| The ability to overwrite at the user's request a certain state of the dashboard directly during the game session |
| Rating table | From the start of a new game, a timer counts down how long the game session lasts |
| After the *successful* completion of the game, the timer time is saved in the rating table |
| According to the number of game difficulties, there are three rating tables |

**\*** - that is, the answer values ​​in the cells and sum values, not the form of the dashboard.

**\*\*** - game session - game from the start of the timer until the successful completion of the game, until the start of a new game or until the import of the game's own configuration**\*\*\***

**\*\*\*** - the state of the dashboard and the time of the game timer are saved

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| **Non-functional** | | |
| **Name** | | **Description** |
| User interface | Dashboard |  |
| There are three forms of the dashboard, respectively, for the three difficulties of the game. |
| External settings dashboard view and application | + the function of showing the correct answers - to check the correctness of the game. |

**Used technologies, libraries, patterns, e.t.c.**

1. WPF

2. XUnit

Nuget packages:

Kakuro project:

1. -

XUnit tests project:

1. coverlet.collector

2. Microsoft.NET.Test.Sdk

3. xunit

4. xunit.runner.visualstudio

5. Moq

**Technical documentation**

**Test Documentation**

**Refactoring. Modifications**

**Description**

The reason I created this document is that it’d be bad to put the real minimum requirements and not important ideas all together. So non-functional requirements were moved here, ideas for modifications and ideas what it’d be interesting to try on the project are described here also. I’ve done it just not to lose my focus, so I could implement the most important requirements in the first place.

In the code I’ll put #BAD hashtags and some description so as anybody could see places that require refactoring and could understand why. Also there’re #PRIORITY hashtags which mean that some functionality requires to be implemented in the near time.

**Non-functional requirements**

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| --- | --- | --- | --- |
| **Name** | | **Description** | |
| User interface | | Dashboard | Rating tables are located on the separate tab. But instead of this it’s better to try to implement Stores pattern with Navigation and all this stuff. |
| Architecture | | The ability to easily add new functionality and remove the old one.  Low interdependence and strong ties.  We are developing the architecture in such a way that in the future it is possible to easily replace one place of data storage (e.g., JSON files) with another (e.g., database), with the ability of dynamically changing the number of rating tables in the event that we add game difficulty levels in the future, with the easy ability of adding new game difficulty levels. | |
| Speed, efficiency and system load | | * unnecessary data should not be uploaded; * there should not be a bunch of redundant intermediary classes; * fast dashboard generation; * fast uploading of data. * should be all ***async*** so the main thread doesn’t get blocked when saving or loading files. | |
| Data storage | | * unnecessary data is not stored; * no more than 10 files either for the rating table or for save points; * there must be cache for savepoint, so only 3 savepoint must be loaded in program at the same time; * rating tables of each difficulty are loaded in accordance with which table the user has switched to. After loading, if the rating table of this difficulty has not been viewed for 5 minutes, it is unloaded until the user goes to it again.   Useful services: ICacheService, MemoryCache | |
| Technology stack | | Visual Studio 2022, .NET 8.0, WPF | |
| Hardware requirements | Processor | Intel ® Core ™ 2 / 2 Duo / Pentium ® /  Celeron ® / Xeon™ / i3 / i5 / i7 чи AMD 6  / Turion ™ / Athlon ™ / Duron ™ /  Sempron ™ with clock frequency no  lower 1.5 GHz. | |
| RAM | At least 2GB of RAM is recommended | |
| Hardware architecture | — 32-bit (х86);  — 64-bit (х64). | |
| Target platform | | Windows 10 | |
| Stability | | If the system shuts down unexpectedly or the user hard closes the program, data is automatically saved. | |
| Security | | Limit the user's ability to edit saved files directly through the file explorer. | |
| Usability | | There should be data deletion protection in the program directly. For example, dialog boxes that ask for user permission.  Since loading and saving data must be asynchronous, when data is being saved, user ***mustn’t be*** allowed to change it!  Also, if the user manually changed files through the File Provider, then since we are not be able to upload data, a message about this is displayed. | |
| Maintainability | | There should be logger. | |
| Localization | | Ukrainian and English languages | |

**Userful links:**

<https://learn.microsoft.com/en-us/dotnet/standard/exceptions/best-practices-for-exceptions>

<https://www.youtube.com/watch?v=zlnq3HAhwr8>

<https://www.google.com/search?q=cache+C%23&oq=cache+C%23&gs_lcrp=EgZjaHJvbWUyBggAEEUYOTIHCAEQABiABDIHCAIQABiABDIHCAMQABiABDIHCAQQABiABDIHCAUQABiABDIHCAYQABiABDIHCAcQABiABDIHCAgQABiABDIGCAkQLhhA0gEJMTA1MDlqMGoxqAIAsAIA&sourceid=chrome&ie=UTF-8&safe=strict>

<https://learn.microsoft.com/ru-ru/dotnet/core/extensions/caching>

**Ideas for code refactoring or upgrading:**

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| --- | --- |
| **Name** | **Description** |
| “Factory method” | In the future it’s planned to add an ability to work with DB, maybe CSV, maybe another kind of storage. So it’d be great if system allowed us easily to do it and delete a tool for working with JSON-files easily.  It’s important to mention, that it’s probably better to make possible to pass parameter of type T (any type). It’ll be done so as only some classes could set, for example, filepath, if we’re talking about CSV-files. As I See it now:  interface IXXXFactory<T>  {  IXXX Create(T parameter);  }  class CSVFactory : IXXXFactory<string>  {  IXXX Create(string filepath);  }  Not sure how I’ll do it, just not to forget the idea. |
| Function “Challenge” | It’s a new function for game where user must complete level in some time. |
| Inversion and negative field | A method of field generation that involves its inversion and the transition of the field to negative |
| Obstacles on hard level | Different sounds, color changing, glare of light, e.t.c. |
| Music in the background | On all levels |
| Tests for RatingRecord and Savepoint |  |
| Popping up tips | When user points at some element with mouse, popping up tip appears and tells hotkeys. |
| Hotkeys | For switching between tabs, for buttons, e.t.c. |

**Installation Manual**

**User Manual**

**System Requirements**