**PROBLEM SPECIFICATION TABLE**

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| **CLIENT** | Game development applicant. |
| **USER** | Player |
| **FUNCTIONAL REQUERIMENTS** | * R1. The game must allow the player to configure the graph type. * R2. The game must allow the player to initialize with a valid board. * R3. The game must allow the player to place pipes on the board. * R4. The game must allow the player to give up. * R5. The game must allow the player to clear the board. * R6. The game must allow the player to validate his path from the source to the drain. |
| **CONTEXT OF THE PROBLEM** | A piping that challenges players to effectively connect a fountain to a drain is under development. Both elements appear randomly on a game board, which serves as a canvas for creating the piping system. To enhance the game experience, a graph traversal algorithm is applied. This algorithm not only generates boards with valid pipeline solutions, but also validates the solutions proposed by the players. In addition, a minimum path algorithm highlights the shortest route between the source and the drain, providing players with a visual reference and influencing their scores. The game allows flexibility in the implementation of the graph, offering players a choice between adjacency list and adjacency matrix implementations. |
| **NON-FUNCTIONAL REQUERIMENTS** | NFR 1: The game must be implemented on a JavaFX interface. |

**REQUIREMENTS TABLES**

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| **Identifier or name** | **R1. The game must allow the player to configure the graph type.** | | |
| **Summary** | The game must be playable in either of the two implementations for this case: adjacency matrix graph or adjacency list graph. To this, before starting a game, the player will be asked to indicate graph type. The game will try to generate a game with this choice. | | |
| **Inputs** | **Input name** | **Data type** | **Condition or valid values** |
| Graph type | String | * Adjacency list * Matrix list |
| **General activities required to achieve the results** | * Select graph type. | | |
| **Outcome or Postcondition** | Generation of the game on the selected graph. | | |

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| **Identifier or name** | **R2. The game must allow the player to initialize with a valid board.** | | |
| **Summary** | The game must initialize a board with at least one valid solution. First blocked cells will be generated and the source and drain will be placed in a random position on the board. Then the game will use an algorithm to verify that there is a valid path from the source to the drain. If a route exists, the game will be ready for the user. If not, the user will be told that a valid game was not generated and will be asked to try again. | | |
| **General activities required to achieve the results** | * Click on the play button. * Select graph type. | | |
| **Outcome or Postcondition** | Generation of a valid game or error message. | | |
| **Outputs** | **Output name** | **Data type** | **Selection or repetition condition** |
| Error message | String | The generated game has no solution. |

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| **Identifier or Name** | **R3. The game must allow the player to place pipes on the board** |
| **Summary** | The game should allow the player to place pipes on any cell of the board except those that are blocked. There are six types of pipes and the player can change them by pressing several times on the desired cell. |
| **General activities required to achieve the results** | * Click on the box where the player wants to place the pipe. |
| **Outcome or Postcondition** | An image of the pipe is displayed in the selected cell. |

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| **Identifier or name** | **R4. The game must allow the player to validate his path from the source to the drain.** |
| **Summary** | The game must have the option for the player to give up. To do this, the player must select the option and the game will ask for confirmation. If he goes ahead the game will eliminate all the pipes present and show the player the shortest route from the source to the drain and the game will end. |
| **General activities required to achieve the results** | * Click on give up button |
| **Outcome or Postcondition** | The shortest route from the source to the drain will be shown and the game will end. |

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| **Identifier or Name** | **R5. The game must allow the player to clear the board.** |
| **Summary** | The game must allow the player to clear the board whenever he/she wishes. |
| **General activities required to achieve the results** | * Click on clear button |
| **Outcome or Postcondition** | All the pipes that the user had placed on the board are removed. |

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| **Identifier or name** | **R6. The game must allow the player to validate his path from the source to the drain.** | | |
| **Summary** | The game must have the option for players to validate the route they took from the source to the drain. To do this, the player must select the option and the game will verify that the route chosen is valid. If so, a message box will be displayed with the summary of the game and the score. If not, the error will be indicated and the board will be cleared for the player to try again. | | |
| **General activities required to achieve the results** | * Click on validate button. | | |
| **Outcome or Postcondition** | An information box is displayed and/or the board is cleared. | | |
| **Outputs** | **Output name** | **Data type** | **Selection or repetition condition** |
| Confirmation message | String | The player has won the game or error, the solution is incorrect. |