1. **Requirement Analysis (20 points)**

**Functional Requirements (FR)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ID | Name | Description | Preconditions | Postconditions | Test |
| R1 | Application | Defines the applications primary interface, including the main menu, play screen, configuration, high-scores, and starting splash screen. | applicationOpen:false | applicationOpen:true | TC-01 |
| FR1 | Views | Defines the player interface consisting of multiple views with controls, information, and transition conditions. | viewsActive:false | viewsActive:true | TC-02 |
| FR1.1 | Menu | Displays the menu view with buttons to start a new game, change configuration settings, view high-scores, and close the application. | isMenuView:false, viewsActive:true | isMenuView:true | TC-03 |
| FR1.1.1 | Play button | When the player uses the play button, the menu view closes, the game view opens, and a new game starts. | isMenuView:true, isPlayView:false, isGameActive:false, loadDifficulty:true, loadAiSettings:true, loadExtendedMode:true | isMenuView:false, isPlayView:true, isGameActive:true, loadDifficulty:true, loadAiSettings:true, loadExtendedMode:true | TC-04 |
| FR1.1.2 | Configuration button | When the player clicks the configuration button, the menu view closes and the configuration view opens. | isMenuView:true, isConfigView:false, loadConfig:false | isMenuView:false, isConfigView:true, loadConfig:true | TC-05 |
| FR1.1.3 | High-score button | When the player clicks the high-score button, the menu view closes and the high-score view opens | isMenuView:true, isHighscoreView:false, loadHighscore:false | isMenuView:false, isHighschoreView:true, loadHighscore:true | TC-06 |
| FR1.1.4 | Exit button | When the player clicks the Exit button, the application closes. | isMenuView:true, viewsActive:true, applicationOpen:true | isMenuView:false, viewsActive:false, applicationOpen:false | TC-07 |
| FR1.2 | Play | Displays and starts the game play view, including the game board, score, and an exit button. | isPlayView:false, isGameActive:false, viewsActive:true | isPlayView:true, isGameActive:true | TC-08 |
| FR1.2.1 | Game board | The game board displays the play area at the configured settings and renders tetrominoesreal-time within the moveable play area. | isPlayViewReady:true, isGameActive:false, currentConfig:true | isGameActive:true, | TC-09 |
| FR1.2.2 | Score | The score is displayed and updates after removing any rows. | updateScore:true | updateScore:false | TC-10 |
| FR1.2.3 | Exit button | When the player clicks the Exit button, the game pauses and a confirmation dialog opens. | isDialogOpen:false, | isPaused:true, isDialogOpen:true, | TC-11 |
| FR1.2.3a | Confirm option | When the player clicks the confirm option in the exit confirmation, the dialog closes, game ends, play view closes, and the menu view opens. | isPlayView:true, isDialogOpen:true, isGameActive:true | isPlayView:false, isDialogOpen:false, isMenuView:true, isGameActive:false | TC-12 |
| FR1.2.3b | Cancel option unpause | When the player clicks the cancel option in the exit confirmation, the dialog closes and the game resumes. | isPlayView:true, isDialogOpen:true, isGameActive:true, wasGamePaused:false | isPlayView:true, isDialogOpen:false, isGameActive:true, isPaused:false | TC-13 |
| FR1.2.3c | Cancel option paused | When the player clicks the cancel option in the exit confirmation and the game was already paused, the dialog closes and the game does not resume. | isPlayView:true, isDialogOpen:true, isGameActive:true, wasGamePaused:true | isPlayView:true, isDialogOpen:false, isGameActive:true, isPaused:true | TC-14 |
| FR1.3 | Configuration | Displays the configuration view with options for game board size (width × height), difficulty level, music option, AI option, Extended mode option. | isMenuView:true, isConfigView:false, configOpen:false, configLoaded:false, viewsActive:true | isMenuView:false, isConfigView:true, configOpen:true, configLoaded:true | TC-15 |
| FR1.3.1 | Size field (height × width) | The game board size is displayed in separate height and width fields. | newSize:false | newSize:true | TC-16 |
| FR1.3.1a | Height | When the player changes the height field, the in-game height setting is updated. | newHeight:false | newHeight:true | TC-17 |
| FR1.3.1b | Width | When the player changes the width field, the in-game width setting is updated. | newWidth:false | newWidth:true | TC-18 |
| FR1.3.2 | Level number field | When the player enters a number into the field, the in-game difficulty level is updated. | newLevel:false | newLevel:true | TC-19 |
| FR1.3.3 | Music toggle | When the player switches the toggle option it enables or disables the background music. | toggleMusic:true/false | toggleMusic:true/false | TC-20 |
| FR1.3.4 | AI toggle | When the player switches the AI toggle option it enables or disables the in-game AI setting. | toggleAi:true/false | ToggleAi:true/false | TC-21 |
| FR1.3.5 | Extended toggle | When the player switches the Extended toggle option it enables or disables the in-game extended setting. | toggleExtended:true/false | toggleExtended:true/false | TC-22 |
| FR1.3.6 | Back button | When the player clicks the Back button, the configuration view closes and the menu view opens. | isConfigView:true, isMenuView;false | isConfigView:false, isMenuView:true, | TC-23 |
| FR1.4 | High-score | Displays the high-score view and loads, then displays ten names and scores from a file. | isHighscoreView:false, viewsActive:true | isHighscoreView:true, loadHighscores:true | TC-24 |
| FR1.4.1 | Top 10 names | The window loads and displays the top 10 names from the high-score file. | loadHighscores:false | loadNames:True | TC-25 |
| FR1.4.2 | Top 10 scores | The window displays scores next to each name. | loadNames:True | loadHighscores:true | TC-26 |
| FR1.4.3 | Back button | When the player clicks the Back button, the high-score view closes and the menu view opens. | isHighscoreView:true, isMenuView:false | isHighscoreView:false, isMenuView:true | TC-27 |
| FR1.5 | Splash window | Displays a centered splash window containing the course code, authors, game title, and application details (language and version). | isSplashOpen:false | isSplashOpen:true | TC-28 |
| FR1.5.1 | Course code | The splash window displays the course code. | isSplashOpen:true | isCodeVisible:true | TC-29 |
| FR1.5.2 | Authors | The splash window displays the authors. | isSplashOpen:true | isAuthorVisible:false | TC-30 |
| FR1.5.3 | Game title | The splash window displays the game title. | isSplashOpen:true | isTitleVisible:true | TC-31 |
| FR1.5.4 | App info | The splash window displays application details, including programming language and version. | isSplashOpen:true | isDetailsVisible:true | TC-32 |
| FR1.5.5 | Screen position | The splash window is displayed in the center of the screen. | isSplashOpen:true | isSplashCentered:true | TC-33 |
| R2 | Controls | Defines the controls for player interaction, including movement, rotation, pausing, and exiting the game. | controlsActive:false, isPlayView:true, isGameActive:false | controlsActive:true, isGameActive:true | TC-34 |
| FR2 | Input | Defines the keyboard input controls for rotating, moving, and changing game state. | inputReady:false | inputReady:true | TC-35 |
| FR2.1 | Up | When the player presses the Up key, the current tetromino rotates. | upKeyActive:false | upKeyActive:true, rotateCurrent:true | TC-36 |
| FR2.1.1 | Rotate | tetrominoes rotate clockwise 90 degrees. | rotateCurrent:true, canRotate:true | rotateCurrent:false, canRotate:false | TC-37 |
| FR2.2 | Down | When the player presses the Down key, the current tetromino falls faster. | downKeyActive:false | downKeyActive:true | TC-38 |
| FR2.2.1 | Can move | When there is space below the current tetromino, it moves twice the normal speed. | downKeyActive:true, hasSpaceDown:true | downKeyActive:false, hasSpaceDown:false | TC-39 |
| FR2.2.2 | Cannot move | When there is no space below, the current tetromino lands and becomes part of the stack. | downKeyActive:true, hasSpaceDown:false, touchingBottom:true, isCurrentShape:true | downKeyActive:false, hasSpaceDown:false, touchingBottom:false, isCurrentShape:false | TC-40 |
| FR2.3 | Left | When the player presses the Left key, the current tetromino attempts to move left. | leftKeyActive:false | leftKeyActive:true | TC-41 |
| FR2.3.1 | Can move | The tetromino moves left when there is space. | leftKeyActive:true, hasSpaceLeft:true | leftKeyActive:false, hasSpaceLeft:false | TC-42 |
| FR2.3.2 | Can't move | The tetromino does not move when there is no space to the left. | leftKeyActive:true | leftKeyActive:false | TC-43 |
| FR2.4 | Right | When the player presses the right key, the current tetromino attempts to move right. | rightKeyActive:false | rightKeyActive:true | TC-44 |
| FR2.4.1 | Can move | The tetromino moves right when there is space. | rightKeyActive:true, hasSpaceRight:true | rightKeyActive:false, hasSpaceRight:false | TC-45 |
| FR2.4.2 | Can't move | The tetromino does not move when there is no space to the right. | rightKeyActive:true | rightKeyActive:false | TC-46 |
| FR2.5 | Pause | When the player presses the 'p' key, the game pauses and a paused message is displayed. | keyPActive:false, isPaused:false | keyPActive:true, isPaused:true | TC-47 |
| FR2.5.1 | Unpaused | When the player presses the 'p' key again, the game resumes and the paused message disappears. | keyPActive:true, isPaused:true | keyPActive:false, isPaused:false | TC-48 |
| FR2.5.2 | Paused message | When the game is paused, a message is displayed indicating the game is paused. | isPaused:true | pausedMessage:true, isPaused:true | TC-49 |
| FR2.6 | Esc | When the player presses the 'esc' key, a confirmation dialog opens and the game is paused if it is not already. | keyEscActive:true, isPlayView:true, isDialogOpen:false | keyEscActive:false, isPaused:true isDialogOpen:true | TC-50 |
| FR2.6.1 | Confirm | When the player presses the confirm option, the game is stopped, the play view closes and the menu view opens. | isGameActive:true, isDialogOpen:true, isPlayView:true | isGameActive:false, isDialogOpen:false, isPlayView:false, isMenuView:true | TC-51 |
| FR2.6.2 | Cancel | When the player cancels the confirmation dialog, it closes and attempts to unpause the game. | isDialogOpen:true, isPlayView:true, isPaused:true, | isDialogOpen:false | TC-52 |
| FR2.6.2a | Game paused | When the game was already paused, it remains paused. | wasPaused:true, isPaused:true, isDialogOpen:true | isDialogOpen:false, isPaused:false, wasPaused:true, | TC-53 |
| FR2.6.2b | Game active | When the game was active, it resumes. | wasPaused:false, isPaused:true, isDialogOpen:true | isDialogOpen:false, isPaused:false, | TC-54 |
| R3 | Gameplay | Defines the gameplay logic, including scoring, pausing, terominoes, game conditions, high-scores, and configuration options. | gameplaySetup:false | gameplaySetup:true | TC-55 |
| FR3 | Behavior | Defines the game logic, including scoring, pause handling, tetromino creation, game end, saving high-scores, and configurable options. | isGameActive:false | isGameActive:true | TC-56 |
| FR3.1 | Scoring | When the player completes a row of tetrominoes, it removes the row and increases the score based on the number of rows removed. | updateScore:false, removedRow:true, scoreAccurate:true | updateScore:true, scoreAccurate:false | TC-57 |
| FR3.1.1 | One row | When one row is removed the score increases by 100 points. | updateScore:true, removedSingleRow:true, scoreAccurate:false | updateScore:false, removedSingleRow:false, scoreAccurate:true | TC-58 |
| FR3.1.2 | Two rows | When two rows are removed the score increases by 300 points. | updateScore:true, removedDoubleRow:true, scoreAccurate:false | updateScore:false, removedDoubleRow:false, scoreAccurate:true | TC-59 |
| FR3.1.3 | Three rows | When three rows are removed the score increases by 600 points. | updateScore:true, removedTripleRow: true, scoreAccurate:false | updateScore:false, removedTripleRow:false, scoreAccurate:true | TC-60 |
| FR3.1.4 | Four rows | When four rows are removed the score increases by 1200 points. | updateScore:true, removedQuadRow:true, scoreAccurate:false | updateScore:false, removedQuadRow:false, scoreAccurate:true | TC-61 |
| FR3.2 | Pause | When the game is paused, the game actions stop and a message is displayed. | isPaused:true, isPausedMessage:false | isPaused:true, isPausedMessage:true | TC-62 |
| FR3.2.1 | Esc | When the game is paused with the 'p' key, canceling the 'esc' key dialog will not unpause the game. | wasPaused:true, isPaused:true, isDialogOpen:true | wasPaused:true, isPaused:true, isDialogOpen:false | TC-63 |
| FR3.2.2 | Paused message | When the game is paused, a message is displayed indicating the game is paused. | pausedMessage:false, isPaused:false | pausedMessage:true, isPaused:true | TC-64 |
| FR3.3 | Tetromino | Defines the structure and generation of tetromino pieces. | newTetromino:true, selectShape:true | newTetromino:false, isValidShape:true, selectShape:false | TC-65 |
| FR3.3.1 | Model | Tetrominoes are modeled in the seven standard shapes, represented by the letters I, O, T, S, Z, J, L. | isValidShape:false | isValidShape:true | TC-66 |
| FR3.3.2 | Factory | Tetrominoes are selected in a 7-bag randomizer, ensuring each appears once before repeating. | selectShape:true, availableShapes.size:n, canGetShape:true | selectShape:false availableShapes.size:n-1, resetShapes:false, | TC-67 |
| FR3.4 | Game over | Defines how the game ends. | isGameActive:true, gameStop:true | isGameActive:false, gameStop:false | TC-68 |
| FR3.4.1 | Reached the top | When a tetromino can no longer move down because the stack has reached the top, the game ends | touchingTop:false, gameStop:false | touchingTop:true, gameStop:true | TC-69 |
| FR3.4.2 | Game over message | When the game is over a message is displayed with the final score. | finalScore:false, gameStop:true | finalScore:true | TC-70 |
| FR3.5 | Beating the score | When the player achieves a score on the leaderboard, it is added to the top 10 list. | gameStop:true, topTenScore:true | topTenScore:false, scoreViewUpdated:true, newHighscore:true | TC-71 |
| FR3.5.1 | Saving scores | When the final displayed score qualifies for the leaderboard, the new score is saved to the high-score file. | newHighscore:true | scoreSaved:true, newHighscore:false | TC-72 |
| FR3.6 | Difficulty settings | When the game loads, the tetromino speed is increased by the difficulty multiplier. | isGameReady:false, loadDifficulty:true | loadDifficulty:false | TC-73 |
| FR3.7 | Ai settings | When the game loads, the AI setup is run when enabled. | isGameReady:false, loadAiSettings:true | loadAiSettings:false | TC-74 |
| FR3.8 | Extended mode settings | When the game loads, the extended mode setup is run when enabled. | isGameReady:false, loadExtendedMode:true | loadExtendedMode:false | TC-75 |