Sprint 3

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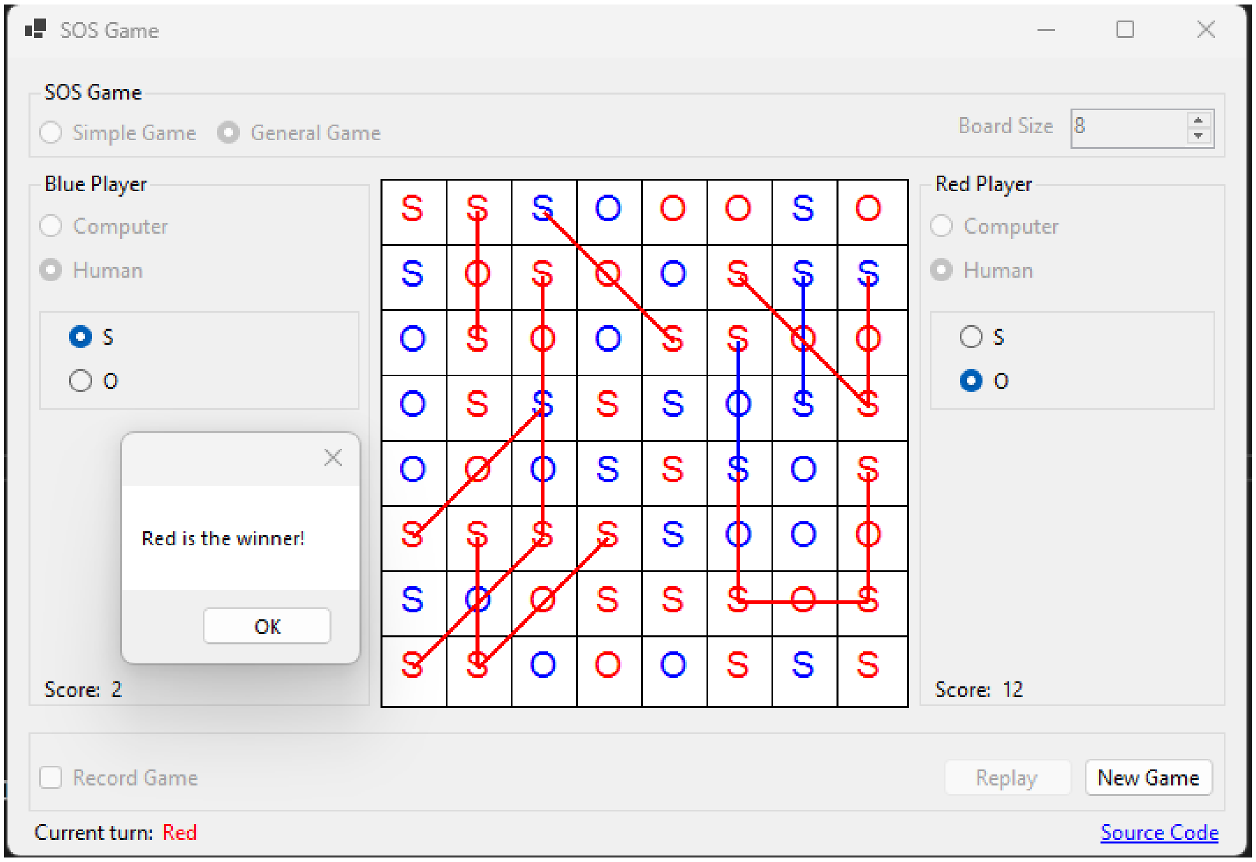
GitHub Link for Source Code (sprint_3 folder): [GitHub - jonathanbenson/sosgame]

1. Demonstration Video Link: https://youtu.be/Ll_Q_A0j9fc

Screenshot of SOS Game at the End of Sprint 3



S	S	S	O	O	O	S	O
S	O	S	O	O	S	S	S
O	S	O	O	S	S	O	O
O	S	S	S	S	O	S	S
O	O	O	S	S	S	O	S
S	S	S	S	S	O	O	O
S	O	O	S	S	S	O	S
S	S	O	O	O	S	S	S

User Stories

*Content highlighted in GREEN is new content specific to this sprint

ID	User Story Name	User Story Description	Priority	Estimated Effort (hours)
1	Choose a board size	As a player, I want to be able to choose the board size, so that I can play SOS on different board sizes	2	1
2	Choose the game mode	As a player, I want to be able to choose the game mode, so that I can play SOS in different game modes	3	1
3	Start a new game	As a player, I want to be able to start a new game, so that I can play a new game	4	2
4	Make a move	As a player, I want to be able to make a move, so that I can progress in the game	6	2
5	A simple game is over	As a player, I want to be able to know when a simple game is over, so that I do not waste time in the game	7	2
6	A general game is over	As a player, I want to be able to know when a general game is over, so that I do not waste time in the game	8	2
7	Game replay	As a player, I want to be able to replay the previous game, so I can analyze my performance	8	2
8	Move selection	As a player, I want to be able to select S or O, so I can play the SOS game the way it is designed to play	5	1

Updated Acceptance Criteria

Story ID	AC ID	AC Name	Description of Acceptance Criterion	Status
1	1.1	User attempts to select an invalid board size	Given a SOS application, when the user attempts to select an invalid board size, then the board size will stay the same	completed
	1.2	User attempts to select a board size within a game	Given a SOS application that is in a game, when the user attempts to select a board size, then the board size will stay the same	completed
	1.3	User does not select a board size	Given a SOS application, when the does not select a board size, then the board size will be set to 8	completed
	1.4	User selects a valid board size outside of a game	Given a SOS application that is not in a game, when the user selects a valid board size, then the SOS board will be rendered with the correct size and the new board size will be visible in the board size selection	completed
2	2.1	User attempts to select an invalid game mode	Given a SOS application that is not in a game, when the user attempts to select an invalid game mode, then the game mode will stay the same	completed
	2.2	User attempts to select a game mode inside of a game	Given a SOS application that is in a game, when the user attempts to select a game mode, then the game mode will stay the same	completed
	2.3	User does not select a game mode	Given a SOS application, when the user does not select a game mode, then the game mode will be set to simple game	completed
	2.4	User selects a valid game mode outside of a game	Given a SOS application that is not in a game, when the user selects a valid game mode, then the new selected game mode will be checked in the game mode selection	completed
3	3.1	User starts a new game during a game	Given a SOS application that is in a game, when the user starts a new game, then a new game mode will start with the correct game mode	completed
	3.2	User starts a new game outside of a game	Given a SOS application that is outside of a game, when the user starts a new game, then a new game will start	completed
4	4.1	User makes a move on a nonempty cell	Given an SOS application during a game, when a user makes a move on a nonempty cell, then the cell will remain unchanged and the player's turn will not change	completed

	4.2	User makes a move outside the game board	Given an SOS application during a game, when a user attempts to make a move outside of the game board, then all cells will remain unchanged and the user's turn will not change	completed
	4.3	User makes a move on an empty cell	Given SOS application during a game, when the user makes a move on an empty cell, then fill the cell with the corresponding S or O and mark an SOS on the board with the color of the current player if it completes a SOS	completed
	4.4	User makes a move not during a game	Given SOS application outside of a game, when the user makes a move, then the game state will not change	
	4.5	The user makes a move when it's not their turn	Given SOS application during a game, when the user makes a move and it's not their turn, their move will not count	
5	5.1	User makes move that wins a simple game	Given a SOS application inside a simple game, when the user makes a move that completes an SOS, then tell the user that they won the game and end the game	completed
	5.2	User makes move that does not win a simple game	Given a SOS application inside a simple game, when the user makes a move that does not complete an SOS, then switch turns between players and do not end the game	completed
	5.3	Simple game ends in a draw	Given a SOS application inside a simple, game, when the user makes a move that fills the last nonempty cell and no SOSs have been completed yet, then end the game in a draw	completed
6	6.1	User makes move that wins a general game	Given a SOS application inside a general game, when the user makes a move on the last empty square and they have more completed SOSs than their opponent, then tell the user which player won the game and end the game	completed
	6.2	User makes move that does not win a general game, but completes a SOS	Given a SOS application during a general game, when the user makes a move on an empty square that is not the last empty square and their move completes an SOS, then do not switch turns between players and do not end the game	completed
	6.3	User makes move that does not win a general game and does not complete a SOS	Given a SOS application during a general game, when the user makes a move on an empty square that is not the last empty square and their move does not complete a SOS, then switch turns between players and do not end the game	completed

	6.4	User makes move that ends general game in a draw	Given a SOS application during a general game, when the user makes a move that fills up all the squares and the number of completed SOSs by each player are the same, then tell the user that there is a draw and end the game	completed
7	7.1	User attempts to replay previous game while playing a game	Given a SOS application during a game, when the user replays the previous game, then the previous game will not be replayed	toDo
	7.2	User replays game outside of a game with no previous game played	Given a SOS application outside of a game with no previous game player, when the user attempts to replay the non-existent previous game, then the non-existent previous game does not replay	toDo
	7.3	User replays game outside of a game with previous game played	Given a SOS application outside of a game with a previous game played, when the user replays the previous game, then the previous game will replay from start to finish on the game board with constant time steps for each turn	toDo
8	8.1	User attempts to select another move option besides S or O	Given an SOS application, when the user attempts to select another move option besides an S or O, then the user's move option will stay the same	completed
	8.2	User does not select a move option	Given an SOS application, when the user does not select a move option, then the user's move option will be set to "S"	completed
	8.3	User selects a move option with the values S or O	Given an SOS application, when the user selects S or O, then the user's move option will update to their desired selection	completed
	8.4	User attempts to select a move option outside of a game	Given an SOS application not during a game, when the user tries to select S or O, their move type will remain unchanged	completed

2. Summary of Source Code

Source Code file Name	Production code or test code?	Notes	# Lines of Code
BoardPainter.cs	Production Code	Drawing board items (grid lines, S's & O's, SOS's)	215
Form1.cs	Production Code	GUI operations and control event handlers	403
AccessibilityManager.cs	Production Code	Manage accessibility and visibility of GUI controls	162
ComputerPlayer.cs	Production Code	Computer player logic	28
Game.cs	Production Code	SOS game base class	519
GeneralGame.cs	Production Code	SOS game logic associated with a general game	53
HumanPlayer.cs	Production Code	Human player logic	32
Move.cs	Production Code	Logic associated with a move	87
Player.cs	Production Code	SOS player base class	70
SimpleGame.cs	Production Code	SOS game logic associated with a simple game	43
SOSEngine.cs	Production Code	High-level SOS application logic (starting games, etc.)	147
SOSLine.cs	Production Code	Simple class model for a completed SOS line	53
GameTest.cs	Test Code	Testing for the Game class	431
AccessibilityManagerTest.cs	Test Code	Testing for the AccessibilityManagerClass	120
PlayerTest.cs	Test Code	Testing for the Player class	47
SOSEngineTest.cs	Test Code	Testing for the SOSEngine class	88
ComputerPlayerTest.cs	Test Code	Testing for the ComputerPlayer class	30
HumanPlayerTest.cs	Test Code	Testing for the HumanPlayer class	32
MoveTest.cs	Test Code	Testing for the Move class	41
GeneralGameTest.cs	Test Code	Testing for the GeneralGame class	201
SimpleGameTest.cs	Test Code	Testing for the SimpleGame class	137
		Total	**2939**

3. Production Code vs User Stories / Acceptance Criteria

Story ID	Story Name	AC ID	Classes	Method Name(s)	Status	Notes (optional)
1	Choose a board size	1.1	Game	Game.Game	complete	The Game.Game constructor will throw an ArgumentOutOfRangeException if the board size is not between the values of 8 and 12
		1.2	AccessibilityManager	AccessibilityManager.IsBoardAccessibile, AccessibilityManager.IsAccessible	complete	The AccessibilityManager.IsAccessible determine the accesibility of all controls at any given time. The AccessibilityManager.IsBoardAccessibile method determines if the board is accessibile during a game (which it is not).
		1.3	Game	Game.Game, SimpleGame.SimpleGame, GeneralGame.GeneralGame	complete	The Game.Game constructor will set the board size to 8 if the user does not choose a board size. The SimpleGame and GeneralGame constructors also follow suit.
		1.4	Game	Game.Game	complete	The Game.Game constructor will set the board size to the user's specified number upon game initialization
2	Choose the game mode	2.1	SOSEngine	SOSEngine.StartGame	complete	The SOSEngine.StartGame method will throw an exception if the game mode is not either simple or general
		2.2	AccessibilityManager	AccessibilityManager.IsGameModeAccessible, AccessibilityManager.IsAccessible	complete	The AccessibilityManager.IsGameModeAccessible determines that the user is not able to select a new game mode inside a game
		2.3	SOSEngine	SOSEngine.StartGame	complete	The SOSEngine.StartGame method will set the game mode to simple if no game mode was specified
		2.4	SOSEngine	SOSEngine.StartGame	complete	The SOSEngine accepts the choice of either simple or general game mode when starting a new game
3	Start a new game	3.1	SOSEngine	SOSEngine.StartGame	complete	The SOSEngine will start a new game with the same settings as the current game (game mode, player types, board size)
		3.2	SOSEngine	SOSEngine.StartGame	complete	The SOSEngine will start a new game with the desired settings

4	Make a move	4.1	Player, Game, Move	Player.MakeMove, Game.MakeMove, Game.IsMoveValid, Move.DoesConflict	complete	Player.MakeMove is called which calls Game.MakeMove, and then Game.IsMoveValid checks if the move is valid with the help of Move.DoesConflict. An exception is thrown inside Game.MakeMove to let the GUI know of invalid move.
		4.2	Player, Game, Move	Player.MakeMove, Game.MakeMove, Game.IsMoveValid, Move.DoesConflict	complete	Refer to 4.1 notes. Game.IsMoveValid checks if the move is outside of the board
		4.3	Player, Game, Move	Player.MakeMove, Game.MakeMove, Game.IsMoveValid, Move.DoesConflict	complete	Refer to 4.1 notes. Game.IsMoveValid checks if the move conflicts with another move
		4.4	AccessibilityManager	AccessibilityManager.IsBoardAccessible, AccessibilityManager.IsAccessible	complete	The accesibility manager determines that the user is not able to make a move on the game board outside of a game
		4.5	Player, Game, Move	Player.MakeMove, Game.MakeMove, Game.IsMoveValid, Move.DoesConflict	complete	Refer to 4.1 notes. Game.IsMoveValid checks if the move's turn is the same with the current turn of the game
5	A simple game is over	5.1	Player, Game, SimpleGame, Move	Player.MakeMove, SimpleGame.IsOver, Game.GetWinner	complete	Refer to 4.1 notes about general move making. SimpleGame.IsOver checks if the game is over (no SOSs completed). Since SimpleGame.IsOver will end the game once an SOS is made, Game.GetWinner will determine the winner by who had the most SOSs made (only 1 in this case).
		5.2	Player, SimpleGame, Move	Player.MakeMove, SimpleGame.IsOver, Game.GetWinner	complete	Refer to 4.1 notes about general move making. SimpleGame.IsOver checks if the game is over (no SOSs completed). The game is not over if an SOS is not completed yet and there is at least one more empty cell on the board.
		5.3	Player, SimpleGame, Move	Player.MakeMove, SimpleGame.IsOver, Game.GetWinner	complete	Refer to 4.1 notes about general move making. SimpleGame.IsOver checks if the game is over (no SOSs completed). Game.GetWinner will determine that there is no winner of no SOSs have been completed.

6	A general game is over	6.1	Player. GeneralGame, Move	Player.MakeMove, GeneralGame.IsOver, Game.GetWinner	complete	Refer to 4.1 notes about general move making. GeneralGame.IsOver checks if the general game is over (if no empty cells are remaining). Game.GetWinner will determine the winner by whoever has the most completes SOS lines.
		6.2	Player. GeneralGame, Move	Player.MakeMove, GeneralGame.IsOver, Game.GetWinner, GeneralGame.NewTurn	complete	Refer to 4.1 notes about general move making. GeneralGame.IsOver checks if the general game is over (if no empty cells are remaining). GeneralGame.NewTurn then does not switch turns because in a general game, the player gets a second turn after they complete an SOS.
		6.3	Player. GeneralGame, Move	Player.MakeMove, GeneralGame.IsOver, Game.GetWinner	complete	Refer to 4.1 notes about general move making. GeneralGame.IsOver checks if the general game is over (if no empty cells are remaining). GeneralGame.NewTurn then switches turns because the current player did not complete an SOS.
		6.4	Player. GeneralGame, Move	Player.MakeMove, GeneralGame.IsOver, Game.GetWinner	complete	Refer to 4.1 notes about general move making. GeneralGame.IsOver checks if the general game is over (if no empty cells are remaining). Game.GetWinner will determine if there is a draw if both players have the same number of completed SOS lines.
8	Move selection	8.1	Player	Player.SetMoveType	complete	Player.SetMoveType will make sure the only moves a user can use are MoveType.S and MoveType.O
		8.2	Player	Player.Player	complete	Player.Player constructor will set the default move type to S
		8.3	Player	Player.SetMoveType	complete	Player.SetMoveType will set the new move type to either MoveType.S or MoveType.O
		8.4	AccessibilityManager	AccessibilityManager.IsBlueSOAccessible, AccessibilityManager.IsRedSOAccessible	complete	The accessibility manager will determine that the SO options for both the red and blue players are inacessible outside of a game

4. Tests vs User Stories / Acceptance Criteria

4.1 Automated tests directory corresponding to acceptance criteria:

User Story ID	AC ID	AC Name	Classes	Methods	Description
1	1.1	User attempts to select an invalid board size	GameTest	GameTest.TestGame	Input: ints from -100 to board size lower limit (6) and board size upper limit (12) + 1 to 100. Expected output: exceptions thrown on all test inputs
	1.2	User attempts to select a board size within a game	AccessibilityManagerTest	AccessibilityManagerTest.TestIsBoardSizeAccessible	Input: a SOSEngine object with a game that is underway Output: the accessibility manager should recognize that the game is underway and deem the board size inaccessible
	1.3	User does not select a board size	GameTest	GameTest.TestGame	Input: none (Game.Game called wihout supplying the board size) Expected output: the board size defaults to 8
	1.4	User selects a valid board size outside of a game	GameTest	GameTest.TestGame	Input: ints from board size lower (6) limit to board size upper limit (12) Expected output: board size is correctly set to the supplied value
			AccessibilityManagerTest	AccessibilityManagerTest.TestIsBoardSizeAccessible	Input: an SOSEngine with no game underway Output: the acecsibility manager recognizes that not game has started yet and deems the board size selection accessible
2	2.1	User attempts to select an invalid game mode	SOSEngineTest	SOSEngineTest.TestStartGame	Input: An invalid game mode passed to SOSEngine.StartGame method Output: an exception is thrown
	2.2	User attempts to select a game mode inside of a game	AccessibilityManagerTest	AccessibilityManagerTest.TestIsGameModeAccessible	Input: a SOSEngine with a game that is underway Output: the accessibility manager should recognize that the game is underway and deem the game mode selection inaccessible

	2.3	User does not select a game mode	SOSEngineTest	SOSEngineTest.TestStartGame	Input: No game mode supplied to SOSEngine.StartGame Output: a new game will start with the simple game mode
	2.4	User selects a valid game mode outside of a game	SOSEngineTest	SOSEngineTest.TestStartGame	Input: simple and general game modes passed to SOSEngine.StartGame method Output: new games will start with their corresponding valid game modes
			AccessibilityManagerTest	AccessibilityManagerTest.TestIsGameModeAccessible	Input: an SOSEngine with no game underway Output: the accessilbility manager recognizes that no game has started yet and deems the game mode selection accessible
3	3.1	User starts a new game during a game	SOSEngineTest	SOSEngineTest.TestStartGame	Input: an SOSEngine with a game underway Output: an SOSEngine with a new game underway that has the same settings as the game before (board size, player types, game mode)
	3.2	User starts a new game outside of a game	SOSEngineTest	SOSEngineTest.TestStartGame	Input: a SOSEngine with no game underway Output: a SOSEngine with a game underway that has the desired settings passed to it (board size, player types, game mode)
4	4.1	User makes a move on a nonempty cell	GameTest	GameTest.TestMakeMove	Input: a Game with a Player that makes a move on a nonempty cell Output: an exception is thrown when Player.MakeMove is called
	4.2	User makes a move outside the game board	GameTest	GameTest.TestMakeMove	Input: a Game with a Player that makes a move outside the game board Output: an exception is thrown when Player.MakeMove is called
	4.3	User makes a move on an empty cell	GameTest	GameTest.TestMakeMove	Input: a Game with a Player that makes a move on an empty cell Output: a new Move is added to the list of moves in the Game

	4.4	User makes a move not during a game	AccessibilityManagerTest	AccessibilityManager.TestIsBoardAccessible	Input: a SOSEngine with no game underway Output: the accessibility manager determines that the board is inaccessible
	4.5	The user makes a move when it's not their turn	GameTest	GameTest.TestMakeMove	Input: a Game with a Player that makes a move when it is not their turn Output: an exception is thrown and no move added to the board
5	5.1	User makes move that wins a simple game	SimpleGameTest	SimpleGameTest.TestIsOver	Input: A SimpleGame where a player completes the first SOS Output: A SimpleGame that is over and its winner is the one who completed the first SOS
	5.2	User makes move that does not win a simple game	SimpleGameTest	SimpleGameTest.TestIsOver	Input: A SimpleGame where a player does not complete an SOS or fill up the entire board Output: A SimpleGame that is not over and does not have a winner
	5.3	Simple game ends in a draw	SimpleGameTest	SimpleGameTest.TestIsOver	Input: A SimpleGame where a player fills the last empty cell, and does not complete an SOS Output: A SimpleGame that is over and the winner is null because the game is a tie
6	6.1	User makes move that wins a general game	GeneralGameTest	GeneralGameTest.TestIsOver	Input: A GeneralGame where the current player fills in the last empty square and they have the most completed SOS lines Output: A GeneralGame where the winner was the player who made the last move
	6.2	User makes move that does not win a general game, but completes a SOS	GeneralGameTest	GeneralGameTest.TestIsOver	Input: A GeneralGame where the current player completes an SOS line but does not fill in the last empty cell Output: A GeneralGame where the current player gets a second turn and the game is not over

	6.3	User makes move that does not win a general game and does not complete a SOS	GeneralGameTest	GeneralGameTest.TestIsOver	Input: A GeneralGame where the current player complete an SOS line not does not fill in the last empty cell Output: A GeneralGame where the current player is the other player (switched turns) and the game is not over
	6.4	User makes move that ends general game in a draw	GeneralGameTest	GeneralGameTest.TestIsOver	Input: A GeneralGame where the current player fills in the last empty square to end the game and both players have the same amount of SOS lines Output: A GeneralGame that is over and resulted in a draw
8	8.1	User attempts to select another move option besides S or O	PlayerTest	PlayerTest.TestSetMoveType	Input: a Player that sets their move type to a move other than MoveType.S or MoveType.O Output: An exception is thrown and the Player's MoveType does not change
	8.2	User does not select a move option	PlayerTest	PlayerTest.TestSetMoveType	Input: A Player that has not set its move type yet Output: the Player's move type will be set to MoveType.S as default
	8.3	User selects a move option with the values S or O	PlayerTest	PlayerTest.TestSetMoveType	
	8.4	User attempts to select a move option outside of a game	AccessibilityManagerTest	AccessibilityManagerTest.TestIsBlueSOAccessible, AccessibilityManagerTest.TestIsRedSOAccessible	

4.2 Manual tests directly corresponding to acceptance criteria:

User Story ID	AC ID	AC Name	Test Case Input	Test Oracle
1	1.1	User attempts to select an invalid board size	Attempt to increase the value of the board size numeric updwon control below its lower limit (6) and over its upper limit (12)	The value of the board size does not decrease lower than the lower limit or increase above the upper limit
	1.2	User attempts to select a board size within a game	Attempt to change the board size after the game has started	The value of the board size does not change
	1.3	User does not select a board size	Start a new game, but do not select a board size	A new game will start with the correct board size of 8
	1.4	User selects a valid board size outside of a game	Start a new game, but select board sizes within the lower limit (6) and upper limit (12)	The new games will start with the chosen board sizes
2	2.2	User attempts to select a game mode inside of a game	Start a new game, and try to select the game mode different from the current game mode	The game mode should remain unchanged
	2.3	User does not select a game mode	Start a new game without selecting a game mode	The game mode should default to simple game in the new game
	2.4	User selects a valid game mode outside of a game	Start two new games: one with simple game and the other with general game mode	The two games should start with the correct coresponding game modes
3	3.1	User starts a new game during a game	Start a game, and then start a new game inside of the game	The new game should start with the same settings as the first game (board size, game mode, and player types)
	3.2	User starts a new game outside of a game	Start a new game by selecting the game mode, board size, and player types	The new game should start with the desired game mode, board size, and player types

4	4.1	User makes a move on a nonempty cell	Make a move on a nonempty cell in a simple or general game	A message box should show saying an invalid move has been made and no changed to the game state should happen
	4.2	User makes a move outside the game board	Make a move outside the game board	No changes should be made to the game board
	4.3	User makes a move on an empty cell	Make a move on an empty cell	The cell should be filled with an S or O depending on the current move type, and color depending on the player (blue or red)
	4.4	User makes a move before a game has started	Make a move on the board before a game has started	A message box will show telling the user to start a new game and no changes will be made to the board
5	5.1	User makes move that wins a simple game	Start a new simple game and complete an SOS	A message box will show telling the user that they are the winner because they completed the first SOS in a simple game
	5.2	User makes move that does not win a simple game	Start a new simple game and make moves that do not complete any SOSs	The turn should switch to the other player, and the game should not end
	5.3	Simple game ends in a draw	Start a new simple game and make moves until the board is filled and no SOSs are completed	A message box will show telling the user that the game ended in a tie and the game should end
6	6.1	User makes move that wins a general game	Start a new general game and complete at least one SOS with the blue player. Then fill in the rest of the board without completing another SOS by the blue player or the red player.	A message box will show telling the user that the blue player won because they completed the most SOS lines
	6.2	User makes move that does not win a general game, but completes a SOS	Start a new general game and complete an SOS with the blue player.	After completing the SOS, the blue player should get another turn.

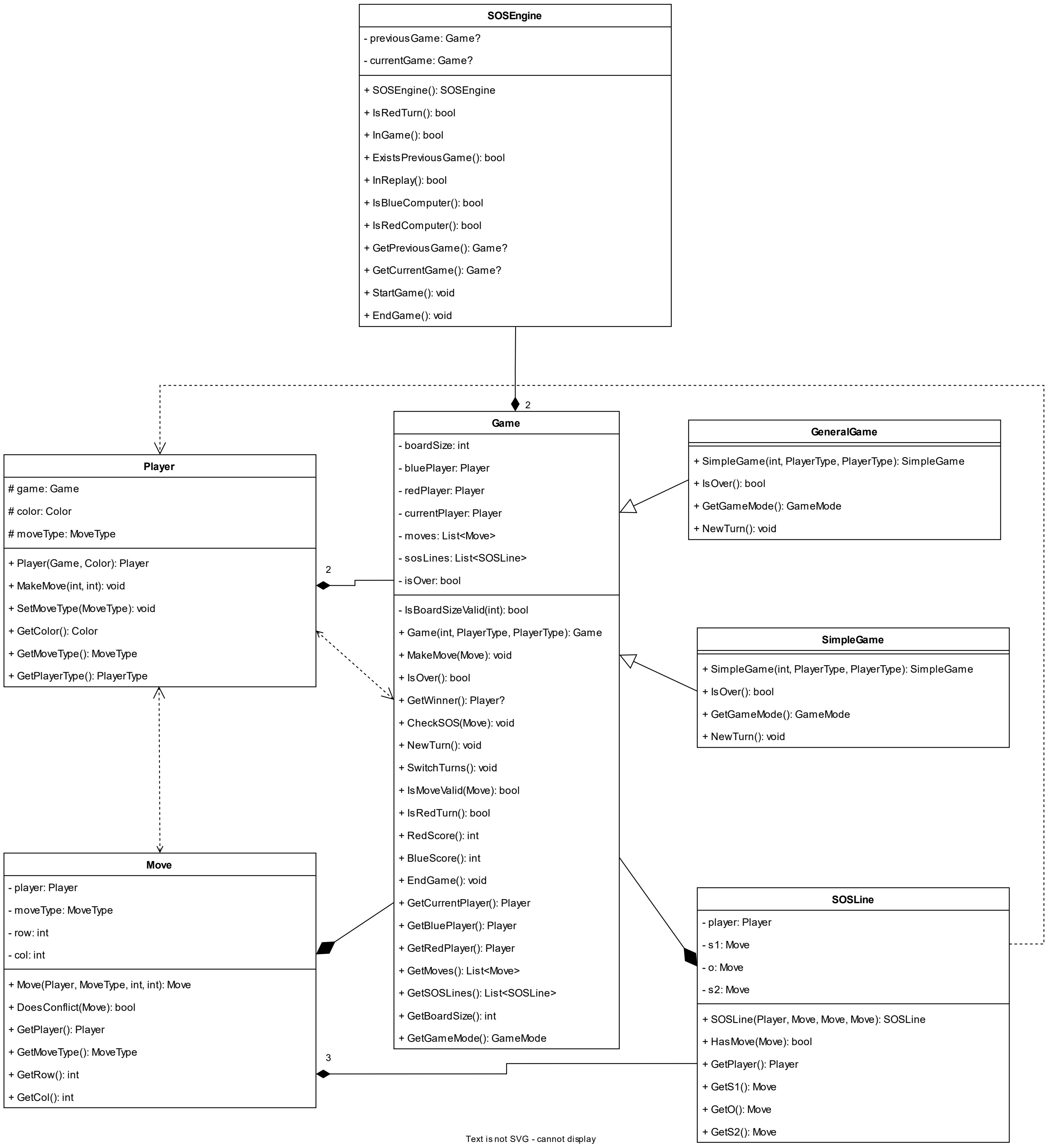
	6.3	User makes move that does not win a general game and does not complete a SOS	Start a new general game and make a move with the blue player, but do not complete an SOS.	After making a move without completing an SOS, it should be the red player's turn.
	6.4	User makes move that ends general game in a draw	Start a new general game and make moves until the board is completely filled up, but make sure the number of SOSs completed by the blue and red players are the same.	A message box will show telling the user that the general game ended in a draw because the blue and red players completed the same number of SOS lines.
8	8.2	User does not select a move option	Start a new game, and then make a move on an empty cell	The cell should be filled with the default move type, S
	8.3	User selects a move option with the values S or O	Start a new game, then select a move option, and then make a move on the board	The corresponding cell should be filled with the S or O move option that the user picked
	8.4	User attempts to select a move option outside of a game	Before a game has started, select a new move option	No changes should be made to the move option

4.3 Other automated or manual tests not corresponding to the acceptance criteria

Number	Production Code Class.Method	Test Code Class.Method	Test Input	Expected Result
1	AccessibilityManager.IsNewGameButtonAccessible	AccessibilityManagerTest.TestIsNewGameButtonAccessible	A game that hasn't started yet	FALSE
2	^	^	A game that has started	TRUE
3	AccessibilityManager.IsCurrentTurnDisplayAccessible	AccessibilityManagerTest.TestIsCurrentTurnDisplayAccessible	A game that has not started	FALSE
4	^	^	A game that has started	TRUE
5	ComputerPlayer.GetPlayerType	ComputerPlayerTest.TestGetPlayerType	The player type of a new ComputerPlayer object	MoveType.Computer
6	HumanPlayer.GetPlayerType	HumanPlayerTest.TestGetPlayerType	The player type of a new HumanPlayer object	MoveType.Human
7	Game.SwitchTurns	GameTest.TestSwitchTurns	The player's turn when the game just started, so the blue player	After switch turns, it should be the red player
8	Move.DoesConflict	MoveTest.TestDoesConflict	A move that conflicts with another move	TRUE
9	SimpleGame.NewTurn	SimpleGameTest.TestNewTurn	SimpleGame.NewTurn is called during a game when it is the blue player's turn	It should now be the red player's turn
	^	^	SimpleGame.NewTurn is called during a game when it is the red player's turn	It should now be the blue player's turn
11	GeneralGame.NewTurn	GeneralGameTest.TestNewTurn	GeneralGame.NewTurn is called when it is the blue player's turn and they did not complete an SOS on their last move	It is now the red player's turn
12	^	^	GeneralGame.NewTurn is called when it is the blue player's turn and they completed an SOS on their last move	It is still the blue player's turn
13	^	^	GeneralGame.NewTurn is called when it is red player's turn and they did not complete an SOS on their last move	It is now the blue player's turn

14	^	^	GeneralGame.NewTurn is called when it is the red player's turn and they completed an SOS on their last move	It is still the red player's turn
15	Game.CheckSOS	Game.TestCheckSOS	SOS line (last O) ->vertical line case	New SOS line appended to Game.sosLines
16	^	^	SOS line (last O) ->horizontal line case	New SOS line appended to Game.sosLines
17	^	^	SOS line (last O) -> positive diagonal case	New SOS line appended to Game.sosLines
18	^	^	SOS line (last O) -> negative diagonal case	New SOS line appended to Game.sosLines
19	^	^	SOS line (last S) -> vertical line case (last move on top S)	New SOS line appended to Game.sosLines
20	^	^	SOS line (last S) -> vertical line case (last move on bottom S)	New SOS line appended to Game.sosLines
21	^	^	SOS line (last S) -> horizontal line case (last move on right S)	New SOS line appended to Game.sosLines
22	^	^	SOS line (last S) -> horizontal line case (last move on left S)	New SOS line appended to Game.sosLines
23	^	^	SOS line (last S) -> positive diagonal case (last move on top-right S)	New SOS line appended to Game.sosLines
24	^	^	SOS line (last S) -> positive diagonal case (last move on bottom-left S)	New SOS line appended to Game.sosLines
25	^	^	SOS line (last S) -> negative diagonal case (last move on top-left S)	New SOS line appended to Game.sosLines
26	^	^	SOS line (last S) -> negative diagonal case (last move on bottom-right S)	New SOS line appended to Game.sosLines

5. Class hierarchy design regarding implementation of the Simple and General Game:



Explanation of Class Hierarchy

The SimpleGame and GeneralGame classes both inherit from the abstract Game class, and override the methods GetGameMode, IsOver, and NewTurn. The Game.GetGameMode method assists the SOSEngine class upon starting a new game with the appropriate game mode (SimpleGame or GeneralGame).

The Game.IsOver method assists the SOSEngine in determining whether a Game is over when a user makes a move. In a SimpleGame, the game is over when the user completes an SOS, or the entire game board is filled up without any completed SOS's resulting in a draw. On the other hand, a GeneralGame is over when the entire game board is filled up with SOSs and the winner is the player with the most completed SOS's; if both players have the same number of SOSs, then the game is a draw.

The Game.NewTurn method determines whether the game should switch turns after a player makes a move. In a SimpleGame, the turns will switch each time a player makes a move. In a GeneralGame, on the other hand, the turns will switch only if the last move did not complete an SOS.

The Move, Player, and SOSLine classes mainly act as simple state managers for helping manage move making, turn switching, and SOS completion respectively.