System Requirements

CSC 480-800 / HCI 521-800
Spring 2018

For “Oswebble”

SUNY Oswego
Version 1.4.2

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Section 1 - Introduction:

Pretext

The product at question is the resultant of the State University of New York [SUNY] Oswego's HCI 521-800 / CSC 480-800 Software Design Spring 2018 course; directed and managed by Dr. Bastian Tenbergen. The objective of this course is to apply the concepts of software engineering and software development in a structured group project. The entire class will work together on a project assigned by the instructor(s) and will collaborate throughout the semester.

Our purpose is to sufficiently outline and shape a system that can effectively deliver a unique variation of Scrabble™ to a workstation in the Richard S. Shineman Center of SUNY Oswego. The system will only interact with those close enough to connect a mobile device, laptop, or any device with web capabilities to the hardware.

1.1 System Definition Glossary:

A.I. -	an artificial intelligent player, that becomes a placeholder for a [human] player during a game session
Chosen Dictionary -	refer to 'dictionary'
'Dictionary' -	the database containing all the allowed words to be used in our game
Forfeit -	the human player leaves the game session
'Game' -	refers to the system being created
Game Bag -	refers to the digitally-bottomless repository that randomly deals tiles; based on a team dependent algorithm.
Game Board -	the graphically displayed shape with smaller shapes inside it representing spaces where tiles may be played
Game Interface -	the screen in which the player will interact with
Game Session -	the allotted time that it takes from the start of a new board to an endgame scenario

Hand -	the set of letters a player is allowed to play onto the board
Pass -	when a player, deliberately skips their turn during the current game session, due to their belief of having no available words to contribute to the game board
Player -	a person or AI actively playing the game session
Space(s) -	an individual spot that a tile can reside in a game session
Tile -	an individual game piece that has either a single letter or is ‘blank’--with a corresponding point value--playable on the board
Word Dictionary -	refer to ‘dictionary’

1.2 Misc Glossary

Abbreviation -	a shortened form of a word or phrase
Anagram -	a word, phrase, or name formed by rearranging the letters of another, such as *cinema*, formed from *iceman*.
Apostrophe -	a punctuation mark (’) used to indicate either possession (e.g., *Harry's book* ; *boys' coats*) or the omission of letters or numbers (e.g., *can't* ; *he's* ; *class of ’99*)
Cardinality -	the number of elements in a set or other grouping, as a property of that grouping.
Mulligan -	pertaining to switching out letters for new ones.
Noun -	is the word used for a class of person, place or thing
Pronoun -	a word that can function by itself as a noun phrase and that refers either to the participants in the discourse (e.g., *I*, *you*) or to someone or something mentioned elsewhere in the discourse (e.g., *she*, *it*, *this*)
Proper Noun -	is the name of a person, place or thing (i.e., its own name); a proper noun always starts with a capital letter
Prefix -	a word, letter, or number placed before another.
Suffix -	a morpheme added at the end of a word to form a derivative, e.g., *-ation*, *-fy*, *-ing*, *-itis*.

Section 2 - Overall Description

2.1 Product Perspective

Based from the instructor selected topic, “arcade”, the class agreed upon developing a SUNY Oswego Themed spin-off of the classic board game Scrabble™. Scrabble™ is a word game in which two to four players score points by placing tiles bearing a single letter onto a board divided into a 15x15 grid of squares. The tiles must form words which, in crossword fashion, read left to right in rows or downwards in columns, and be defined in a standard dictionary or lexicon. This product will be subjected to the original Scrabble™ parameters, except inherently different.

2.2 Product Functions

The game itself will consist of a game session with four players--be them all AI players, all human players, or a combination of the two. Each player will take their turn in placing randomly selected tiles from their hand--any amount of tiles so long as it does not exceed the amount of tiles the player is currently holding--onto the game board; in an attempt to stem valid words off of one another until the game session runs into a end-game scenario. The end-game scenario can be one of two: (1) the game board is filled to a point where no possible moves are available, or (2) the players in the present game session ‘pass’ a given amount of times, such that they activate end-game scenario (1).

The players will be able to shuffle the tiles within their hand, place tiles onto the game board, exchange a given amount of tiles for new ones, access a ‘help’ button that shall explain the rules of the game and how to operate the game.

2.3 User Class and Characteristics

C1.0 SUNY Oswego Student(s)

- Visits Shineman Center frequently: has some course in Shineman
- Knows that the game exists and how to access it

C1.1 Education Level

- C1.1a : English as primary language : has a fluent level of English vocabulary
- C1.1b : English as secondary language : has a basic level of English vocabulary

C1.2 Game Experience

- C1.2a : Has played some variation of Scrabble™ prior
- C1.2b : Has never played some variation of Scrabble™ prior

C2.0 SUNY Oswego Faculty

- Knows that the game exists and how to access it

C2.1 Visits Shineman Center frequently

- C2.1a : Has some course in Shineman
- C2.1b : Has an office in Shineman

C2.2 Education Level

- C2.2a : English as primary language : has a fluent level of English vocabulary
- C2.2b : English as secondary language : has a basic level of English vocabulary

C2.3 Game Experience

- C2.3a : Has played some variation of Scrabble™ prior
- C2.3b : Has never played some variation of Scrabble™ prior

2.4 Operating Environment

There is a kiosk stationed at the main entrance of Richard S. Shineman Science Center of SUNY Oswego, where two monitors will be garrisoned. The primary monitor will be projecting a live imitation of the game board, as well as the player's hand, all placed words on the game board, and the current game scores between the two teams. The secondary monitor will project game statistics--i.e. Each team's cumulative scores, team's best game scores, highest yielding word score, most frequently used word, etc.

The players are able to interact with the game via any device that has the ability to access the internet--such as smart devices, laptops, tablets, etc.--so long as the player is within the Shineman Center.

2.5 Design and Implementation Constraints

(1) Scrabble™ is a copyrighted game, therefore the game must be inherently different to the original; meaning the board cannot exhibit these properties:
    (a) 15x15 board
    (b) Center logo be a star
    (c) Same word/letter bonuses board layout
    (d) Same point value for letter tiles as Scrabble™

(2) The Chosen Dictionary database
    (a) English language
    (b) Must not contain any proper nouns
        (i) The Oswego Themed dictionary database is the only exception to this constraint
    (c) Must not contain any word that is only a suffix, abbreviation, or prefix
    (d) Must not include, nor contain, any word that requires a hyphen or apostrophe
    (e) Shall not contain words of profanity

2.6 Assumptions and Dependencies

(1) User Assumptions:
    (a) The User has a device that can connect to the target hardware.
    (b) The User is able to use their device correctly to play the game.
    (c) The User is completely literate in the English language.
    (d) The User understands how to start and end a game .
(2) Software Assumptions and Dependencies:
    (a) The Ubuntu operating system will be stable.
    (b) The server will be constantly running.
(3) Hardware Assumptions and Dependencies:
    (a) The monitor will display the user interface consistently
    (b) The CPU will never fail to execute instructions
(4) Other Assumption and Dependencies:
    (a) All libraries used during development are reliable and consistent.
    (b) The interface will be understandable for all players.

Section 3 - System Requirements

3.1 - External Interface Requirements:

3.1.1 User Interfaces

ID	Type	Requirement
UI1.0	Functional	The primary monitor shall display information relating to the game session.
UI1.0.1	Functional	The game session statistics shall include the team scores, individual scores, and individual player usernames.
UI1.1	Functional	The primary monitor shall display the gameboard.
UI1.2	Functional	The primary monitor shall display the players and the game board.
UI2.0	Functional	The secondary monitor shall display game statistics.
UI2.1	Constraint	Any high scores that are displayed must only be that of a human player.
UI3.0	Functional	The game board shall be a shape that allows the game to be playable.
UI3.1	Constraint	The game board must not be circular.
UI3.2	Constraint	The game board must be two-dimensional.
UI4.0	Functional	The overall stats should display the ten highest accumulated scores by human players.
UI4.0.1	Functional	The top accumulated scores shall be separated by team, five for each team.
UI4.1	Functional	The overall stats shall display the five all-time highest word scores by human players.

3.1.2 Hardware Interfaces

ID	Type	Requirement
HI1.0	Constraint	The system must operate on a Intel Core i7-3770 CPU which runs at 3.40 GHZ on 8 cores.
HI2.0	Constraint	The system must work on a Gallium 0.4 on NVC1 graphics card.
HI3.0	Constraint	The system must not use more memory than is available on the computer.
HI3.1	Constraint	The system must not exceed the available RAM on the computer.
HI3.1a	Quality	The computer has the capacity of running 40% of the 8 cores.
HI4.0	Constraint	The data must not exceed the available storage on the hard drive.
HI4.0a	Quality	The computer has 218 GB of available storage of 243 GB total.

3.1.3 Software Interfaces

ID	Type	Requirement
SI1.0	Constraint	The system must run on the Ubuntu 16.04 LTS operating system.
SI1.1	Constraint	The system must run on a 64-bit operating system.
SI2.0	Constraint	The system must work on the following browsers: Google Chrome, Mozilla Firefox, Internet Explorer, and Apple Safari.
SI2.0a	Quality	The browsers used to interact with the system must be to the most current version.
SI3.0	Constraint	The system must be tested using the following set of frameworks: JUnit 5, Jasmine, and SQL Server Unit Tests.

3.1.4 Communications interfaces

ID	Type	Requirement
CI1.0	Constraint	The game must be accessible from mobile devices.
CI1.1	Functional	Mobile devices include smartphones, tablets, and laptops.
CI2.0	Constraint	Mobile devices must be able to communicate with the game via a wireless connection.
CI2.1	Functional	The user shall interact with the game via web browsers allowed in SI2.0.

3.2 - Functional Requirements

3.2.1 Performance Requirements

ID	Type	Requirement
PR1.0	Quality	The response time of the UI upon user input shall be no more than one second time.
PR2.0	Functional	The system shall be available whenever a student wants to play, with a reliability factor of 90%.
PR3.0	Quality	The system shall run in a manner which is consistent with the game rules 90% of the time.

3.2.2 Design Constraints

ID	Type	Requirement
DC1.0	Constraint	The game must only use the English language.
DC2.0	Constraint	A game must have four players.
DC2.1	Functional	Either four human players, four A.I. players, or some combination of both.
DC3.0	Functional	The game shall have an English word dictionary.
DC3.1	Constraint	The dictionary must not contain any proper nouns.
DC3.2	Constraint	The dictionary must not contain any word that is only a suffix, abbreviation, or prefix.
DC3.2a	Constraint	The dictionary must not include any word that requires a hyphen or apostrophe.
DC3.2b	Constraint	The dictionary must not contain any word that requires a hyphen or apostrophe.
DC3.3	Functional	If a word does not exist in the chosen dictionary, it cannot be played.
DC3.3.1	Functional	All words formed must be a valid word from the chosen dictionary, upon submission.
DC3.4	Constraint	Foreign words are not allowed to be placed on the board unless it is already in the dictionary described in DC3.0.
DC3.5	Constraint	There must be no word deemed as profanity in the chosen dictionary.
DC4.0	Constraint	Each player will always start their turn with 7 tiles in their hand.
DC4.1	Functional	Each player's tiles should be visible to all other players.
DC5.0	Constraint	On their turn, a player must either add a new word to the board or replace any amount of existing tiles in their hand, with an equal amount of new tiles from the game bag.

DC6.0	Constraint	The first word placed must cover the center space.
DC7.0	Constraint	All words played by any player must share at least one letter with an existing word on the board.
DC7.0a	Functional	Except for the first word played on the board; refer to DC6.0 for further constraints.
DC7.1	Constraint	Words played horizontal must be read from left to right.
DC7.2	Constraint	Words played vertically must be read from top to bottom.
DC8.0	Functional	Blank tiles can represent any letter, but award no points.
DC8.1	Functional	A blank tile already played, cannot change its assigned letter.
DC9.0	Functional	The teams will be: Green and Gold.
DC9.1	Constraint	Once a human player has been assigned a team, they are permanently on that team.
DC10.0	Functional	The game interface will display information pertinent to its human player.
DC10.1	Functional	Pertinent information includes, the gameboard and the player's tiles.
DC11.0	Functional	Each tile shall have a letter, as well as a numeric value in one of the corners.
DC11.0.1	Quality	There must be design consistency between tiles.
DC11.1	Constraint	DC8.0 and DC8.1 are exempt from DC11.0
DC11.2	Constraint	The letter must be bigger in print size than that of the numeric value.
DC12.0	Functional	On the game board, some spaces shall be allocated as multipliers.
DC13.0	Constraint	The game board must be significantly different from Hasbro's scrabble board.
DC13.1	Constraint	Point values of tiles must differ from the official Hasbro point distribution.

DC14	Constraint	The ‘end game’ and ‘submit word’ options must be located on the game interface; such that they will not cause accidental ‘pressed’ and or confusable.

3.2.3 Software System Attributes

ID	Type	Requirement
SA1.0	Functional	When a word is placed on the game board, the system shall search the word dictionary, upon submission, for validity in the chosen dictionary.
SA2.0	Functional	There will be a seperate dictionary representing Oswego oriented words.
SA2.1	Functional	Proper nouns that are Oswego oriented are exempt from DC3.1.
SA2.2	Functional	A word referencing SUNY Oswego should receive a predetermined bonus to its score.
SA3.0	Functional	The sequence of players shall be determined randomly.
SA4.0	Functional	If a human player is inactive for a determined amount of time, the human player shall be replaced with an AI player.
SA5.0	Functional	Tiles used to form a word will be removed from that player’s hand.
SA5.1	Functional	After a word is played, the player will receive random tiles until they have 7.
SA6.0	Functional	Tiles on the board will persist until the game session is over.
SA7.0	Functional	Information on the player includes: current tiles, current score, player name.
SA8.0	Functional	Relevant statistics shall be determined by developers.
SA9.0	Functional	A playable space with a multiplier will have a combination of one number followed by a “W” or “L”.
SA9.1	Functional	The “W” multiplier shall be applied to the summed value of the word or the ‘whole word’.

SA9.2	Functional	The “L” multiplier shall be applied to the individual letter placed on that space.
SA9.3	Functional	If a word is placed upon multiple multipliers, the “L” multiplier(s) is applied first, followed by any “W” multiplier(s).
SA10.0	Functional	When a word is played by a player, the total points earned are from all the tile values added together; along with the multipliers.
SA11.0	Functional	Multiple word multipliers shall be resolved multiplicatively.
SA11.1	Functional	The multiplier space counts only once towards any player’s score.
SA12.0	Functional	Points shall be kept track of throughout the game session.
SA13.0	Functional	Spaces allocated as multipliers shall be distributed as designed by each respective team.
SA14.0	Functional	There shall be a game bag.
SA15.0	Functional	The value of each tile shall be determined preemptively by the developers.
SA16.0	Functional	Any other letters connecting to the tiles placed shall also be added into the total score; so long as the subsequent connecting letters are from a dictionary accepted word.
SA17.0	Functional	The AI shall use an anagram generator when playing.
SA18.0	Functional	Any player can quit and or forfeit during the game at any time.
SA18.1	Functional	All players shall be given the option to play again or quit.
SA19.0	Functional	Players shall be able to temporarily switch teams.
SA19.0a	Functional	This is an exception to DC9.1.
SA20.0	Constraint	The system must be able to inform the players of the rules of the game.

3.2.4 Other Requirements

ID	Type	Requirement
OR1.0	Constraint	The chosen name of the game must be significantly different from “Scrabble”.
OR2.0	Functional	The game shall end when there are no available moves.
OR2.1	Functional	There are no available moves if every space is filled.
OR2.2	Functional	There are no available moves if a player is unable to play at least one tile resulting in a valid word.
OR3.0	Functional	Each human player shall have a profile to track overall statistics.
OR3.1	Functional	If a human player does not have a profile, they shall be required to make one before playing.
OR3.2	Functional	The statistics tracked will be determined by the developers.
OR4.0	Functional	The player profile shall be placed on a team.
OR5.0	Constraint	There must only be a single game session running at any given time.
OR6.0	Functional	The team with the most points at the end state is deemed the winner.
OR7.0	Functional	After a game session ends, a new game session will begin.
OR8.0	Quality	Extra Rules may be added so long as they are deemed fun by the stakeholder.
OR9.0	Functional	Players must finalize their word, thereby being able to make corrections, before committing their word.

Section 4 - System Goals:

4.1 System Goals

ID	Type	Goal
G1	Quality	The players will have an engaging and fun experience
G2	Quality	The statistics screen shall show accurate stats of players.
G3	Functional	The game will have a functional and beatable AI.
G4	Quality	The UI shall be simple and easy to use.
G5	Quality	The game will have a catchy name.
G6	Quality	The system will use the two screens in an interesting and intuitive way.
G7	Quality	The system shall run smoothly with no game breaking bugs.
G8	Constraint	The system shall have a SUNY Oswego theme.
G9	Functional	The system shall be fair for all players.
G9.1	Functional	The game board will be evenly balanced for all players.
G10	Quality	The game shall feel rewarding to the players.
G11	Quality	The kiosk shall be visually appealing and inviting.
G12	Functional	Creating a new game session shall be easy and fast to do.

Section 5 - System Scenarios:

5.1 Primary Scenarios

ID	Actor Action	System Response
S1	Player exchanges a number of tiles.	The system gives them random tiles until they have seven tiles.
S2	A human player joins the game session for the first time.	The system prompts the user to create a profile before placing them in the game.
S2.1	A human player joins the game session.	The system places the player on their respective team as determined by the player database.
S3	A human player elects to switch teams.	For one game session, the system tracks statistics as if the player is on the opposite team.
S4	A human player walks away from the game session.	The system removes the player from the game session, and the AI takes over.
S5	A human player plays a valid word.	The system calculates the value of the word, looks for any multiplier bonuses and adds the score to the players respective team. The score is then recorded in the database for statistical analysis.
S6	A human player attempts to play an invalid word.	The system prompts an error message indicating that the attempted word is invalid.
S7	The game session ends.	The system records all relevant game statistics, prompts a message notifying the players of the winning team, and starts a new game session.
S8	A human player plays an Oswego based word	The system prompts a message to the human player acknowledging an Oswego word was used. The system then provides a score bonus and adds the score to the

		player's respective team.
S9	A human player presses the help button.	The system displays a list of rules pertaining to playing the Oswebble and instructions about the game interface.
S10	A human player wins the game session as denoted by one of the win conditions.	The system congratulates the player who has won. The system then restarts the game session and refreshes the tiles in the hand of any player still in the game session.
S11	A human idles on the play screen for an allotted time.	The system removes the player from the active game session. The system provides an informative notification that the player was removed for inactivity.
S12	A human player forfeits a game session.	The system removes that player from the game session and notifies on the primary screen that the player has left.
S13	A human player tries to play a tile in an invalid space.	The system notifies the player, through some means of feedback, indicating that that move conflicts with the rules of the game.
S14	A human player plays a word that fills a multiplier space.	The system prompts a message to the user acknowledging that a bonus was awarded. The system then provides a score bonus and adds the score to the player's respective team.
S15	A human player places a blank tile.	The system prompts the player to select a letter that tile will now represent. The system will then show the chosen letter on the blank tile for the rest of the game session.
S16	A human player extends an existing word (i.e. adds 's' to 'extend')	The system acts according the response in S5, but only receives multiplier bonuses for new tiles placed.
S17	A human player switches teams for a game session.	The system prompts the human player that they have switched from one team to the other, and refreshes the player's game

		session.

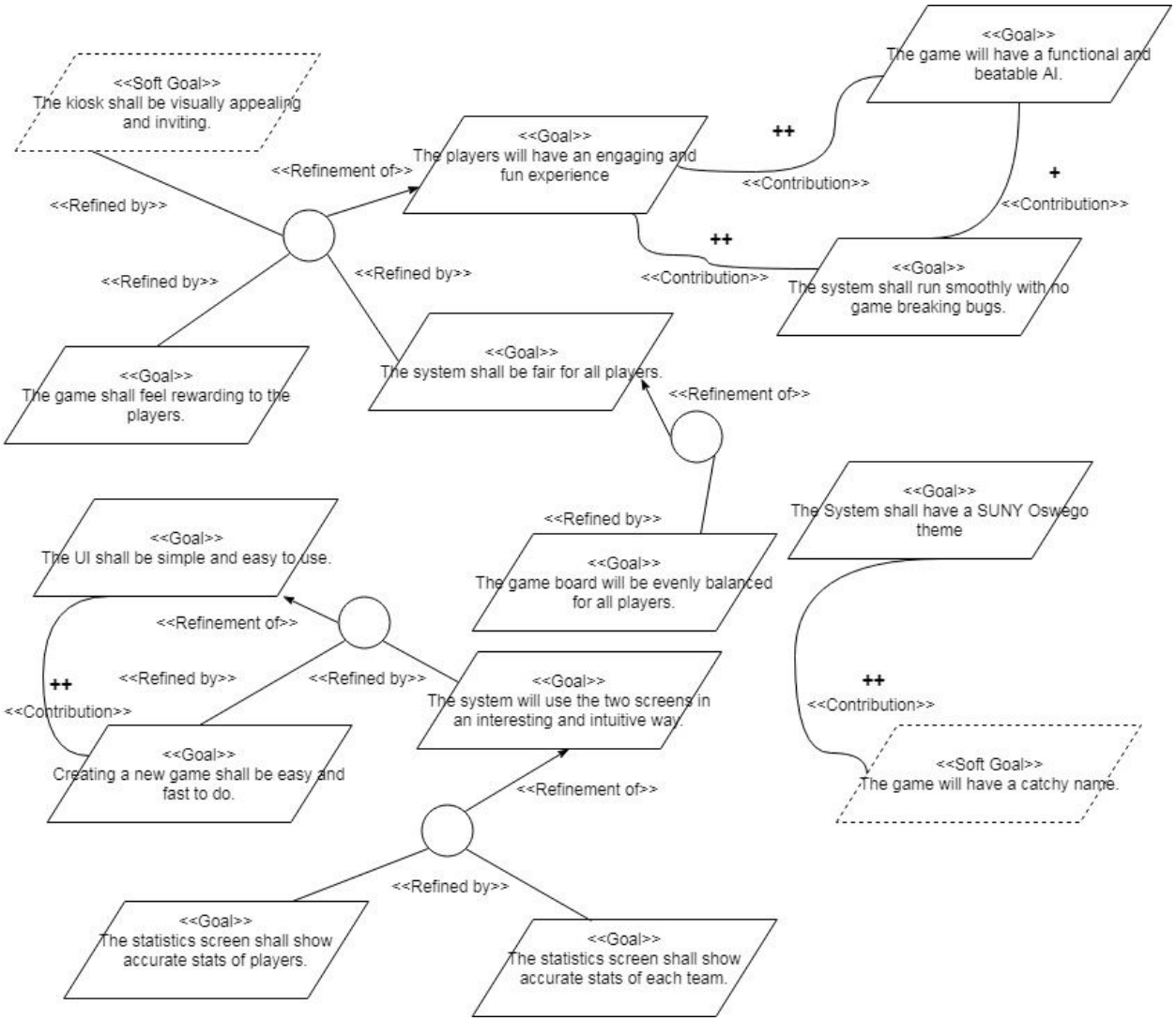
5.2 Alternative Scenarios

ID	Actor Action	System Response
A1	Human player decides to close the webpage.	The system replaces them with an AI player.
A2	A human player switches their phone from horizontal to vertical.	The system GUI changes from horizontal to vertical.
A3	A human player switches their phone from vertical to horizontal.	The system GUI changes from vertical to horizontal.
A4	A human player tries to play a word on top of another word.	The system prompts an error message, indicating that the chosen space is already taken.
A5	A human player attempts to make the first move of the game session not on the center space.	The system prompts an error message, indicating that the first word of the game session must be played on the center tile.
A6	A human player attempts to place a word diagonally.	The system prompts an error message indicating that words may only be played horizontally or vertically.
A7	A human player tries to mulligan zero tiles.	The system prompts an error message saying that at least one tile must be replaced.
A8	A human player tries to go when it is not their turn.	The system prompts an error message saying that it is not their turn yet.
A9	A human player tries to play a profanity word.	The system prompts an error message saying that the word is invalid, and to try a new word.
A10	A human player attempt to join the a game	The system prompts an error message,

	session with 4 existing players.	stating that the game session is full.
A11	A human player accidently presses the web-browser 'back' button.	The system prompts the user if they intended to leave the page.

Section 6 - Relevant System Diagrams:

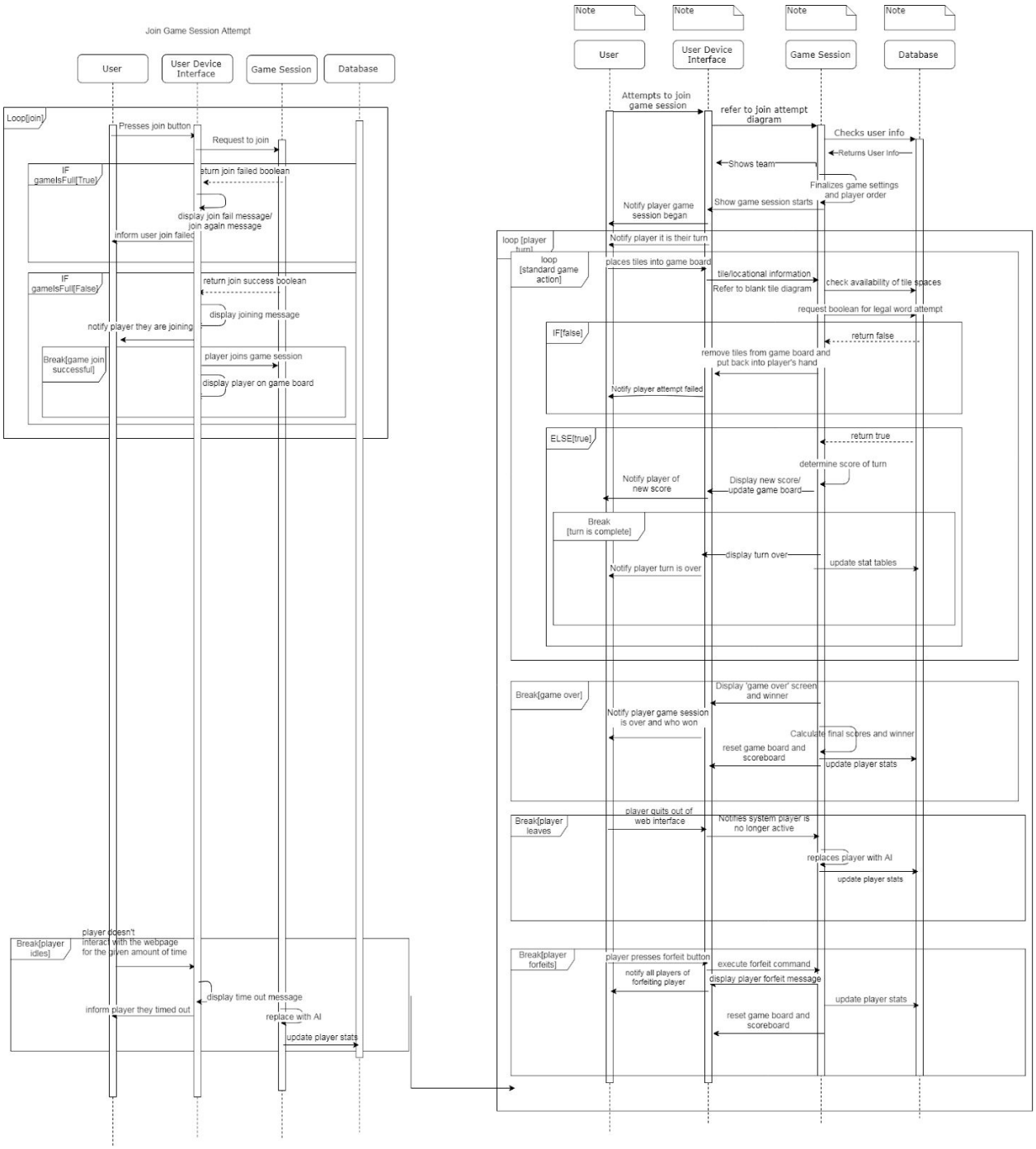
6.1 KAOS Diagram

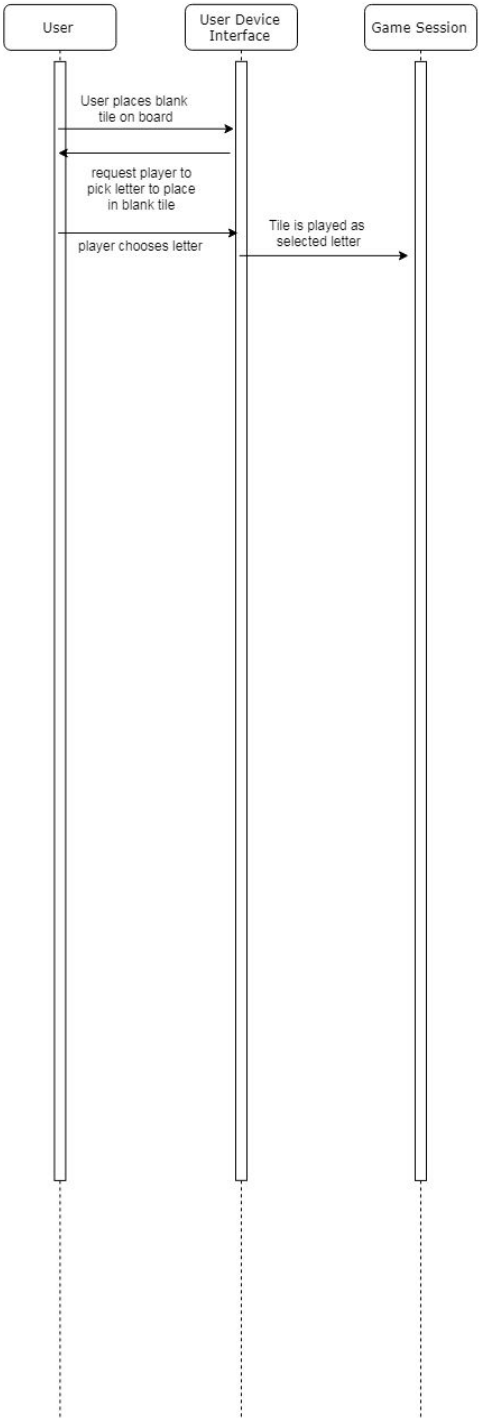


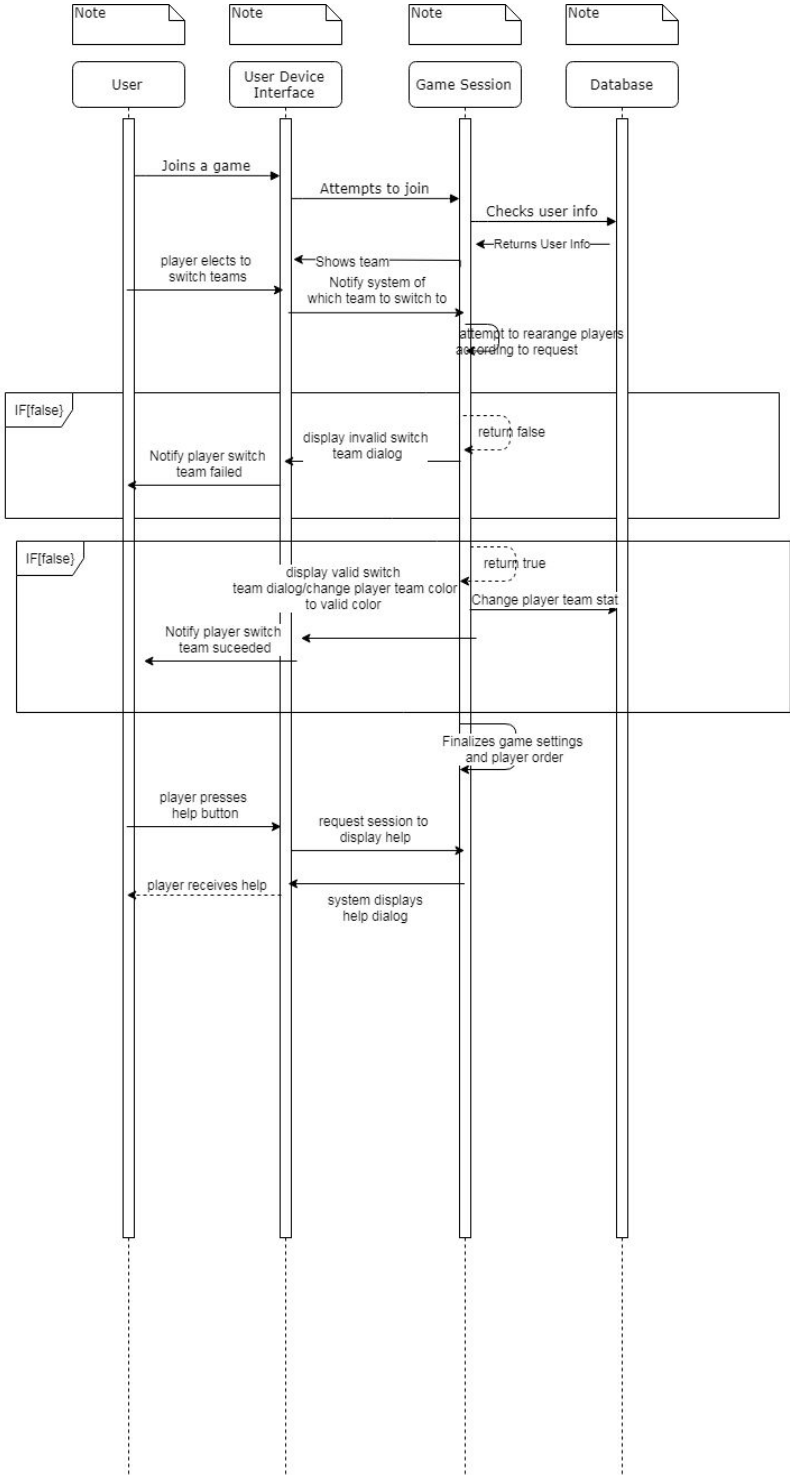
6.2 System Interaction Diagram

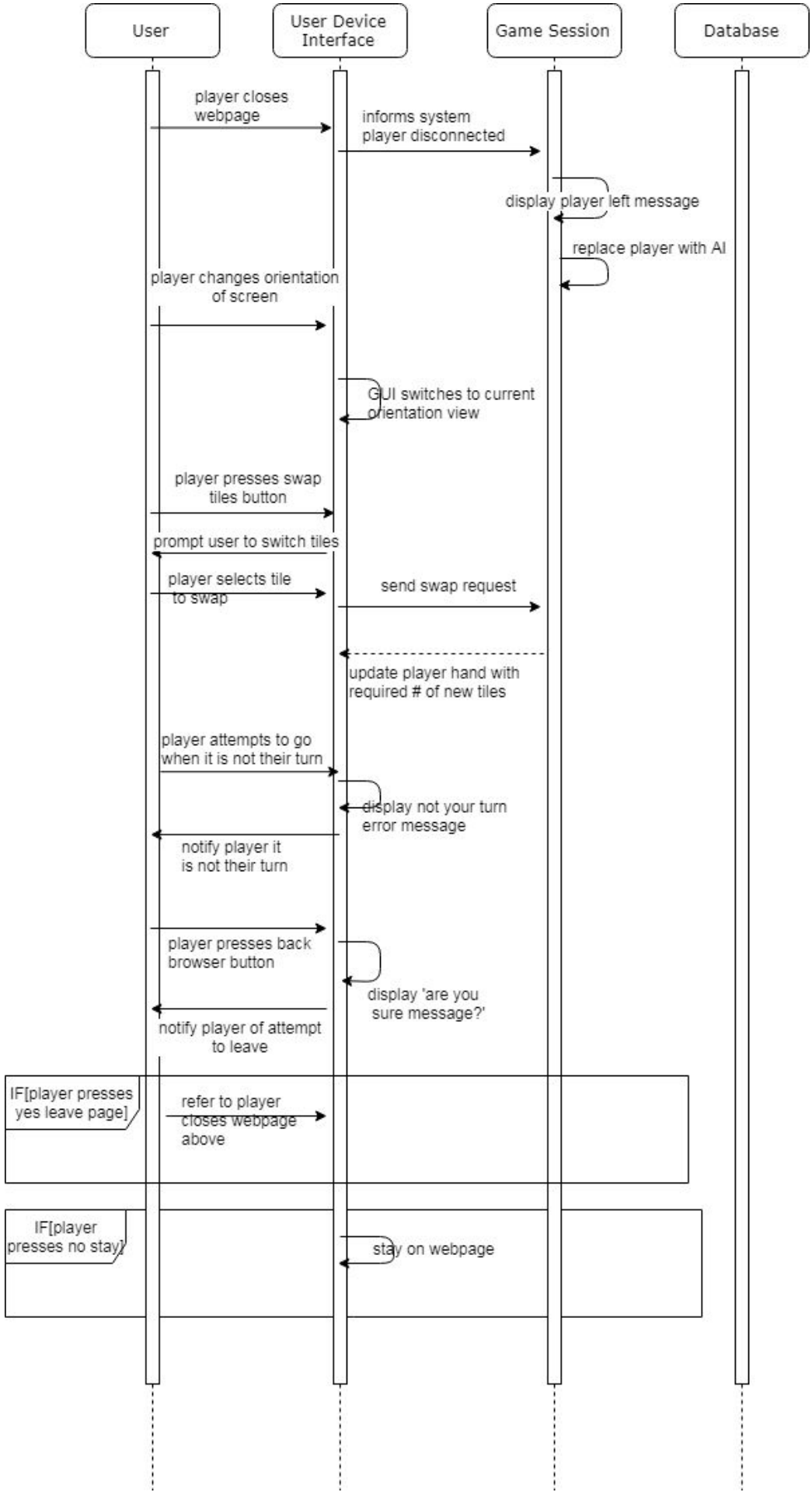
[NOTE] All the diagram have been publish to the web and can be located here:

https://www.draw.io/?lightbox=1&highlight=0000ff&edit=_blank&layers=1&nav=1#G1KE6Xr4q6bodnfNTukm-tev6yhBy8aSX4




User
User Device Interface
Game Session
User places blank tile on board
request player to pick letter to place in blank tile
player chooses letter
Tile is played as selected letter


Note
Note
Note
Note
User
User Device Interface
Game Session
Database
Joins a game
Attempts to join
Checks user info
Returns User Info
player elects to switch teams
Shows team
Notify system of which team to switch to
attempt to rearange players according to request
IF[false]
display invalid switch team dialog
return false
Notify player switch team failed
IF[false]
return true
display valid switch team dialog/change player team color to valid color
Change player team stat
Notify player switch team suceeded
Finalizes game settings and player order
player presses help button
request session to display help
player receives help
system displays help dialog


User
User Device Interface
Game Session
Database
player closes webpage
informs system player disconnected
display player left message
replace player with AI
player changes orientation of screen
GUI switches to current orientation view
player presses swap tiles button
prompt user to switch tiles
player selects tile to swap
send swap request
update player hand with required # of new tiles
player attempts to go when it is not their turn
display not your turn error message
notify player it is not their turn
player presses back browser button
display 'are you sure message?'
notify player of attempt to leave
IF[player presses yes leave page]
refer to player closes webpage above
IF[player presses no stay]
stay on webpage