

UML Specification and UI Design Document

bigBang

A Gobang game with “big” features

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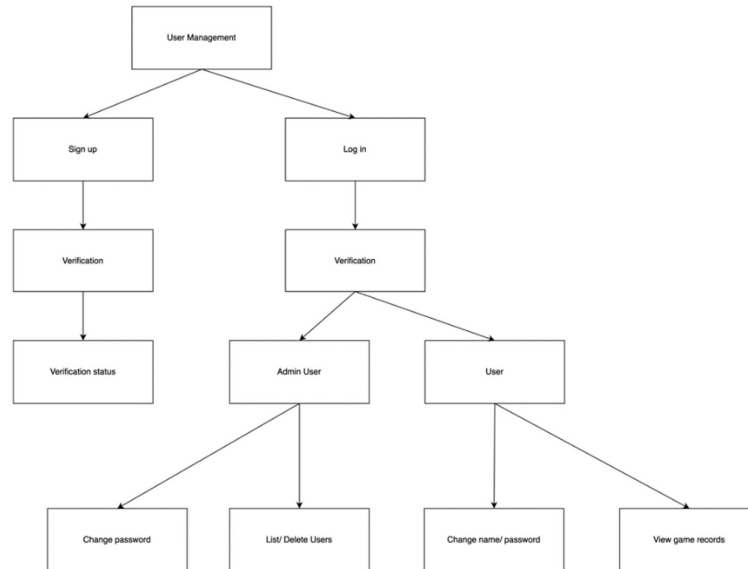
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I. UML DESIGN

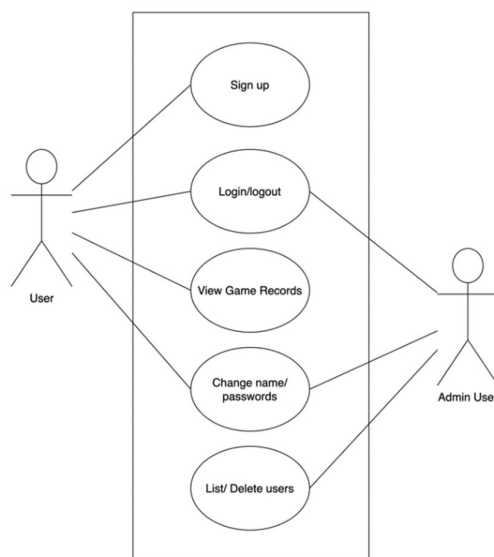
I.I Component-1: User Management

I.I.I Structural Diagram

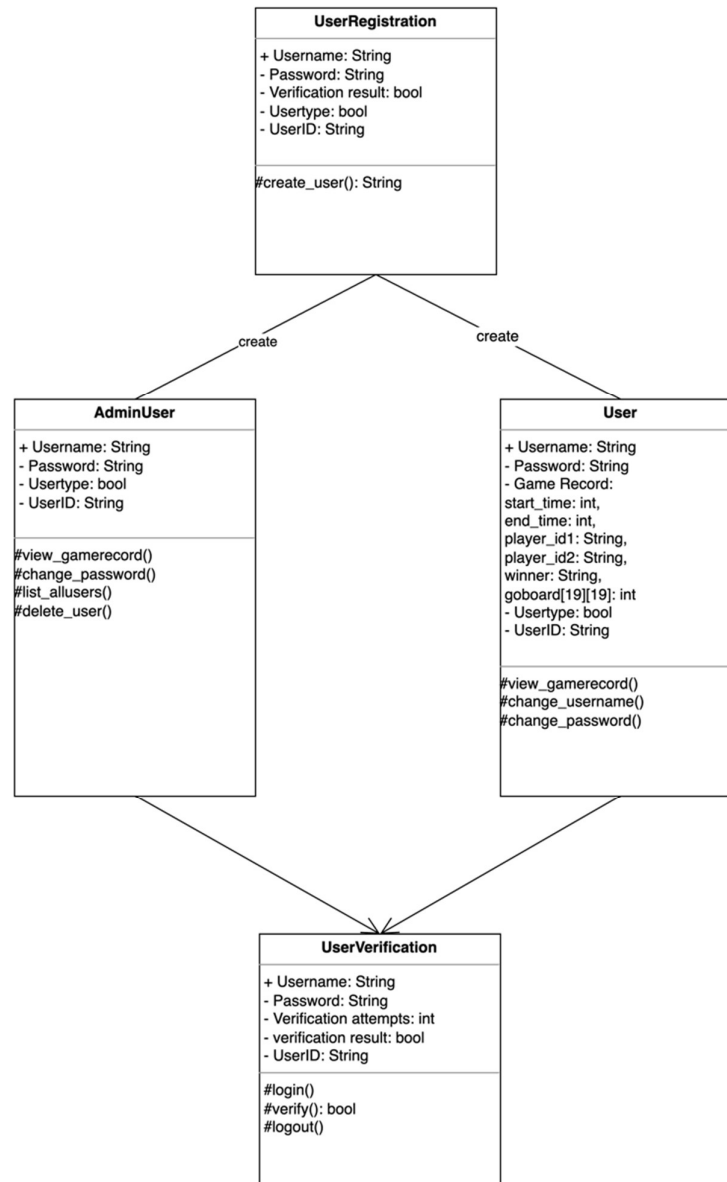


I.I.II UMLs

Use-case Diagram



Class Diagram



User ID: It is like a unique ID card that is given to each user when they create an account. It's like a special number that's used to tell one user from another, and it's important for managing user accounts and game records.

Username: It is simply the name that each user chooses for their account. It's like a nickname or username that helps other people recognize them in the system.

Password: It is the code that each user chooses to authenticate their account. It is used to protect the user's account from unauthorized access and must be kept confidential.

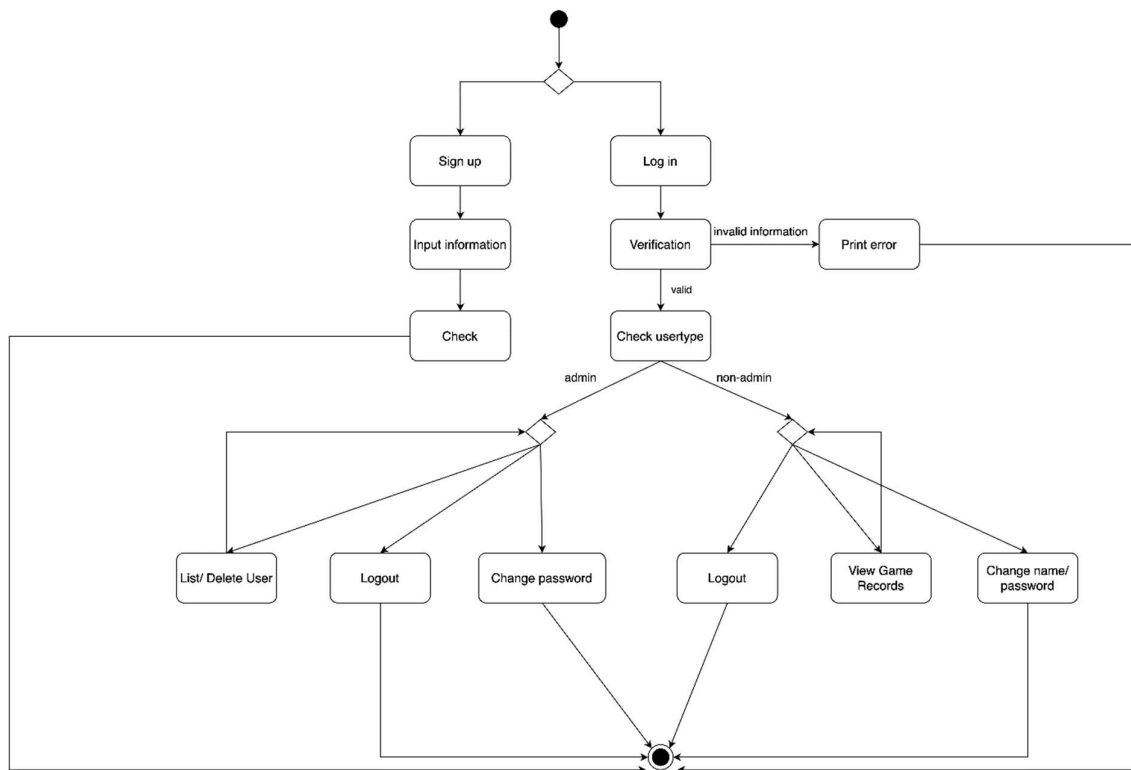
Game Record: It keeps track of all the games that each user has played in the system. It includes information like starting time, duration, users, and final goboard. It's a great way to see how well users are doing and keep track of their progress.

User Type: This variable define whether the user is an admin user or not. Different user will have different functionalities.

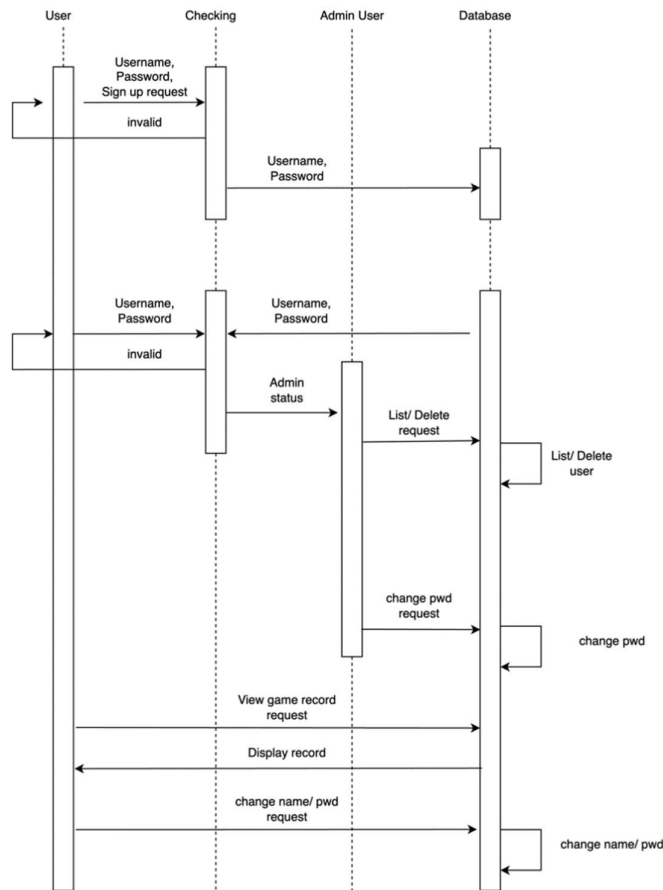
Verification Attempts: This variable represents the number of times that a user has attempted to verify their identity. It is used to limit the number of unsuccessful attempts. And it can protect the system from massive attempting activities by setting a reasonable limit.

Verification Result: This component represents the result of a user verification process, which could be a success or failure. It is used to determine whether the user can access their account.

UML Activity Diagram



UML Sequence Diagram



I.I.III Functionality

The user management system in our Gobang game provides various functionalities for managing user accounts and game records. Users can create new accounts by entering a unique userid, username and password. The system also allows users to log in to their existing accounts with their username and password.

After logging in, users are able to start new games, update their user information, and view their previous game records. In terms of updating user information, they can change their usernames and password. They can also view their previous game records, including start time, elapsed time, player names, winner, and the record of final goboard. They can access their game records by pressing a simple bottom in the user interface.

If the user is an administrative user, then they can list all users and displaying their registration date, usernames, and account status. Besides, they can also delete users. They can change their user information as the same procedure as the normal users.

Overall, the user management system is an essential component in the bigBang. This allows users easily creating and managing their account, which can enhance their gaming experience.

I.I.IV Procedures and Functions

Procedures:

User registration: new users can create an account in the system. During registration, users typically provide a unique username and password, which they will use to log in to their account in the future.

User login: existing users can access their account in the system. To log in, users must enter their username and password. Once they are logged in, they can access their account information, game records, and other features of the system.

User verification: after existing users entering their usernames and passwords, the system will check whether users' information is match from the user database. This step ensures that only authorized users can access the system and protects against unauthorized access.

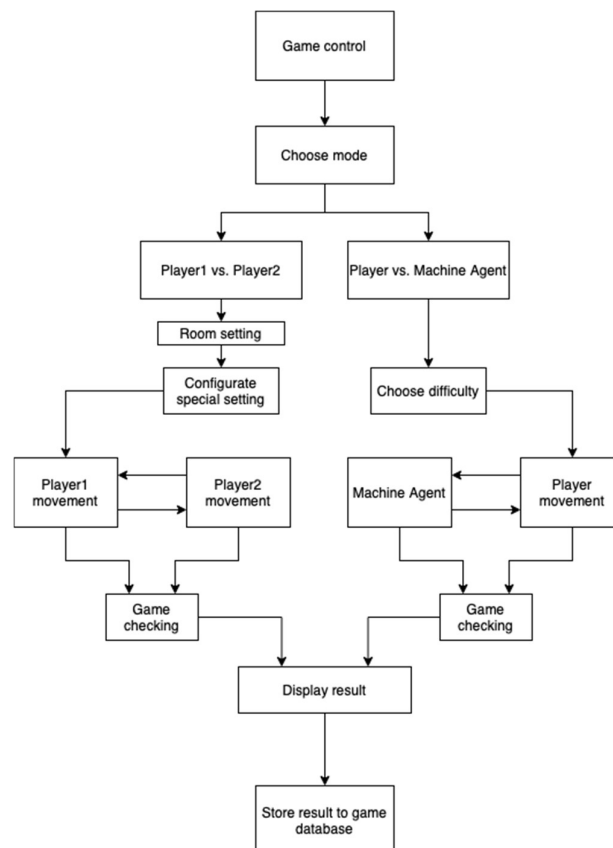
Major Functions:

Class	Functions	Description
UserRegistration	createUser(username, password):	This function creates a new user by checking the validity of input username and password, adding them to the database.
UserVerification	login(username, password):	This function will handle login actions. It requires input of username and password, it will check with the database whether the information is correct.
	verify(username, password):	This function will check the input data with the database, and it will return a Boolean to determine whether this provided information can be verified.
	logout(userid):	This function will change the status of user, from active to inactive.
AdminUser	listAllusers():	This function will display all users' information, including their registration date, usernames, and account status.
	deleteUser(userid):	This function will permanently delete a user information in the user database.

User	changeUsername(username, new_username, password):	This function will use verify function to verify if the input information is correct firstly, then change the username in the database.
	changePassword(username, password, new_password):	This function will use verify function to verify if the input information is correct firstly, then change the password in the database.
	viewGamerecords(userid):	This function will display the game records: including start time, elapsed time, player names, winner, and the record of final goboard. The data displayed is based on the userid provided.

I.II Component-2: Game Control

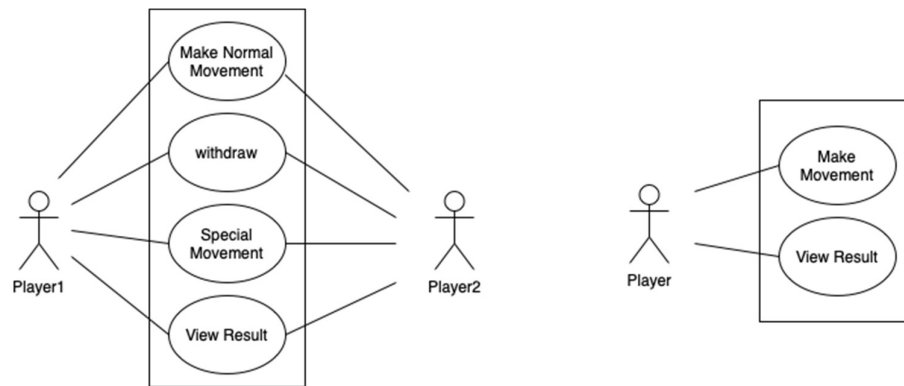
I.II.I Structural Diagram



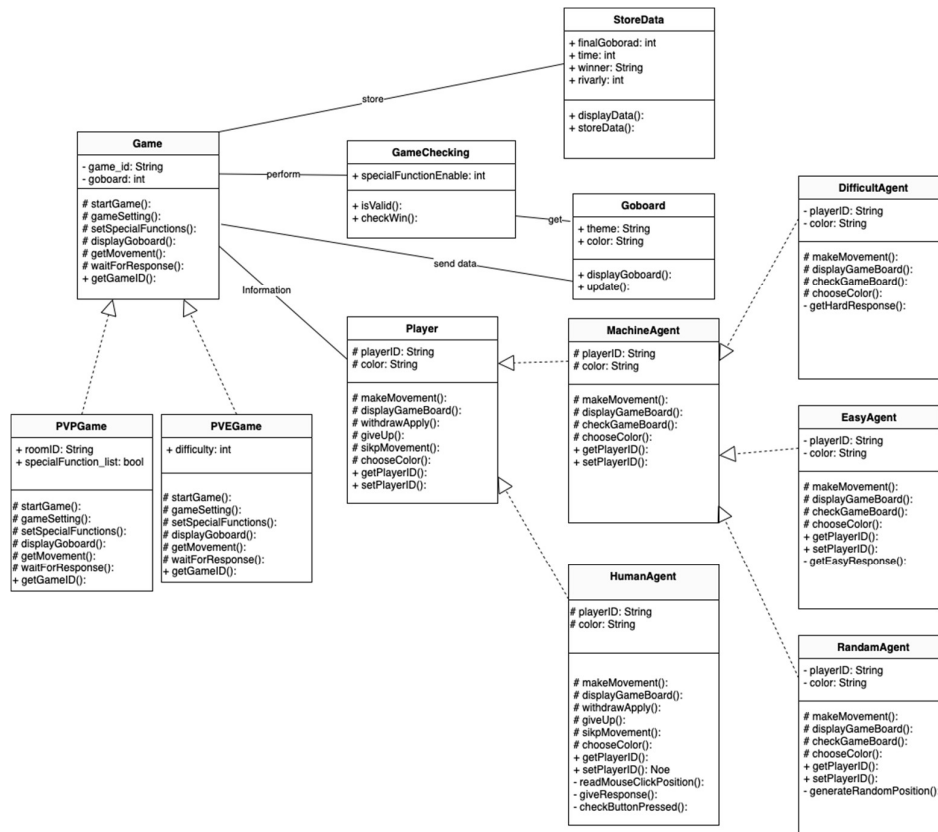
Description: This diagram describes the flow of the game control component. The user will choose his/her desired game mode. Then the user will undergo the configuration step, during which extra setting of PvP mode or difficulty of PvE mode will be determined. Then the user can enter the gobang game. Finally, if the checking unit detects a winning condition, the result will be displayed on the user's screen. and the game record will be transferred to the game database.

I.II.II UMLs

Use-case Diagram

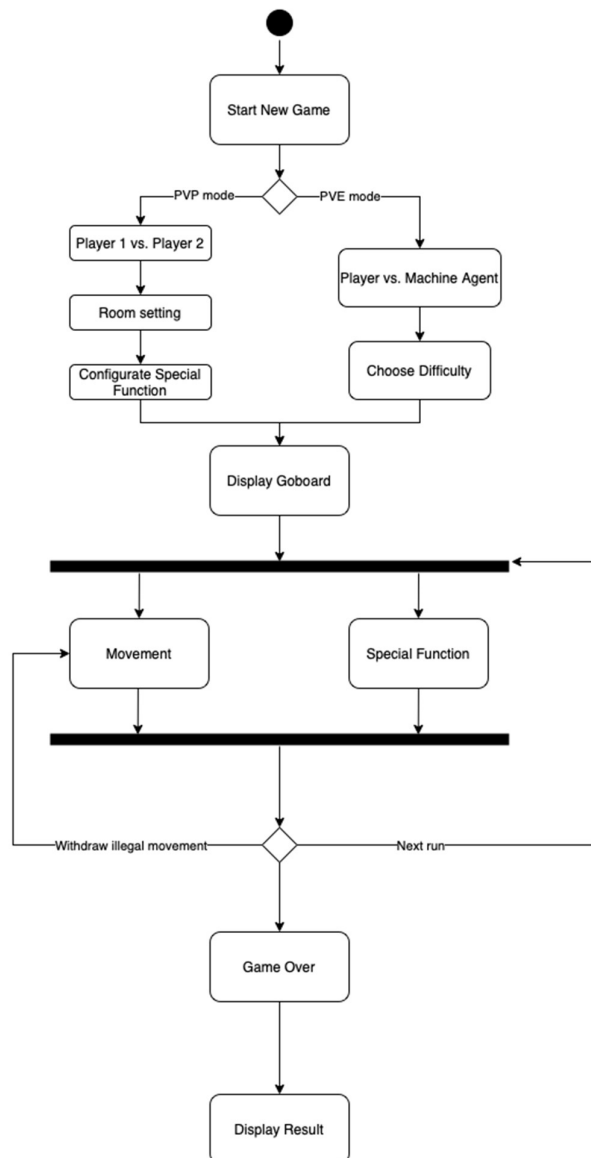


Class Diagram

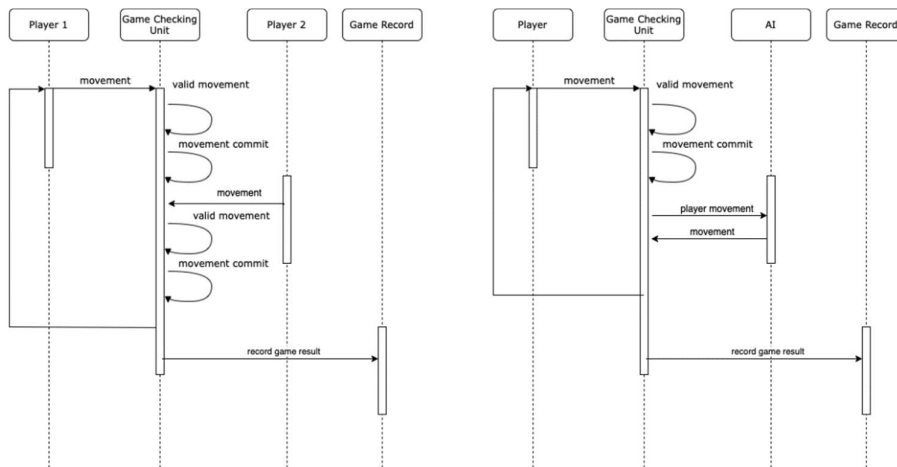


Description: The class diagram shows the object-oriented design of the game control component of our project. We introduce 5 main classes to build our game control system, which are *Game*, *Player*, *GameChecking*, *StoreData*, and *Goboard*. The *Game* class is the core of the game control system. The *Player* object will make movement based on the information that passes through the *Game*. The *GameChecking* object will check the validity of movements and winning condition based on the *Goboard* object. Once the *Game* is ended, the details of this game will be passed to the *StoreData* object, which will interact with backend database and save necessary information to the game database.

Activity Diagram



Sequence Diagram



Description: This diagram describes the the sequence of major activities in the game control system. First, player 1 will make movement. Then the movement will be checked by the checking unit. Second, player 2 or machine agent will make movement, which will also be checked by the checking unit. If the game is still alive, the turn will be passed back to player 1, so on and so forth. When a winner is determined, the game result will be passed to the game record object, which will transfer the game data to the game database.

I.II.III Functionality

Game Control contains two major parts, game setting and game play. As for the first part, the user will be shown a game setting page once he/she initiates a new game. The user will choose the game mode to decide whether he/she wants to have a PvP game or PvE game. After game mode is determined, if the user chooses PvP mode, the host player (denoted as player 1) can enable the special configurations he/she desires. If the user chooses PvE mode, the user can choose the difficulty of the game. When game mode and subsequent setting are confirmed, the user can start the game. Player 1 and player 2 (or machine agent) can make their movement alternately until one of them wins the game. The record of the game will be stored in the game database afterwards, which can be viewed in the user profile.

I.II.IV Procedures and Functions

Procedures:

This component depicts the model procedure of game control component in detail. After the user starts a new game, the control flow will go from *Start New Game* to one of the mode branches based on the user choice. Then the control flow will go through the setting before the game. A goboard will be displayed after the setting is done before players make movements. The movement and special movements will be checked concurrently and circularly. When the game is ended, the result will be displayed and then the game record will be transferred to the game

database.

Class	Function	Description
Goboard	displayGoboard():	Get the game board status and display it.
	Update():	Update the goboard status after player make movement
Game	startGame():	Initial setup at the start of the game, including initializing other objects, displaying the UI, creating the gameboard, and getting the player id
	gameSetting():	When a PvP game begin, we allow students to set their own special setting. The method will pop up a windows and let players to check,
	setSpecialFunctions():	All special functions are put here. After player check
	getMovement():	Get the movement from player class.
	getGameID():	Return game ID
GameChecking	isValid()	After one player make movement, if this step violated the rules and return True/False. If It's break the rules, send error message to player and return false.
	checkWin	After one player make movement, literally find all positions on the Goboard to determine if any player won.
Player	makeMovement():	Input a position, after GameChecking check it's legal, renew the gameboard.

	skipMovement():	Will be called when a player skip movement. Skip this player's turn
	chooseColor():	When a game begins,
	getPlayerID():	return the player ID. This method is used to let other methods get the plater ID but do not change it.
HumanAgent:	readMouseClickPosition():	This function reads the position of players' mouse click and, if it is this player's turn, will pass this position to the makeMovement function as the player's chosen position.
	askForRetract():	Input the player's ID who want to retract send message to the other one and waiting for response.
	retractMovement():	Call this method to restore the board state to before the previous player makeMovement.
	playerGiveUp():	Input the player's ID given up, announce the other player win and then end the game.
	checkButtonPressed():	This method will check whether the button on the screen is clicked. For example, if a player click "retract", then this function will call askForRetract to ask the other player for permission. Or when a player concedes defeat, playerGiveUp will be called to end the game.
Difficult/Easy/Random Agent	getResponse():	Except general functions, three different Machine

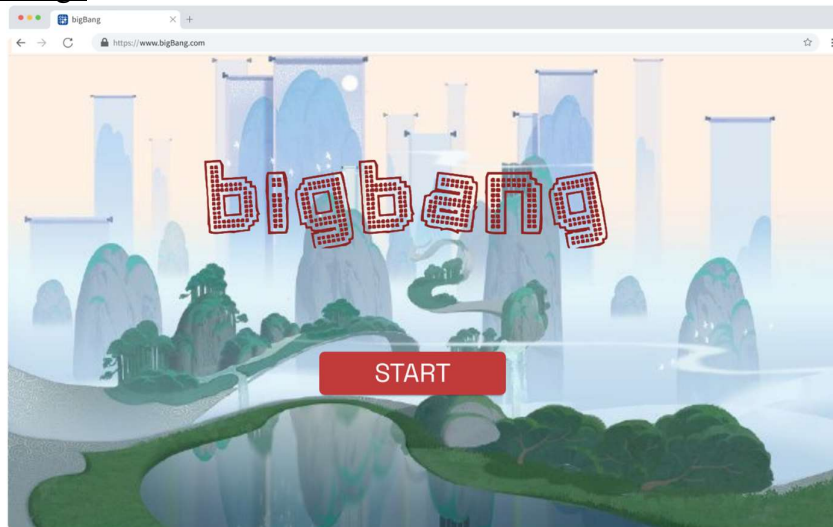
		Agent also have their own function to generate pieces position. By input the Goboard status now, functions will give back a position.
	Hard:	Put Goboard status into the referenced open source project and get the position it decided.
	Easy:	The computer will try to prevent the player from winning when placing pieces. Return to a position of offensive or defensive significance
	Random:	Give an empty position on the Goboard randomly
StoreData	storeData():	Save game result (win/lose/draw), Goboard status, Player ID and other data into Player(s) database. This function needs to know which player win the game and their ID and connect to the Database to implement data storage.
	displayData():	Display the data restore recently to the player.

II. UI DESIGN

II.I User Management

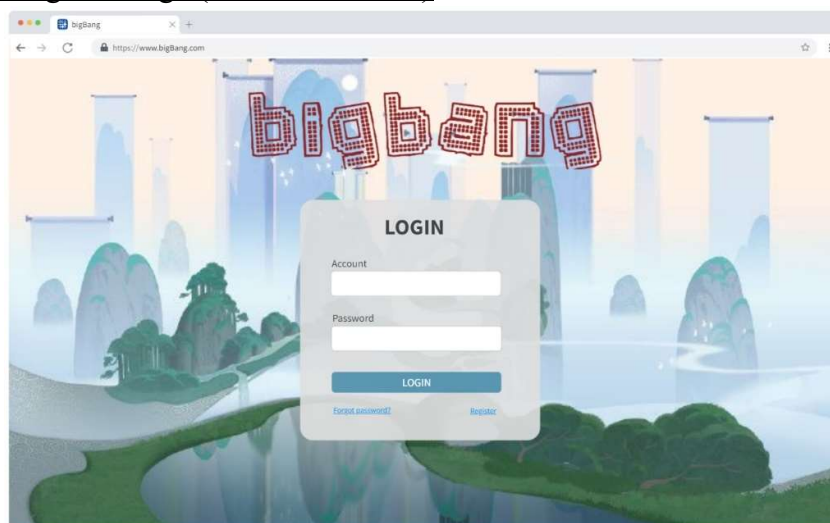
There are various UI designs from various perspectives, which are divided into normal users and administrators. While some UI designs are the same for both roles if no further specifications are provided.

Welcome Page



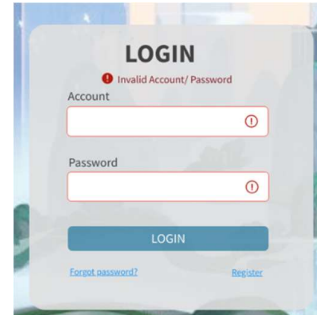
This is the welcome page UI shown to all users when they are visiting the bigBang online website game. It welcomes users to enter the game by clicking on “START” button. Then, the page will go to the login page.

Login & Register Page (for normal users)

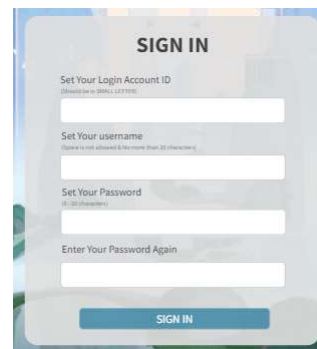


After users click “START” button, the login tab is shown for users to login their own account with registered name and password. User can submit after inputting the correct account and password by click on the “LOGIN” button to login bigBang and users will be directed to the Start Game Page.

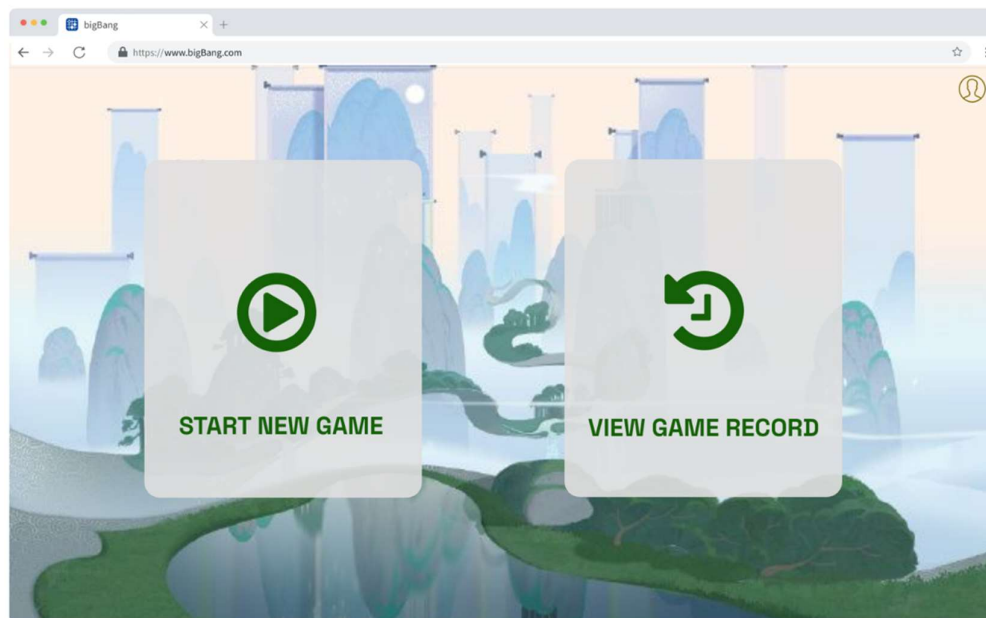
If users’ input cannot be found on the users’ account in the bigBang database, there will be a warning message “Invalid Account/ Password” to remind users and request a correct input, as shown in the right picture. If users forgot their password, they could click on “Forgot Password?” to do a further action to find back their account.



For users who are playing bigBang for the first time, users can click on “Register” which is provided for registering a new account and direct users to a sign in page. In this page, users are required to set up their account with the account ID, name and password by following to the required instruction, as shown in the right picture. When entered all information required, users can click on “SIGN IN” button. After checking the account ID is not same with the existing users, he/ she will be directed to start page.



Start Page (for normal users)




In the start page, users are giving “START NEW GAME” and “VIEW GAME RECORD” button. “START GAME” button will direct users to select the game mode in order to start a new game. “VIEW GAME RECORD” button will direct users to a page that show the account gaming history. Also, there is a user icon on the top right corner which allows users to edit their account setting.

After click on user icon, users can change their username and password as pictures shown on the right and above. Users can also exit their account through “LOGOUT”. For changing password, users need to enter the current password and new password twice. For the game history, it will be shown later.

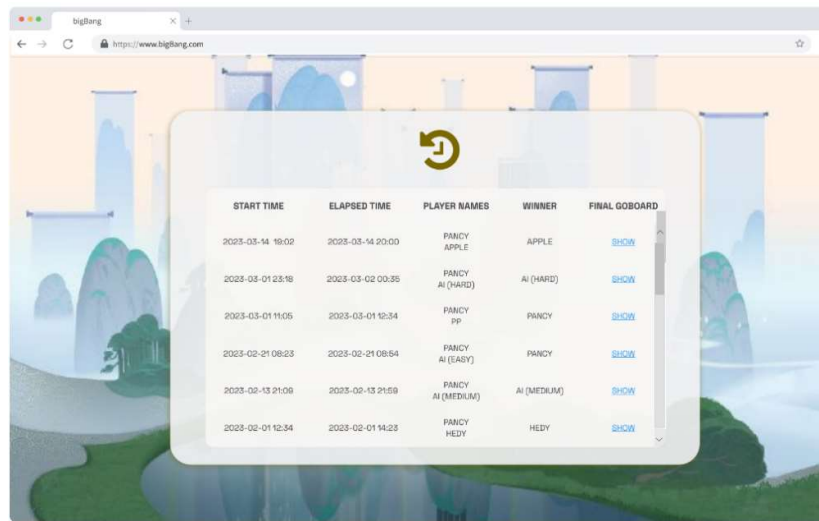
Start Page (for admin)

ACCOUNT ID	USERNAME	LAST ONLINE	STATUS
ppyyqq	Pancy	2023-03-18	NORMAL
admin11111	ADMIN1	2023-03-25	ADMIN
appleishere	Apple	2023-03-01	NORMAL
hedyyyp	Hedy	2023-02-24	NORMAL
implayer	PLAYER000	2023-02-19	NORMAL
lalala	LALA	2023-03-19	NORMAL
csci3100	CSCI	2023-02-11	NORMAL
admin007	ADMIN_7	2023-03-22	ADMIN
nohope	lifeStruggle	2023-02-23	NORMAL

bigBang will automatically direct to admin page after checking the login account is an admin account. Admin can change their password by clicking on “CHANGE PASSWORD”, the process is same as the users, which required to enter current password and enter new password twice.

The right-hand corner of the page lists all users, which include account ID, username, last online time, and status. Admin is allowed to delete user account by click on  logo. After double confirm the action, the user account is deleted.

View Game Record Page (for normal users)



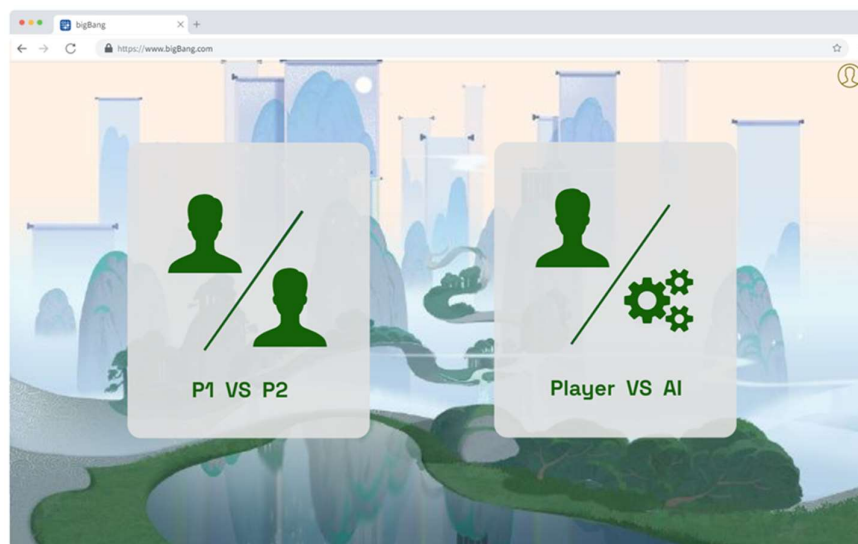
START TIME	ELAPSED TIME	PLAYER NAMES	WINNER	FINAL GOBOARD
2023-03-14 19:02	2023-03-14 20:00	PANCY APPLE	APPLE	SHOW
2023-03-01 23:18	2023-03-02 00:35	PANCY AI (HARD)	AI (HARD)	SHOW
2023-03-01 11:05	2023-03-01 12:34	PANCY PP	PANCY	SHOW
2023-02-21 08:23	2023-02-21 08:54	PANCY AI (EASY)	PANCY	SHOW
2023-02-13 21:08	2023-02-13 21:59	PANCY AI (MEDIUM)	AI (MEDIUM)	SHOW
2023-02-01 12:34	2023-02-01 14:23	PANCY HEDY	HEDY	SHOW

User will be directed to the game record page after click on “VIEW GAME RECORD” in the start page. This page shows start time, elapsed time, player names, winner and final goboard (as shown in right picture). The final goboard print with stone is shown after user click on “SHOW” of the corresponding turn.

II.II Game Control

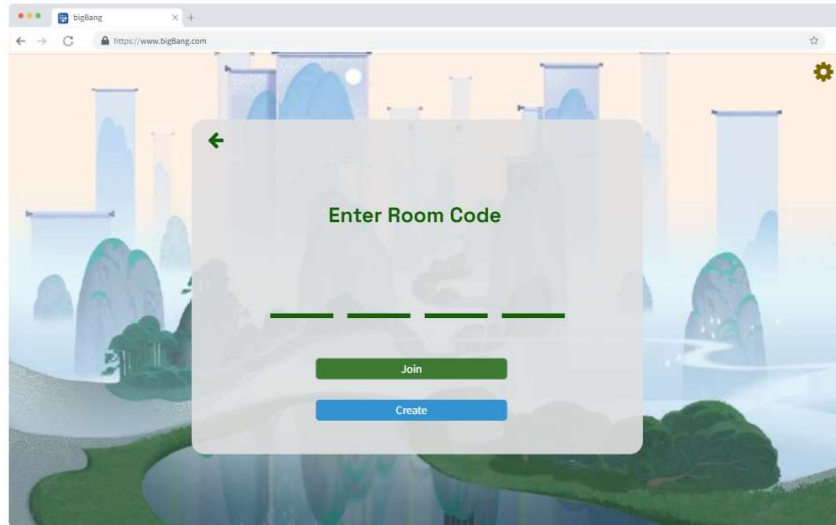
bigBang provides different playing modes for users and there is various setting of different mode which will be explained below. Extra configurations also be provided for users to address the difficulty of the game.

Chose Game Mode Page



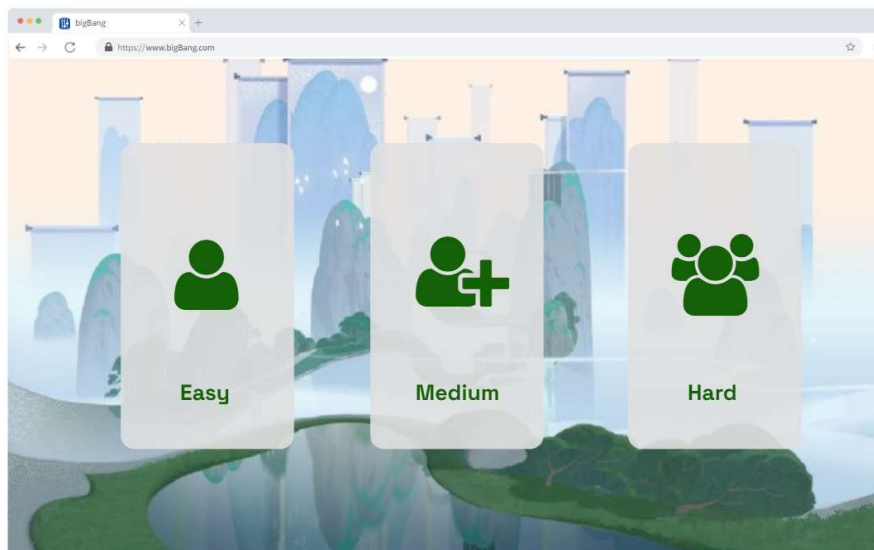
Users will be directed to select the game mode after click on “START NEW GAME” button (shown in the right picture). There are Player vs Player and Player vs AI two modes available for users. For “P1 vs P2”, bigBang will require users to enter a room number or join an existing room to pair up with their opponent. For “Player VS AI”, users are allowed to play with bot, there will be three different difficulty levels available for users choose to play with.

Player VS Player Page



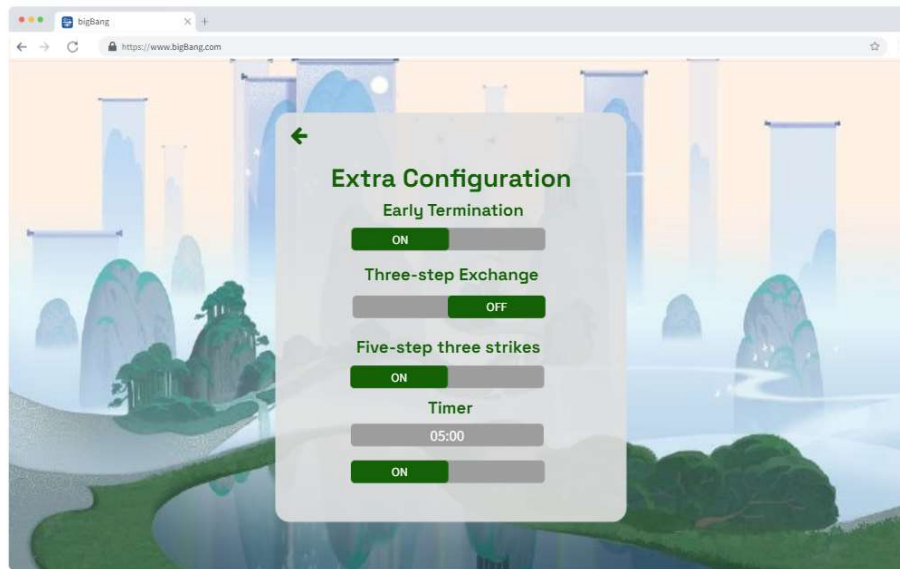
Players are required to enter room code when they choose “P1 VS P2” in the game mode. If player do not have a room to join, they can click on “Create” button to open a new room and direct room owner to extra configuration page.

Player VS AI Page



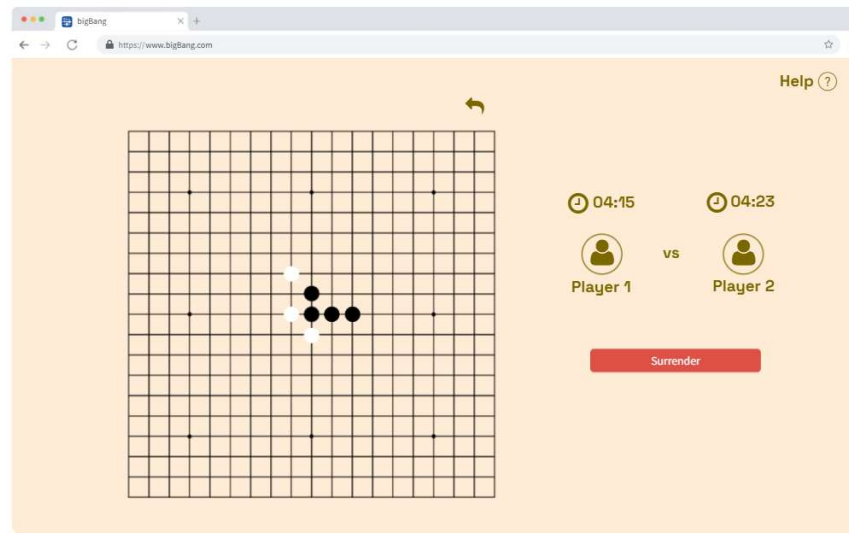
For gaming with AI, bigBang provides three different levels of difficulty, including easy, medium, and hard. "Easy" mode is played with a robot that randomly places the stone. "Medium" mode is playing with a robot that slightly smarter and has the sense to stop users from winning the game. "Hard" mode is playing with an advanced AI that is developed by open source and hard to win. After click on the button users are directed to set the extra configuration.


Extra Configuration Page (for room owner only)



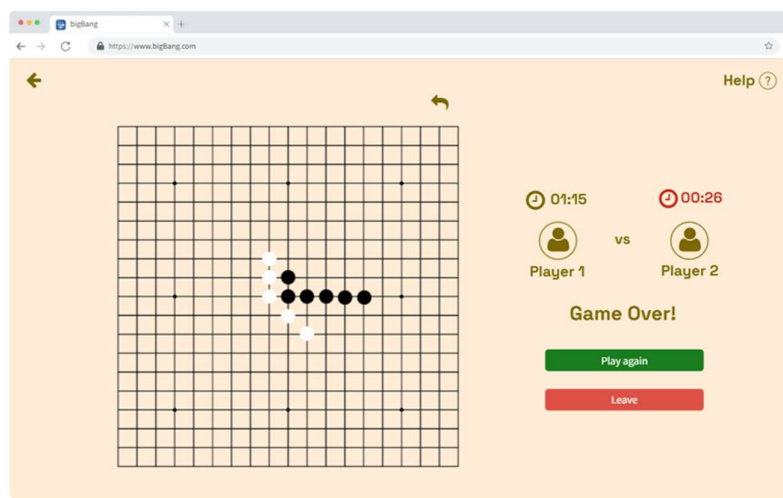
For extra configuration, there are four settings that users can set. "Early Termination" is used to determine whether the game is terminated before all available moves have been made. The terms "three-step Exchange" and "five-step Exchange" refer to the standard gobang regulation. "Timer" is used for counting down the total playing time of each player. If the user fails to place their stone within the time limit, they will lose the game. Users can click on "Confirm" button to start playing the game.

Gaming Page



During the game, “Surrender” button is allowed for player to end and quit the game. Players can place their stone by clicking on the correct position of goboard as picture shown above. If player want to withdraw a move, he/ she can click on  logo to get the permission from opponent and message will automatically send to opponent. If players add extra configuration before the game, there are some roles need to be followed during the game. For example, if they set a timer during the game settings, each player will have a timer to count down their playing time, and there will be a warning when the time is almost up.

Game Over Page



If there is a winner, "Game Over!" will be shown, and players can continue playing by clicking on "Play again" button or go back to start page by clicking on “Leave” button.