

EECS 22L: Poker Game v3.0

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Contents

Glossary	3
1 Online Poker	10
1.1 Usage scenario	10
1.2 Goals	16
1.3 Features	16
2 Installation	17
2.1 System requirements	17
2.2 Setup and Configuration	17
2.3 Uninstalling	18
3 Program Functions and Features	18
3.1 Client and Server Communication	18
3.2 Dealer Choice and Card Distribution	19
3.3 Poker Game Integration	19
3.4 User Interface	19
3.5 Gameplay Options	20
3.6 Scoring and Winning Conditions	20
4 Back matter	20
4.1 Copyright	20
4.2 Error Messages	21
4.3 Index	21
5 Visual Presentation	24

Glossary

- Texas Hold'em Poker: A version of poker where players try to get the best poker hand from the two they were dealt and the five community cards.
- Ante: A small forced bet that everyone at the table is required to pay before each hand.
- Dealer: The player who deals the cards. In online poker, the dealer is a computer.
- Suit: A group of thirteen cards that share the same symbol. Decks have two red (diamonds and hearts) and two black (spades and clubs) suits.
- Big Blind: The larger of the two forced bets in a game with blinds. The big blind is paid by the player two seats to the left of the dealer button.
- Small Blind: The smaller of the two forced bets in a game with blinds. The small blind is paid by the player one seat to the left of the dealer button.

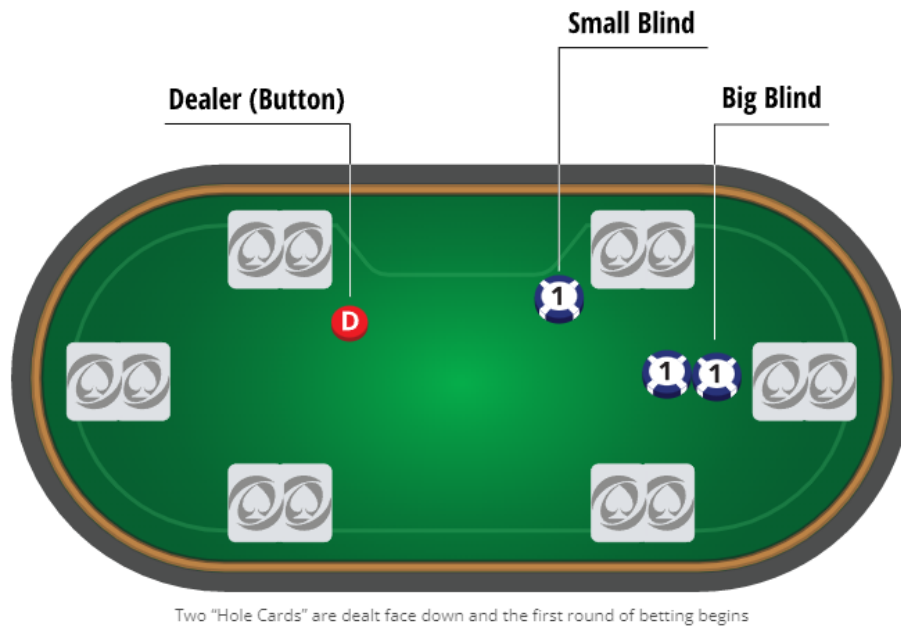


Figure 1: Dealer and blinds

- Check: When a player passes a bet, effectively betting zero. Players can only check if nobody has bet before them. If all players check, the betting round is over and another card is put into the community cards (if it is not already at five cards). If a player after a check does bet, then the betting round will continue and the player who checked will now have to either fold, call, or raise.
- Fold: When a player discards their hand for the current round. They do not play for the remainder of the round and cannot re-enter.
- Call: Matching the current highest bet in the round.
- Raise: Increasing the current highest bet.
- All-in: Betting all of one's chips.
- Community Cards: The cards dealt face-up in the middle of the table that can be used by all players to form their best hand.

- Flop: The first three community cards dealt.
- Turn: The fourth community card dealt.
- River: The fifth and final community card dealt.



Figure 2: Flop, turn, and river

- Showdown: The final phase of the game, where players reveal their hands and the best hand wins the pot.
- Pot: The total amount of chips bet in a hand.
- Poker Hand: A combination of five cards. A hand's ranking determines the player's score.
- Best Hand: The highest scoring poker hand at the end of the betting round.
- Royal Flush: A type of flush with the Ace, King, Queen, Jack, and 10 all of the same suit. This is the highest hand poker.



Figure 3: Royal flush

- Straight Flush: A combination of a flush and a straight where all cards are of the same suit and are in increasing order (eg, 4, 5, 6, 7, 8). This is the second highest hand.



Figure 4: Straight flush

- Four of a Kind: Four of the same card. The fifth card is the highest card in the player's hand or on the table. This is the fourth highest hand.



Figure 5: Four of a kind

- Full House: A three of a kind with a pair. This is the fifth highest hand

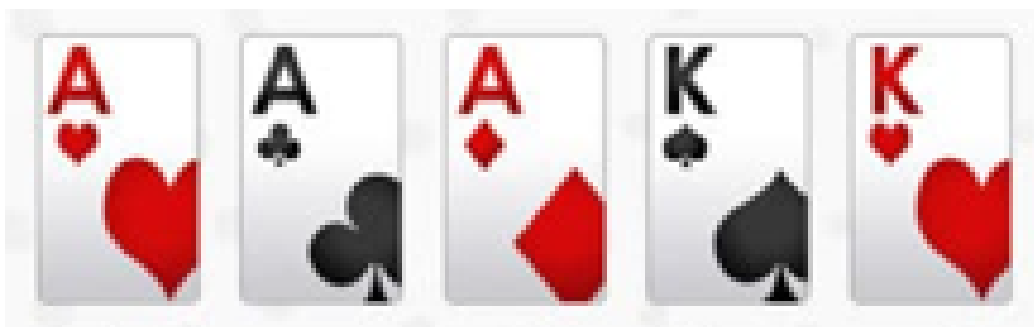


Figure 6: Full house

- Flush: Five cards all of the same suit in no particular order. This is the sixth highest hand. If two players both have a flush, the player with the highest card in the flush wins.



Figure 7: Flush

- Straight: Five cards that are in increasing order but are not of the same suit. Aces can either follow a king (10, J, Q, K, A) or be followed by a two (A, 2, 3, 4, 5) to create a straight. This is the seventh highest hand.



Figure 8: Straight

- Three of a Kind: Three of the same card. The highest two cards complete the hand.



Figure 9: Three of a kind

- Two Pair: Two sets of pairs. The remaining card is the highest card in the player's hand or on the table.

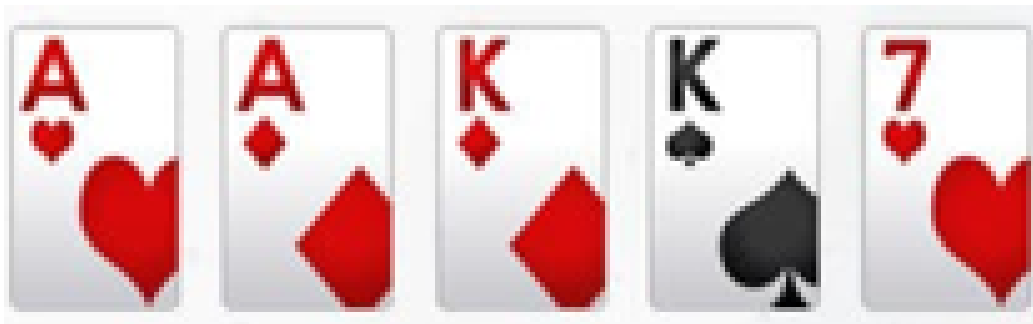


Figure 10: Two pair

- Pair: Two of the same card. The remaining three cards are the three highest available.



Figure 11: Pair

- High Card: A single card that is high in value (eg. an Ace). This hand occurs when none of the higher hands are available.



Figure 12: High card

1 Online Poker

1.1 Usage scenario

- 1) Navigate to the bin directory and run the command: `"./server #port"`, replacing `#port` with the port number you wish to use. This starts the server.
- 2) In a new terminal, navigate to the bin directory and run the command: `"./poker servername #port"`, replacing `"servername"` with the name or

IP address of the server, and #port with the port number used by the server. This starts the client and connects it to the server.

- 3) Use the command "CREAT [room name] SEAT [seat number] PLAYER [player count] BOT [bot count] POINT [point count] ROUND [round count] SB [small blind]" to create a new game room. Replace each parameter with the respective value you wish to use. For example, "CREAT Jacky SEAT 1 PLAYER 2 BOT 0 POINT 1000 ROUND 10 SB 5".
- 4) Other players can join the game room by using the command "JOIN [player name] SEAT [seat number]". For example, "JOIN Alice SEAT 2".
- 5) Seat information can be retrieved using the command "GET SEAT [seat number]". For example, "GET SEAT 3".

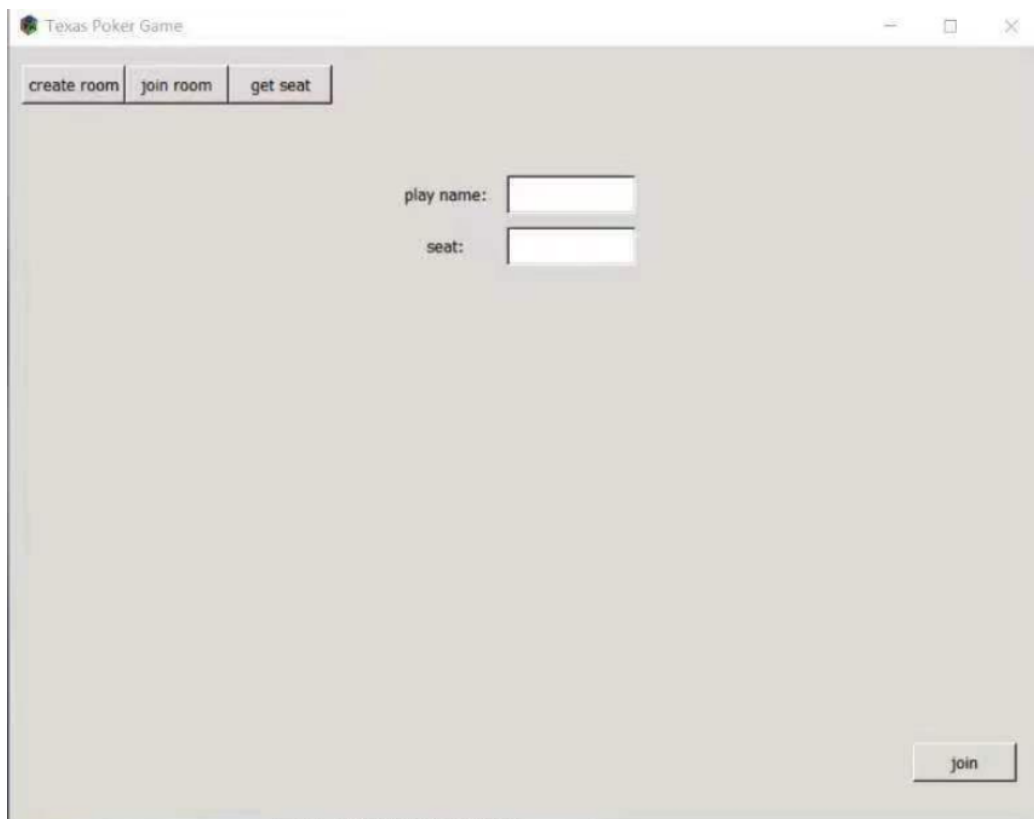


Figure 13: Main menu

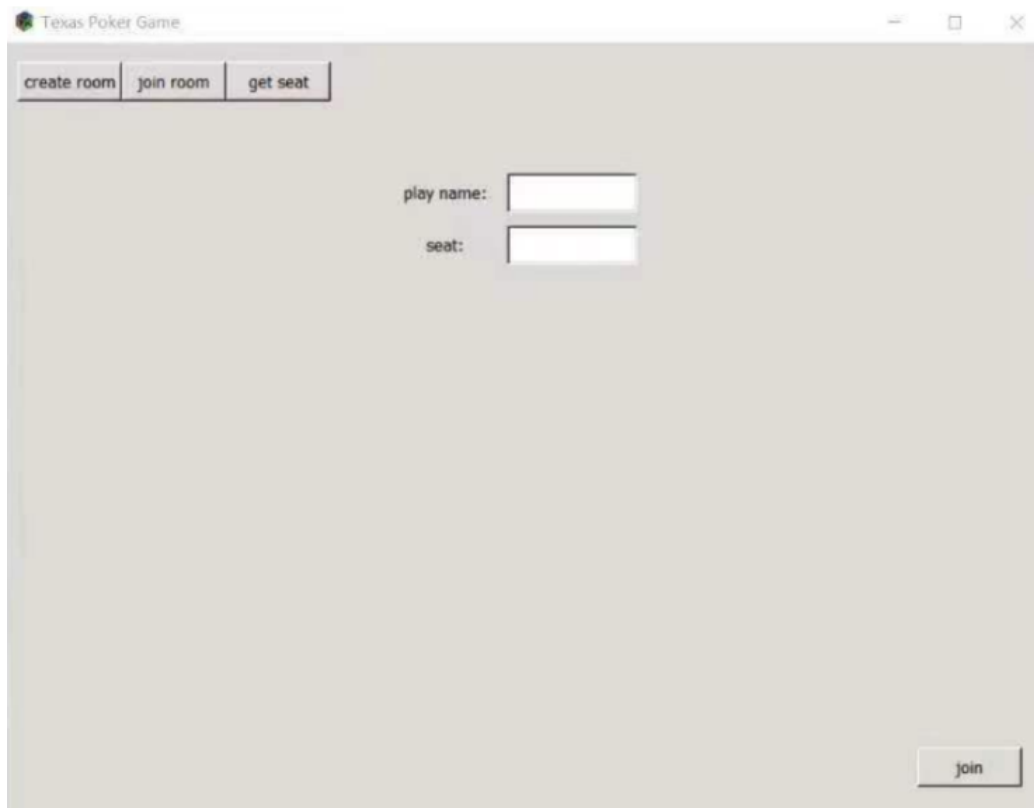


Figure 14: Join menu



Figure 15: Get menu

- 6) Once connected and all players have joined, the game will start. Follow the text prompts to play the game.
- 7) Use commands "BET [amount]", "CALL", "RAISE [amount]", "CHECK", "ALLIN", or "FOLD" to make moves.
 - a) "BET [amount]": Place a bet of a certain amount.
 - b) "CALL": Match the current highest bet on the table.
 - c) "RAISE [amount]": Increase the current highest bet on the table by a certain amount.
 - d) "CHECK": Pass the action to the next player without making a bet. This is only allowed if no other player has made a bet in the current round.

- e) "ALLIN": Bet all of one's remaining chips.
- f) "FOLD": Surrender one's hand, forfeiting the current round.

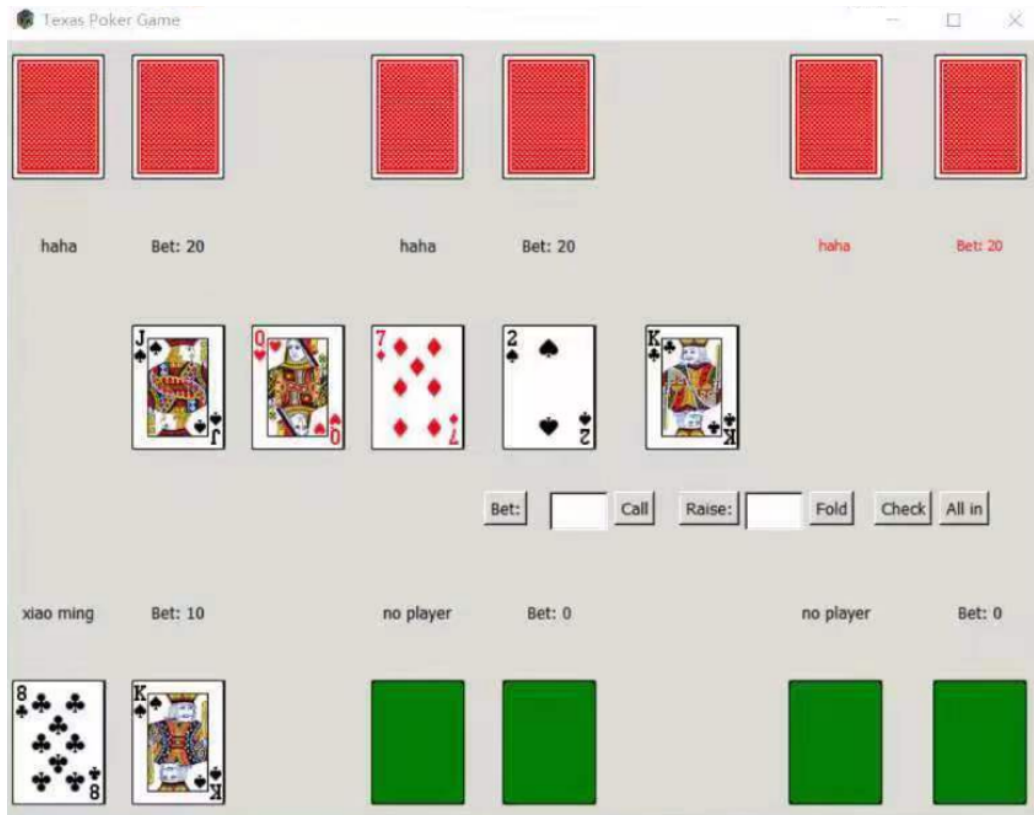


Figure 16: Poker table

- 8) The game continues until a player wins by having the best hand at the showdown or by having all other players fold to them. Alternatively, the game concludes after the predetermined number of rounds.
- 9) After the conclusion of the specified number of rounds, the server will automatically shut down and the clients will be presented with the game over screen. The server does not have to be manually terminated; it will shut down on its own once the game reaches the round limit set at the beginning of the game. Make sure to wrap up your game actions before the last round ends.

1.2 Goals

- Build an online multiplayer Texas Hold'em poker game: This game will allow users to play against each other over the internet. The game will be operated through a user-friendly interface, which will clearly display each player's status (including their hand, current chip count, etc.), the community cards on the table, the current bet, and the progress of the game.
- Implement a robust game logic module: This module will contain functions for handling player actions, updating game state, and determining the outcome of the game. All rules and actions should be implemented precisely according to the rules of Texas Hold'em poker, including blinds, betting, calling, raising, going all-in, folding, etc.
- Design and implement an efficient communication protocol: This protocol should support the exchange of information between the server and multiple clients, including sending player actions to the server and sending game state updates from the server to the clients.
- Implement a user-friendly user interface: The interface should clearly display all necessary game information, including each player's status, the community cards on the table, the current bet, and the progress of the game. Moreover, the interface should provide a way for players to input their actions, such as a button or a text input field.
- Ensure the scalability and maintainability of the project: All code should be well-commented and organized by module. The project should adhere to good software engineering practices, such as the use of version control, automated testing, and continuous integration.
- Incorporate comprehensive unit testing: The game logic module should be thoroughly tested to ensure its correctness and stability. Each function should have associated unit tests, verifying that it works as expected in various scenarios.

1.3 Features

- Follow official rules of Texas Hold'em poker.

- Players can connect to the online poker program, choose a seat, and have their chosen name displayed during gameplay.
- The server will keep track of points for each player, fostering a friendly competition.
- Server and users communicate via TCP/IP through sockets.
- A user-friendly graphical interface designed using GTK 2.0 enhances the user experience.
- Game interface where player can see their own cards, the community cards, and the current state of the pot.
- Adjustable number of AI or human players.

2 Installation

2.1 System requirements

- Processor: 1 GHz or faster
- RAM: 2 GB
- Disk Space: 200 MB
- Operating System: Linux OS (CentOS-7-x86_64)
- Network: Internet connection for multiplayer games

2.2 Setup and Configuration

To install the online poker game, follow these steps:

- Extract files to your desired location.
- Open a terminal and navigate to the program directory.
- Run the "make" command to build the program. This will create an executable file in the program directory.

- Before running the program, ensure that your system meets the network requirements for multiplayer games.
- To start the program, run the executable file from the terminal.
- The program will open in a new window, ready for you to play.

2.3 Uninstalling

To uninstall the program, follow these steps:

- Open a terminal and navigate to the program directory.
- Run the "make clean" command. This will remove the executable file and any object files created during the build process.
- Delete the program directory and any associated files.

3 Program Functions and Features

3.1 Client and Server Communication

The online poker application uses TCP/IP for communication between the client and the server. The server coordinates the game by sending messages to all clients. These messages include updates on the game state, such as the cards dealt, the current bet, and the actions taken by players. The clients send messages to the server to inform it of the actions taken by the user, such as folding, calling, or raising.

- User Input: User's actions (check, call, raise, fold) sent to the server via the client interface.
- Program Output: Updates to the game state from the server, including the community cards, the current bet, the players' chip counts, and the player's own hand.

3.2 Dealer Choice and Card Distribution

The dealer is chosen randomly at the beginning of the game. The dealer button then moves clockwise around the table after each hand. The server uses a random number generator to shuffle the deck and deal the cards. Each player is dealt two private cards, and five community cards are dealt to the table.

- User Input: User starts the game, triggering the dealer role rotation and card distribution.
- Program Output: Visual representation of the dealer button moving, shuffled deck, and dealt cards to each player.

3.3 Poker Game Integration

The online poker application integrates the rules of Texas Hold'em poker. It tracks the state of the game, including the current bet, the pot, and the community cards. It also tracks the private cards and chip count of each player.

- User Input: User's decisions during each betting round (check, call, raise, fold) and at the showdown (whether to reveal their hand).
- Program Output: Updates to the game state after each betting round and the showdown, including the revealed hands and the winner of each hand.

3.4 User Interface

The application provides a user-friendly graphical interface designed using GTK 2.0.

- User Input: User's interactions with the graphical interface, including clicking on buttons to make decisions (check, call, raise, fold), entering their username, choosing a seat, selecting the number of AI or human opponents, and setting the difficulty level of AI opponents.
- Program Output: The program responds to the user's interactions by updating the game state displayed on the interface. This includes updates to the poker table, community cards, players' avatars, usernames,

and chip counts. The menus for setting up a new game and adjusting game settings are also updated based on the user's choices.

3.5 Gameplay Options

The application offers a variety of gameplay options. Players can choose the number of AI or human opponents and the difficulty level of the AI. They can also choose to start a new game or join an existing one.

- User Input: User's choices for the number of AI or human opponents.
- Program Output: The chosen game settings are applied, affecting the game's difficulty and the number of players in the game.

3.6 Scoring and Winning Conditions

The application follows the standard scoring and winning conditions of Texas Hold'em poker. The player with the best hand at the showdown wins the pot. If all other players fold during a round, the last player remaining wins the pot. The game continues until one player has all the chips.

- User Input: User's actions that contribute to the game's outcome (their decisions to check, call, raise, fold, and whether to reveal their hand at the showdown).
- Program Output: Updates to the game state and winner(s) after each hand and at the end of the game.

4 Back matter

4.1 Copyright

- Copyright ©2023 Team rand(). All rights reserved.
- Redistribution or modification of this program is prohibited with the exception of personal/non-commercial use.
- Distribution of this program for commercial use must have our written approval.

4.2 Error Messages

The online poker game includes a robust error-handling system. If an error occurs during gameplay, an error message will be displayed on the screen. The error message will provide a description of the error and, if applicable, suggest corrective actions. Here are some common error messages and their meanings:

- "Network Connection Error": This error occurs when the program is unable to establish a connection with the server. Make sure your internet connection is working and try again.
- "Server Full": This error occurs when the server has reached its maximum number of connected clients. Try again later when a spot becomes available.
- "Invalid Argument Error": This error occurs when the player sends a message to the server that it understands but with an invalid value. The server will reply that the given value is invalid.
- "Invalid Message Error": This error occurs when the player sends a message to the server that it does not recognize. The server will reply that it did not understand the message it received.
- "Invalid Move Error": This error occurs when the player attempts to do an action that they are not allowed to, like performing a check after a bet has been made.
- "Out of Memory Error": This error occurs when the system does not have enough memory to run the program. It is recommended to close other applications and try again.

4.3 Index

- A
 - Ante
 - All-in
- B

- Big Blind
 - Best Hand
- C
 - Call
 - Check
 - Client and Server Communication
 - Community Cards
 - Configuration
 - Copyright
- D
 - Dealer Choice and Card Distribution
 - Difficulty
- F
 - Features
 - Flush
 - Fold
 - Full House
 - Four of a Kind
- G
 - Goals
 - Glossary
 - graphical user interface (GUI)
- H
 - High Card
- I

- Installation
- M
 - Multiplayer
 - Makefile
- O
 - Operating System
- P
 - Pair
 - Poker Hand
 - Pot
- R
 - Raise
 - RAM
 - Royal Flush
 - Raise
- S
 - Suit
 - Scoring and Winning Conditions
 - Showdown
 - Small Blind
 - Straight
 - Straight Flush
 - System Requirements
- T
 - Three of a Kind

- Turn
 - Timer
- U
 - Uninstalling
 - Usage Scenario
 - User Interface
- F
 - Flush
 - Four of a Kind

5 Visual Presentation

- When a player's turn comes, the available actions (check, call, raise, fold) are highlighted. At the end of a round, the winning hand is highlighted, and the chips in the pot are moved to the winner.

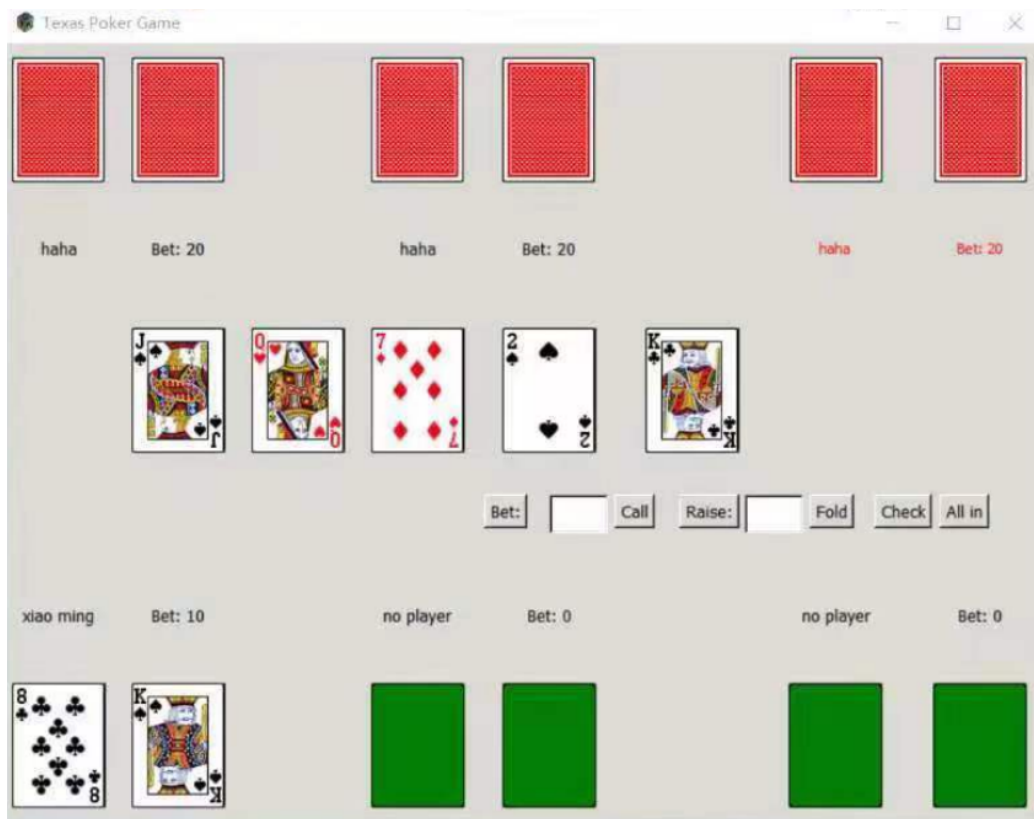


Figure 17: A screenshot of the game window

- The program also includes menus for setting up a new game, adjusting game settings. These menus are easily accessible from the main game window.

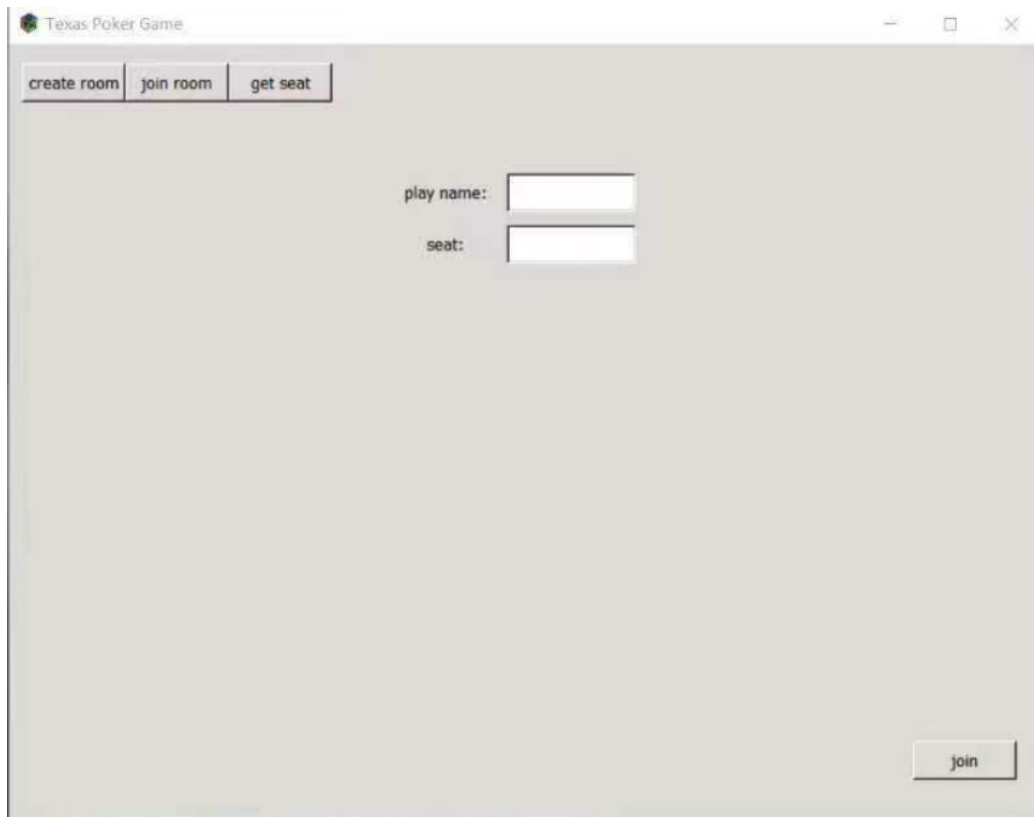


Figure 18: A screenshot of the menu

- The program also shows the scoreboard at the end of each game. This scoreboard displays the usernames and points of all players, allowing them to track their progress.