CS32 Final Project Specifications

Cube Blokus

Rules of Cube Blokus

The game board is a cube, each side of which is a 9x9 square. There are 4 players, and each receives 21 pieces, all of different shapes (polyominoes made up of between 1 and 5 squares). The object of the game is for each player to cover as much of the cube with his/her 21 pieces as possible. The game begins with every player given the three squares adjacent to a corner on two diagonally opposite corners. The turns proceed from Player 1 to Player 4 (blue, yellow, red, green). Every new piece that is played must touch another piece of the same color (i.e. your own color), but only at the corners, never along the sides. When a player cannot place a piece down, they are skipped automatically. The play continues until the players can no longer play, either because they have no place to put their remaining pieces or because they have played all of their pieces.

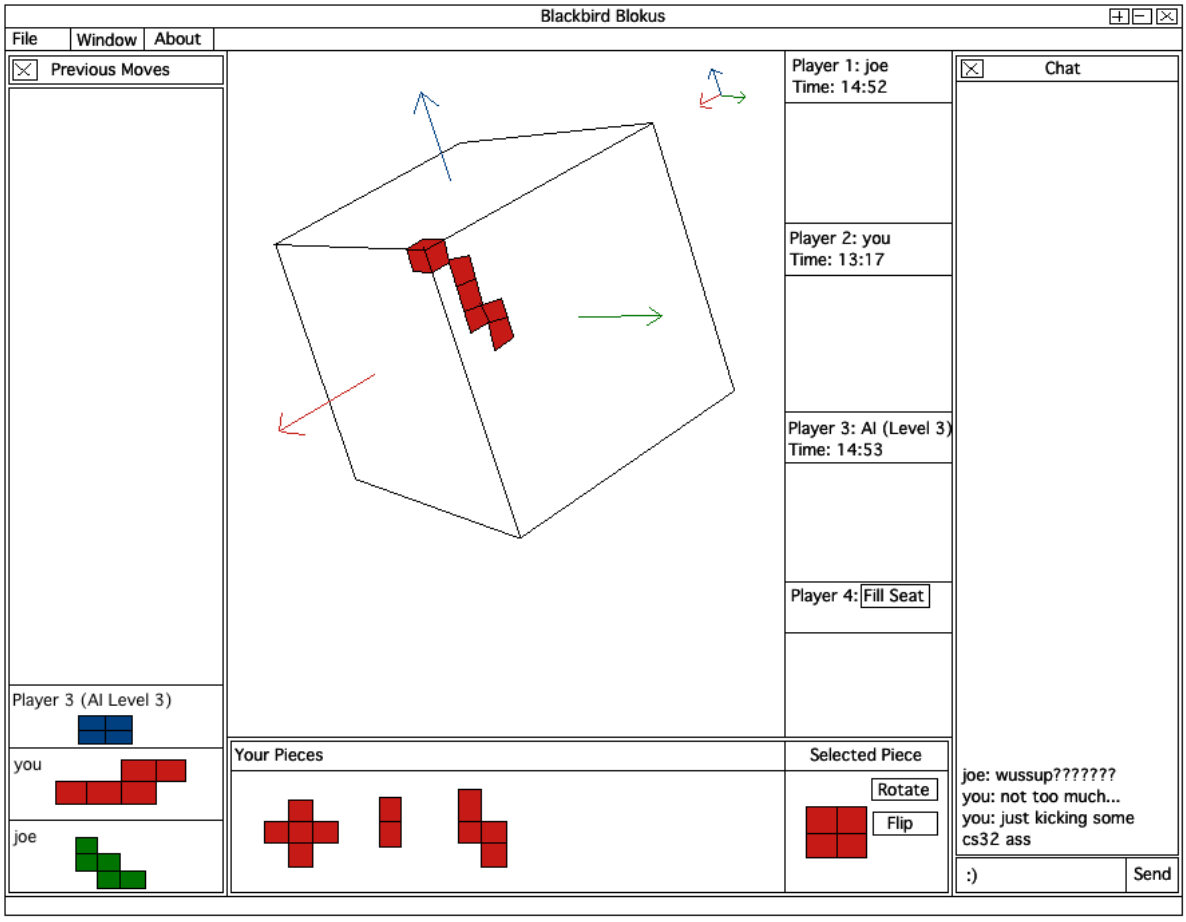
[CS32 Final Project Specifications - Google Docs]

Scoring

Every square on the board counts as one point, and an additional 20 points are awarded if all 21 pieces are played, and the last piece played was the single square piece. Note that this point bonus is relevant (besides giving the winner a larger score gap) only because scores carry over from game to game. The winner is the player with the most points.

User Interface

Game Window



This is the main window in which the game is played. It has the menubar on the top, the game display in the center, and the optional "Previous Moves" and "Chat" sections on the left and right, respectively. When these two optional panels are disabled, the window resizes to fit only the game display.

The game display consists of the 3D cube representing the game's current state, the panel of pieces and move options for the player, and the panel containing information on the other three players. The cube display takes up most of this space and is displayed in the top left, the player's own pieces are displayed in a row along the bottom, and the other player information is in the top right section.

The cube, which floats in space in the center of the cube panel, can be controlled by holding and dragging a right mouse click. If the player is holding a piece, its "shadow" will appear over spots on the board. The shadow will be colored a darker shade of that piece's color if the piece can be played there and dark gray otherwise. The player places the piece on the board by clicking once when the shadow is in a proper location. The cube has three axes pointing from its center, and a smaller version of these axes is displayed in the top right of the cube panel to show the player the current orientation of the cube. These axes rotate as the cube rotates. If the "Show Move Rating" option is enabled (see "Window" section below), a percentage from 0% to 100% will be displayed in the top left corner of the cube display after a player places a piece. When a piece is played on a network game, the host's server will automatically update the current state of the board on each client's display.

The player's own pieces are displayed in a narrow panel along the bottom of the game display. It is divided into an area for pieces and a set of buttons to rotate the piece or flip vertically. A label displaying the player's name and the overall time remaining (which decreases throughout the player's turn) is displayed above the pieces. A player clicks on a piece to pick it up and can click again anywhere in the piece area to put the piece back, at which point it fills the exact same spot it left. Once a piece has been picked up, the player can either rotate or flip the piece vertically by using keyboard shortcuts (<-- and --> for rotation and up/down arrows for vertical flipping). or pressing one of the four buttons on the right side of the panel (rotate clockwise, rotate counterclockwise, or flip the piece vertically or horizontally). When it is someone else's turn, this entire panel appears darker than usual and the remaining time will be paused. Note that in a hotseat game, this panel will switch to whoever's turn it currently is.

The panel displaying information on the other players is divided into three equal parts, one for each player. Each part will display the player's name (or "Computer #", where # is the difficulty level if it is a computer player), that player's remaining pieces, that players total score, and remaining total time. The player whose turn it is will appear brighter than the rest and his or her remaining time will appear as decreasing. If the player is AI, its difficulty level can be changed by clicking on a drop-down menu where the player's name would otherwise be placed. The level of the AI can be changed mid-game in local games only.

The "Previous Moves" panel is displayed by default but can be turned off through either the Window menu or by clicking a small x in its top right corner. This displays a scroll menu of all previous moves but only shows about 8 at any given time. Each is represented by a player's name and the piece that player put down on that move. When a player clicks on the panel representing a previous move, the cube returns to the state of the game at the moment just after that move was played. If it was that player's turn, his or her panel of pieces will be grayed out and disabled, though the remaining time would still count down. All moves that happened after the currently selected move will be grayed out as well, and the currently selected move will be highlighted.

The "Chat" window is also displayed by default for network games and can be removed either through the Window menu or by clicking a small x in the top right corner. Chat is disabled for local games and the window does not appear. This window displays about 10 of the most recent messages sent and the name of the player who sent each one in a scrollable text area. There is a smaller text box below this area in which the user can type messages to the other players. The message can be sent either by pressing the enter key or by clicking a button labeled "Send". Once a message is sent on a network game, the host's server updates the chat display of all clients to show the

message. More recent messages will appear on the bottom and the scrollable text area will scroll down automatically.

If, at any point during a network game, a player is disconnected or leaves the game, that player becomes AI of the level specified at the beginning. If the host player becomes disconnected, the next player in the sequence (Player 1, 2, 3, 4) becomes the new host, which is indicated by a pop-up message. Note that the only privileges the host has are to kick a player if they are being unresponsive or for any other reason, or to turn a player into a computer AI.

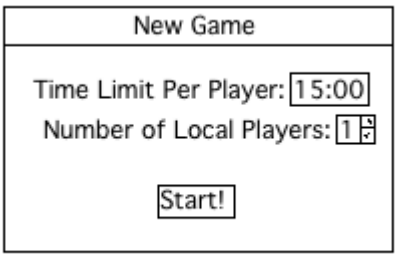
Menubar

There are three menus on the menubar: "File", "Window", and "About".

File

From File, you can call New Game, Host Game, Join Game, New Tutorial, Save, Open, and Quit. Any of the options presented upon opening a new game are in a new, smaller window, but only one game can be run at the same time (per running instance of our program).

New Game



When the user clicks "New Game", a small window appears with options for the new game, including "Time Limit", and "Number of Local Players". Per player time limit for an entire game ranges from 3 minutes to infinite length (no limit), which the user specifies by entering 0 minutes. The default value will be 15 minutes. If some player of the game doesn't finish putting down all their pieces in the specified time limit, they forfeit the rest of their moves. The "Number of Local Players" allows the user to play a "hotseat" game, where the actual person sitting at the computer changes after one of them finishes a turn. Note that this can also be easily changed mid-game, by clicking on the appropriate "seat" in the game. When a user is ready, they click "Start!" and they are presented with the main window, where the cube is grayed out. The specified number of local players will be set, and the user will have to specify the difficulty of all of the AI's (or turn them into humans) before the cube becomes clickable and the game starts. Seats are either taken (by clicking the seat(s) that they want to take) or occupied by a computer (by clicking "Computer Player" and setting the difficulty). Their most recent settings for displaying ratings (see "Window" section below) will be used for this new game.

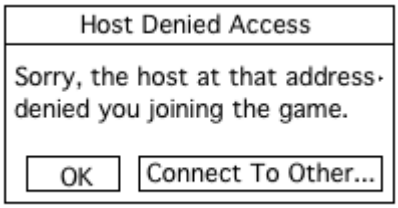
Host Game

When the user clicks "Host Game", the user will see a similar prompt as for "New Game", except that they will be able to choose a username for any player(s) that they take. They must also specify the default difficulty level of AI that will be set if someone leaves or disconnects. There will be 4 levels of difficulty for the computer AI (1 = Beginner, 2 = Intermediate, 3 = Advanced, and 4 = Awe-Inspiring). They will also have to specify whether this is a public or a private game. If it is a private game, whenever someone joins the host hast to confirm that it is ok. If it's not, the this confirmation box will not appear. Also, the most recently used setting for displaying the chat pane (see "Window" section below) will be used for this network game. When someone clicks "Computer Player" in a network game, the player will be running on their machine.

Join Game

When the user clicks "Join Game", the user will see a prompt asking for the IP address of the host and the username they want to join with. When they click "Connect", the host will be prompted with a window saying, "Do you want to let <username> join the game?".

If the host user clicks "Allow", the client user will see the table, where they can click on any empty seat to take it. If the host user clicks "Deny", the client user will see a window saying, "Sorry, the host at that address denied you joining the game."



New Tutorial

A new window appears with two options presented: a button that says "New Training Game" (or "Continue Training" if you have played before), and below it, a scrollable pane called "Lessons." A training game consists of an adaptable AI which will get better or worse as you play. The first time you play, the AI is set to the easiest, and if you win you are promoted. After that, if you win or lose three games in a row the AI goes up or down by one level. However, upon being promoted a level, if you win your first game you are promoted immediately. This information will be displayed in the top left of the main pane (the pane with the cube), in the same place where checks and 'x's are displayed during a lesson (see below). It will be represented by one or two checks or X's (for one or two wins or losses in a row), or a 0 if you just broke a streak (i.e. are in 'equilibrium' for that difficulty level).

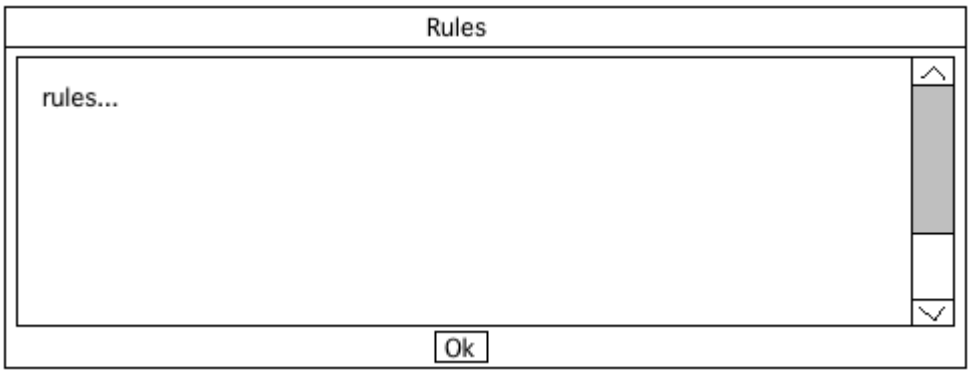
Lessons are simply practice scenarios. You can scroll and choose a practice scenario, and the entry in the table will indicate which ones you have already completed. A practice scenario begins with a pre-determined state of the game (usually with a small subset of pieces to play). There will be directions telling you what your objective is in this tutorial at the bottom of the "cube display". If you make a suboptimal move, the GUI will show a red X in the top left corner of the "cube display" and the game will not move on. If you do make the optimal move, the GUI will show a green check mark in the same place, and the game continues until the practice scenario is completed. When you see the green check mark, a short explanation of why that was a good move will appear, which is helpful for new players. Each scenario will have a limited set of pieces to play and a partially-filled board.

Window

From Window, you can toggle whether the previous moves pane is showing or not ("Previous Moves"), whether the AI's percentage rating of your move is shown or not ("Rate Moves"), (if you are in an online game) whether the chat window is showing or not ("Chat"), and finally (if you are in a Training Game) whether to show you what the computer would have done in your position after you make each move ("Best Move"). The best move is displayed as a different color on the game board for a small amount of time, and the cube is rotated smoothly so that you can see it.

About

About will only have two option. One will be "About Cube Blokus", which will create a pop up box displaying information about the creators of the game (us!). The other will be called "Rules" and upon clicking this button a pop up box will show up displaying the rules of the entire game.



A game is then played out where each player takes a turn placing a piece of their own onto the board, from player 1 to player 4. A player must pass if they cannot find a place to put one of their pieces. A players gets no more turns and will be automatically skipped if their time runs out. When all 4 players have passes in succession, the game is over, and the points for all 4 players are displayed in the main pane. Also, two options in the main pane will show up saying "Ready to start another Round" (in a network game. In a local game this option will say "Begin another round", which upon begin clicked will immediately begin another round) or "Quit the current game". In a network game, if all 4 players select "Ready to start another round," another round will start. Until then, the players can browse the previous moves and rotate the cube to see the final state of the game. Note that everything is still enabled, so if someone is taking too long players can complain/communicate via the chat window, and the host can choose to boot the player or to change him into an AI. In either a network or a local game, if someone selects "Quit the current game", all the information about the current game will disappear and it will look as if you had just opened up the application (Note that in a network game this will only happen to the person who decides to quit. For everyone else, the person who quit will simply turn into AI). If a new game is started, the point totals of the previous game are added to the players' total scores, which are shown in their "player box" in the gui (the bottom for 'you', on the right for the other 3 players).

Walk-through of a user's experience, from beginning to end

Upon opening Blockus, the entire main pane will be empty (completely gray), but the menubar will be visible and click-able at the top. The user can then choose any available option from the menubar, all of which are explained above.

If the user chooses New Game, Host Game, or Join Game:

After choosing the relevant settings (also detailed above), the user is brought back to the main window, which is the same as before except now all of the game information is displayed. The cube is grayed out. If this is a local game, the user must then choose which seats are for humans and which are for computers (and what level of difficulty of AI) by clicking on the seats on the right. After this is done, the cube will un-gray and become click-able, and the game will start. If the user is hosting a game, they will have to wait until enough players have joined for the game to start (if not enough players have joined you can always set the remaining seats to be computers). If the user is joining a game, they will have to wait until either enough people join or the host sets enough computer players, and then the game will start. The game will then be played out. Afterwards, the user will be presented with the options detailed in the paragraph above this walkthrough, which will lead either to the player returning to the initial, empty state of the game, or to a new game being started (with the same players and their total scores being cumulative).

If the user chooses Tutorial Game

Similar to above. If the tutorial game is a training game, then the process is the exact same as for a local game (except that the player cannot choose to turn another seat into a player, since training games are only for one person).

If the tutorial game is a practice scenario, then the tutorial immediately starts since there are no more options to be configured. Upon completion of a practice scenario, the user will be told that the tutorial is over, and they can then choose a new game if they want to from the menubar.