Konane Manual

Neel Verma

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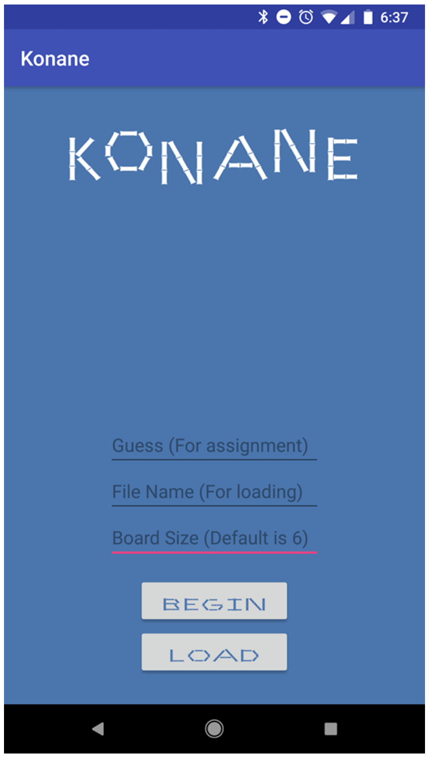
1 Activities

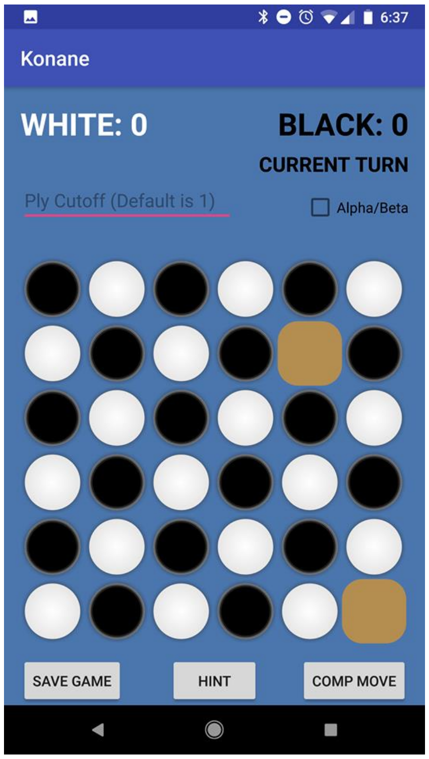
1.1 MainActivity

This activity is the welcome screen for my game. It displays the game's name (Konane) and has one button. This button is the one that must be pressed to begin the game. All of this is contained within a relative layout. After the "BEGIN" button is pressed, this activity will destroy itself and redirect to "BoardActivity". One other thing to mention is that this game must be played in portrait mode. Landscape mode is not available. This is so that the board will fit nicely on the screen.



1.2 BoardActivity

This activity is where the game takes place. It handles all game logic (via the model) and applies changes in game state to the GUI. At first, it has a button that says to press it to begin the game. It starts with the initial state of the board, being that all 36 pieces are in order and none are removed. All of this is contained in a relative layout. The board itself is contained in a linear layout. The pieces are implemented as image buttons. In this present state, none of those buttons are enabled, meaning that the state of the board cannot be modified until the "PRESS TO START THE GAME" button is pressed. After it is pressed, the model will remove two random slots from the board, which will be reflected in the GUI. It also makes available the two players' scores as well as the current turn. The name of the game was moved to the bottom so that the scores and current turn could be most easily read at the top. This can be seen on the next page.



After the game starts, the two users can start alternating turns until the game is over. All invalid moves are handled. The list goes as follows:

1) Trying to move from an empty space.

2) Trying to move a piece of a different color than yours.

3) Trying to move outside of the four given directions (up, down, left, right).

4) Trying to jump over your own piece, or over an empty space.

5) Trying to jump to a filled space.

6) Trying to jump too far.

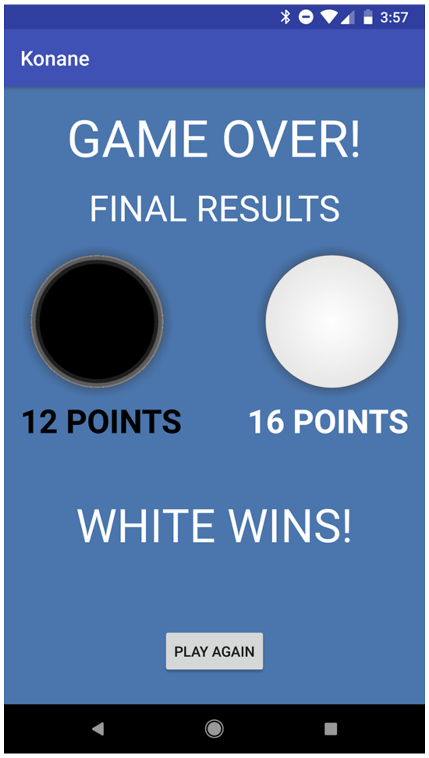
7) When in a multi-jump move, trying to move a piece that you were not already moving.

These are all communicated to the player(s) via Toast messages. See below for an example.

When all moves have been exhausted and when both players cannot move, a dialog box pops up telling the user(s) to press "OK" to see the game results. This redirects to a new activity called "EndActivity".

1.3 EndActivity

As you can see, the ending screen shows the scores of both players and tells who wins or if there was a draw. It then gives the option to play again if the user(s) wants to.



2 Model Classes and AI

2.1 Model Classes

- Slot: This class represents a single slot in the game board. It has a row, column, and a color. It provides methods to get and set the row, column, and color so that this information may be used to modify the game board.
- Player: This class represents one player of the game. A player has a color, a way of knowing whether it's their turn, and a score. It provides getter and setter methods, as well as a method to add to the existing score.
- Board: This class represents the game board. The board is implemented as a 6x6 2D array. It has methods to set a slot (only used in the constructor), set a slot color, and get a slot.
- Game: This class enforces all game logic. It has 2 players, one playing black pieces and one playing white pieces, and a board object. It has a method to remove two slots, verify the validity of a move, make a move, determine whether a player can move, determine

whether a player can make a successive move, and verify the validity of the possible successive move.
- MoveNode: This class represents a node in the minimax tree. It contains the source, destination, intermediate positions, score, and heuristic value.

2.2 AI

- Minimax: This algorithm generates the entire game tree and evaluates what the best move would be for either the computer or the human for the current game state. Can handle multi-hop and single-hop moves.
- Alpha Beta Pruning: This addition to minimax prunes off certain parts of the tree based on alpha and beta values, which signal that if a node guarantees it can never generate a more optimal child than it, those nodes are never generated.

3 Bug Report

- No bugs that I found or in the demo. The app ran as expected.

4 Feature Report

4.1 Implemented

- Implemented all features as part of the project requirements.

4.1 Not Implemented

- Implemented all features as part of the project requirements.

5 Log

- 3/4/2018 (4 hours): Implemented saving to and loading from multiple files. User can select the file they want to load by typing in the name.
- 3/7/2018 (8 hours): Conceptualized minimax and attempted to solve it without the context of a game.
- 3/10/2018 (4 hours): Finished minimax without the context of the game, just to fully understand the algorithm.
- 3/12/2018 (4 hours): Implemented dynamic board sizes.
- 3/13/2018 (4 hours): Implemented dynamic board size serialization.
- 3/16/2018 (8 hours): Attempted minimax in the context of the game. Ran into a lot of bugs and issues. Was not making showing the optimal move, but was showing the first move that it found. (This is because all heuristic values were 0).

- 3/20/2018 (8 hours): Fixed an issue in my dfs to get all moves. It was not showing all moves, and even showing some moves twice.
- 3/23/2018 (8 hours): Fully implemented minimax and alpha beta pruning in the context of the game. Implemented the computer and the option to make a guess to see who plays black stones. Computer makes optimal move. It wins the game 90% of the time with a ply cutoff of 8.
- 3/24/2018 (2 hours): Implemented the option to have the user ask for a hint, using the minimax algorithm.
- 3/26/2018 (1 hour): Implemented the feature to change ply cutoff/alpha beta usage any number of times before making the move.

Total: 51 hours