

Online chess game

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1 Analysis

1.1 Problem Identification

Students need a way to play chess online with their friends which is fast, free and accessible anywhere, even on mobile devices. The project should allow people to play chess online against each other or play offline against an AI to practise. One player on the online play should be the teacher, and be able to reverse moves in order to show the other player how to best play. I should also have an EVAL bar to show which side has the advantage in the game. I may also add puzzles so that the player can learn from interesting situations.

Ideally the moves will check the validity on either client's side in order to save time, since the networking will take the longest.

1.2 Stakeholders

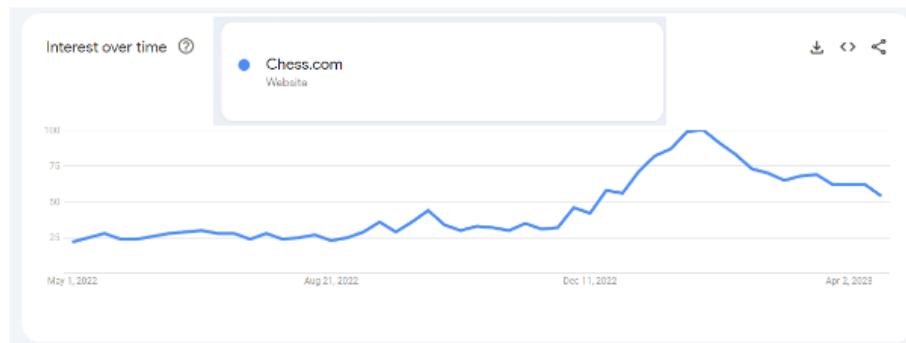


Figure 1: A google trends graph of chess.com

The primary users will be chess tutors and students learning chess, using my web application in order to teach and be taught chess. More widely it could be used by people playing chess with friends or just to practise against the bot.

There are more than 2.5 million active users on a similar website chess.com, as you can see in the figure above. Some of those users will prefer a platform specifically for teaching with a more abstracted GUI. The recent rise in popularity of chess in schools means that my target audience is probably the student population who want to play chess with their friends online. Maybe they want to avoid the advertisements from chess.com and would prefer a more barebones UI. Since the project is available online via a website, our clients can also connect on a mobile phone over the internet and play there.

1.3 Computational methods used

1.3.1 Decomposition

The project can quickly be split into the multiplayer and offline parts, then further divided into matters of GUI and backend computation. The GUI consists of getting the position of the mouse, what it is dragging / clicking and passing to the move checking part of the algorithm. The move checker checks if the move is valid and either carries it out or throws an exception. For the online part of the project, I will need to pass the moves between clients and process any extra requests from the teacher. The networking should run completely separately from the move checking, so that only valid moves are passed over the network. The eval bar should take an average of the current position and display it as a ratio to the other side's advantage.

1.3.2 Pattern Recognition

A lot of the functions for the offline part of the program can be reused for the online part also, the move validation and eval bar will be extremely useful for both, so those parts should be put into their own functions, which will make the code neater in general. Functions for the eval bar will be used in the move evaluation in the AI.

The move generation will implement a lot of pattern recognition due to the fact that some pieces share moves, the queen's moveset is simply both the bishop's and the rook's. The pawn's captures are similar to the bishop's moves, just a smaller range. I will make and use a 2d raycasting function, for the valid sliding moves.

1.3.3 Thinking Abstractly

Javascript stores integers in 64 bits, so I could store the available moves in a 8x8 bitboard, essentially a collapsed one dimensional array of booleans stored in a single binary number.

2 interview

Here is the list of questions I will ask my stakeholders in order to determine a more specific and fulfilling project specification, hopefully these questions will create a much better understanding of consumer needs in reference to the product.

2.1 Questions

these are the questions for casual chess player Harry, and beginner player Annabel

1. Have you tried online chess applications?

2. If so: Which one? How was it?
3. Have you had any issues with online chess games?
4. Any problems with the graphical user interface?
5. What platform do you play chess on?
6. Do you usually play chess with your friends? How do you do that?
7. Do you find a rating system useful when playing with friends?
8. Have you ever played chess variants, which are your favourite?
9. What are some features you would like to see in an online chess game?

The first questions establish how familiar they are with the software out there already, and which applications they have used. Then the next questions outline problems with online chess applications and how they can be improved. Including the graphical user interface. Then the user can suggest any features they would want in the application that I could implement after building the main game. I need to make sure the program is usable on all platforms that the stakeholders use.

2.2 Results of interview

1. Have you tried online chess applications? If so: How was it?

Harry - "Yes, I have tried **chess.com** and various chess apps which allowed me to play games however I didn't like the amount of ads on the apps and the limits that **chess.com** incorporates in order to coerce you into paying to play. I also like the ability to pass and play on one device so we can play with and without internet connection"

Michael - "yes, **chess.com** kinda mid"

Jed - "I have, I played chess on **chess.com**. It was okay"

2. Have you had any issues with online chess games?

Harry - "I find that time in crucial endgames lag can make the timer unreliable and cause jumping around to keep up with the server. cheats are also an issue so a smaller site would be more peaceful."

Michael - "Players are too good, UI is confusing"

Jed - "UI is too complex, and I don't like the ads"

3. Explain the problems with the UI?

Harry - "overall the gui is reliable but I find that it can be clunky and make it difficult to alter pre moves that you don't want to be made. I like minimal distractions when playing so the gui on some websites is quite overwhelming and unnessecary"

Michael - "Too much information and no way to nagigate it. all icons with no text"

Jed - "Complex and I never know how to do certain functions"

4. What platform do you play on?

Harry - "Mobile or on a laptop"

Michael - "Laptop"

Jed - "Physical board or a computer"

5. Do you usually play chess with friends?

Harry - "Yes, that is my main motivation to play. We enjoy to play in person and online since it is convinient, however I always enjoy the excitement of in person games more than that of the online ones. I do enjoy playing against strangers but prefer interacting with people I know."

6. Do you find a rating system useful?

Harry - "I think a rating system can create competition which many people may enjoy but when I play for leisure with my friends I often find ratings do more emotional harm than good. turning it off helps to keep the games fun and not as toxic. If there is a competitive aspect to the game, the rating motivates players to climb and get better"

7. Have you played chess variants, Do you enjoy them?

Harry - "I have played some variants, I enjoy the 'fog of war' and 'invisible pieces' games on chess.com, along with different starting positions like

'chess960' I think it's important to provide clear instructions along with the game itself"

8. What are some features you would like to see in an online chess game?

Harry - "I want to be able to send messages to my opponents while we play the game and edit the appearance of the board and pieces to custom templates so I can best fit the game to me. I think that some form of tournament system could also be an interesting event to create"

2.2.1 Analysis

The most popular existing online solution seems to be chess.com, I will have to research this website for my next section.

Supposedly chess.com has clunky UI and lag problems, I will hope to improve on these.

I'd like the application to work on mobile and on pc, maybe a web based solution would be best.

Playing with friends is a key feature, Harry also mentioned a chat feature to be implemented.

2.3 Research

2.3.1 Existing similar solution

The existing solution that was mentioned most by my stakeholders was chess.com, which is also a service I have used in the past. It is an online chess application connected with what is essentially a social media, such that players can have friends and play with them at the click of a button.

chess.com has a rating system and has a very competitive atmosphere that has been adopted by the newest generation of chess players very recently. Chess as a whole has evolved into an online sport, tournaments such as "pogchamps" taking place on Twitch and other online streaming platforms. Hopefully my solution will boast similar features to chess.com and improve on some of its features (most likely the confusing UI and ads)

2.3.2 Features of proposed solution

The proposed solution will have the ability to play chess online with friends through a website, There will be a chat feature where users can talk to each other. It must have simple UI so as not to confuse the user, also I would like to have as little lag as possible.

2.3.3 Futhur meeting with stakeholders

2.4 Requirements

2.4.1 Software and hardware requirements

2.4.2 Stakeholder requirements

2.5 Success Criteria

3 Design

Here is a flowchart of my program design Here are some UI elements I designed for the chess pieces

4 Development and testing

4.1 startup and UI

4.1.1 storing the pieces

4.1.2 making the board

To start off the program is going to read the starting positions for the pieces from a FEN string. They way it's written is in rows, so for brevity I interpret it into an array of [y,x] then flip it to so it is indexed in the correct way.

As you may notice, this is also the constructor for the board class

4.1.3 displaying the pieces

5 Evaluation

6 Final code

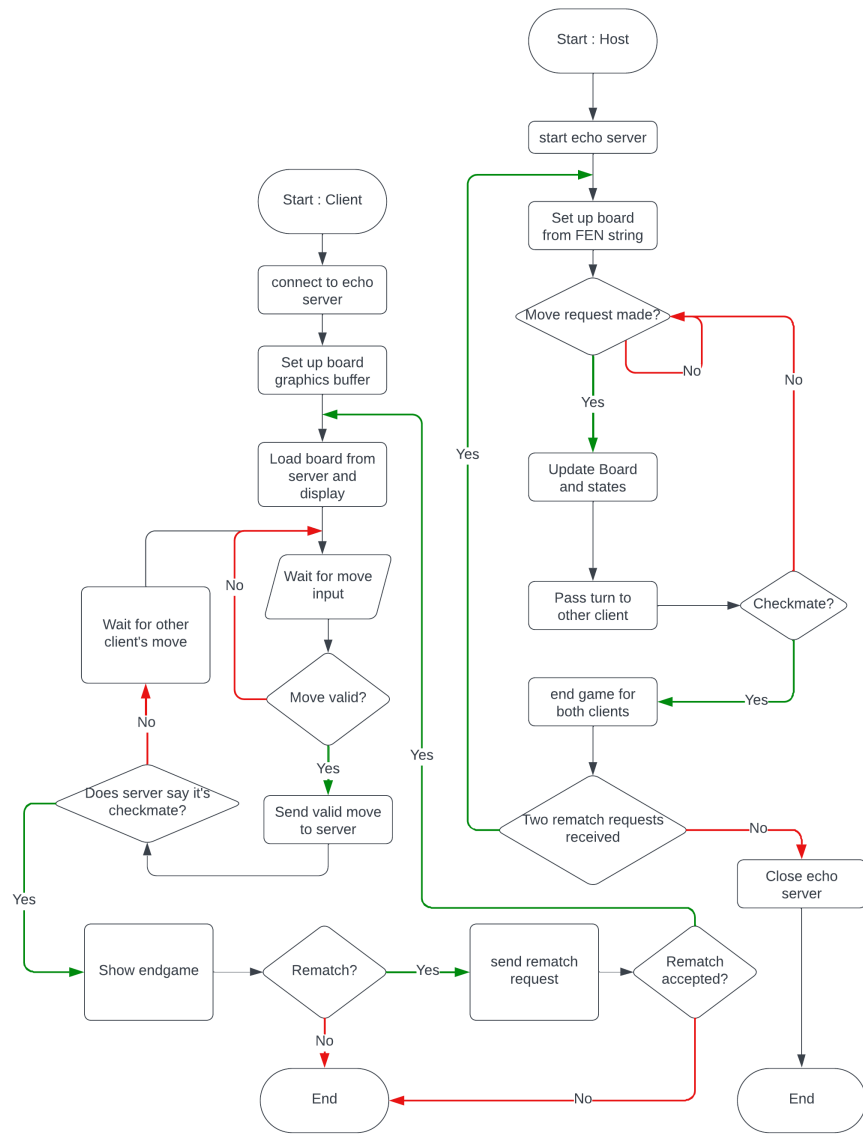


Figure 2: A flowchart of my program



Figure 3: Chess Pieces I drew

```
class Board {
  constructor(string) {
    this.contents = []
    let board = []
    let b = string.split("/")
    for ( let i = 0; i < b.length; i++ ) {
      let rank = []
      let ranktwo = []
      for ( let j = 0; j < b[i].length; j++ ) {
        let n = int(b[i][j])
        if (isNaN(n)){
          rank.push(PIECES[b[i][j]])
          ranktwo.push(0)
        }
        else {
          for (let k = 0; k < n; k++){
            rank.push(0)
            ranktwo.push(0)
          }
        }
      }
      board.push(rank)
      this.contents.push(ranktwo)
    }
    for (let i = 0; i < 8; i++) {
      for (let j = 0; j < 8; j++) {
        this.contents[i][j] = board[j][i]
      }
    }
  }
}
```

Figure 4: code that interprets a FEN string