go

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# Analysis

## Identification

Go is a board game which is said to be one of the oldest board games as it was created nearly 4000 years ago in China. It is popular in china, kora and especially in japan. Japan had 4 very competitive go schools which was set up and funded by the government during the Tokugawa, which made Go a profession in Japan. It later became globally popular in other countries after World War 2. There is also a European Go federation which holds many different competitions and championships in several countries every year.

Go is a 2-player abstract strategy board game where the opponent is trying to capture territories on the board by encapsulating the territory with their pieces, also known as stones. The two plyers get assigned a colour at the start and usually the weaker opponent gets white, at a turn you can either place a stone down or pass a stone to your opponent to ‘surrender’ your go. You win by capturing the most territories on the board, where one territory is an intersection between lines on the playing board.

I have spotted that not many people enjoy playing Go or have the physical board game at hand, so I will be solving this issue. I will be creating an online virtual version of Go that will allow multipole users from the same network to play the game. They will be able to choose their difficulty level and get a randomly selected person at the same difficulty level to play with them. This is will be suitable to all skill levels as I will accommodate players that have no prior knowledge of go to play as well.

### Why this is solvable by a computational approach

This is solvable by a computational approach as I can discretely compute the all the necessary outputs needed for the game to run properly as I will explain now.

Finding captured territory can be thought of like a graph, where each node is a stone and each edge is a connecting chain of stones, so I must find a loop of same-coloured stones for a capture, a cycle. Cycle detection is a classic computer theory problem which can be applied to this game. This takes a finite amount of time and due to the nature of the game, regardless of how the game is played, the algorithm I will develop will always be able to compute the required output, like to see if a valid move can be played, within an acceptable time frame for the user regardless of their level of skill. I can use algorithms such as union find to detect any cycles within the current game state.

The game can also span many hours at the highest skill levels, so allowing them to save and store games virtually and easily restore them can be solved using software. Instead of needing to play the full game to completion I can use the computer to be able to store and save game states so the players can come back to it later when they have more free time at hand.

Another reason is that they may not have the board and pieces available to them all the time or have enough people to play with. To overcome this, having a virtual version allows you to always be able to play on demand and to know there are always going to be people wanting to play with you. The computer can guarantee you the board will always be exact and that, assuming other users are on the game, another player will want to actively play the game with you.

Keeping track of rankings can be tedious and has a lot of room for error. We can by-pass this by using the computer to do all the math for calculating the Elo rating for us. We can also use the computer to store the rating as this would mean the rating and the game would be in one application and in one place rather than it being in multiple different places or apps which will benefit the end user as its less to remember.

## Stakeholders

### 1.2.1 End Users

My end users will players wanting to advance their skills within the game. For this I will interview and talk with potential players and see what they would like to see in a game like this, any specific features that would entice them to play the game or enhance their experience.

Players with little or no knowledge of the game will be able to select the board size of 9x9 and play a relatively simple game to start off with as they can learn how to play the game and begin to understand the rules, they will be matched with someone at the same skill level as them so they can reasonably advance within the game.

Intermediate players with be able to choose a board size that is either 13x13 or 17x17 to be able to play a more stimulating and challenging game as they will need a more advanced level of play for them to enjoy the game.

For the most skilled players they can play with board sizes 19x19 which should satisfy their needs and allow them to play a challenging enough game for them. They will most probably play for hours so the ability to save is and save the game state is a needed requirement.

Another more general stakeholder is the casual player of Go, this is where they may not have the board and pieces available to them all the time or have enough people to play with. To overcome this having a virtual version allows you to always be able to play on demand and to know there are always going to be people wanting to play with you.

|  |  |  |
| --- | --- | --- |
| The user | Interaction | Availability |
| Newbie | * Smaller sized 9x9 boards for games * Using the online feature to find other players at same level * Maybe 10x10 boards for advancement | * 2 times a week |
| Intermediate player | * Medium sized boards for games * Playing games of about an hour or more * Tries to advance by using larger boards | * weekly |
| Advanced players | * larger sized boards for games such as 17x17 or 19x19 * they will play for long period, such as 2-3 hours or more * will need the ability to pause and save a game state * maybe play smaller boards for shorter amount of time such as 30 mins | * weekly |

### 1.2.2 Requirements

The system will be written in python 3, so as a guide the user must have the necessary requirements to run python 3, they will also need enough disk space to store the game. The hardware requirements are that they will need a mouse to control the stones and where to place them, a screen so they can see visually what the current state of the system is, a keyboard to be able to press the enter key when required and enough hard disk space to store the Go game itself.

Here are the basic requirements to run python 3 from the python website itself

## Research

### 1.3.1 online-go.com

This is online-go.com version of the game. They have a wide variety of services that include puzzles, learning the fundamentals of the game, many tournaments, multiple forums to discuss the game and much more. The main feature is the online playing of Go, where you can play against other people with roughly the same rank as you to play against. They also have a joseki, which is a hotseat version which analyses the game as you play each other telling you whether you played a good or bad move.

Graphical user interface, table

Description automatically generated

This is the main menu and fundamentals section on the page (fig 3)

A picture containing text, yellow

Description automatically generated

This is the wooden style board (fig 2)

Chart

Description automatically generated

The automatic stone placement (fig 1)

Features:

* Their boards is supposed to model a wooden go board, imitating the real life original version of Go (fig 2)
* They have a menu section in the left-hand side of the screen, I think this is a very good idea as it makes using the app much easier and has less friction when starting to play in the new environment. It would be a beneficial feature to my solution (fig 3)
* They highlight the icon or word the user is currently hovering their mouse over
* Their board puts in automatic stones put in for you when you are over the different positions (fig 1)
* They also have a fundamentals section and a basics section for beginners when they start the game online so they can learn how to play the game
* (fig 3)

### 1.3.2 Go by AI Factory Limited

Go is an online downloadable phone app that allows you to play against its AI Go player or has a hotseat option to play with other friends you currently have around you. It offers the chance for you to play the AI at multiple different difficulties and lets you choose what board size you want to play on (9, 13, 17 or 19). It has the very useful setting that allows you to edit the white handicap so you can play harder versions of the AI while still finding it enjoyable or play a more skilful friend in the hot seat section.

Chart, scatter chart

Description automatically generated

Here is their wooden board

(fig 4)

A picture containing text, calculator

Description automatically generated

The settings page

(fig 5)

Features:

* It has an AI which you can play against if you are offline, this is beyond the scope of my solution and so I will not implement but still an excellent feature as it would guarantee users the ability to play the game regardless of their internet connection
* Their board is modelling a wooden go board, imitating the real-life original version of Go, I think I will follow this design as it would make the game feel more realistic for the user. This will greatly benefit my solution (fig 4)
* It allows you to change the different factors of the game, such as the board size, Chinese/Japanese rules, the difficulty of the AI and what handicap white should have, in a setting menu (fig5)
* It keeps the number of stones captured by the opposition in brackets by their username
* It also has a two player hot seat option
* It gives you hints when you get to the higher levels, such as Dan 1

Limitations:

* It doesn’t allow you to randomise your starting colour. This isn’t good as it wouldn’t allow the user to have the chance to play as the second player. This would not meet the needs of my end user as they would want to experience the game from both angles as they would be players from a range of experience so the most experienced wanting to challenge themselves while the least experienced wanting to learn how to think while being the second player. So, this would not be a suitable feature for my solution.
* You cannot play online against others, only hot seat or against an AI. This would not meet the needs of my end users as being able to play others while not having anyone physically near you is the key idea behind my solution. They would not be able to play whenever they want against another human.
* They do not offer the ability to save the current game, this would not be suitable as a single game of go could last a couple hours. This wouldn’t satisfy the needs of my users might not have the time block of a couple of hours in a day to play a full game of go. Saving the game state is needed in my solution as my targeted userbase includes advanced players which will play for long hours which they may not have in one sitting

### 1.3.3 BadukPop – GO by CorePlane Inc.

This is an android mobile app that allows you to play games against others online at any time. It also has features such as practice problems to be able to sharpen your skills at go, what they call tsumego, while completing the problems you can also collect keys that you can use to see how far you have advanced through the game. They also allow you to rank yourself against other players with a global leader board. You can play against an AI with a variety of different difficulty levels which allows for multiple users.

Chart, bubble chart

Description automatically generated

A view of one of their practice problem boards (fig 7)

A picture containing text

Description automatically generated

Their board layout with two active users

(fig 6)

Graphical user interface

Description automatically generated

The study room page showing multiple problems you can solve (fig 8)

Features:

* It has over 4000 practice problems which will allow for beginners to get better and advance throughout the game (fig 7)
* Has an AI which you can play against, this is good when the user does not have access to a stable internet connection or doesn’t have one at all
* Has personal leader boards for you and friends which is good as this enhances the user experience as it adds a more personal feeling making user more attached to the app
* It has an ‘Automatch’ feature that allows the user to instantly find an active player within their skill level range to play against. This motivates the beginners to play more as they are not constantly being beaten by the more advanced players
* The live board game is mimicking the real-life wooden board game, it also has the users as small images of cartoons instead of a chosen image.
* They also have the nationality flag of the user on screen with their elo rating. I think the elo rating being visible is important as it shows the two players how they compare against each other and allows them to know how good their opponent is, I will incorporate this feature into my solution as I think it will increase user satisfaction and it would benefit my users.

Limitations:

* It doesn’t allow for offline gaming; this is a major drawback as maybe their users might want to play while on a plane on the bus but are unable to due to no stable connection to internet, especially when they have features such as mini problems which should be stored onto the device upon installing. Unlike their userbase, by users will tolerate this as they will only have access to online gaming against other players
* Their game has a feature that only allows the user to play a certain number of games a month unless they pay and get more games per month. This subscription service deters users away and will put off beginners as they will not be able to play enough games to advance their skills within go. I will not have this on my solution as it will do nothing but deter users as I am not offering them a premium service.

## Essential features and limitations of my solution

### initial concept of the solution considering the research

my solution will be an application that when started will present the user with the menu screen, it will allow the user to start a new game or open a previously, saved, game. The active gameboard will be a wooden one. There will be a menu next to the board which will allow the user to either save or exit the game. They will have an icon to represent them, as the player, and will have their elo rating next to their name while playing visible to both users.

When starting a new game they will be given the option to choose their board size and the amount of time allowed per move for the game. The users will have a timer on the side of the board to show them how much time they have left per move so to allow them to easily know how much time they have left to play the move

# Design

## 2.1 decomposition

## 2.2 algorithms being used

## 2.3 usability

## 2.4 structure

## 2.5 testing

# Development

## Prototype 1

## Prototype 2

## 3.3 Prototype 3