go

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Table of Contents

[1.0 Analysis 2](#_Toc76105476)

[1.1 Identification 2](#_Toc76105477)

[1.1.1 Why this is solvable by a computational approach 2](#_Toc76105478)

[1.2 Stakeholders 3](#_Toc76105479)

[1.2.1 End Users 3](#_Toc76105480)

[1.2.2 Requirements 5](#_Toc76105481)

[1.3 Research 5](#_Toc76105482)

[1.3.1 online-go.com 5](#_Toc76105483)

[1.3.2 Go by AI Factory Limited 7](#_Toc76105484)

[1.3.3 Online GO by Zen Android 9](#_Toc76105485)

[1.4 Essential features of my solution 9](#_Toc76105486)

[2.0 Design 10](#_Toc76105487)

[2.1 decomposition 10](#_Toc76105488)

[2.2 algorithms being used 10](#_Toc76105489)

[2.3 usability 10](#_Toc76105490)

[2.4 structure 10](#_Toc76105491)

[2.5 testing 10](#_Toc76105492)

[3.0 Development 10](#_Toc76105493)

[3.1 Prototype 1 11](#_Toc76105494)

[3.2 Prototype 2 11](#_Toc76105495)

[3.3 Prototype 3 11](#_Toc76105496)

# 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 divide the game into two main sections. Placing a valid move, finding cycles for capturing stones and keeping track of scores and ranking. This is because finding cycles is a classic computer theory problem which can be applied to this game and it uses heavy use of algorithms, this allows the game to be played quicker and easier than needing to double check if a capture has been made or not. The scores and ranks may be forgotten so we can store them to avoid this problem

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. Players are also rated using Kyu and Dan. Where Kyu is a set of student level ranks and Dan is a set of master level rank. People would, and most probably, end up forgetting their rank and their rating number if just done using pen and paper, however if it was stored virtually on a user-friendly interface, it would allow the players to get rid of the hassle of needing to remember their rating and allow them to compare their ratings with others across the world.

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.

We can computationally find a cycle within the game board which would represent a capturing of stones. There are many cycle detection algorithms such as Hamiltonian cycle detection and the Floyd Warshall cycle detection algorithm, I will discuss these algorithms in more detail later. This can allow us to quickly identify if a player has successfully

captured a set of stones or not.

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 educational institutions wanting to teach the game and players wanting to advance their skills within the game. For this

I will interview and talk with teachers and other people within the school to see what their expectations and wants are for a virtual Go game and see if I can reasonably reach their needs while developing the game.

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

(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)

Limitations:

### 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 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
* Their board is modelling a wooden go board, imitating the real-life original version of Go (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. So saving the game state would be a part of my solution

### 1.3.3 Online GO by Zen Android

Features:

* They have used the wooden board background for the board to try and imitate the real life version
* They have a rating system which you can use to compare yourself to other players
* Allows for an online game between other players
* It tells you the number of captures stones in the centre at the top of the screen with ‘Prisoners’ in the middle
* It has an AI that also tells you the percentage chance for you to win or lose while playing against it

## Essential features of my solution

My solution will include some aspects as seen from my research section, I will discuss all the of feature I will provide within my solution and explain and justify the reasons for them.

I will include a board that has a wooden design, this will allow for the user to feel like he his playing on the original board and make it feel more like the original board game was Infront of him.

There will be a hot seat and online player version to this game. If the user pleases to he can play with friends that are currently around them and enjoy playing with others who are physically around him, however if that is not possible he will be given the option to be able to play against others online and play on demand whenever he wants. This will be essential as it allows the users to play whenever they want, not limiting them to anything other than number of available users.

I will also include a game saving option. This is needed as sometimes they most skilful players will be playing for hours at end, so they will most probably not have the time to do this in one sitting during the day. To be able to save the game state will incentivise them to play longer games as they can come back to it later instead of needing to worry for any time constraints.

I will also randomise the starting colour of the players as this will allow beginner players to see and experience the game in both positions. This will teach them and help them to become a better go player. If they do eventually get better, they will be incentivised to come back and to try and take on the challenge of it being randomised and it will be rewarding for the newbie users.

I will also include the number of captured pieces by each player by their name and their elo rating by their name as well. This will allow the two players see the skill level of their opposition very easily and will get rid of any confusion on how difficult the game against others will be.

# 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