



G O M O K U

Final Presentation

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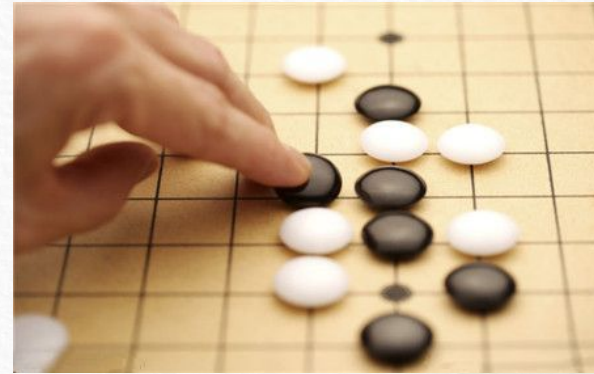
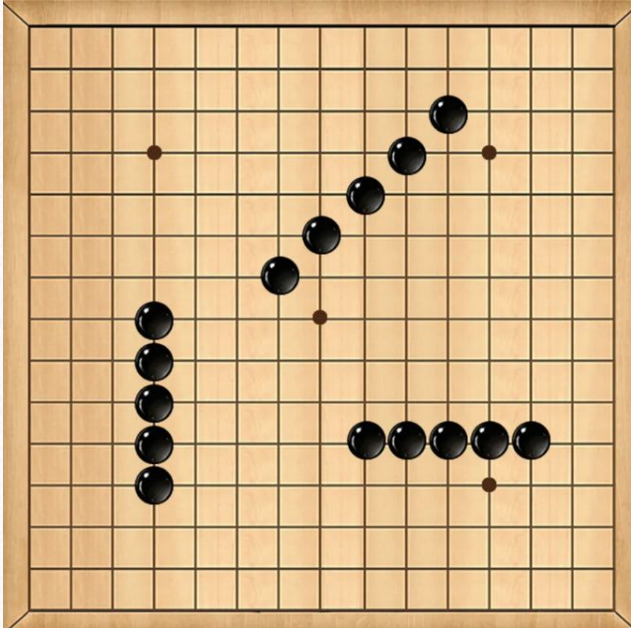
Overview

- Background
- Game Logic & UI Design
 - Menu Diagram
 - Game Diagram
- Hardware
 - Memory
 - Input Device
- Software
 - AI Algorithm

Background

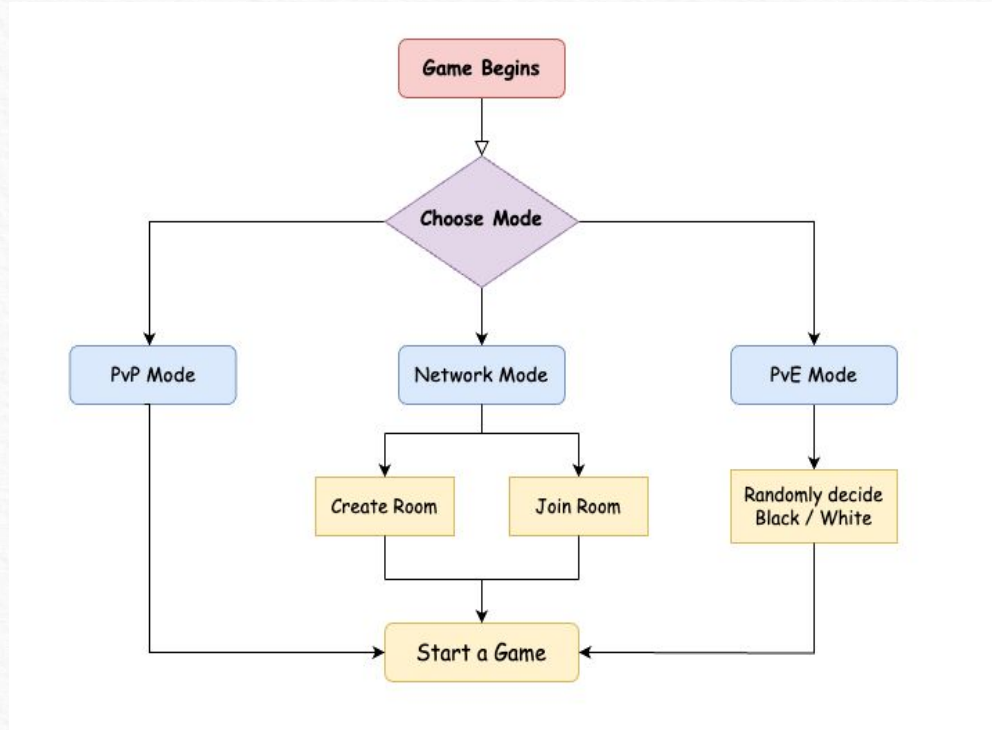
Gomoku is a board game played by two players on a 15x15 grid board.

Players take turns placing their pieces, and the first player to form a continuous line of five pieces of the same color (**horizontally, vertically, or diagonally**) wins.



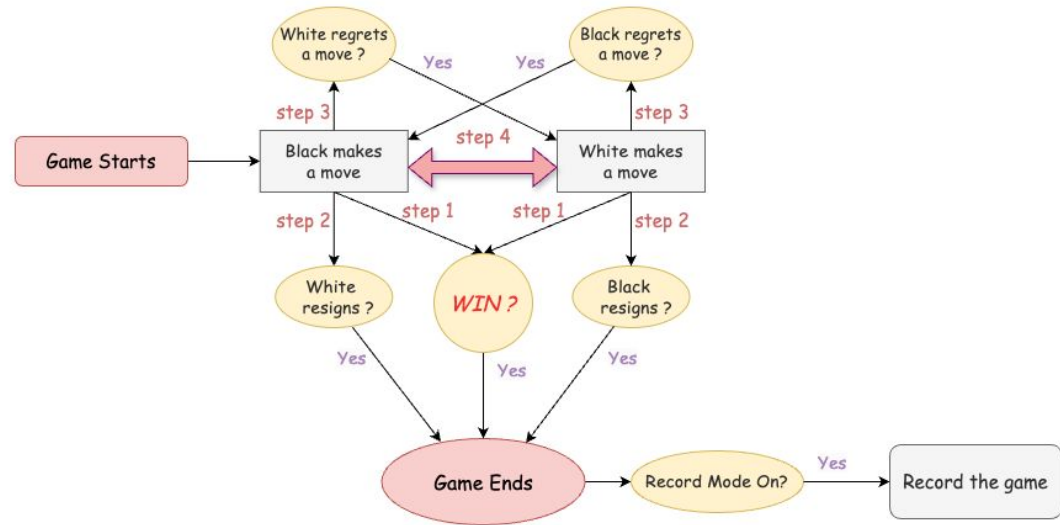
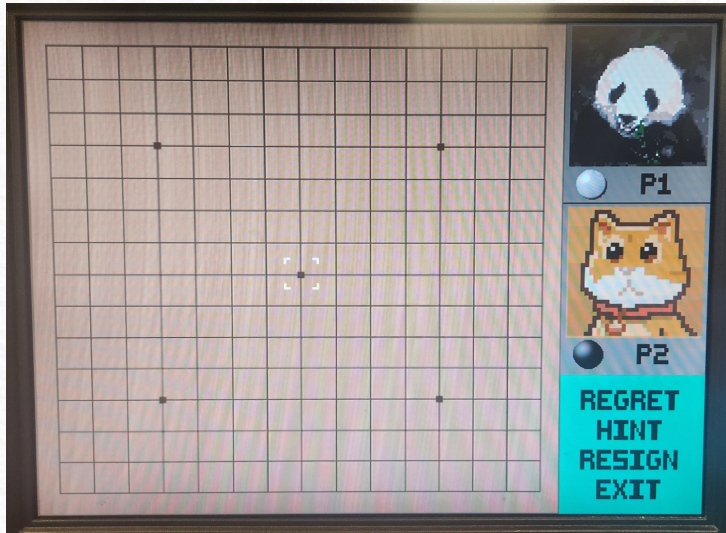
Game Logic & UI Design

- Menu

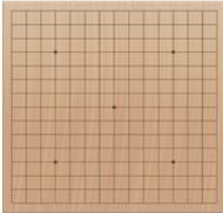





Game Logic & UI Design

- In Game



Memory

Name	Graphic	Size (pixels)	Bits per Pixel	Total Bytes
Board		500 x 480	4	120,000
Black Piece		33 x 31	8	1023
White Piece		33 x 31	8	1023
Fonts		55 x 8 x 5	1	225
		Memory Budget (bits)		978,168

Avalon Bus Interface

Address	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Details	
00					Sound						MSG	PF	T	P	C	M	Display	
02						Black Piece	White Piece		Piece Y Position			Piece X Position			Piece information			
04	Selected mark Y location			Selected mark X Location			Last Piece Y Location			Last Piece X Position			Selected mark, Last piece mark					
06	Message group index						V	V	V	V	V	V	V	V	V	V	V	Message Visibility Info
08	Message Index, 0 means no message is selected.															Selected Message Info		
10	Touchpad mark X position															Touchpad mark Info		
12	Touchpad mark Y position																	

Address 06:

- We categorize messages into groups, so that we can set the visibility of a group of message simultaneously
- 0~9 - Visibility status of each message in one group. So there are at most 10 messages in a group.
- 11~15 - Message group index. At most 64 groups
- So we could have at most 640 messages to show using this interface

Address 00, offset:

- 0 - Whether to show menu page or board page
- 1 - Whether to show touchpad cursor
- 2 - Player UI, player piece information. Whether player 1 takes black piece
- 3 - Player UI, current player mark. Whether it is player 1's turn.
- 4 - Player UI, player 2 profile image. Whether player 2's profile image is cat or dog
- 5 - Message box UI. Whether to show the popup message
- 8 - Victory Sound
- 9 - Defeat sound
- 10 - Show menu sound
- 11 - Piece move sound

Input Devices

- Xbox One controller
- XP Touchpad
- Both use libusb





Input Device

Base class : `BaseInputDevice`

Methods :

`open_device`, `close_device`, `create_handling_thread`, `stop_handling_thread`
and more ...


Xbox : inherits from `BaseInputDevice`

`class XboxController`

```
class XboxController: public BaseInputDevice
public:
    XboxController()
    {
        device_name_ = "Xbox controller";
        vendor_id_ = CONTROLLER_VENDOR_ID;
        product_id_ = CONTROLLER_PRODUCT_ID;
        interface_ = 0;
        endpoint_ = CONTROLLER_ENDPOINT;
    }
};
```

Transfer protocol

data[2]	Direction Button
data[3]	Function Button(Y/B/A/X/L B/RB)
data[4]	Button LT
data[5]	Button RT
data[6:9]	Movement of the left rotate
data[10:13]	Movement of the right rotate



Touchpad : inherits from BaseInputDevice
`class TouchPad`

Different status

NO PEN	No Pen detected
PEN	Pen is detected
LEFT	Left button clicked
RIGHT	Right button clicked
LEFT&RIGHT	Both are clicked

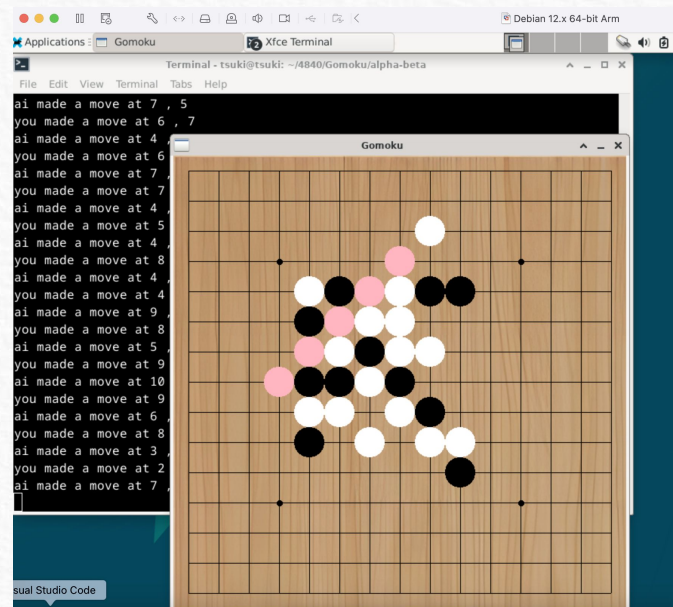
```
class Touchpad : public BaseInputDevice{
public:
    Touchpad()
    {
        device_name_ = "Touchpad";
        vendor_id_ = TOUCHPAD_VENDOR_ID;
        product_id_ = TOUCHPAD_PRODUCT_ID;
        interface_ = TOUCHPAD_INTERFACE;
        endpoint_ = TOUCHPAD_ENDPOINT;
    }
}
```

Software

- Basic game logic — Implemented in C++
- AI algorithm — MiniMax with Alpha-Beta Pruning on branch tsuki — Test it and have fun !

```
5 11
You made a move at 5, 11
AI made a move at 9, 8

  1  2  3  4  5  6  7  8  9  10 11 12 13 14 15
1  -  -  -  -  -  -  -  -  -  -  -  -  -  -
2  -  -  -  -  -  -  -  -  -  -  -  -  -  -
3  -  -  -  -  -  -  -  -  -  -  -  -  -  -
4  -  -  -  -  -  -  -  -  -  -  -  -  -  -
5  -  -  -  -  -  -  -  -  -  -  0  -  -  -  -
6  -  -  -  -  -  -  -  -  -  -  X  -  -  -  -
7  -  -  -  -  -  -  -  -  X  -  -  -  -  -  -
8  -  -  -  -  -  -  -  X  -  -  -  -  -  -  -
9  -  -  -  -  -  0  @  0  -  -  -  -  -  -  -
10 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
11 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
12 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
13 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
14 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
15 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
```





Thank you