

## Gobang Game Design based on Module Division

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### ABSTRACT

Gobang is a pure strategy chess game for two players. it can realize the function of two people playing Gobang on computer through C programming language. The program consists of welcome interface, game board interface, cursor movement and drop, judgment of victory or defeat, take back a move function, providing sound effect and other subprograms; the whole program applies elements and sentences such as structure, array, global variables, key processing and graphic programming. The program realizes the effect of two people playing chess on the computer through the functions of generating chessboard and chessman image, moving the two people and judging the outcome.

**KEYWORDS:** C language, Gobang, two person game

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### I. INTRODUCTION

Gobang is a kind of easy to use, suitable for all ages, but also interesting, fascinating game; it can not only enhance the ability of thinking, improve intelligence, but also rich in philosophy, which is conducive to self-cultivation. This paper uses C language, a process oriented programming language, to design and write a simple Gobang game for two people, so as to deeply understand the application of C language.

### II. FUNCTION ANALYSIS OF GAME

This program is designed for people to play chess, one side holds black chess, the other side holds white chess, and each side tries to connect its five pieces before the end of the game, and the party with five connected pieces wins first. During the execution of the program, chessboard and pieces are required to be visible from time to time. The game interface information prompts where to play chess. You can move the cursor through the keys on the keyboard, and then press enter to place the chess pieces. Every time a drop is made, there is a system sound, and at the same time, it can provide repentance function. The whole program is tested in DEV-C++ software environment.

### III. MODULE COMPOSITION OF GAME

According to the functional requirements, the program is divided into four modules: interface display, player operation, sound effect provision and winner or loser judgment. The following analyzes the requirements of each module.

**3.1 Interface display module:** When the program starts to run, it displays the creator and gives the welcome and exit interface; after the game starts, it is required to generate an 18x18 chessboard image, and the welcome message "welcome to play Gobang" is displayed on the top of the board. The game below the chessboard shows that it is the turn of Party A or Party B to drop the pieces. During the process, it is required to display the pieces that have been dropped on the chessboard in real time Party A is the white spot and Party B is the white circle; after winning or losing, the game ending screen is required and the user is asked whether to continue the game.

**3.2 Player operation module:** At the beginning of the program, the player needs to confirm and select "two players play" to start the game; in the process of the game, two players move the cursor through different buttons to select the landing position; In the process of the game, after the current player plays chess, and before another player plays chess, the current player can repent. The repentance prompt is at the bottom left of the chessboard, which is the key B. At the end of the game, some players choose whether to start a new game.

**3.3 Sound supply module:** Every time a player drops a piece, the system provides a sound effect to increase the interest of playing chess.

**3.4 Judgment module of victory or defeat:** It monitors of the chessboard pieces real time, once a certain color of the five pieces appears, computer terminates the game program, and colors the five connected into a line, the bottom of the board pops up the winning information of the color player.

#### IV. FUNCTION REALIZATION OF GAME

The main function `main ()` first calls the function `Init ()` to realize the initialization of the program, then calls the `Welcome ()` function to enter the welcome interface, and decides whether to start the two player chess game through the choice of the main menu. After selecting "two people playing chess", the game enters into the player operation module. By calling the `putdown()` function, the game can realize the chess game between Party A and Party B. The `record()` function is called to record the chess pieces that have been dropped by both parties in the process of falling. The keyboard operation is read by calling the `play()` function, including the cursor moving up and down, playing chess and repenting chess. After one player drops a piece, but before the other player does not, the current player can perform repentance operation, and the program will call automatically `go_back()` function. When Party A and Party B are finished, they will judge the outcome by calling the `judge()` function. In the whole process of playing chess, in order to improve the interest of the game, the program provides a simple system sound effect at each drop, which is realized by the `printf ("a");` to state. Next, each function is analyzed in detail.

**4.1 main():** The main function `main ()` is the entrance of the whole program, which is responsible for the declaration of variables and the call of each sub function, and finally realizes the Gobang function of double play. Each function is finally called and executed directly or indirectly in the main function. At the beginning of the program, some header files should be included, and the response structure and global variables should be declared. The position of the chessmen adopts coordinates and is recorded by array `Q`.

**4.2 Welcome()function:** The `welcome()` function is mainly used to display the main menu interface by calling `goto_xy ()` cursor movement function is used to display menu information. The `init()` function is mainly used to initialize the game. In this game, there are two main menu options, one is "two people play chess" option, the other is "exit" option. The system sets the default option as "two players playing chess". At the same time, the system has set up two players, and set player a as the first player.

**4.3 Draw()function:** When the player in the main menu to select the "two people play" option, they will start to play the game. The system first calls the `draw()` function to draw the chess board interface. At the beginning of the game, the chessboard is initialized and abstracted into an  $18 * 18$  two-dimensional array. The value of each element in the array is set to 0. At the same time, it is called `goto_xy()` cursor movement function is used to display the chess playing methods of a and B.

**4.4 Record()function:** The `record()` function is mainly used to record the chess pieces. After both party A and B drop, the program will assign a specific value to the `Q` array element at the drop. In this game, the chess pieces of player A are assigned as 2 and the pieces of player B are assigned as 1, which is used to determine the winner or loser and repent. The core sentence is "`Q [point. x] [point. y] = player + 1;`". The `player = 1` is player a and `player = 0` is player B.

**4.5 PutDown()function:** `Putdown()` function is mainly used to display the chess pieces of Party A and Party B. This function first detects whether there are chess pieces at the cursor position on the chessboard in the process of playing chess. If there is no chess piece, when the player is a, it will be displayed as "●". At the same time, the `record()` function will be called to record the situation of the chess pieces; when the player is B, it will be displayed as "○". At the same time, the `record()` function will also be called to record the situation of the chess pieces.

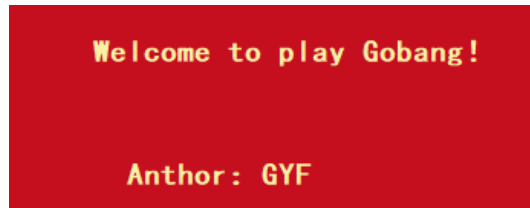
**4.6 Play()function:** In this game, the movement and falling of the chess pieces are controlled by the keys on the keyboard. The keys of player A and B are `↑`, `↓`, `←`, `→`, `Enter`, `b` and `ESC`, which represent up, down, left, right, drop, repent and exit. In the process of moving the cursor, the cursor moves according to the player's key; after the player presses the down button, the program automatically calls the `putdown()` function for displaying chess pieces and the `judge()` function for judging the winner or loser. After the current player plays chess, the current player can repent before another player plays. The repentance prompt is at the bottom left of the chessboard, and the key is `b`.

**4.7 go\_back()function:** In the process of playing chess, the repentance operation will call `go_back()` function. In the process of playing the game, the `Q` array element of party A's place is assigned as 2, and the element of `Q` array at party B's place is assigned as 1. Therefore, in the operation of repentance, The `go_back()` function will set the corresponding data of the pieces popped up to 0 in the `Q` array, and the core statement is "`Q [point. x] [point. y] = 0;`".

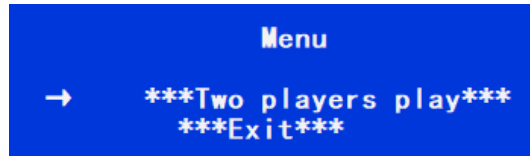
**4.8 Judge()function:** Winning or losing judgment is the key of the whole program, which is directly related to the running speed and result of the program. According to the winning conditions of Gobang, the winner can be obtained by judging whether there are five pieces in the same direction in row, column, bevel and anti skew. At the beginning of the game, the chessboard array element value is set to 0. The party A shall assign 2 to the elements at the corresponding coordinates in the array when party A places a son; the party B shall assign the coordinates of the corresponding positions in the array to 1. After scanning chessboard array circularly, if there are 5 consecutive 2 in the direction of row, column, bevel and back bevel, the party A will win; if 5 consecutive ones are found in the direction of line, column, bevel and back bevel, the party B will win.

**V. TEST RESULTS OF GAME**

(1)When the program runs the test, the welcome words and the designer are displayed firstly. After a short pause, the main menu interface is automatically entered. The program running results are shown in figure5.1 and figure 5.2.

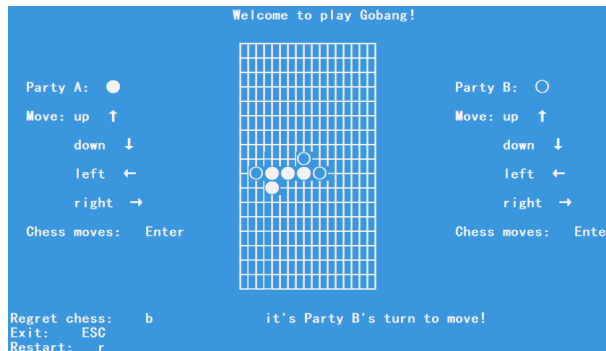


**Figure: 5.1 welcome interface**

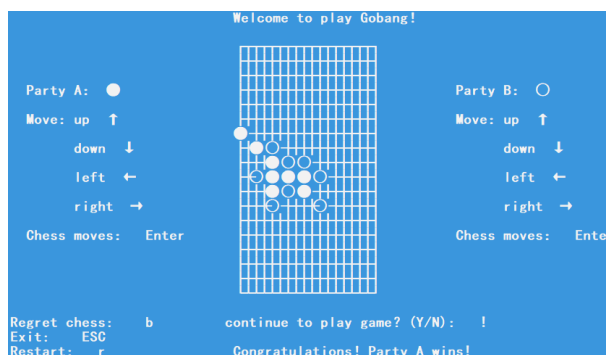


**Figure: 5.2 menu interface of game**

(2)In the main menu interface, the default option is "two people playing chess". The partyers press Enter in this interface to enter the game interface. Through the up and down, left and right direction keys to select the location of the drop, and press Enter to complete the drop. At the same time, each drop will be accompanied by a prompt tone. When any party completes the five sub connection, the winner or loser will be judged.



**Figure: 5.3 Game chess interface**



**Figure: 5.4 Judge the winning / losing interface**

(3) When both sides of the game win or lose, the system will prompt whether to continue the game (Y / N). If Y is selected, the next game will be continued, otherwise exit the interface. The system will have a prompt message. If the user clicks the "OK" button, he will exit the game, otherwise he will stay in the current interface.

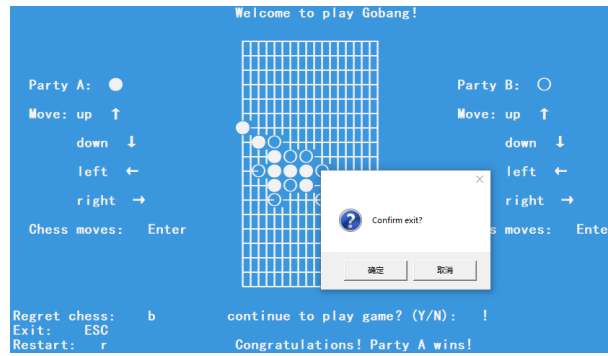


Figure: 5.5 Game exit prompt interface

(4) After exiting the interface, the whole game is over.

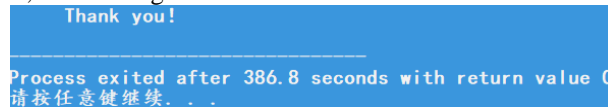


Figure: 5.6 End of game interface

## VI. CONCLUSION

This paper completes the simple program design of Gobang game in DEV-C++ environment, and tests the whole game process based on C language. The results show that the program can be compiled without errors in syntax logic, and there is no big difference between the running results and the theoretical prediction, and can achieve the effect of two people playing chess.

## REFERENCES

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