Hanged Man Game

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May 24, 2020

Abstract In our paper, we designed a computer game called ”Hanged Man”. We utilized top-down programming methodology, dividing our design into several modules.
This paper includes the structure of our design, flowchart and pseudocode of each module, and c++ program implementation.

Contents

1 Introduction

Hanged Man is a game. One player enter the hardness, word, and hint, another player try characters and if the character he / she input is in the word, all same characters in the word would appear; if the character is NOT in the word, a stroke is added to a hanged man. When all the characters are tried out, player 2 win; when the hanged man are completely drawn, player 2 die.
All the works of this project are uploaded to github repository `https://github.com/EricEricEricJin/Hanged-Man-Game.git](https://github.com/EricEricEricJin/Hanged-Man-Game.git`

2 Task assigning

Task	Name
Structure chart	Leo
Flowchart	Rifile
Pseudocode	Eric
C++ implementation	Eric and Rifile
Presentation	Rifile and Noel
Document	Eric

3 Design choice

1. **Hardness and lives** Due to the relationship between 2 players is different, the probability for player 2 to think up the word is different. So we set three hardness in the game. Different hardness stands for different number of lives the player2 initially have, as shown in table below:

Hardness	Initial lives
SIMPLE	10
MIDDLE	9
HARD	8

2. **Represent the hanged man** In order to give player2 a better game experience, we draw the man with ascii characters. In this way, player2 can clearly know how many lives he / she still have.

4 Structure

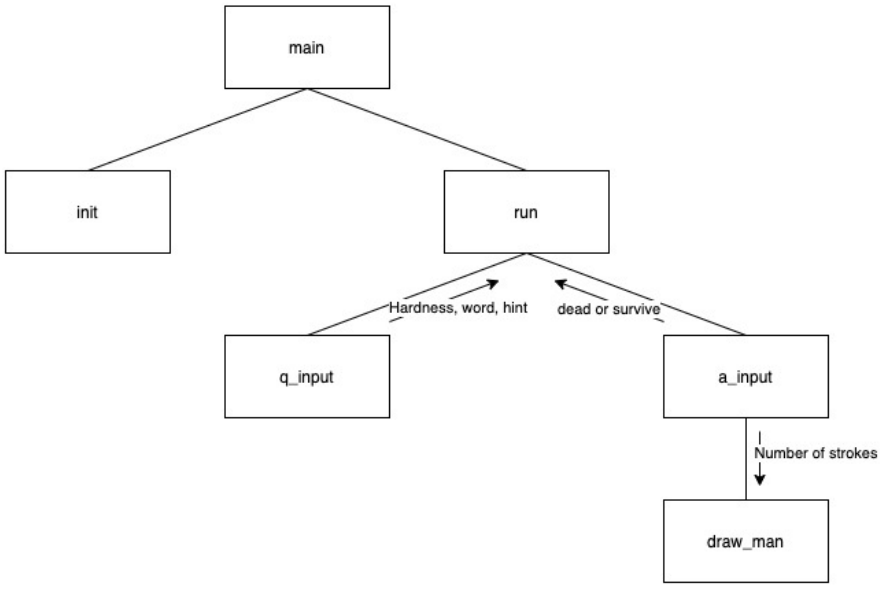


Figure 1: Structure chart

5 Flowchart

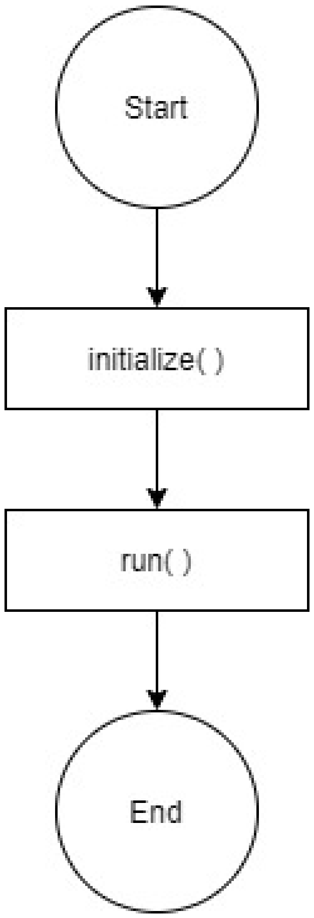


Figure 2: main

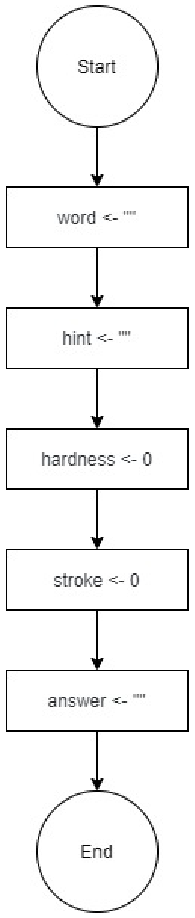


Figure 3: initialize

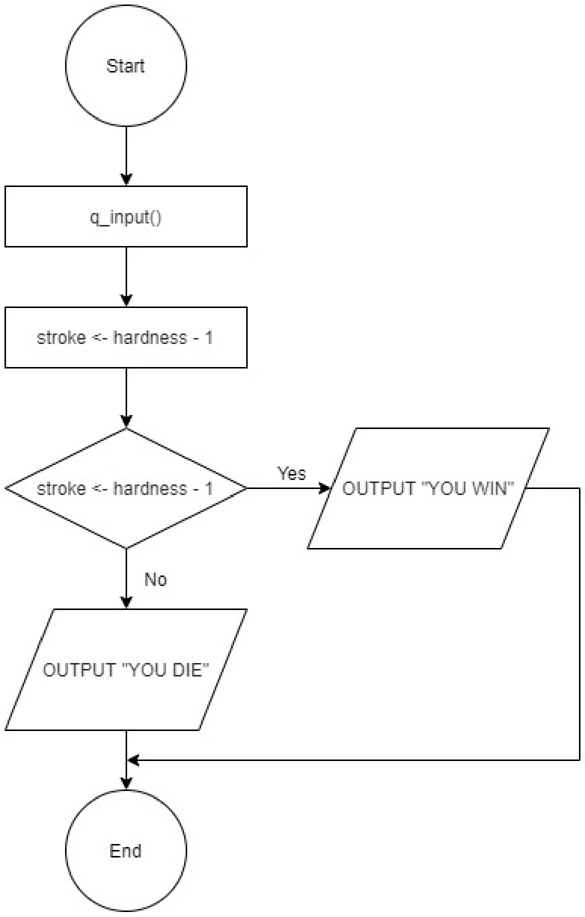

Start
q_input()
stroke <- hardness - 1
stroke <- hardness - 1
Yes
OUTPUT "YOU WIN"
No
OUTPUT "YOU DIE"
End

Figure 4: run

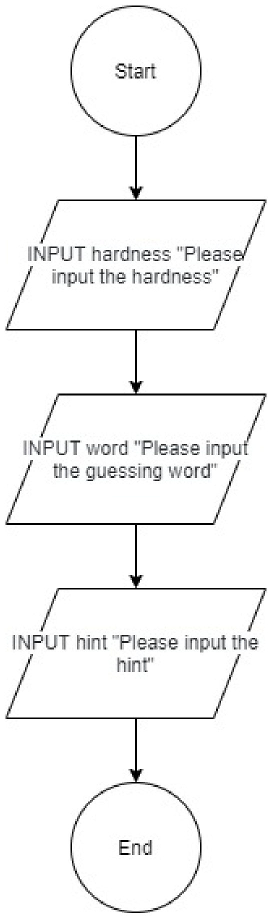

Start
INPUT hardness "Please input the hardness"
INPUT word "Please input the guessing word"
INPUT hint "Please input the hint"
End

Figure 5: q_input

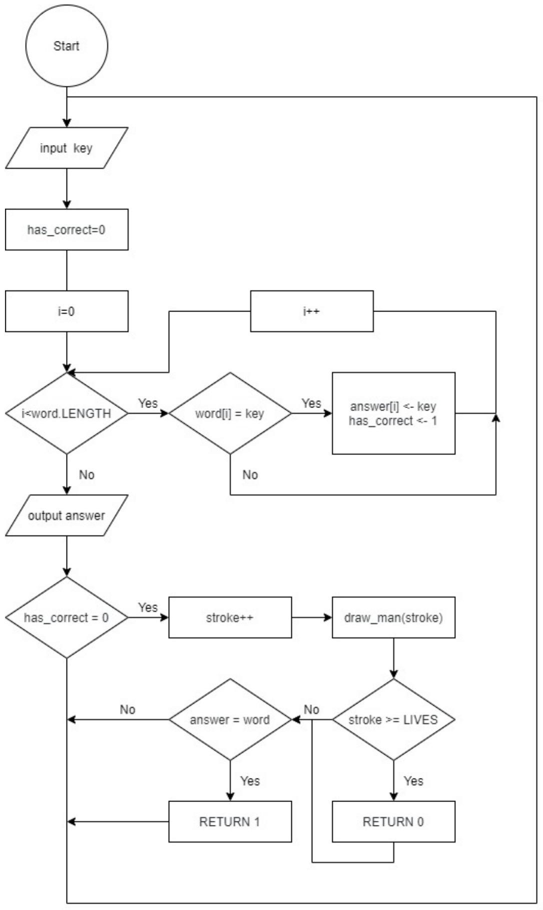


Figure 6: a_input

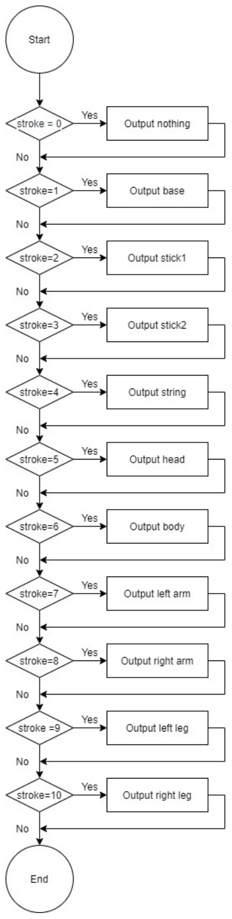


Figure 7: draw_man

6 Pseudocode

main

```
initialize()
run()
```

init

```
PROC initialize ()
    DECLARE word: STRING
    DECLARE hint: STRING
    DECLARE hardness: INTEGER
    DECLARE stroke: INTEGER
    DECLARE answer: STRING

    word <- ""
    hint <- ""
    hardness <- 0
    stroke <- 0
    answer <- ""
ENDPROC
```

run

```
PROC run()
    q_input()
    stroke <- hardness - 1
    IF a_input() = 1 THEN
        OUTPUT "YOU WIN"
    ELSE
        OUTPUT "YOU DIE"
    ENDIF
ENDPROC
```

q_input

```
PROC q_input()
    INPUT hardness "Please input the hardness"
    INPUT word "Please input the guessing word"
    INPUT hint "Please input the hint"
ENDPROC
```

a_input

```
PROC a_input()
    DECLEAR key: CHARACTER
    DECLEAR i: INTEGER
    DECLEAR has_correct: BOOLEN
    key <- ""

    WHILE
        INPUT key
        has_correct <- 0
        FOR i <- 0 TO word.LENGTH
            IF word[i] = key THEN
                answer[i] <- key
                has_correct <- 1
            ENDIF
        ENDFOR
        OUTPUT answer
        IF has_correct = 0 THEN
            stroke <- stroke + 1
            draw_man(stroke)
            IF stroke >= LIVES THEN
                // loose
                RETURN 0;
            ENDIF
        ELIF answer = word THEN
            // win
            RETURN 1;
        ENDIF
    ENDWHILE
ENDPROC
```

draw_man

```
PROC draw_man()
    IF stroke == 0 THEN
        OUTPUT
            "








            "

    ELIF stroke == 1 THEN
        OUTPUT
            "

```

```
                  ********
             ”

     ELIF stroke == 2 THEN
          OUTPUT
             ”
                  *
                  *
                  *
                  *
                  *
                  *
                  *
                  ********
             ”

     ELIF stroke == 3 THEN
          OUTPUT
             ”
                  *****
                  *
                  *
                  *
                  *
                  *
                  *
                  ********
             ”

     ELIF stroke == 4 THEN
          OUTPUT
             ”
                  *****
                  *    *
                  *
                  *
                  *
                  *
                  *
                  ********
```

```
            "

    ELIF stroke == 5 THEN
        OUTPUT
            "
                *****
                *   *
                *  * *
                *   *
                *
                *
                *
                ********
            "

    ELIF stroke == 6 THEN
        OUTPUT
            "
                *****
                *   *
                *  * *
                *   *
                *   *
                *   *
                *
                ********
            "
    ELIF stroke == 7 THEN
        OUTPUT
            "
                *****
                *   *
                *  * *
                *   *
                *  **
                *   *
                *
                ********
            "
    ELIF stroke == 8 THEN
        OUTPUT
            "
                *****
                *   *
                *  * *
                *   *
                *  ***
                *   *
                *
                ********
            ”

    ELIF stroke == 9 THEN
        OUTPUT
            ”
                *****
                *   *
                *  * *
                *   *
                *  ***
                *   *
                *  *
                ********
            ”

    ELIF stroke == 10 THEN
        OUTPUT
            ”
                *****
                *   *
                *  * *
                *   *
                *  ***
                *   *
                *  * *
                ********
            ”
    ENDIF
ENDPROC
```

7 Identifier table

Name	Type	Description
word	STRING	the word input by player 1
hint	STRING	hint input by player 1 offered to player 2
hardness	INTEGER	game hardness input by player 1
stroke	INTEGER	stroke of the hanged man
answer	STRING	characters input by player 2
key	CHARACTER	key pressed by player 2
i	INTEGER	counter
has$_correct$	BOOLEN	the character exist in the word or not

Table 1: Identifier table

8 C++ implementation

hanged_man.h

```
#ifndef _H_M__
#define _H_M__

#define WINDOW_H 24
#define WINDOW_W 80

#define WORD_MAX_LEN 20
#define HINT_MAX_LEN 100

#define LIVES 10

#include <cstdio>
#include <cstdlib>
#include <curses.h>

struct string {
    char* text;
    int len;
};

class hangedMan {
    private:
        WINDOW* main_win;
        WINDOW* man_win;
        WINDOW* IO_win;

        int q_input_stage;
        int hardness;
        string* hint;
        string* word;
        string* answer;

        int stroke;


        int restart;

        void draw_man();
        int q_input(int key_val);
        int a_input(int key_val);
        int strcomp(char* s1, char* s2, int len);
        void die();
        void win();
        void del();
        int rst_input(int key_val);
        string* init_str(int len, char chr);
        void free_str(string* str);

    public:
        hangedMan();
        void run();

};
#endif
```

main.cpp

```
#include "hanged_man.h"

using namespace std;
int main() {
    hangedMan H;
    H.run();
}
```

init.cpp

```
/**
* Function: init
* Description: initialize as the class is instantiated
* Parameter: None
* Return: None
*/

#include "hanged_man.h"

hangedMan::hangedMan() {
    main_win = initscr();
    man_win = subwin(main_win, LINES, int(COLS / 2), 0,
        int(COLS / 2));
    IO_win = subwin(main_win, LINES, int(COLS / 2), 0, 0)
        ;
    // cbreak();
    noecho();
}
```

run.cpp

```
/**
```

```
* Function: run
* Description: the main loop of the game
* Parameter: None
* Return: None
*/

#include "hanged_man.h"

void hangedMan::run() {
    word = init_str(WORD_MAX_LEN, 0);
    hint = init_str(HINT_MAX_LEN, 0);
    q_input_stage = 0;
    hardness = 0;
    stroke = 0;
    restart = 0;

    wclear(main_win);
    wclear(man_win);
    wclear(IO_win);

    box(main_win, ACS_VLINE, ACS_HLINE);

    int key_val = 0;
    q_input_stage = 0;
    while (1) {

        if (q_input(key_val) == 1) {
            break;
        }
        key_val = getch();
    }

    wclear(main_win);
    box(main_win, ACS_VLINE, ACS_HLINE);
    box(man_win, ACS_VLINE, ACS_HLINE);
    box(IO_win, ACS_VLINE, ACS_HLINE);

    stroke += hardness - 1;
    answer = init_str(word -> len, 95);

    wprintw(IO_win, answer -> text);
    key_val = 0;

    int brk = 0;
    while (1) {
        if (brk == 1) {
            break;
        }
        switch (a_input(key_val)) {
            case 1:
                win();
                brk = 1;
                break;
            case -1:
                brk = 1;
                die();
                break;
            default:
                key_val = getch();
                break;
        }
    }

    // restart or quit
    getch();
    key_val = 0;
    restart = 0;
    while (1) {
        if (rst_input(key_val) == 1) {
            if (restart == 0) {
                del();
            } else if (restart == 1) {
                del();
                run();
            }
            break;
        }
        key_val = getch();
    }
}
```

a_input.cpp

```
/**
* Function: a_input
* Description: the player input the answer
* Parameter: key_val
* Return: die(-1) or win(1) or unfinished(0)
*/

#include ”hanged_man.h”

```

```cpp
int hangedMan::a_input(int key_val) {
    if (key_val != 0) {
        int hasCorrect = 0;
        for (int i = 0; i < word -> len; i++) {
            if (*(word -> text + i) == key_val) {
                hasCorrect = 1;
                *(answer -> text + i) = key_val;
            }
        }

        if (hasCorrect == 0) {
            stroke += 1;
        }
    }
    wclear(IO_win);
    box(IO_win, ACS_VLINE, ACS_HLINE);
    wmove(IO_win, int(LINES / 2), 5);
    wprintw(IO_win, answer -> text);
    wmove(IO_win, int(LINES / 2) + 2, 5);
    wprintw(IO_win, "Hint:");
    wmove(IO_win, int(LINES / 2) + 3, 5);
    wprintw(IO_win, hint -> text);
    wrefresh(IO_win);
    draw_man();

    if (stroke >= 10) {
        // dead
        return -1;
    } else if (strcomp(answer -> text, word -> text, word
        -> len) == 1) {
        return 1;
    }
    return 0;
}
```

q_input.cpp

```cpp
/**
* Function: q_input
* Description: input of question
* Parameter: key_val
* Return: 0 not decide or 1 decided
*/

#include "hanged_man.h"

```

```
int hangedMan::q_input(int key_val) {
    wclear(main_win);
    box(main_win, ACS_VLINE, ACS_HLINE);
    if (key_val == 9) {
        q_input_stage += 1;
        if (q_input_stage > 3) {
            q_input_stage = 0;
        }
    } else {
        switch (q_input_stage) {
            case 0: // hardness
                switch (key_val) {
                    case 49:
                        hardness = 1;
                        break;
                    case 50:
                        hardness = 2;
                        break;
                    case 51:
                        hardness = 3;
                        break;
                }
                break;

            case 1: // word
                if (key_val >= 97 && key_val <= 122) {
                    if (word -> len < WORD_MAX_LEN) {
                        *(word -> text + word -> len) =
                            key_val;
                        word -> len += 1;
                    }
                } else if (key_val == 127) { // delete
                    if (word -> len > 0) {
                        *(word -> text + word -> len - 1)
                             = 0;
                        word -> len -= 1;
                    }
                }
                break;

            case 2: // Hint
                if (key_val >= 97 && key_val <= 122) {
                    if (hint -> len < HINT_MAX_LEN) {
                        *(hint -> text + hint -> len) =
                            key_val;
                        hint -> len += 1;
                    }
                } else if (key_val == 127) { // delete
                    if (hint -> len > 0) {
                        *(hint -> text + hint -> len - 1)
                            = 0;
                        hint -> len -= 1;
                    }
                }
                break;

            case 3:
                if (key_val == 10) {
                    return 1;
                }

            default:
                break;
        }
    }

    // show
    wmove(main_win, 1, 10);
    wprintw(main_win, "Hardness");

    wmove(main_win, 2, 10);
    switch (hardness) {
        case 1:
            wprintw(main_win, "SIMPLE");
            break;
        case 2:
            wprintw(main_win, "MIDDLE");
            break;
        case 3:
            wprintw(main_win, "HARD");
            break;
        default:
            break;
    }

    wmove(main_win, 3, 10);
    wprintw(main_win, "Word");

    wmove(main_win, 4, 10);
    wprintw(main_win, word -> text);

    wmove(main_win, 5, 10);
    wprintw(main_win, "Hint");

    wmove(main_win, 6, 10);
    wprintw(main_win, hint -> text);

    wmove(main_win, 7, 10);
    wprintw(main_win, "Finish");

    wmove(main_win, int(q_input_stage * 2 + 1), 1);
    wprintw(main_win, "->");
    return 0;
}
```

rst_input.cpp

```
/**
* Function: rst_input
* Description: get user's restart or quit input after
  game end
* Parameter: key_val
* Return: 0: not decide, 1: decided
*/

#include "hanged_man.h"

int hangedMan::rst_input(int key_val) {
    int rt = 0;
    switch (key_val) {
        case 9:
            restart += 1;
            if (restart > 1) {
                restart = 0;
            }
            rt = 0;
            break;
        case 10:
            rt = 1;
            break;
        default:
            rt = 0;
            break;
    }

    wclear(main_win);
    wmove(main_win, int(LINES / 2) + 5, int(COLS / 2));
    wprintw(main_win, "RESTART");
    wmove(main_win, int(LINES / 2) + 6, int(COLS / 2));
    wprintw(main_win, "QUIT");
    wmove(main_win, int(LINES / 2) + 6 - restart, int(
        COLS / 2) - 5);
    wprintw(main_win, "-->");
    wrefresh(main_win);

    return rt;
}
```

draw_man.cpp

```
/**
* Function: draw_man
* Description: draw the man
* Parameter: None
* Return: None
*/

#include "hanged_man.h"

void hangedMan::draw_man() {
    wclear(man_win);
    box(man_win, ACS_VLINE, ACS_HLINE);
    // wprintw(man_win, "%d", stroke);
    int counter = 0;
    if (counter >= stroke) {
        wrefresh(man_win);
        return;
    }

    wmove(man_win, LINES - 5, 5);
    whline(man_win, 42, 10);

    counter += 1;
    if (counter >= stroke) {
        wrefresh(man_win);
        return;
    }

    wmove(man_win, 5, 5);
    wvline(man_win, 42, (LINES - 10));

    counter += 1;
    if (counter >= stroke) {
        wrefresh(man_win);
        return;
    }

    whline(man_win, 42, 8);

    counter += 1;
    if (counter >= stroke) {
        wrefresh(man_win);
        return;
    }

    wmove(man_win, 5, 13);
    wvline(man_win, 42, 4);

    counter += 1;
    if (counter >= stroke) {
        wrefresh(man_win);
        return;
    }

    wmove(man_win, 7, 12);
    whline(man_win, 42, 3);
    wvline(man_win, 42, 3);
    wmove(man_win, 9, 12);
    whline(man_win, 42, 3);
    wmove(man_win, 7, 14);
    wvline(man_win, 42, 3);


    counter += 1;
    if (counter >= stroke) {
        wrefresh(man_win);
        return;
    }

    wmove(man_win, 8, 13);
    wvline(man_win, 42, 4);


    counter += 1;
    if (counter >= stroke) {
        wrefresh(man_win);
        return;
    }

    wmove(man_win, 10, 10);
    whline(man_win, 42, 3);

    counter += 1;
    if (counter >= stroke) {
        wrefresh(man_win);
        return;
    }

    wmove(man_win, 10, 13);
    whline(man_win, 42, 4);

    counter += 1;
    if (counter >= stroke) {
        wrefresh(man_win);
        return;
    }

    wmove(man_win, 12, 12);
    wvline(man_win, 42, 2);

    counter += 1;
    if (counter >= stroke) {
        wrefresh(man_win);
        return;
    }

    wmove(man_win, 12, 14);
    wvline(man_win, 42, 2);
    counter += 1;
    if (counter >= stroke) {
        wrefresh(man_win);
        return;
    }
}
```

win.cpp

```
/**
* Function: win
* Description: called after player2 win
* Parameter: None
* Return: None
*/

#include "hanged_man.h"

```

```
void hangedMan::win() {
    wclear(main_win);
    wmove(main_win, int(LINES / 2), int(COLS / 2) - 5);
    wprintw(main_win, "YOU WIN");
    box(main_win, ACS_VLINE, ACS_HLINE);
    wrefresh(main_win);
}
```

die.cpp

```
/**
* Function: die
* Description: what to do after die
* Parameter: None
* Return: None
*/

#include "hanged_man.h"

void hangedMan::die() {
    wclear(IO_win);
    wmove(IO_win, int(LINES / 2), int(COLS / 4));
    wprintw(IO_win, "YOU DIE!");

    stroke = 5;
    draw_man();

    wmove(man_win, 13, 13);
    wvline(man_win, 42, 4);


    wmove(man_win, 15, 10);
    whline(man_win, 42, 3);


    wmove(man_win, 15, 13);
    whline(man_win, 42, 4);


    wmove(man_win, 17, 12);
    wvline(man_win, 42, 2);

    wmove(man_win, 17, 14);
    wvline(man_win, 42, 2);

    box(IO_win, ACS_VLINE, ACS_HLINE);
    wrefresh(man_win);
    wrefresh(IO_win);
}
```

del.cpp

```
/**
* Function: del
* Description: free the allocated memory
* Parameter: None
* Return: None
*/

#include "hanged_man.h"

void hangedMan::del() {
    endwin();
    free_str(word);
    free_str(hint);
    free_str(answer);
}
```

init_free_str.cpp

```
#include "hanged_man.h"

/**
    * Function: init_str
    * Description: initizlize a string structure
    * Parameter: string max length, initialize character
    * Return: string* of the string.
*/
string* hangedMan::init_str(int len, char chr) {
    string* str;
    str = (string*)malloc(sizeof(string));
    str -> text = (char*)malloc(sizeof(char) * len);
    for (int i = 0; i < len; i++) {
        *(str -> text + i) = chr;
    }
    str -> len = 0;
    return str;
}

/**
    * Function: free_str
    * Description: free the string structure
    * Parameter: string* string
    * Return: None
*/
void hangedMan::free_str(string* str) {
    free(str -> text);
    free(str);
}
```

strcomp.cpp

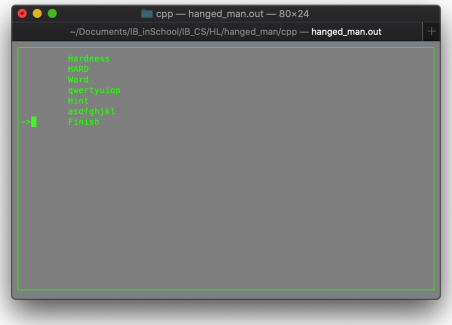
```
/**
* Function: strcomp
* Description: use to compare two string which have same
   length
* Parameter: string1, string2, length
* Return: 0 not smae or 1 same
*/

#include "hanged_man.h"

int hangedMan::strcomp(char* s1, char* s2, int len) {
    int same = 1;
    for (int i = 0; i < len; i++) {
        if (*(s1 + i) != *(s2 + i)) {
            same = 0;
        }
    }
    return same;
}
```

9 Testing of implementation

Compile environment
Mac OS X 10.15, g++ version 4.2.1, with curses lib installed
Makefile

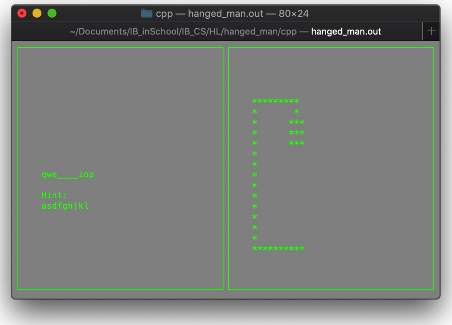
```
main:
g++ -o hanged_man.out main.cpp init.cpp run.cpp draw_man.
    cpp a_input.cpp q_input.cpp strcomp.cpp die.cpp win.
    cpp del.cpp rst_input.cpp init_free_str.cpp -l curses
```

Running environment
Mac OS X 10.15, terminal window with size 80 cols and 24 rows
Testing results



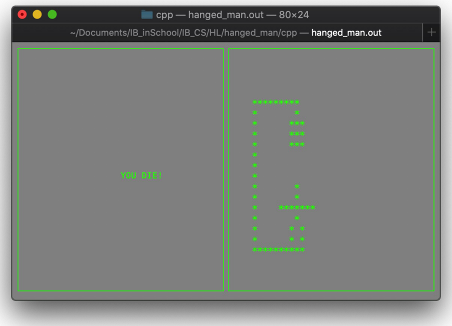
```
cpp — hanged_man.out — 80×24
~/Documents/IB_inSchool/IB_CS/HL/hanged_man/cpp — hanged_man.out

          Hardness
          HARD
          Word
          qwertyuiop
          Hint
          asdfghjkl
->        Finish
```

Figure 8: Player 1 input hardness, word, and hint



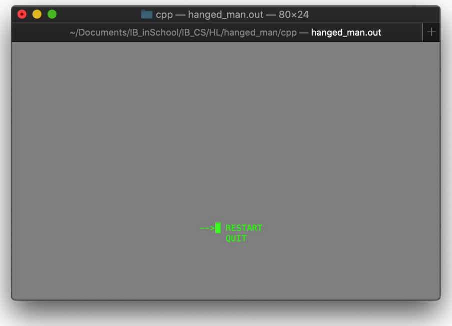
```
cpp — hanged_man.out — 80×24
~/Documents/IB_inSchool/IB_CS/HL/hanged_man/cpp — hanged_man.out

                              *********
                              *       *
                              *      ***
                              *      ***
                              *      ***
                              *
                              *
    qwe____iop                *
                              *
    Hint:                     *
    asdfghjkl                 *
                              *
                              *
                              *
                              **********
```

Figure 9: Player 2 input answer



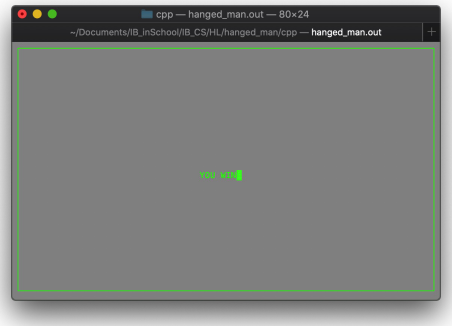
```
cpp — hanged_man.out — 80×24
~/Documents/IB_inSchool/IB_CS/HL/hanged_man/cpp — hanged_man.out

YOU DIE!

*********
*       *
*      ***
*      ***
*      ***
*
*
*
*       *
*       *
*    *******
*       *
*      * *
*      * *
***********
```

Figure 10: Player 2 pass away



```
cpp — hanged_man.out — 80×24
~/Documents/IB_inSchool/IB_CS/HL/hanged_man/cpp — hanged_man.out

-->█ RESTART
     QUIT
```

Figure 11: Quit or restart



```
cpp — hanged_man.out — 80×24
~/Documents/IB_inSchool/IB_CS/HL/hanged_man/cpp — hanged_man.out

YOU WIN█
```

Figure 12: Player 2 survive