

Programming Fundamentals

Mini Project 1

Submitted To:

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Mini Project 1: Develop a Maze Solving Game.

Game Description:

Ali has been visiting the mansion like house of the great grandfather of his friend Asim. Ali has been given a room (R1) to stay the night by his host (Asim). As Ali lay awake due to the strange new place he was in, he felt very hungry. Remembering that there was some delicious Biryani left over, he decides to go get some Biryani from the kitchen (R9) refrigerator. The mansion is a labyrinth of rooms and corridors and suddenly Ali realizes that he can't seem to find his way to the kitchen.

You have to help Ali get to the kitchen and back to his room so that he may sleep peacefully. The mansion has 9 rooms in all numbered R1 to R9.

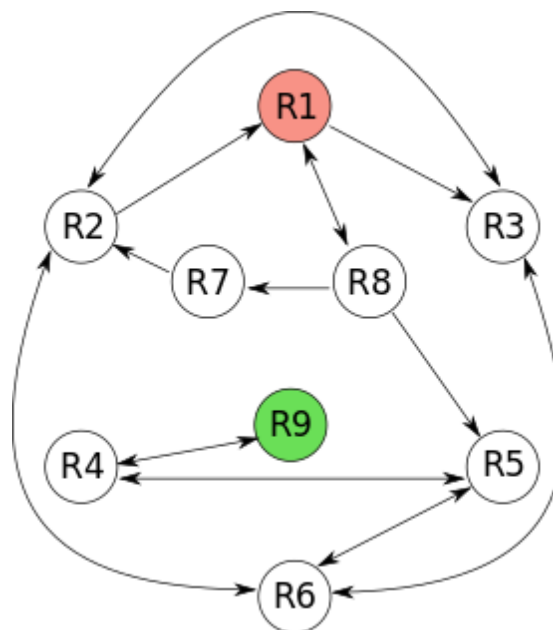


Figure 1: Connections between all the rooms.

Task:

Figure 1 shows the connections between different rooms (R1, R2 etc) in the mansion. Arrows connecting the rooms represent the doors. A one-way arrow depicts a one-way door. E.g. the arrow between R8 and R5 means that Ali can enter R5 from R8 but cannot use the same door back to R8. A two-way arrow depicts a two-way door what can be used to move freely between the connecting rooms (for example Ali can enter from R1 to R8 and back again).

Your task is to write a C program that fulfills the following requirements

1. It should present the player with options to try different doors (by entering a number 1-4).

2. If a door is open (arrow leaving the room node), player should find himself in the connecting room.
3. If the entered door number is invalid (e.g. the room only has 2 doors and the user enters 3), the user should get a message to ask him to enter a valid choice.
4. Your program must ensure that the connections shown in Figure 1 are correctly implemented.
5. Upon entering the kitchen R9 (for the first time only) it should print a messaging congratulating the player that he has successfully guided Ali to the kitchen.
6. Upon entering the bedroom (R1) after visiting the kitchen (R9), it should print a message congratulating the player that he has finished the game successfully and return exit.

FSM Based Design:

Finite State machine is a useful tool for designing the given type of problems. Following is a description of a FSM specifications for the given task.

Σ (1,2,3,4)

S (R1, R2, R3, R4, R5, R6, R7, R8, R9)

So (R1)

δ : transition function: $\delta : S \times \Sigma \rightarrow S$

O (M1, EM1, EM2)

Figure 2 depicts the FSM for Figure 1.

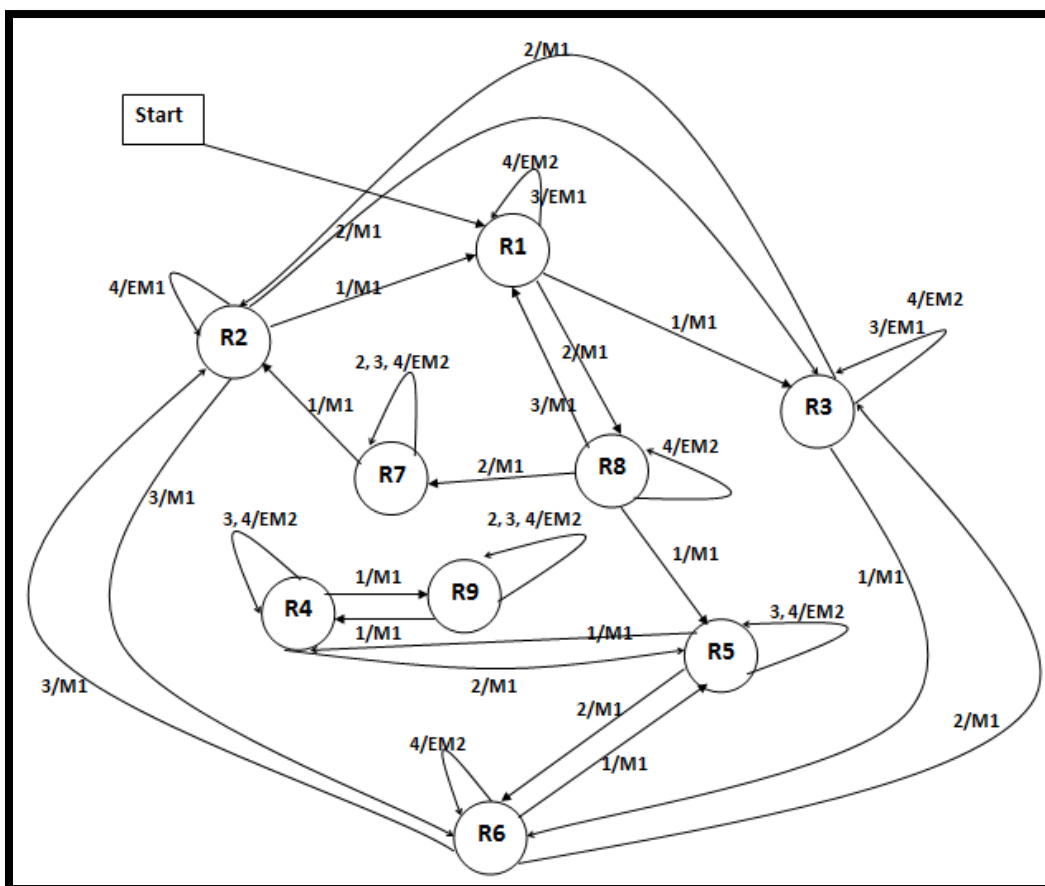


Figure 2: FSM for the game

FlowChart:

Please find a flowchart attached in another word document describing the algorithm of the game.

Program:

In this program first of all variables are declared and initialized as shown in the code. Then a block of printf statements presents the user with a welcome message and the choices. Afterwards the program enters in a while loop if flag_bedroom is not equal to 1. flag_bedroom is a variable to indicate whether Ali is in bedroom after visiting the kitchen or not. After entering the while loop, the user is asked to enter his choice. Once the user give his choice, then the program first locate the room in which Ali is in by checking current_room. Then depending on the user's choice a transition occurs according to Figure 2. Once the user successfully guided Ali from bedroom to kitchen and back to bedroom the program is exited.

```
1  #include <stdio.h>
2  #include <stdlib.h>
3
4  int main()
5  {
6      //Variable declarations
7      int current_room = 1; //specifies in which room Ali is
8      int choice;           //specifies user choice
9      int flag_kitchen = 0; // 1 indicates Alii has visited the kitchen
10     int flag_bedroom = 0; //1 indicates Ali has reached room no. 1
        after visiting the kitchen
11
12     //print welcome message
13     printf("\n*****");
14     printf("\n**      Welcome to the Game.  **");
15     printf("\n**                               **");
16     printf("\n*****\n\n");
17
18     printf("Ali is at a new place, he is feeling restless and suddenly
he starts feeling\n");
19     printf("hungry. He remembered that there is some tasty Biryani left
in the kitchen\n");
20     printf("which is Room 9. Ali is currently in his bedroom i.e. Room
1. You have to guide\n");
21     printf("him to the kitchen and then back to his bedroom so that he
can sleep peacefully.\n");
22     printf("Enter choices 1-4 to move from one room to another.\n");
23
24     while(flag_bedroom != 1)
25     {
26         printf("\n\nEnter your choice(1-4):  "); //present user to
enter his choice
27         scanf("%d", &choice);           //get user choice
28
```

```

29 //logic to move from room 1
30 if(current_room == 1)
31 {
32     switch (choice)
33     {
34         case 1:
35             current_room = 3;
36             printf("\nYou are in Room 3 now. " );
37             continue;
38         case 2:
39             current_room = 8;
40             printf("\nYou are in Room 8 now. " );
41             continue;
42         case 3:
43             printf("\nThis door is locked. " );
44             continue;
45         default:
46             printf("\nInvalid choice. Enter a valid choice " );
47     }
48 }
49
50 //logic to move from room 2
51 else if(current_room == 2)
52 {
53     switch (choice)
54     {
55         case 1:
56             current_room = 1;
57             if (flag_kitchen == 1)
58             {
59                 printf("\nCongratulations! You have successfully
60 guided Ali back to his bedroom.\n");
61                 printf("He has eaten his full and now he can
62 peacefully go to sleep.");
63                 flag_bedroom = 1;
64                 continue;
65             }
66             else
67             {
68                 printf("\nYou are in Room 1 now. " );
69                 continue;
70             }
71         case 2:
72             current_room = 3;
73             printf("\nYou are in Room 3 now. " );
74             continue;
75         case 3:
76             current_room = 6;
77             printf("\nYou are in Room 6 now. " );
78             continue;
79         case 4:
80             printf("\nThis door is locked. " );
81             continue;
82         default:
83             printf("\nInvalid choice. Enter a valid choice " );
84     }
85 }

```

```

83         }
84
85         //logic to move from room 3
86         else if(current_room == 3)
87         {
88             switch (choice)
89             {
90                 case 1:
91                     current_room = 6;
92                     printf("\nYou are in Room 6 now. " );
93                     continue;
94                 case 2:
95                     current_room = 2;
96                     printf("\nYou are in Room 2 now. " );
97                     continue;
98                 case 3:
99                     printf("\nThis door is locked. " );
100                    continue;
101                default:
102                    printf("\nInvalid choice. Enter a valid choice " );
103            }
104        }
105        //logic to move from room 4
106        else if(current_room == 4)
107        {
108            switch (choice)
109            {
110                case 1:
111                    current_room = 9;
112                    if(flag_kitchen == 0)
113                    {
114                        printf("\nCongratulations! you have successfully
guided Ali to the kitchen.\n");
115                        printf("Now he can eat Biryani.\n...\nHe has
eaten Biryani; guide him back to his bedroom.");
116                        flag_kitchen = 1;
117                        continue;
118                    }
119                    else
120                    {
121                        printf("\nYou are in Room 9 now. " );
122                        continue;
123                    }
124                case 2:
125                    current_room = 5;
126                    printf("\nYou are in Room 5 now. " );
127                    continue;
128                default:
129                    printf("\nInvalid choice. Enter a valid choice " );
130            }
131        }
132        //logic to move from room 5
133        else if(current_room == 5)
134        {
135            switch (choice)
136            {

```

```

137         case 1:
138             current_room = 4;
139             printf("\nYou are in Room 4 now. " );
140             continue;
141         case 2:
142             current_room = 6;
143             printf("\nYou are in Room 6 now. " );
144             continue;
145         default:
146             printf("\nInvalid choice. Enter a valid choice " );
147     }
148 }
149 //logic to move from room 6
150 else if(current_room == 6)
151 {
152     switch (choice)
153     {
154         case 1:
155             current_room = 5;
156             printf("\nYou are in Room 5 now. " );
157             continue;
158         case 2:
159             current_room = 3;
160             printf("\nYou are in Room 3 now. " );
161             continue;
162         case 3:
163             current_room = 2;
164             printf("\nYou are in Room 2 now " );
165             continue;
166         default:
167             printf("\nInvalid choice. Enter a valid choice " );
168     }
169 }
170 //logic to move from room 7
171 else if(current_room == 7)
172 {
173     switch (choice)
174     {
175         case 1:
176             current_room = 2;
177             printf("\nYou are in Room 2 now. " );
178             continue;
179         default:
180             printf("\nInvalid choice. Enter a valid choice " );
181     }
182 }
183
184 //logic to move from room 8
185 else if(current_room == 8)
186 {
187     switch (choice)
188     {
189         case 1:
190             current_room = 5;
191             printf("\nYou are in Room 5 now. " );
192             continue;

```



```

193         case 2:
194             current_room = 7;
195             printf("\nYou are in Room 7 now. " );
196             continue;
197         case 3:
198             current_room = 1;
199             if(flag_kitchen == 1)
200             {
201                 printf("\nCongratulations! You have successfully
guided Ali back to his bedroom.\n");
202                 printf("He has eaten his full and now he can
peacefully go to sleep.");
203                 flag_bedroom = 1;
204                 continue;
205             }
206             else
207             {
208                 printf("\nYou are in Room 1 now. " );
209                 continue;
210             }
211         default:
212             printf("\nInvalid choice. Enter a valid choice " );
213     }
214 }
215
216 //logic to move from room 9
217 else if(current_room == 9)
218 {
219     switch (choice)
220     {
221         case 1:
222             current_room = 4;
223             printf("\nYou are in Room 4 now. " );
224             continue;
225         default:
226             printf("\nInvalid choice. Enter a valid choice " );
227     }
228 }
229 }
230 printf("\n\nBye Bye!!! Have a good time!\n\n");
231 }

```

Output:

```

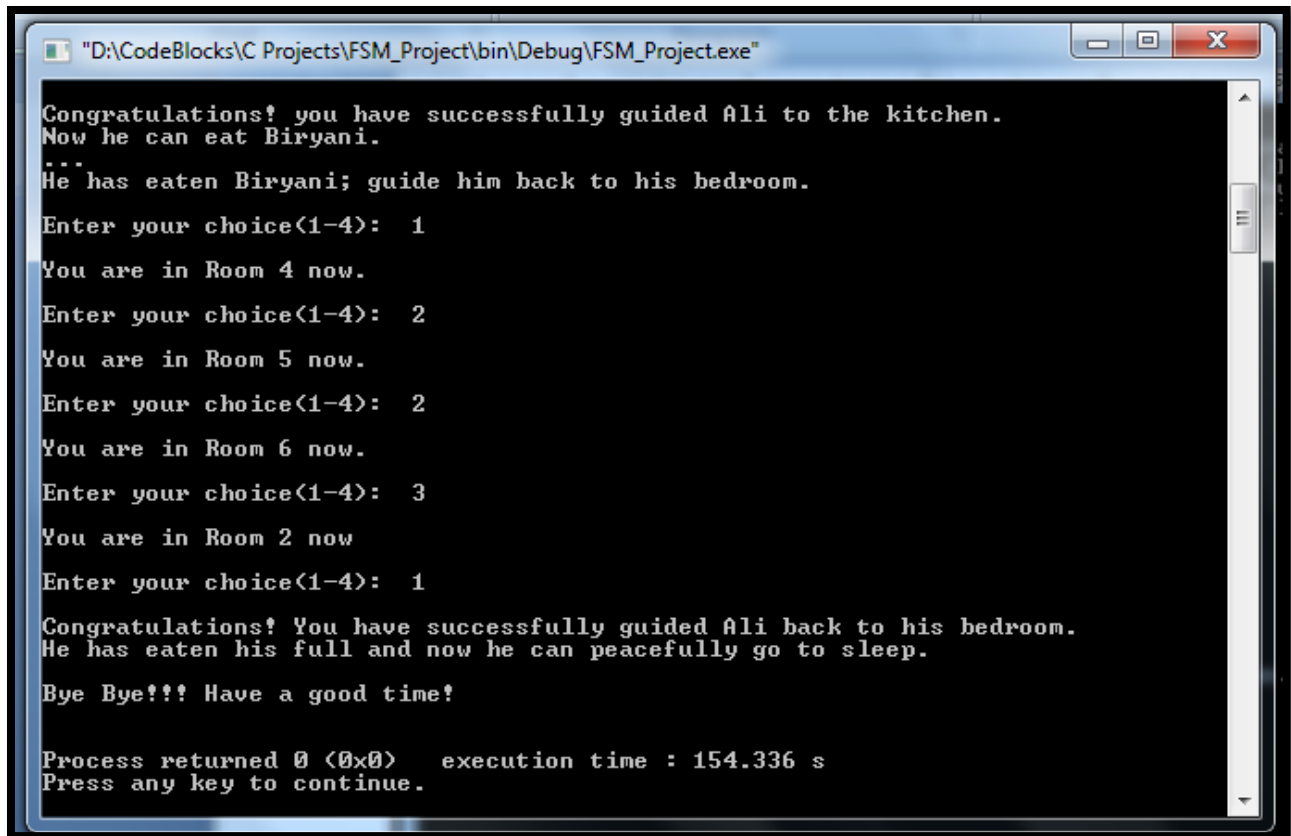
D:\CodeBlocks\C Projects\FSM_Project\bin\Debug\FSM_Project.exe
*****
**      Welcome to the Game.    **
**                               **
*****

Ali is at a new place, he is feeling restless and suddenly he starts feeling
hungry. He remembered that there is some tasty Biryani left in the kitchen
which is Room 9. Ali is currently in his bedroom i.e. Room 1. You have to guide
him to the kitchen and then back to his bedroom so that he can sleep peacefully.

Enter choices 1-4 to move from one room to another.

Enter your choice<1-4>: 1
You are in Room 3 now.
Enter your choice<1-4>: 1
You are in Room 6 now.
Enter your choice<1-4>: 1
You are in Room 5 now.
Enter your choice<1-4>: 1
You are in Room 4 now.
Enter your choice<1-4>: 1
Congratulations! you have successfully guided Ali to the kitchen.
Now he can eat Biryani.
...
He has eaten Biryani; guide him back to his bedroom.
Enter your choice<1-4>: _

```



```
"D:\CodeBlocks\C Projects\FSM_Project\bin\Debug\FSM_Project.exe"

Congratulations! you have successfully guided Ali to the kitchen.
Now he can eat Biryani.
...
He has eaten Biryani; guide him back to his bedroom.
Enter your choice<1-4>: 1
You are in Room 4 now.
Enter your choice<1-4>: 2
You are in Room 5 now.
Enter your choice<1-4>: 2
You are in Room 6 now.
Enter your choice<1-4>: 3
You are in Room 2 now
Enter your choice<1-4>: 1
Congratulations! You have successfully guided Ali back to his bedroom.
He has eaten his full and now he can peacefully go to sleep.
Bye Bye!!! Have a good time!

Process returned 0 (0x0)   execution time : 154.336 s
Press any key to continue.
```

THE END
