Department of Computer Science and Engineering

Compiler Design Lab (CS 306L)

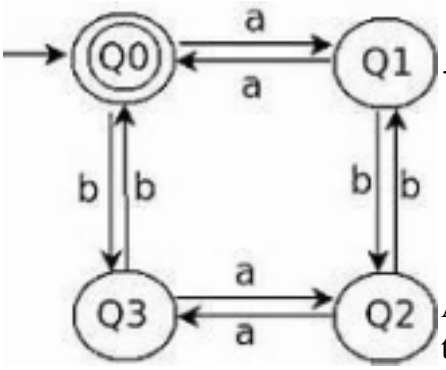
Week 1: Implementation of Language recognizer

1. Implementation of Language recognizer for set of all strings over input alphabet ∑={a,b} containing even number of a's and even number of b's.

Description:

The acceptable strings of the language are ε(Null string), aa, bb, abba, babbab etc.

Deterministic Finite Automata for the given language is given below:



DFA M=(Q,∑,δ,Q_0,F) Where Q=Set of all states ={Q_0,Q_1,Q_2,Q_3} ∑=Input Alphabet={a,b},
Start state is Q_0
F=Set of all final States={ Q_0}

And the transitions are defined in the transition diagram

Algorithm: Language recognizer

Input:

input //input string

Output:

Algorithm prints a message

"String accepted": If the input is acceptable by the language,
"String not accepted" otherwise,
"Invalid token": If the input string contains symbols other than input alphabet.

Method:

state=0 //initial state

```
 i=0
 while((current=input[i++])!='\0'){
switch(state)
case 0: if(current=='a') state=1;
else if(current=='b') state=2;
else
Print "Invalid token" ; exit;
case 1: if(current=='a') state=0;
else if(current=='b') state=3;
else
        Print "Invalid token" ; exit;
case 2: if(current=='a') state=3;
        else if(current=='b') state=0;
        else
Print "Invalid token" ; exit;
case 3: if(current=='a') state=2;
else if(current=='b') state=1;
else
Print "Invalid token" ; exit;
end switch
end while
//Print output
if(state==0)
 Print ”String accepted”
else
 Print ”String not accepted”
```

Test cases:

Input	Expected Output
aabb	String accepted
abab	String accepted
aaabb	String not accepted
aaa	String not accepted
abcd	Invalid token

C Code

```
#include<stdio.h>
void main(){
 int state=0,i=0;
 char current,input[20];
```

```
 printf("Enter input string \t :");
 scanf("%s",input);
 while((current=input[i++])!='\0'){
switch(state)
 {
 case 0: if(current=='a')
 state=1;
 else if(current=='b')
 state=2;
 else
 {
 printf("Invalid token");  exit(0);
 }
 break;
 case 1: if(current=='a')
 state=0;
 else if(current=='b')
 state=3;
 else
 {
 printf("Invalid token");  exit(0);
 }
 break;
 case 2: if(current=='a')
 state=3;
 else if(current=='b')
 state=0;
 else
 {
 printf("Invalid token");  exit(0);
 }
 break;
 case 3: if(current=='a')
 state=2;
 else if(current=='b')
 state=1;
 else
 {
 printf("Invalid token");
 exit(0);
 }
 break;
 }
 }
 if(state==0)
 printf("\n\nString accepted\n\n");
 else
```

```
printf("\n\nString not accepted\n\n");
}
```

Test cases:

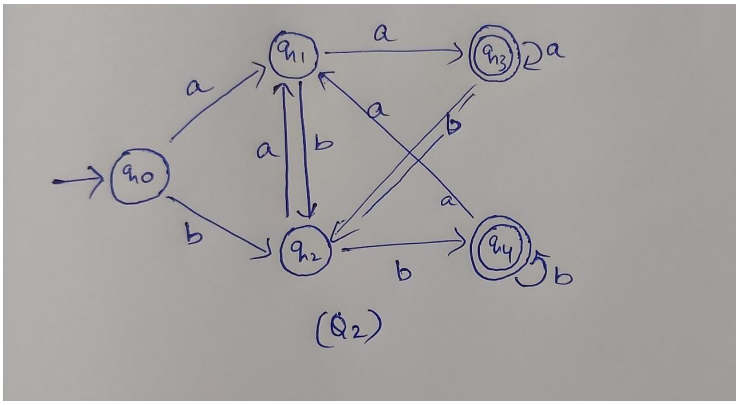
aabb	String accepted
aaabb	String not accepted
ababa	String not accepted
aaabbabb	String accepted

2. Implementation of Language recognizer for a set of all strings ending with two symbols of the same type.

Description:

The acceptable strings of the language are ε(Null string), aa, bb, abba, babbab etc. The string is accepted if the last two elements of the strings are the same. Deterministic Finite Automata for the given language is given below:

DFA M=(Q,∑,δ,Q_0,F) Where Q=Set
of all states ={Q_0,Q_1,Q_2,Q_3,Q_4} ∑=Input Alphabet={a,b},
Start state is Q_0
F=Set of all final States={ Q_0}



Algorithm: Language recognizer

Input:

input //input string

Output:

Algorithm prints a message

"String accepted": If the input is acceptable by the language,

"String not accepted" otherwise,

"Invalid token": If the input string contains symbols other than the input alphabet.

Method

```
state=0 //initial state
i=0
switch (state)
case 0:
 if (token == 'a')
 state = 1;
else if (token == 'b')
state = 2;
  else
  {
   printf("Invalid token");
    exit(0);
   }
   break;
      case 1:
        if (token == 'a')
            state = 3;
        else if (token == 'b')
            state = 2;
        else
        {
            printf("Invalid token");
            exit(0);
        }

        break;
      case 2:
        if (token == 'a')
            state = 1;
        else if (token == 'b')
            state = 4;
        else
        {
            printf("Invalid token");
            exit(0);
        }
        break;
      case 3:
        if (token == 'a')
            state = 3;
        else if (token == 'b')
            state = 2;
        else
        {
            printf("Invalid token");
            exit(0);
        }
        break;
```

```
        case 4:
            if (token == 'a')
                state = 1;
            else if (token == 'b')
                state = 4;
            else
            {
                printf("Invalid token");
                exit(0);
            }
            break;
```

Test Cases:

Input	Expected Output
aabb	String accepted
abab	String not accepted
aaabb	String accepted
aaa	String accepted
abcd	Invalid token

C CODE

```
/*Implementation of Language recognizer for a set of all strings ending with two symbols of the same type.
*/

#include <stdio.h>
#include <stdlib.h>
void main()
{
    int state = 0, i = 0;
    char token, input[20];
    printf("Enter input string \t :");
    scanf("%s", input);
    //printf("Given string is : %s");

    while ((token = input[i++]) != '\0')
    {
        // printf("current token : %c \n",token);
        switch (state)
        {
        case 0:
```

```
    if (token == 'a')
        state = 1;
    else if (token == 'b')
        state = 2;
    else
    {
        printf("Invalid token");
        exit(0);
    }
    break;
case 1:
    if (token == 'a')
        state = 3;
    else if (token == 'b')
        state = 2;
    else
    {
        printf("Invalid token");
        exit(0);
    }

    break;
case 2:
    if (token == 'a')
        state = 1;
    else if (token == 'b')
        state = 4;
    else
    {
        printf("Invalid token");
        exit(0);
    }
    break;
case 3:
    if (token == 'a')
        state = 3;
    else if (token == 'b')
        state = 2;
    else
    {
        printf("Invalid token");
        exit(0);
    }
    break;
case 4:
    if (token == 'a')
        state = 1;
    else if (token == 'b')
        state = 4;
    else
```

```
            {
                printf("Invalid token");
                exit(0);
            }
            break;
        }
        // printf("state = %d  ",state);
    }
    if (state == 3 || state == 4)
        printf("\n\nString accepted\n\n");
    else
        printf("\n\nString not accepted\n\n");
}
```

Test cases:

aabbabb	String accepted
aabbab	String not accepted
aabbaba	String not accepted
ababb	String accepted