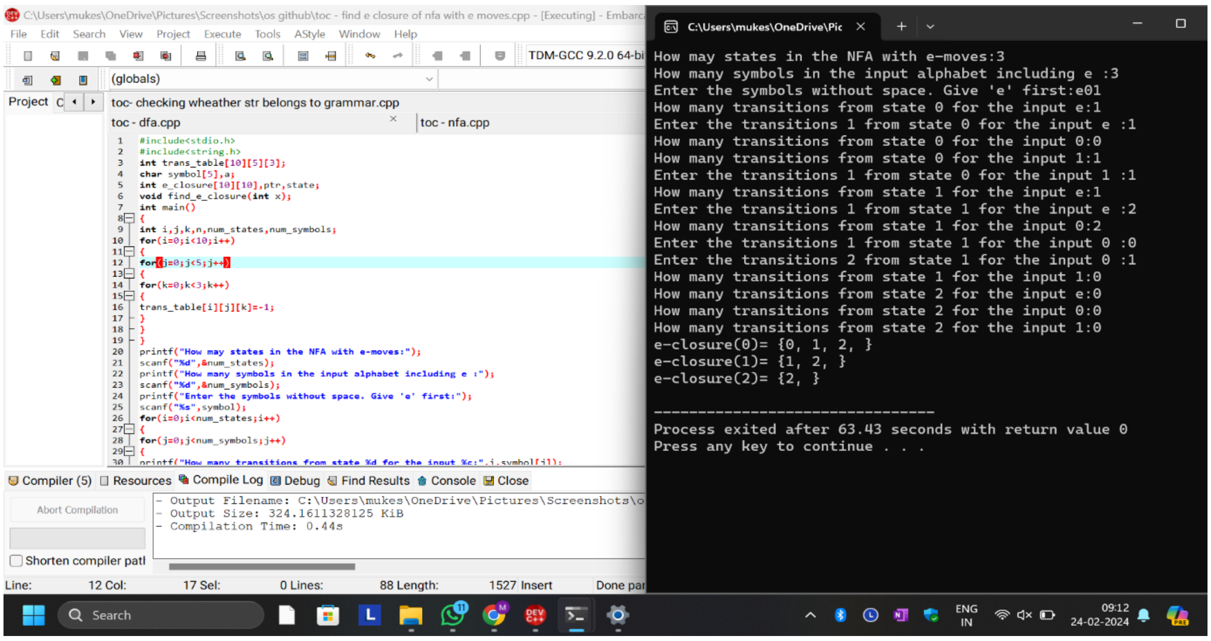
1. FINDING EPSILON CLOSURE FOR NFA WITH EPSILON MOVES

PROGRAM:

```
#include<stdio.h>
#include<string.h>
int trans_table[10][5][3];
char symbol[5],a;
int e_closure[10][10],ptr,state;
void find_e_closure(int x);
int main()
{
int i,j,k,n,num_states,num_symbols;
for(i=0;i<10;i++)
{
for(j=0;j<5;j++)
{
for(k=0;k<3;k++)
{
trans_table[i][j][k]=-1;
}
}
}
printf("How may states in the NFA with e-moves:");
scanf("%d",&num_states);
printf("How many symbols in the input alphabet including e :");
scanf("%d",&num_symbols);
printf("Enter the symbols without space. Give 'e' first:");
scanf("%s",symbol);
for(i=0;i<num_states;i++)
{
for(j=0;j<num_symbols;j++)
{
```

```
printf("How many transitions from state %d for the input %c:",i,symbol[j]);
scanf("%d",&n);
for(k=0;k<n;k++)
{
printf("Enter the transitions %d from state %d for the input %c :", k+1,i,symbol[j]);
scanf("%d",&trans_table[i][j][k]);
}
}
}
for(i=0;i<10;i++)
{
for(j=0;j<10;j++)
{
e_closure[i][j]=-1;
}
}
for(i=0;i<num_states;i++)
e_closure[i][0]=i;
for(i=0;i<num_states;i++)
{
if(trans_table[i][0][0]==-1)
continue;
else
{
state=i;
ptr=1;
find_e_closure(i);
}
}
for(i=0;i<num_states;i++)
{
```

```
printf("e-closure(%d)= {",i);

for(j=0;j<num_states;j++)

{

if(e_closure[i][j]!=-1)

{

printf("%d, ",e_closure[i][j]);

}

}

printf("}\n");

}

}

void find_e_closure(int x)

{

int i,j,y[10],num_trans;

i=0;

while(trans_table[x][0][i]!=-1)

{

y[i]=trans_table[x][0][i];

i=i+1;

}

num_trans=i;

for(j=0;j<num_trans;j++)

{

e_closure[state][ptr]=y[j];

ptr++;

find_e_closure(y[j]);

}

}
```



```
#include<stdio.h>
#include<string.h>
int trans_table[10][5][3];
char symbol[5],a;
int e_closure[10][10],ptr,state;
void find_e_closure(int x);
int main()
{
int i,j,k,n,num_states,num_symbols;
for(i=0;i<10;i++)
{
for(j=0;j<5;j++)
{
for(k=0;k<3;k++)
{
trans_table[i][j][k]=-1;
}
}
}
printf("How may states in the NFA with e-moves:");
scanf("%d",&num_states);
printf("How many symbols in the input alphabet including e :");
scanf("%d",&num_symbols);
printf("Enter the symbols without space. Give 'e' first:");
scanf("%s",symbol);
for(i=0;i<num_states;i++)
{
for(j=0;j<num_symbols;j++)
{
printf("How many transitions from state %d for the input %c:",i,symbol[j]);
```

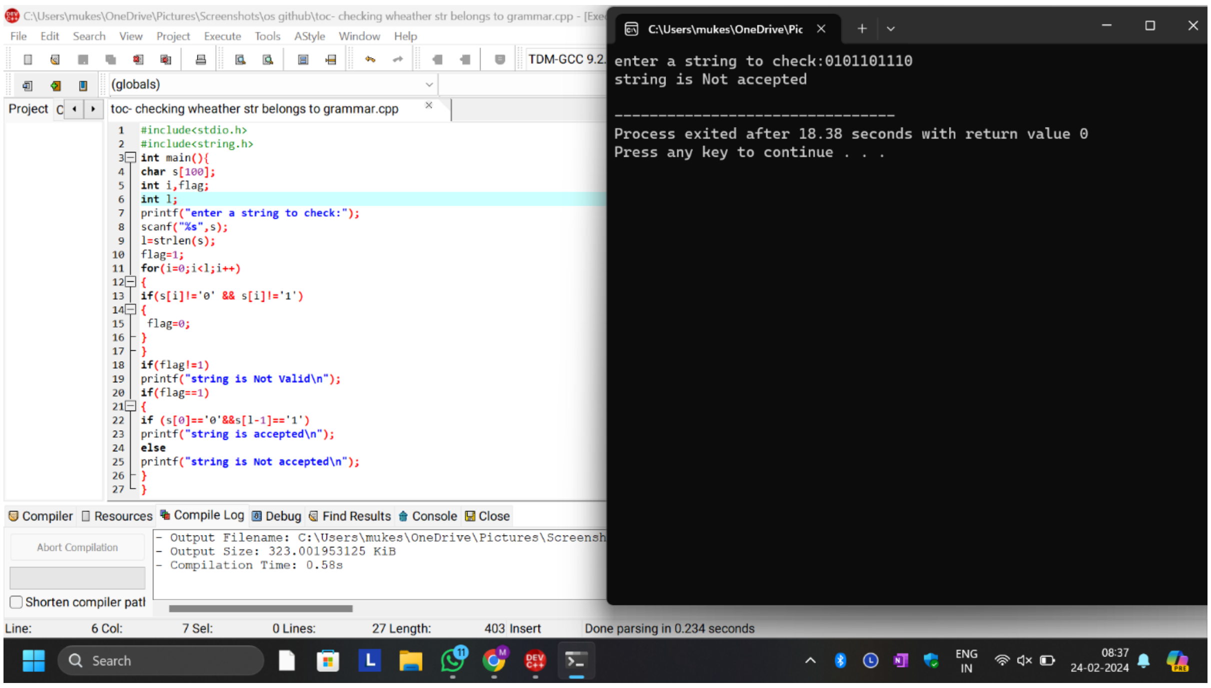
```
- Output Filename: C:\Users\mukes\OneDrive\Pictures\Screenshots\o
- Output Size: 324.1611328125 KiB
- Compilation Time: 0.44s
```

```
How may states in the NFA with e-moves:3
How many symbols in the input alphabet including e :3
Enter the symbols without space. Give 'e' first:e01
How many transitions from state 0 for the input e:1
Enter the transitions 1 from state 0 for the input e :1
How many transitions from state 0 for the input 0:0
How many transitions from state 0 for the input 1:1
Enter the transitions 1 from state 0 for the input 1 :1
How many transitions from state 1 for the input e:1
Enter the transitions 1 from state 1 for the input e :2
How many transitions from state 1 for the input 0:2
Enter the transitions 1 from state 1 for the input 0 :0
Enter the transitions 2 from state 1 for the input 0 :1
How many transitions from state 1 for the input 1:0
How many transitions from state 2 for the input e:0
How many transitions from state 2 for the input 0:0
How many transitions from state 2 for the input 1:0
e-closure(0)= {0, 1, 2, }
e-closure(1)= {1, 2, }
e-closure(2)= {2, }

--------------------------------
Process exited after 63.43 seconds with return value 0
Press any key to continue . . .
```

2. CHECKING WHEATHER STRING BELONGS TO GRAMMAR

CODE:

```
#include<stdio.h>

#include<string.h>

int main(){

char s[100];

int i,flag;

int l;

printf("enter a string to check:");

scanf("%s",s);

l=strlen(s);

flag=1;

for(i=0;i<l;i++)

{

if(s[i]!='0' && s[i]!='1')

{

 flag=0;

}

}
if(flag!=1)
printf("string is Not Valid\n");
if(flag==1)
{
if (s[0]=='0'&&s[l-1]=='1')
printf("string is accepted\n");
else
printf("string is Not accepted\n");
}
}
```


C:\Users\mukes\OneDrive\Pictures\Screenshots\os github\toc- checking wheather str belongs to grammar.cpp - [Exe
File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 9.2.
(globals)
toc- checking wheather str belongs to grammar.cpp
C:\Users\mukes\OneDrive\Pic

```
#include<stdio.h>
#include<string.h>
int main(){
char s[100];
int i,flag;
int l;
printf("enter a string to check:");
scanf("%s",s);
l=strlen(s);
flag=1;
for(i=0;i<l;i++)
{
if(s[i]!='0' && s[i]!='1')
{
 flag=0;
}
}
if(flag!=1)
printf("string is Not Valid\n");
if(flag==1)
{
if (s[0]=='0'&&s[l-1]=='1')
printf("string is accepted\n");
else
printf("string is Not accepted\n");
}
}
```

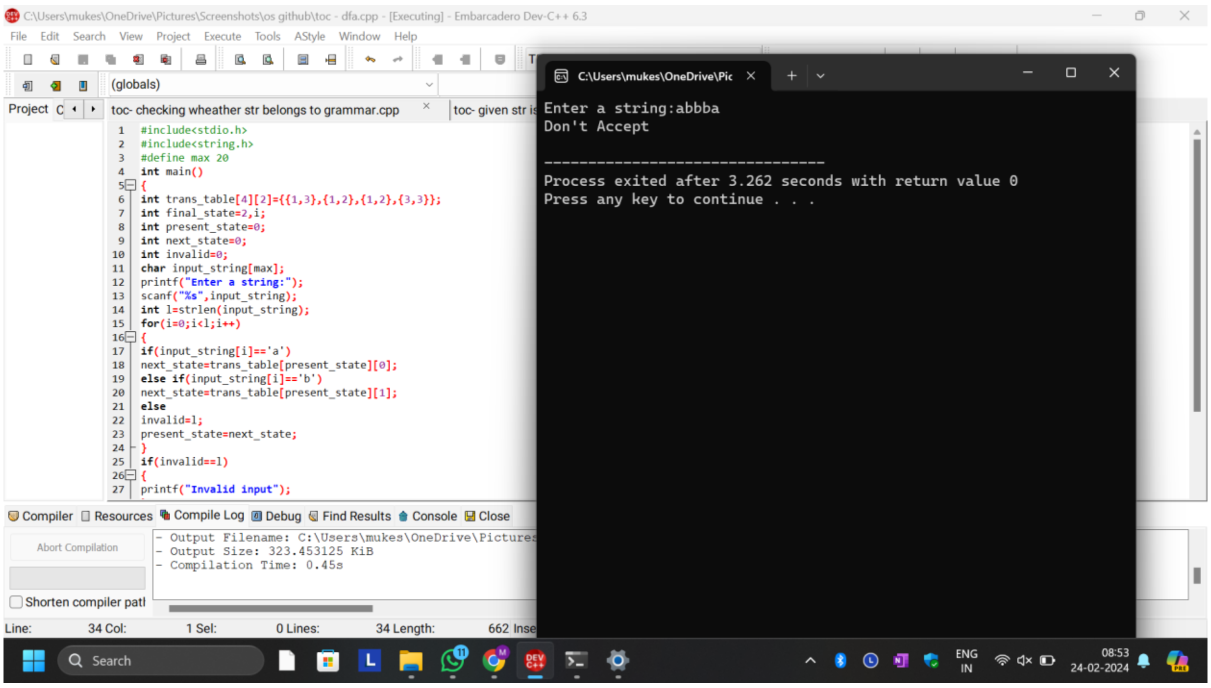
```
- Output Filename: C:\Users\mukes\OneDrive\Pictures\Screensh
- Output Size: 323.001953125 KiB
- Compilation Time: 0.58s
```

```
enter a string to check:0101101110
string is Not accepted

--------------------------------
Process exited after 18.38 seconds with return value 0
Press any key to continue . . .
```

3. DETERMINISTIC FINITE AUTOMATA (DFA)

CODE:

```
#include<stdio.h>
#include<string.h>
#define max 20
int main()
{
int trans_table[4][2]={{1,3},{1,2},{1,2},{3,3}};
int final_state=2,i;

int present_state=0;

int next_state=0;

int invalid=0;

char input_string[max];

printf("Enter a string:");

scanf("%s",input_string);

int l=strlen(input_string);

for(i=0;i<l;i++)

{

if(input_string[i]=='a')

next_state=trans_table[present_state][0];

else if(input_string[i]=='b')

next_state=trans_table[present_state][1];

else

invalid=l;

present_state=next_state;

}

if(invalid==l)

{

printf("Invalid input");

}

else if(present_state==final_state)

printf("Accept\n");

else

printf("Don't Accept\n");

}
```



```
#include<stdio.h>
#include<string.h>
#define max 20
int main()
{
int trans_table[4][2]={{1,3},{1,2},{1,2},{3,3}};
int final_state=2,i;
int present_state=0;
int next_state=0;
int invalid=0;
char input_string[max];
printf("Enter a string:");
scanf("%s",input_string);
int l=strlen(input_string);
for(i=0;i<l;i++)
{
if(input_string[i]=='a')
next_state=trans_table[present_state][0];
else if(input_string[i]=='b')
next_state=trans_table[present_state][1];
else
invalid=1;
present_state=next_state;
}
if(invalid==1)
{
printf("Invalid input");
```

```
- Output Filename: C:\Users\mukes\OneDrive\Pictures
- Output Size: 323.453125 KiB
- Compilation Time: 0.45s
```

```
Enter a string:abbba
Don't Accept

--------------------------------
Process exited after 3.262 seconds with return value 0
Press any key to continue . . .
```

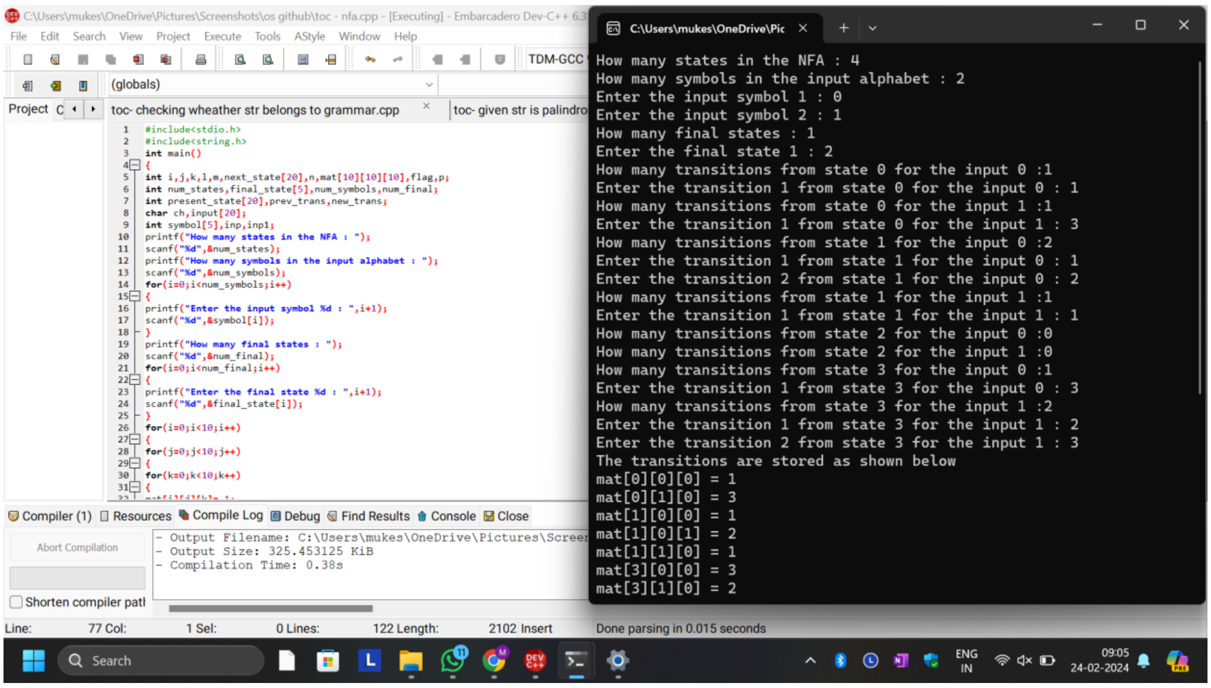
4. NON DETERMINISTIC FINITE AUTOMATA (NFA)

CODE:

```
#include<stdio.h>

#include<string.h>

int main()

{

int i,j,k,l,m,next_state[20],n,mat[10][10][10],flag,p;

int num_states,final_state[5],num_symbols,num_final;

int present_state[20],prev_trans,new_trans;

char ch,input[20];

int symbol[5],inp,inp1;

printf("How many states in the NFA : ");

scanf("%d",&num_states);

printf("How many symbols in the input alphabet : ");

scanf("%d",&num_symbols);

for(i=0;i<num_symbols;i++)

{

printf("Enter the input symbol %d : ",i+1);
```

```
scanf("%d",&symbol[i]);
}
printf("How many final states : ");
scanf("%d",&num_final);
for(i=0;i<num_final;i++)
{
printf("Enter the final state %d : ",i+1);
scanf("%d",&final_state[i]);
}
for(i=0;i<10;i++)
{
for(j=0;j<10;j++)
{
for(k=0;k<10;k++)
{
mat[i][j][k]=-1;
}
}
}
for(i=0;i<num_states;i++)
{
for(j=0;j<num_symbols;j++)
{
printf("How many transitions from state %d for the input %d :",i,symbol[j]);
scanf("%d",&n);
for(k=0;k<n;k++)
{
printf("Enter the transition %d from state %d for the input %d : ",k+1,i,symbol[j]);
scanf("%d",&mat[i][j][k]);
}
}
```

```
}
printf("The transitions are stored as shown below\n");
 for(i=0;i<10;i++)
{
for(j=0;j<10;j++)
{
for(k=0;k<10;k++)
{
 if(mat[i][j][k]!=-1)
 printf("mat[%d][%d][%d] = %d\n",i,j,k,mat[i][j][k]);
}
}
}
while(1)
{
printf("Enter the input string : ");
scanf("%s",input);
present_state[0]=0;
prev_trans=1;
l=strlen(input);
for(i=0;i<l;i++)
{
 if(input[i]=='0')
 inp1=0;
 else if(input[i]=='1')
 inp1=1;
 else
 {
 printf("Invalid input\n");


 }
 for(m=0;m<num_symbols;m++)
{
if(inp1==symbol[m])
{
inp=m;
break;
}
}
new_trans=0;
for(j=0;j<prev_trans;j++)
{
k=0;
p=present_state[j];
while(mat[p][inp][k]!=-1)
{
next_state[new_trans++]=mat[p][inp][k];
k++;
}
}
for(j=0;j<new_trans;j++)
{
present_state[j]=next_state[j];
}
prev_trans=new_trans;
}
flag=0;
for(i=0;i<prev_trans;i++)
{
for(j=0;j<num_final;j++)
{
if(present_state[i]==final_state[j])
{
flag=1;
break;
}
}
}
if(flag==1)
printf("Acepted\n");
else
printf("Not accepted\n");
printf("Try with another input\n");
}
}
```



```
#include<stdio.h>
#include<string.h>
int main()
{
int i,j,k,l,m,next_state[20],n,mat[10][10][10],flag,p;
int num_states,final_state[5],num_symbols,num_final;
int present_state[20],prev_trans,new_trans;
char ch,input[20];
int symbol[5],inp,inp1;
printf("How many states in the NFA : ");
scanf("%d",&num_states);
printf("How many symbols in the input alphabet : ");
scanf("%d",&num_symbols);
for(i=0;i<num_symbols;i++)
{
printf("Enter the input symbol %d : ",i+1);
scanf("%d",&symbol[i]);
}
printf("How many final states : ");
scanf("%d",&num_final);
for(i=0;i<num_final;i++)
{
printf("Enter the final state %d : ",i+1);
scanf("%d",&final_state[i]);
}
for(i=0;i<10;i++)
{
for(j=0;j<10;j++)
{
for(k=0;k<10;k++)
{
```

```
- Output Filename: C:\Users\mukes\OneDrive\Pictures\Screen
- Output Size: 325.453125 KiB
- Compilation Time: 0.38s
```

```
How many states in the NFA : 4
How many symbols in the input alphabet : 2
Enter the input symbol 1 : 0
Enter the input symbol 2 : 1
How many final states : 1
Enter the final state 1 : 2
How many transitions from state 0 for the input 0 :1
Enter the transition 1 from state 0 for the input 0 : 1
How many transitions from state 0 for the input 1 :1
Enter the transition 1 from state 0 for the input 1 : 3
How many transitions from state 1 for the input 0 :2
Enter the transition 1 from state 1 for the input 0 : 1
Enter the transition 2 from state 1 for the input 0 : 2
How many transitions from state 1 for the input 1 :1
Enter the transition 1 from state 1 for the input 1 : 1
How many transitions from state 2 for the input 0 :0
How many transitions from state 2 for the input 1 :0
How many transitions from state 3 for the input 0 :1
Enter the transition 1 from state 3 for the input 0 : 3
How many transitions from state 3 for the input 1 :2
Enter the transition 1 from state 3 for the input 1 : 2
Enter the transition 2 from state 3 for the input 1 : 3
The transitions are stored as shown below
mat[0][0][0] = 1
mat[0][1][0] = 3
mat[1][0][0] = 1
mat[1][0][1] = 2
mat[1][1][0] = 1
mat[3][0][0] = 3
mat[3][1][0] = 2
```