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EXPERIMENT : 3

DATE : 01/02/23

CONVERSION FROM NFA TO DFA

AIM : To write a program to obtain a DFA from NFA.

PROCEDURE:

1. START
2. Set the only state in SDFA to “unmarked”.
3. Set the input from the user.
4. While SDFA contain an unmarked state do:
5. Let T be that unmarked state.
6. For each a in % do S = e-closure(move NFA(T,a))
7. If S is not in SDFA already then, add S to SDFA (as an “unmarked” state).
8. Set move DFA (T,a) to S.
9. For each S in SDFA if any s and S is the final state in the DFA.
10. Print the result.
11. Stop the program.

PROGRAM:

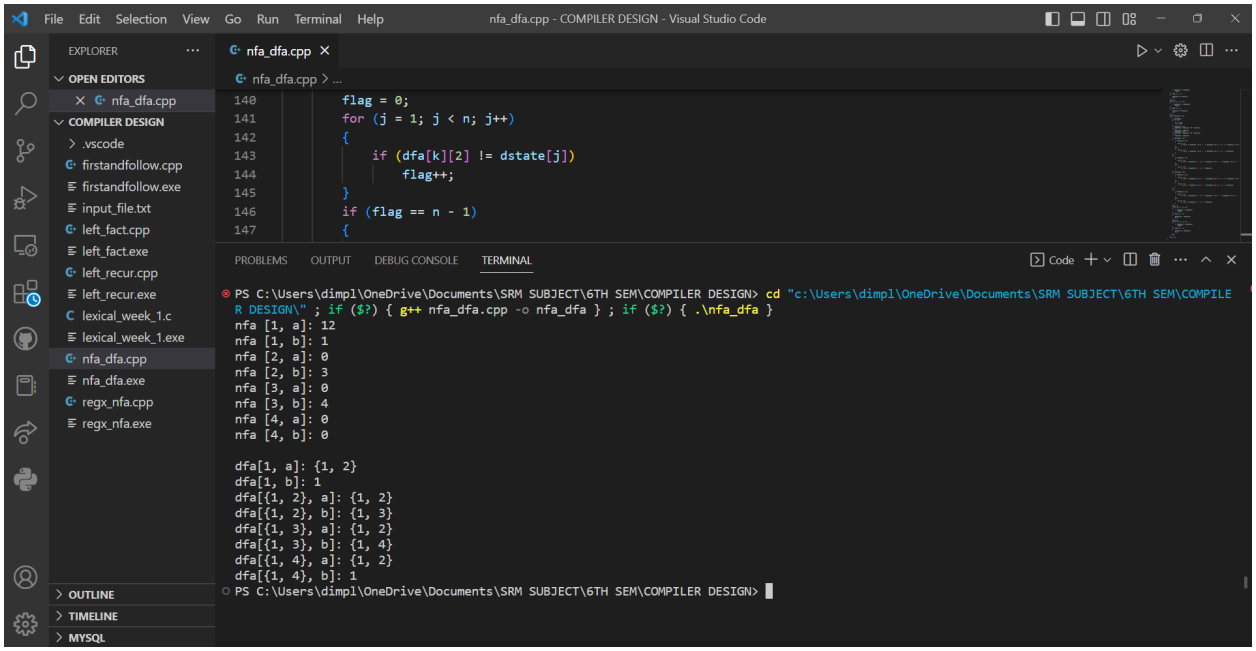
```
#include <vector>
#include <iostream>
using namespace std;

int main()
{
   vector<vector<int>> nfa(5, vector<int>(3));
   vector<vector<int>> dfa(10, vector<int>(3));
   for (int i = 1; i < 5; i++)
   {
      for (int j = 1; j <= 2; j++)
      {
         int h;
         if (j == 1)
         {
            cout << "nfa [" << i << ", a]: ";
         }
         else
         {
            cout << "nfa [" << i << ", b]: ";
         }
         cin >> h;
         nfa[i][j] = h;
      }
```

```
}
int dstate[10];
int i = 1, n, j, k, flag = 0, m, q, r;
dstate[i++] = 1;
n = i;

dfa[1][1] = nfa[1][1];
dfa[1][2] = nfa[1][2];
cout << "\n"
    << "dfa[" << dstate[1] << ", a]: {" << dfa[1][1] / 10 << ", " << dfa[1][1] % 10 << "}";
cout << "\n"
    << "dfa[" << dstate[1] << ", b]: " << dfa[1][2];

for (j = 1; j < n; j++)
{
   if (dfa[1][1] != dstate[j])
      flag++;
}
if (flag == n - 1)
{
   dstate[i++] = dfa[1][1];
   n++;
}
flag = 0;
for (j = 1; j < n; j++)
{
   if (dfa[1][2] != dstate[j])
      flag++;
}
if (flag == n - 1)
{
   dstate[i++] = dfa[1][2];
   n++;
}
k = 2;
while (dstate[k] != 0)
{
   m = dstate[k];
   if (m > 10)
   {
      q = m / 10;
      r = m % 10;
   }
   if (nfa[r][1] != 0)
      dfa[k][1] = nfa[q][1] * 10 + nfa[r][1];
   else
```

```
            dfa[k][1] = nfa[q][1];
        if (nfa[r][2] != 0)
            dfa[k][2] = nfa[q][2] * 10 + nfa[r][2];
        else
            dfa[k][2] = nfa[q][2];

        if (dstate[k] > 10)
        {
            if (dfa[k][1] > 10)
            {
                cout << "\n"
                    << "dfa[{" << dstate[k] / 10 << ", " << dstate[k] % 10 << "}, a]: {" << dfa[k][1] / 10 << ", "
<< dfa[k][1] % 10 << "}";
            }
            else
            {
                cout << "\n"
                    << "dfa[{" << dstate[k] / 10 << ", " << dstate[k] % 10 << "}, a]: " << dfa[k][1];
            }
        }
        else
        {
            if (dfa[k][1] > 10)
            {
                cout << "\n"
                    << "dfa[" << dstate[k] << ", a]: {" << dfa[k][1] / 10 << ", " << dfa[k][1] % 10 << "}";
            }
            else
            {
                cout << "\n"
                    << "dfa[" << dstate[k] << ", a]: " << dfa[k][1];
            }
        }
        if (dstate[k] > 10)
        {
            if (dfa[k][2] > 10)
            {
                cout << "\n"
                    << "dfa[{" << dstate[k] / 10 << ", " << dstate[k] % 10 << "}, b]: {" << dfa[k][2] / 10 << ", "
<< dfa[k][2] % 10 << "}";
            }
            else
            {
                cout << "\n"
                    << "dfa[{" << dstate[k] / 10 << ", " << dstate[k] % 10 << "}, b]: " << dfa[k][2];
            }
```

```
        }
        else
        {
            if (dfa[k][1] > 10)
            {
                cout << "\n"
                    << "dfa[" << dstate[k] << ", b]: {" << dfa[k][2] / 10 << ", " << dfa[k][2] % 10 << "}";
            }
            else
            {
                cout << "\n"
                    << "dfa[" << dstate[k] << ", b]: " << dfa[k][2];
            }
        }
        flag = 0;
        for (j = 1; j < n; j++)
        {
            if (dfa[k][1] != dstate[j])
                flag++;
        }
        if (flag == n - 1)
        {
            dstate[i++] = dfa[k][1];
            n++;
        }
        flag = 0;
        for (j = 1; j < n; j++)
        {
            if (dfa[k][2] != dstate[j])
                flag++;
        }
        if (flag == n - 1)
        {
            dstate[i++] = dfa[k][2];
            n++;
        }
        k++;
    }
    return 0;
}
```

OUTPUT:



RESULT:

Hence, the conversion of NFA to DFA was successfully implemented.