Compiler Design(18CSC304J)

Experiment 6

ELIMINATION OF LEFT RECURSION

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Aim: To study and implement Elimination of Left Recursion.

Language: C++

Theory:

A production of grammar is said to have left recursion if the leftmost variable of its RHS is same as variable of its LHS.

A grammar containing a production having left recursion is called as Left Recursive Grammar.

Procedure:

1. Start the program.
2. Initialize the arrays for taking input from the user.
3. Prompt the user to input the no. of non-terminals having left recursion and no. of productions for these non-terminals.
4. Prompt the user to input the production for non-terminals.
5. Eliminate left recursion using the following rules:-
    1. A->Aα1| Aα2 | . . . . . |Aαm
    2. A->β1| β2| . . . . .| βn
    3. Then replace it by
    4. A-> βi A' i=1,2,3,.....m
    5. A'-> αj A' j=1,2,3,.....n
    6. A'-> ε
6. After eliminating the left recursion by applying these rules, display the productions without left recursion.
7. Stop

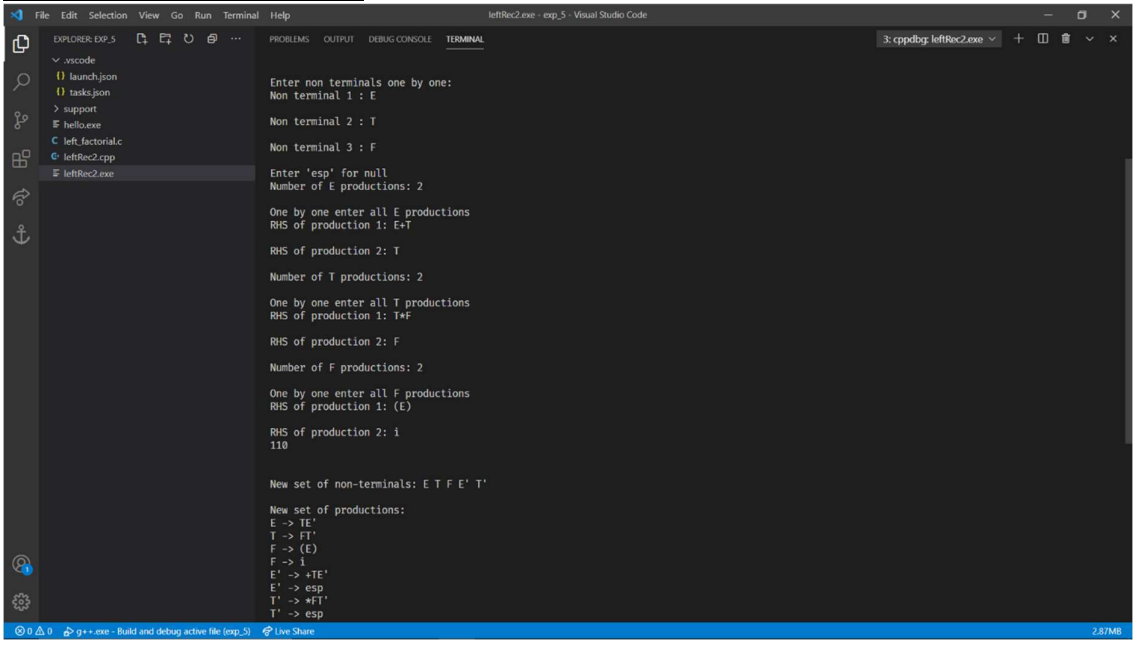
Code Snippet:

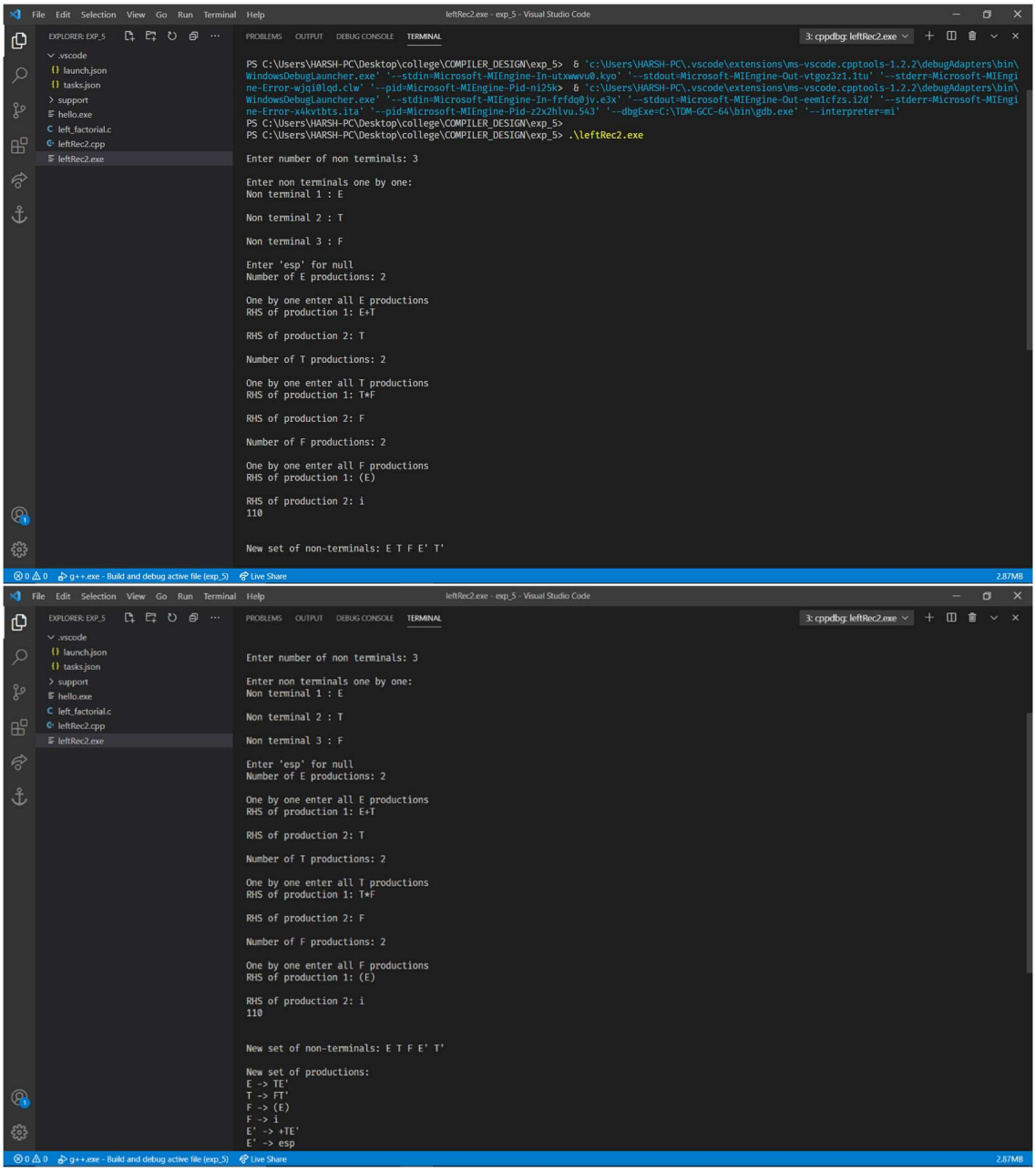
```
#include <iostream>
#include <vector>
#include <string>
using namespace std;

int main()
```

```
{
    int n;
    cout<<"\nEnter number of non terminals: ";
    cin>>n;
    cout<<"\nEnter non terminals one by one: ";
    int i;
    vector<string> nonter(n);
    vector<int> leftrecr(n,0);
    for(i=0;i<n;++i) {
            cout<<"\nNon terminal "<<i+1<<" : ";
        cin>>nonter[i];
    }
    vector<vector<string> > prod;
    cout<<"\nEnter 'esp' for null";
    for(i=0;i<n;++i) {
        cout<<"\nNumber of "<<nonter[i]<<" productions: ";
        int k;
        cin>>k;
        int j;
        cout<<"\nOne by one enter all "<<nonter[i]<<" productions";
        vector<string> temp(k);
        for(j=0;j<k;++j) {
            cout<<"\nRHS of production "<<j+1<<": ";
            string abc;
            cin>>abc;
            temp[j]=abc;
            if(nonter[i].length()<=abc.length()&&nonter[i].compare(ab
c.substr(0,nonter[i].length()))==0)
                leftrecr[i]=1;
        }
        prod.push_back(temp);
    }
    for(i=0;i<n;++i) {
        cout<<leftrecr[i];
    }
    for(i=0;i<n;++i) {
        if(leftrecr[i]==0)
            continue;
        int j;
        nonter.push_back(nonter[i]+"'");
        vector<string> temp;
        for(j=0;j<prod[i].size();++j) {
            if(nonter[i].length()<=prod[i][j].length()&&nonter[i].com
pare(prod[i][j].substr(0,nonter[i].length()))==0) {
                string abc=prod[i][j].substr(nonter[i].length(),prod[
i][j].length()-nonter[i].length())+nonter[i]+"'";
                temp.push_back(abc);
                prod[i].erase(prod[i].begin()+j);
```

```
                --j;
            }
            else {
                prod[i][j]+=nonter[i]+"'";
            }
        }
        temp.push_back("esp");
        prod.push_back(temp);
    }
    cout<<"\n\n";
    cout<<"\nNew set of non-terminals: ";
    for(i=0;i<nonter.size();++i)
        cout<<nonter[i]<<" ";
    cout<<"\n\nNew set of productions: ";
    for(i=0;i<nonter.size();++i) {
        int j;
        for(j=0;j<prod[i].size();++j) {
            cout<<"\n"<<nonter[i]<<" -> "<<prod[i][j];
        }
    }
    return 0;
}
```

Output Screenshots:





Result:

The code was successfully implemented in C and output was recorded. Hence, A program for Elimination of Left Recursion was run successfully.