CD: COMPILER DESIGN
CD: UNIT-2 09/2022

SEPTEMBER 2022 / IT-3rd year, Vth semester
FALL SEMESTER, YEAR (Vth, 3rd)
FALL SESSION (2022-23)
(CD)
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Published: SEPTEMBER, 2022

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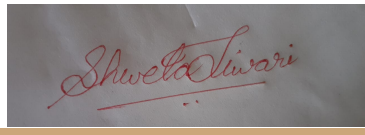
Engineering Students
All Engineering College



CD: COMPILER DESIGN

TOPIC On : UNIT-2 UNIT-2 TOP-DOWN PARSER-RECURSIVE DESCENT PARSER

By SHWETA TIWARI

Under On: Basic Parsing Techniques

TOPIC On : UNIT-2 TOP-DOWN PARSER-RECURSIVE DESCENT PARSER

II-TOP-DOWN-RECURSIVE DESCENT

Top-Down Parsing- Recursive Descent Parsing:

Top-down parsing can be viewed as an attempt to find a leftmost derivation for an input string. Equivalently it can be viewed as an attempt to construct a parse tree for the input starting from the root and creating the nodes of the parse tree in preorder.

A general form top-down parsing called recursive descent parsing, involves backtracking, that is making repeated scans of the input. A special case of recursive descent parsing called predictive parsing, where no backtracking is required.

Consider the grammar

S → cAd

A → ab | a

and the input string w=cad. Construction of the parse is shown in fig 1.

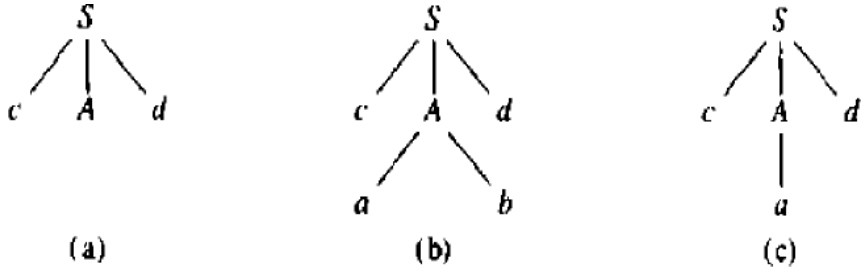


Fig 1 Steps in Top-down Parse

The leftmost leaf, labeled c, matches the first symbol of w, hence advancing the input pointer to a, the second symbol of w. Fig 1(b) and (c) shows the backtracking required to match the input string.

Recursive Descent parser

- It is a top down parser.
- It starts from the top that is the root and applies several productions and gets a bottom that has leaf nodes.
- The name suggests a specific meaning. It contains a recursive procedure.

- So grammar contains three non-terminal that's why this parser contains **three recursive procedures.**
- Recursive means "A function which is called by itself".
- Means the calling function and called function are the same.
- So in this we have to write a recursive procedure of each and every non terminals that is available in Grammar.

Steps of construction for recursive Descent parser

1. If input is a non terminal/variable then call the corresponding procedure of the non terminal. *(meaning call corresponding function).*
2. If input is a terminal symbol then compare terminal with input string *(corresponding input symbol).* If they are the same, then we have to increment the input pointer. *(meaning we have to compare the next input with corresponding terminals.)*
3. If a non terminal procedures 3 productions then we have to write those three productions in the corresponding non terminals. *(meaning produce more than 1 production then all production codes should be written in corresponding function or procedure.)*
4. There is no need to define any main function or no need to define any variable. *(If we define a main function then in the main function. We have to call the start symbol/production/ function.)*

EXAMPLE

E → iE'

E' → +iE' | ε

Here are two non-terminals.

So, define 2 *functions or procedures.*

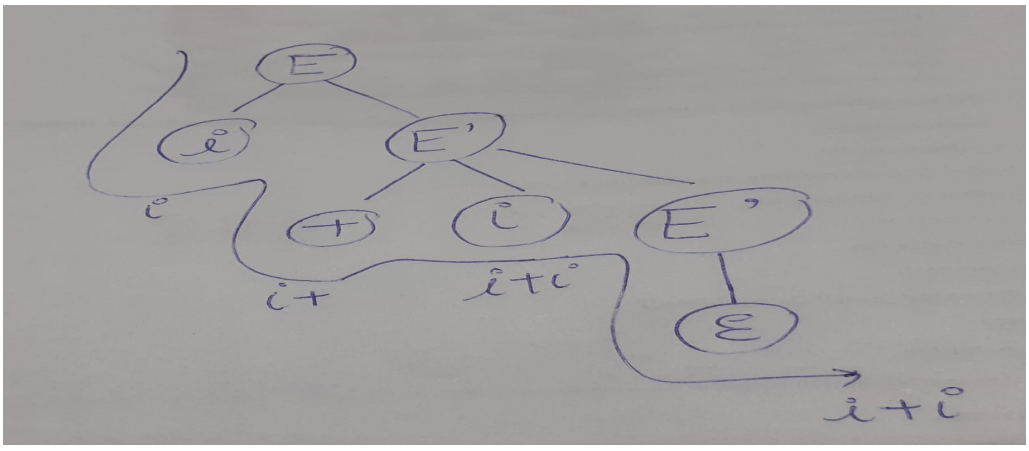
*** Do follow C Language Rule: It is basic Programming Language.*

```
E( )
{
if(input==”i”)
        input++ ;
        Epro( );
}
Epro( )
{
if(input==”+”)
{       input++ ;
        if(input==”i”)
        input++ ;
        Epro( );
}
```

else
return ;
}
Parse this string w=i+i

*Add the **$** symbol at the end of the string which shows that there is no more terminal for parse. And looks like, **w=i+i$***

After accepting string(w=i+i) by the above program of given grammars, the output is generated in the form of a syntax tree.



Question: Write a recursive function for grammar :
And is this string parse **w=id+id** ?
E → TE'
E' → +TE' | ε

T → FT '

T'→ *FT ' | ε

F → (E) |id

Define function for each Non-Terminal. In this there are 5 Non-Terminal. So, define 5 functions.
*** Do follow C Language Rule: It is basic Programming Language.*
E( )
{ T( );
Epro( );
}

Epro( )
{ if (input== "+"
{ input++;
T( );
Epro( );
}
else

return( );
}

T( )
{ F( );
Tpro( );
}

Tpro( )
{ if(input== "")*
{ input++;
F( );
Tpro( );
}
else
return;
}

F( )
{ if (input== "(")
{
input++;
E( );
if (input== ")")
input++;
}
else
if (input== "id")
input++;
}
*Add the **$** symbol at the end of the string which shows that there is no more terminal for parse. And looks like, **w=id+id$***
After accepting string(w=id+id) by the above program of given grammars, the output is generated in the form of a syntax tree.