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ASSIGNMENT 4

Title : Recursive Descent Parser

Problem Statement : Study recursive descent parser

Objectives : • Understand basic principles of top-down parsing
• To study recursive descent parser

Theory : A recursive descent parser is a top-down parser, so called because it builds a parse tree from the top-down and from left to right using input sentences as a target as it is scanned from left to right.

Perhaps the hardest part of a recursive descent parser is the scanning repeatedly fetching the next token from a scanner. It is tricky to decide when to scan and the parser doesn't work all if there is an extra scan or missing scan.

Algorithm :

1) Apply left recursive removal method and remove left recursion in gramar if any.
2) Apply left fetching
3) Compute 1st step

Grammar

S → TL
L → +S|e
T → UM
M → *T | e
U → (S) | V
V → 0|1|...|9

4) Compute 1st sets
• First (V) = {0, ... 9}
• First (U) = First (S) U First (V) = {{} U {0, 9}} = {0, ... 9}
• First (M) = First (*T) U First (e) = {*, e}

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- First (T) = First (UM) = First (U) = {(, 0...9}
- First (L) = First (+S) ∪ First(e) = {+, e}

5) First (S) = First (TL) = First (T)

6) First (S) = First (+L) = First (T) = {0, ... 9}

Recursive Descent Parser

```
parse_S() {
    parse_T() ; parse_L();
}
parse_L() {
  //L → +S
    if (lookhead == "+") {
        match('+'); parse_S();
    }
    //L
     else ...
}
parse_T() {
  //T → UM
   parse_U() ; parse_M();
}
parse_L() {
  //L → +S
   if (lookhead == "+") {
      match("+"; parse_S();
   }
   //L
    else ...
}
parse_U() {
   if (lookhead == "(") {  // U → (S)
      match("("); parse_S(); math(")");
}
```

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```
        else parse_V(); //U → V
}
parse_V() {
    if (lookhead == "0") { //V → 0
        match ("0");
    } else if (lookhead == "1") { //V → 1
        match ("1");
    } else
    } else if (lookhead == "9") { //V → 9
        match ("9");
    } else error();
}
```

Conclusion: I learnt about recursive descent parser concept and implemented it.