Design And Implementaion of Modern Compilers

MiniProject

Aim:- Write a code to generate a predictive parsing table for a given set of production rules.

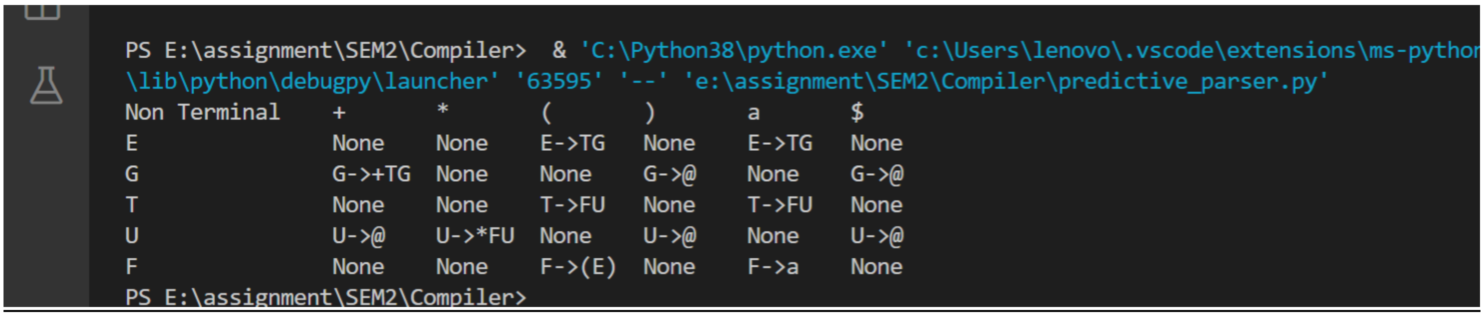
Description: Predictive parsing:

1. A predictive parser is a recursive descent parser with no backtracking or backup.
2. It is a top-down parser that does not require backtracking.
3. At each step, the choice of the rule to be expanded is made upon the next terminal symbol.

Source Code:-

```
from colorama import Fore, init


class PredictiveParser:
    def __init__(self):

        self.non_terminals = list("EGTUF")
        self.terminals = list("+*()a")
        self.production_rules = ["E->TG", "G->+TG", "G->@", "T->FU", "U->*FU", "U->@", "F->(E)", "F->a"]
        self.first = {"E":["(", "a"], "G":["+", "@"], "T":["(", "a"], "U":["*", "@"], "F":["(", "a"]}
        self.follow = {"E":[")", "$"], "G":[")", "$"], "T":[")", "$", "+"], "U":[")", "$", "+"], "F":[")", "$", "+", "*"]}


    def generate_parsing_table(self) -> 'dict[str, list[str]]':
        parsing_table = dict()
        for non_terminal in self.non_terminals:
            parsing_table[non_terminal] = [None for i in range(len(self.terminals) + 1)]
        for production_rule in self.production_rules:
            non_terminal_at_left, remainder = production_rule.split("->") if "->" in production_rule else
production_rule.split("-")
            if not (remainder[0].isupper() or remainder[0] == "@"):
                parsing_table[non_terminal_at_left][self.terminals.index(remainder[0])] =
production_rule
            else:
                update_locations = self.first[non_terminal_at_left]
                if "@" in update_locations:
                    update_locations.remove("@")
                    update_locations += self.follow[non_terminal_at_left]

                for update_location in update_locations:
                    try:
                        position = self.terminals.index(update_location)
                    except ValueError:
                        position = len(self.terminals)

                    if parsing_table[non_terminal_at_left][position] is not None:
                        continue

                    parsing_table[non_terminal_at_left][position] = production_rule

        return parsing_table

    def print_parsing_table(self, parsing_table : 'dict[str, list[str]]'):
        print("Non Terminal", end = "\t")
        for terminal in self.terminals:
            print(terminal, end = "\t")
        print("$", end = "\n")

        for entry in parsing_table:
            print(entry, end = "\t\t")
            for cell in parsing_table[entry]:
                print(cell, end = "\t")
            print(end = "\n")

if __name__ == '__main__':
    predictive_parser = PredictiveParser()
    parsing_table = predictive_parser.generate_parsing_table()
    predictive_parser.print_parsing_table(parsing_table)
```

Output:-



```
PS E:\assignment\SEM2\Compiler>  & 'C:\Python38\python.exe' 'c:\Users\lenovo\.vscode\extensions\ms-pythor
\lib\python\debugpy\launcher' '63595' '--' 'e:\assignment\SEM2\Compiler\predictive_parser.py'
Non Terminal    +       *       (       )       a       $
E               None    None    E->TG   None    E->TG   None
G               G->+TG  None    None    G->@    None    G->@
T               None    None    T->FU   None    T->FU   None
U               U->@    U->*FU  None    U->@    None    U->@
F               None    None    F->(E)  None    F->a    None
PS E:\assignment\SEM2\Compiler>
```