Compilers Project

Team members

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Environment

- 使用Ubuntu20.04.1
- 需有以下套件

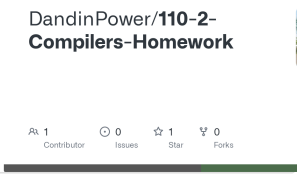
```
sudo apt-get install flex
sudo apt-get install bison
```

- Github地址

110-2-Compilers-Homework/project at main · DandinPower/110-2-Compilers-Homework

Contribute to DandinPower/110-2-Compilers-Homework development by creating an account on GitHub.

https://github.com/DandinPower/110-2-Compilers-Homework/tree/main/project



Target Language

- 使用Standford CS143課程所提供的Coolc作為本次專案的target language
- 該語言的Document

http://web.stanford.edu/class/cs143/materials/cool-manual.pdf

Grammar

```
0 $accept: program $end

1 program: clist

2 clist: clist class SYNTAX_OVER
3      | class SYNTAX_OVER

4 class: CLASS TYPE_ID BLOCKSTART flist_opt BLOCKOVER
5      | CLASS TYPE_ID INHERITS TYPE_ID BLOCKSTART flist_opt BLOCKOVER

6 flist_opt: flist
7          | %empty

8 flist: flist feature SYNTAX_OVER
9      | feature SYNTAX_OVER

10 feature: IDENTIFIER_ID ITEMSTART formal_list ITEMOVER DEFINE TYPE_ID BLOCKSTART expr BLOCKOVER
11        | IDENTIFIER_ID ITEMSTART ITEMOVER DEFINE TYPE_ID BLOCKSTART expr BLOCKOVER
12        | IDENTIFIER_ID DEFINE TYPE_ID ASSIGN expr
```

```
13        | IDENTIFIER_ID DEFINE TYPE_ID

14 formal_list: formal_list NEXT formal
15            | formal

16 formal: IDENTIFIER_ID DEFINE TYPE_ID

17 block_list: block_list expr SYNTAX_OVER
18           | expr SYNTAX_OVER

19 arguments_list: arguments
20                | %empty

21 arguments: arguments NEXT expr
22          | expr

23 action_list: action_list action
24            | action

25 action: IDENTIFIER_ID DEFINE TYPE_ID DO expr SYNTAX_OVER

26 let_action: IDENTIFIER_ID DEFINE TYPE_ID IN BLOCKSTART block_list BLOCKOVER
27           | IDENTIFIER_ID DEFINE TYPE_ID ASSIGN expr IN BLOCKSTART block_list BLOCKOVER

28 expr: IDENTIFIER_ID
29     | DIGIT
30     | BOOLEAN
31     | LETTER
32     | SELF
33     | BLOCKSTART block_list BLOCKOVER
34     | IDENTIFIER_ID ASSIGN expr
35     | expr DOT IDENTIFIER_ID ITEMSTART arguments_list ITEMOVER
36     | expr AT TYPE_ID DOT IDENTIFIER_ID ITEMSTART arguments_list ITEMOVER
37     | IDENTIFIER_ID ITEMSTART arguments_list ITEMOVER
38     | expr OPERATOR expr
39     | ITEMSTART expr ITEMOVER
40     | IF expr THEN expr ELSE expr FI
41     | WHILE expr LOOP expr POOL
42     | LET let_action
43     | CASE expr OF action_list ESAC
44     | NEW TYPE_ID
45     | ISVOID expr
46     | NOT expr
47     | INT_COMP expr
```

使用說明

- 編譯scanner跟parser

```
bison -vdty coolc.y
flex coolc.l
gcc -o coolc y.tab.c lex.yy.c
```

- 使用parser辨識測試資料

```
./coolc < "Test case path"
```

輸出說明

- 輸出使用到的文法規則
  - EX. 如果使用reduce到expr的第5個規則就會輸出

```
expr 5
```

- 全部辨識完畢且正確
  - 輸出Done

```
Done!
```

- 輸出Symbol Table結果
  - EX.使用到了Identifier

```
ID: [<編號>]: <實際儲存的字串>
```

- 輸出Syntax Tree解析結果
  - 根據解析結果分行輸出該文法規則的token, 文法規則, syntax tree深度

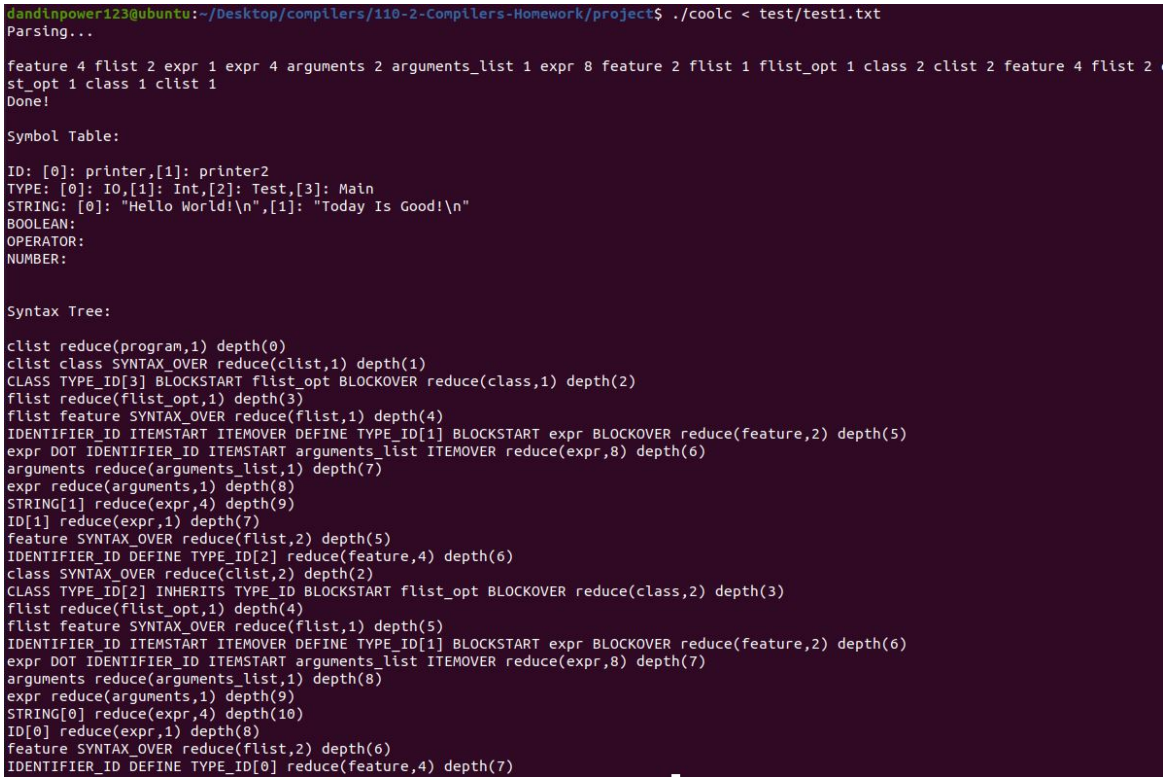
```
clist class SYNTAX_OVER reduce(clist,1) depth(1)
#token token token      文法規則         深度
```

輸出結果

- Test case
  - 輸入指令

```
./coolc < test/test1.txt
```

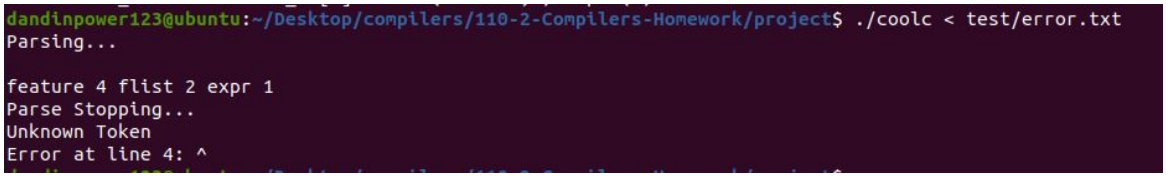
  - 輸出結果



- error case
  - 輸入指令

```
./coolc < test/error.txt
```

  - 輸出結果



可視化Syntax Tree

- 內建的測資為test1.txt

```
class Test inherits IO{
    printer:IO;
    test():Int {
        printer.out_string("Hello World!\n")
    };
};

class Main {
    printer2:Test;
    main():Int {
        printer2.out_string("Today Is Good!\n")
    };
};
```

- 根據解析器轉換完的結果

```
clist reduce(program,1) depth(0)
clist class SYNTAX_OVER reduce(clist,1) depth(1)
CLASS TYPE_ID[3] BLOCKSTART flist_opt BLOCKOVER reduce(class,1) depth(2)
flist reduce(flist_opt,1) depth(3)
flist feature SYNTAX_OVER reduce(flist,1) depth(4)
IDENTIFIER_ID ITEMSTART ITEMOVER DEFINE TYPE_ID[1] BLOCKSTART expr BLOCKOVER reduce(feature,2) depth(5)
expr DOT IDENTIFIER_ID ITEMSTART arguments_list ITEMOVER reduce(expr,8) depth(6)
arguments reduce(arguments_list,1) depth(7)
expr reduce(arguments,1) depth(8)
STRING[1] reduce(expr,4) depth(9)
ID[1] reduce(expr,1) depth(7)
feature SYNTAX_OVER reduce(flist,2) depth(5)
IDENTIFIER_ID DEFINE TYPE_ID[2] reduce(feature,4) depth(6)
class SYNTAX_OVER reduce(clist,2) depth(2)
CLASS TYPE_ID[2] INHERITS TYPE_ID BLOCKSTART flist_opt BLOCKOVER reduce(class,2) depth(3)
flist reduce(flist_opt,1) depth(4)
flist feature SYNTAX_OVER reduce(flist,1) depth(5)
IDENTIFIER_ID ITEMSTART ITEMOVER DEFINE TYPE_ID[1] BLOCKSTART expr BLOCKOVER reduce(feature,2) depth(6)
expr DOT IDENTIFIER_ID ITEMSTART arguments_list ITEMOVER reduce(expr,8) depth(7)
arguments reduce(arguments_list,1) depth(8)
expr reduce(arguments,1) depth(9)
STRING[0] reduce(expr,4) depth(10)
ID[0] reduce(expr,1) depth(8)
feature SYNTAX_OVER reduce(flist,2) depth(6)
IDENTIFIER_ID DEFINE TYPE_ID[0] reduce(feature,4) depth(7)
```

- 運行visualization.py來解析上面的測資

```
python visualization.py
```

- 運行結果