Finite automata of lexical analysis for C programming language in prolog

(Only some key words, variable names and boundary symbols are recognized.)

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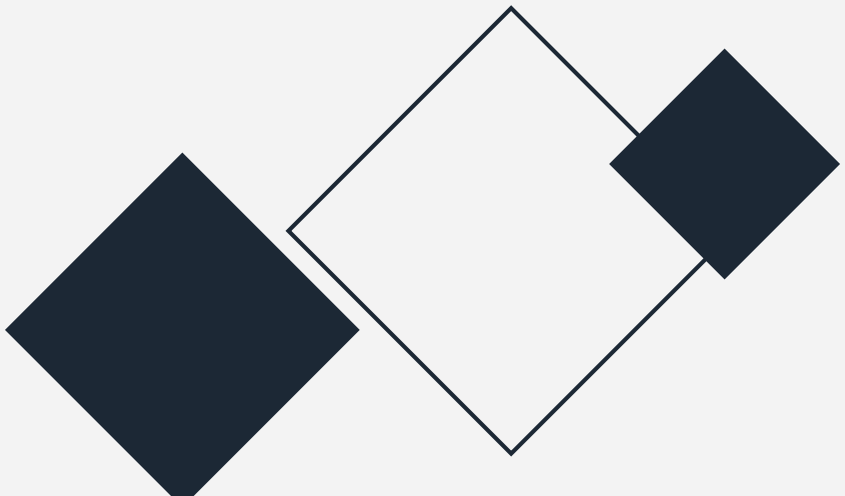


The origin of the project

- This language is suitable for the analysis of natural language.
- Natural language is much more complicated than programming language because it has too many combinations.
- Just now, I need to make a compiler demo recently, so I want to try to use prolog to make lexical analysis and syntax analysis.

about

Its functions and features

NFA —

At present, I have only made a preliminary model of lexical analysis.

It can identify some keywords (if, else, for, int, etc.), variables, numbers and delimiters (spaces, operation symbols, brackets, etc.).

1. Using predicate ‘start/1’ to enter a string, For example, start(‘if (i < 20)’).
2. NFA matches and distinguishes the parts of the string.
3. Output process and result of analysis

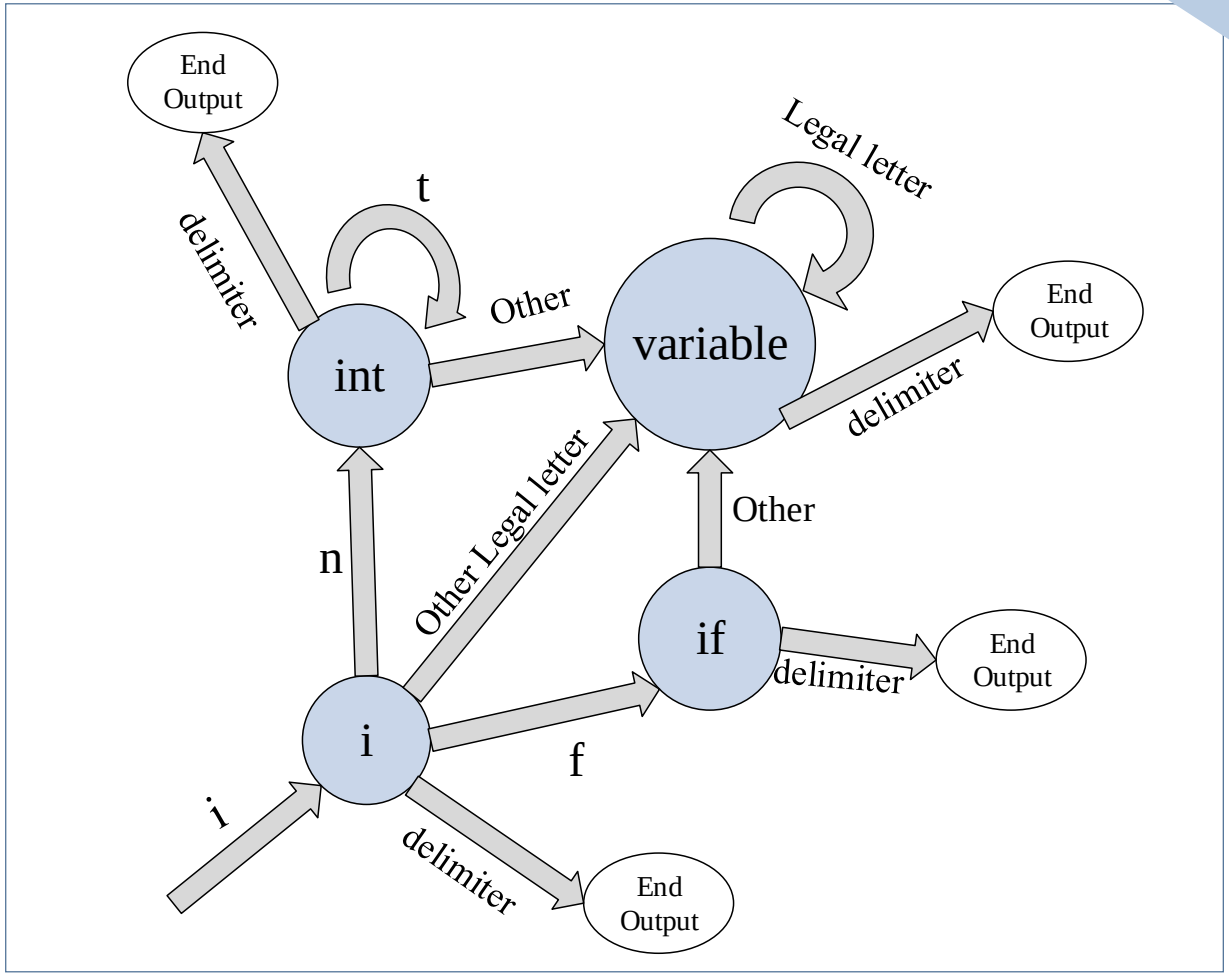
Nondeterministic Finite Automata(NFA)

lexical analysis for C programming language

This is a part of NFA structure.

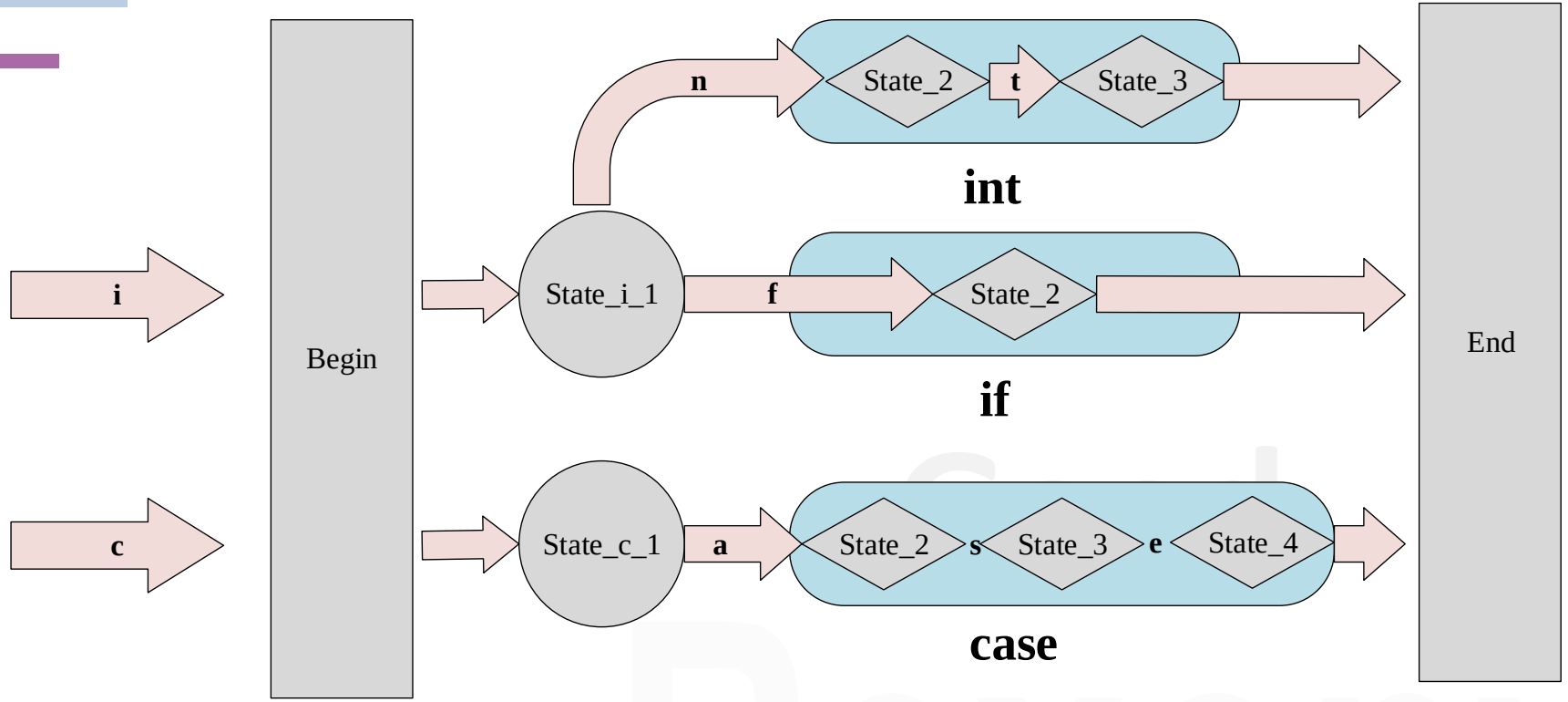
The first letter : ‘i’ ->Goto state ‘i’.
The second letter: ‘n’ ->Goto state ‘int’
The second letter: ‘f’ ->Goto state ‘if’
The second letter: other legal letter(a-z,A-Z,0-9,_)
->Goto state ‘variable’

Now,if into the state ‘int’:
The third letter: ‘t’ ->Goto the next state ‘int’
The third letter: other legal letter(a-z,A-Z,0-9,_)
->Goto state ‘variable’
The third letter: delimiter(+,*,-,/,(space),etc.)
->Goto End input ‘kw_int’



Structure design of NFA

and code implementation



Code In prolog

Path graph of call and recursion

```
/*Finite Automata*/
start(S):-
    name(S,L),
    write(L),nl,
    begin(L-_,_).  % Begin Loop
```

```
%begin:int if
begin([X|Y]-Y,S):-
        [X|Y]\=[],
        X is 105,
        write('begin_i'),nl,
        mover(sta_i_1,Y-_,S),
        write(S),nl,
        begin(S-_,_).
```

```
%i
mover(sta_i_1,[X|Y]-Y,S):-
    delimiter(X),
    write('This is a variable '),nl,
    append(Y,[],S).
```

```
mover(sta_i_1,[X|Y]-Y,S):-
        X is 102,
        write('sta_i_1 '),nl,
        mover(sta_if_2,Y-_,S).
```

```
mover(sta_i_1,[X|Y]-Y,S):-
        X \= 102,X \= 110,
        write('sta_i_1 '),nl,
        mover(sta_var,Y-_,S).
```

```
% End Loop
begin(S-_,_):- S ==[].
```

```
mover(sta_if_2,[X|Y]-Y,S):-
        name_legal(X),
        write('sta_if_2 '),nl,
        mover(sta_var,Y-_,S).
```

```
mover(sta_if_2,[X|Y]-Y,S):-
        delimiter(X),
        write('sta_kw_if'),nl,
        append(Y,[],S),
        write('This is a key word:if'),nl.
```

```
.............
```

SWISH

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NFA in prolog

Defects and development

1 Too much code

The total of more than 700 lines of code,
The rule ‘mover ()’ is repeated many times.

Reason: I'm not familiar with it. I can't use list to reduce the amount of code through recursion.

2 Development

Mixed with other languages to complete a lexical analyzer.

THANK YOU