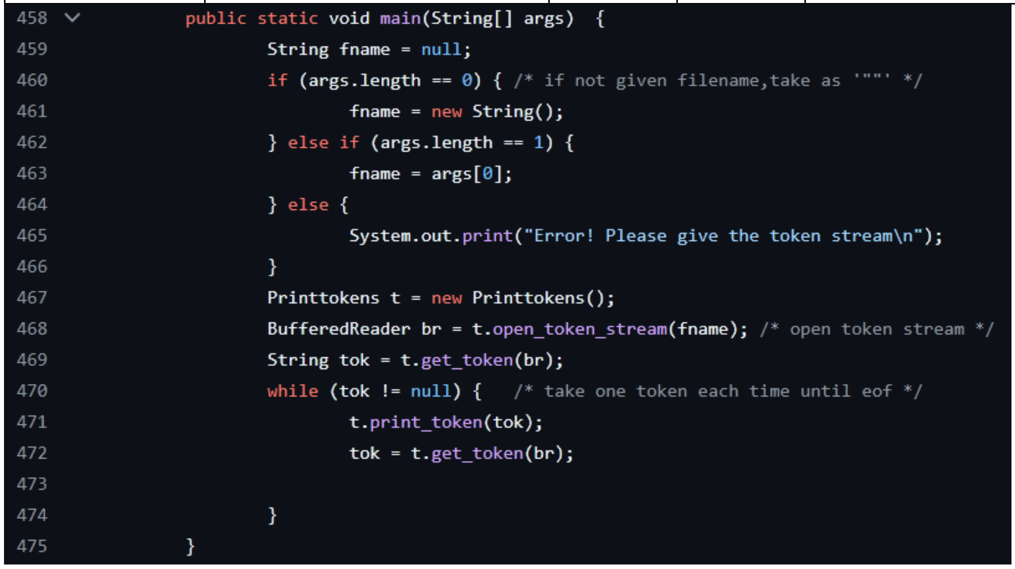
Duy Tran

1002190361

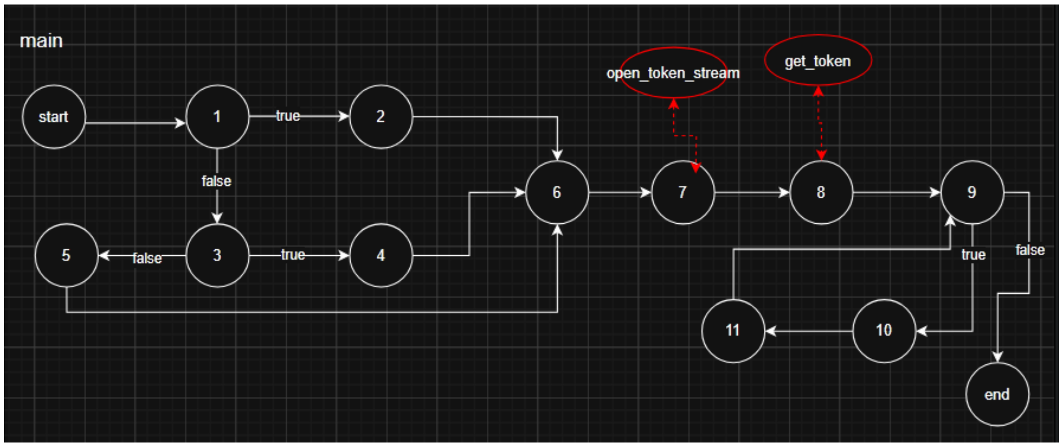
CFG

main

main				
block number	lines	entry	exit	function call
1	459,460	459	460	
2	461	461	461	
3	462	462	462	
4	463	463	463	
5	465	465	465	
6	467	467	467	
7	468			open_token_stream
8	469			get_token
9	470	470	470	
10	471	471	471	print_token
11	472	472	472	get_token

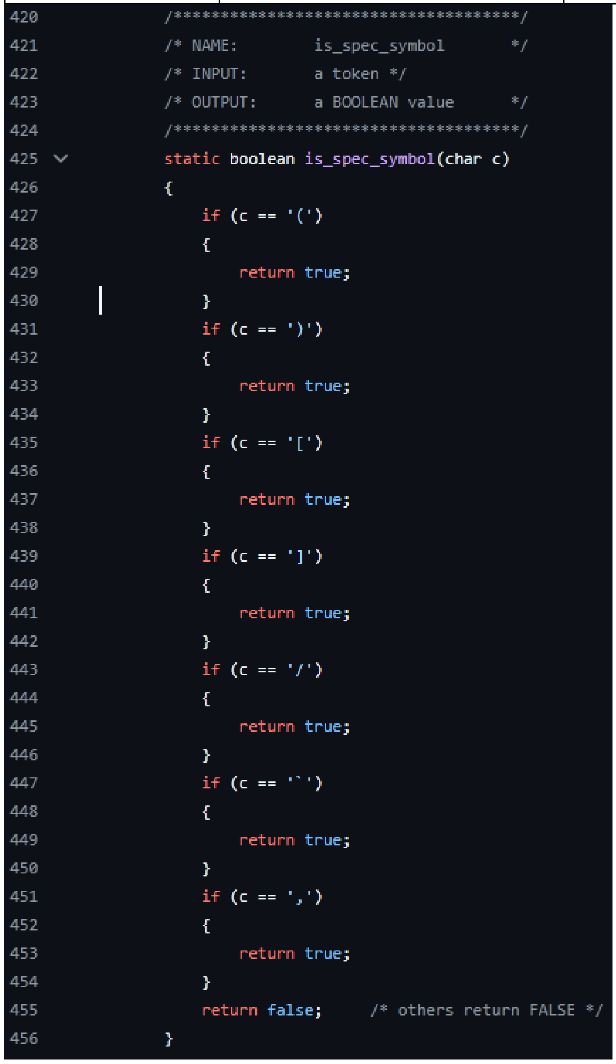


```
458        public static void main(String[] args)  {
459                String fname = null;
460                if (args.length == 0) { /* if not given filename,take as '""' */
461                        fname = new String();
462                } else if (args.length == 1) {
463                        fname = args[0];
464                } else {
465                        System.out.print("Error! Please give the token stream\n");
466                }
467                Printtokens t = new Printtokens();
468                BufferedReader br = t.open_token_stream(fname); /* open token stream */
469                String tok = t.get_token(br);
470                while (tok != null) {   /* take one token each time until eof */
471                        t.print_token(tok);
472                        tok = t.get_token(br);
473
474                }
475        }
```

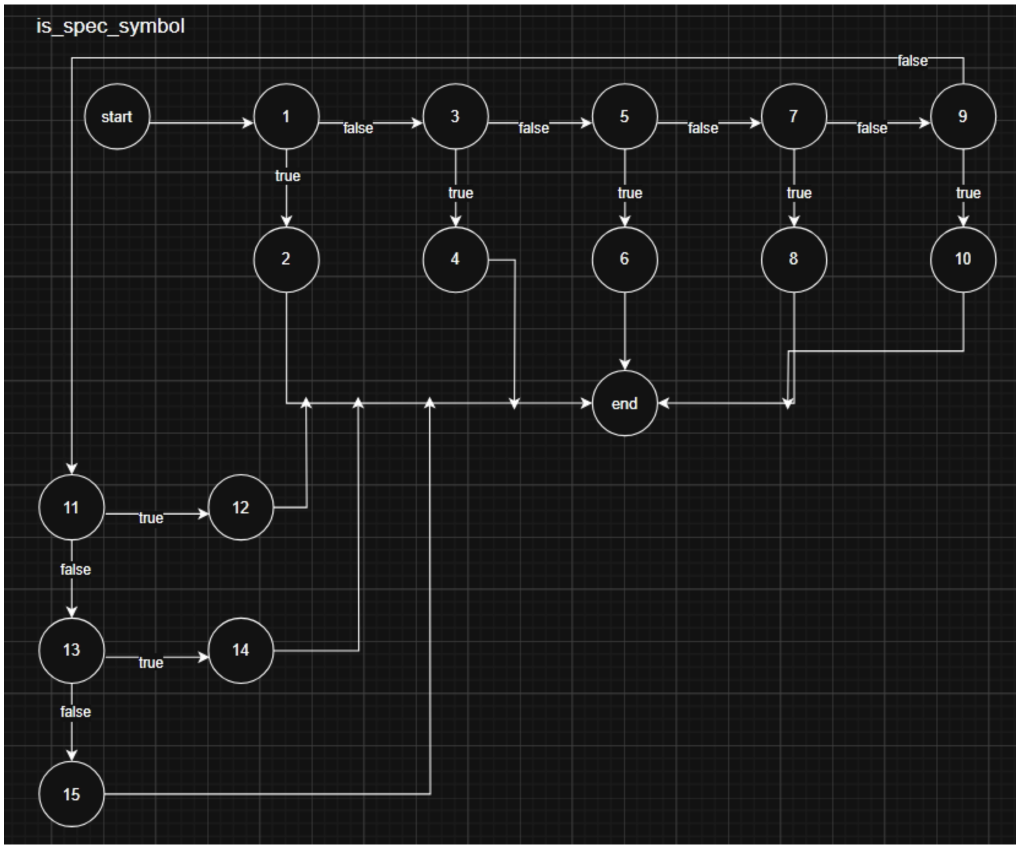


Is_spec_symbol

is_spec_symbol				
Block Number	Lines	Entry	Exit	Function Calls
1	427	427	427	
2	429	429	429	
3	431	431	431	
4	433	433	433	
5	435	435	435	
6	437	437	437	
7	439	439	439	
8	441	441	441	
9	443	443	443	
10	445	445	445	
11	447	447	447	
12	449	449	449	
13	451	451	451	
14	453	453	453	
15	455	455	455	

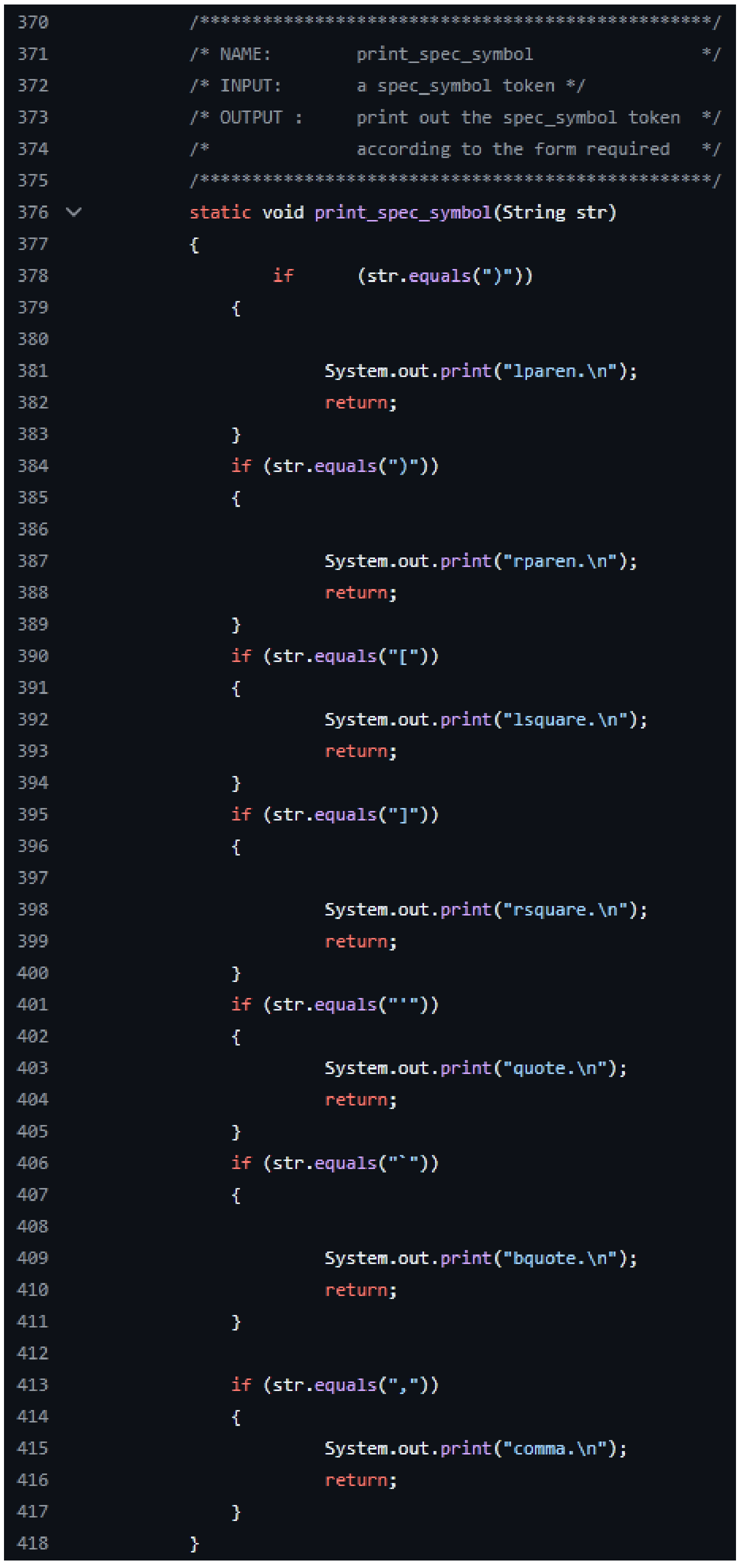


```
420         /**************************************/
421         /* NAME:        is_spec_symbol       */
422         /* INPUT:       a token */
423         /* OUTPUT:      a BOOLEAN value      */
424         /**************************************/
425         static boolean is_spec_symbol(char c)
426         {
427             if (c == '(')
428             {
429                 return true;
430             }
431             if (c == ')')
432             {
433                 return true;
434             }
435             if (c == '[')
436             {
437                 return true;
438             }
439             if (c == ']')
440             {
441                 return true;
442             }
443             if (c == '/')
444             {
445                 return true;
446             }
447             if (c == '`')
448             {
449                 return true;
450             }
451             if (c == ',')
452             {
453                 return true;
454             }
455             return false;     /* others return FALSE */
456         }
```

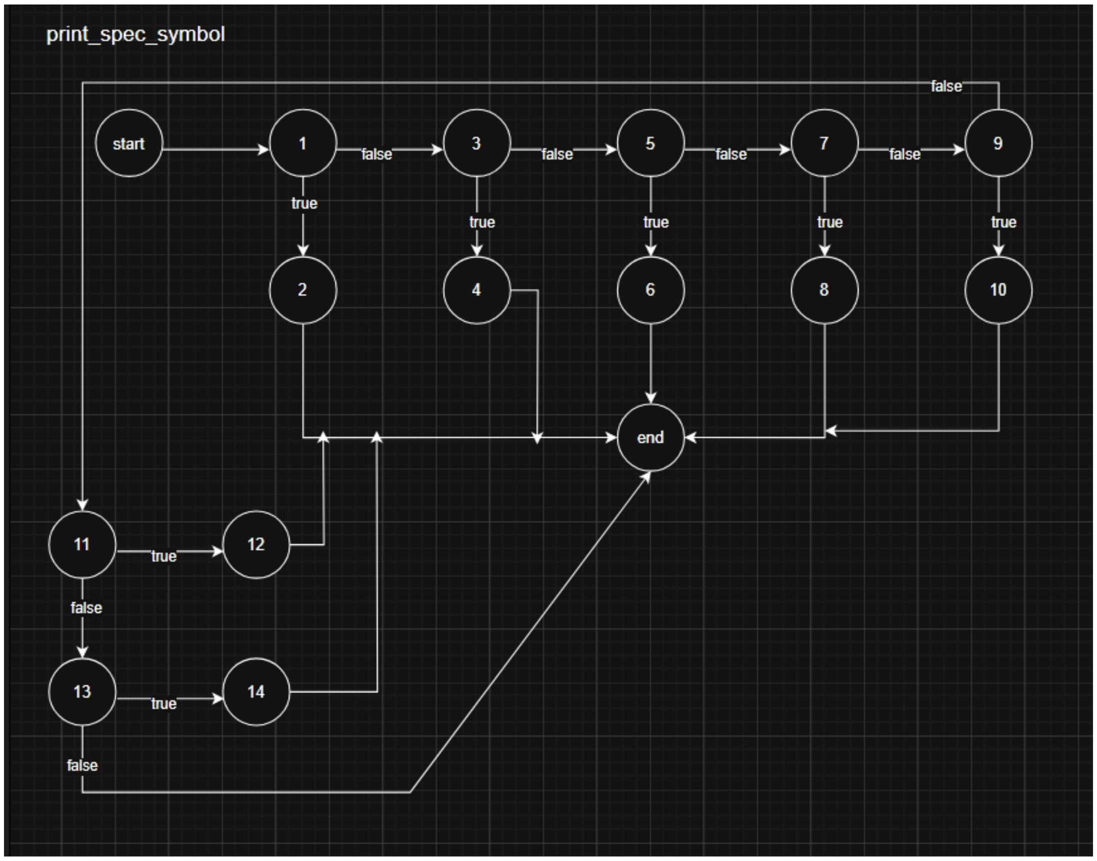


Print_spec_symbol

print_spec_symbol				
Block Number	Lines	Entry	Exit	Function Calls
1	378	378	378	
2	381, 382	381	382	
3	384	384	384	
4	387, 388	387	388	
5	390	390	390	
6	392, 393	392	393	
7	395	395	395	
8	398, 399	398	399	
9	401	401	401	
10	403, 404	403	404	
11	406	406	406	
12	409, 410	409	410	
13	413	413	413	
14	415, 416	415	416	

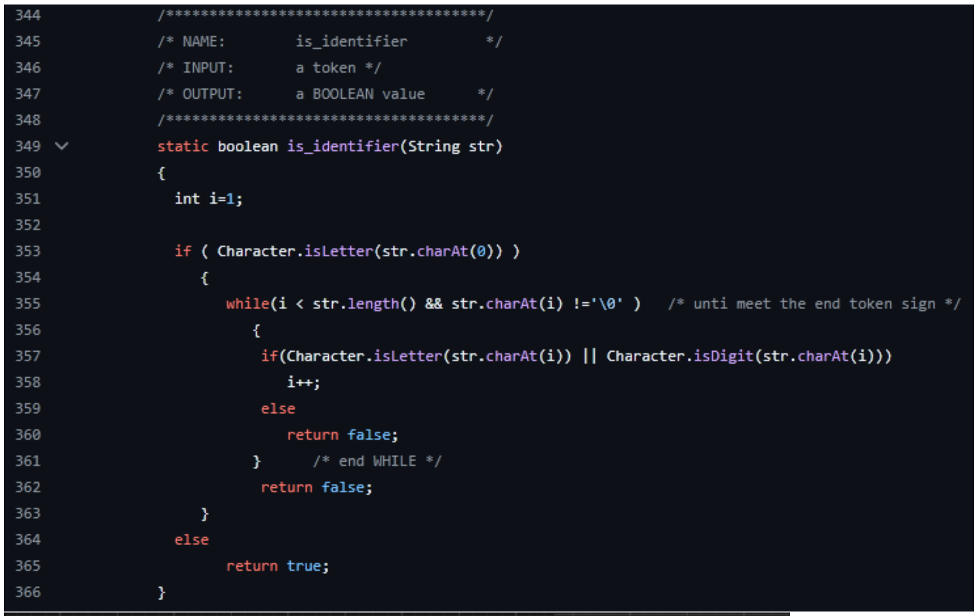


```java
/**************************************************/
/* NAME:        print_spec_symbol                 */
/* INPUT:       a spec_symbol token */
/* OUTPUT :     print out the spec_symbol token  */
/*              according to the form required   */
/**************************************************/
static void print_spec_symbol(String str)
{
        if      (str.equals(")"))
    {

            System.out.print("lparen.\n");
            return;
    }
    if (str.equals(")"))
    {

            System.out.print("rparen.\n");
            return;
    }
    if (str.equals("["))
    {
            System.out.print("lsquare.\n");
            return;
    }
    if (str.equals("]"))
    {

            System.out.print("rsquare.\n");
            return;
    }
    if (str.equals("'"))
    {
            System.out.print("quote.\n");
            return;
    }
    if (str.equals("`"))
    {

            System.out.print("bquote.\n");
            return;
    }

    if (str.equals(","))
    {
            System.out.print("comma.\n");
            return;
    }
}
```

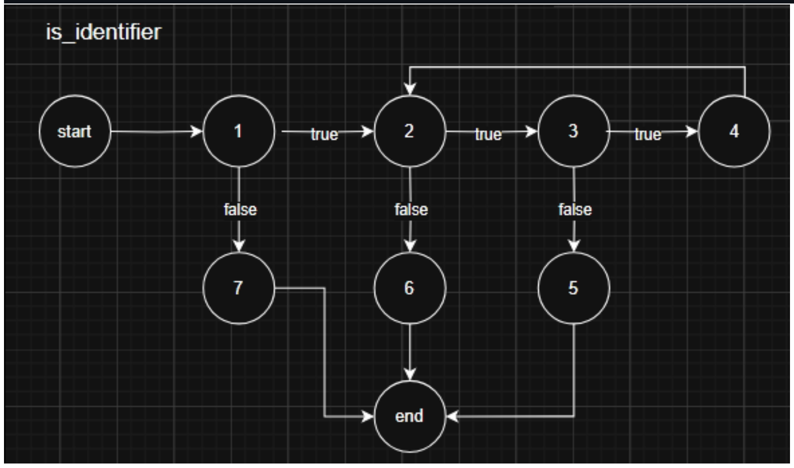


Is_identifier

is_identifier				
Block Number	Lines	Entry	Exit	Function Calls
1	351, 353	351	353	
2	355	355	355	
3	357	357	357	
4	358	358	358	
5	360	360	360	
6	362	362	362	
7	365	365	365	

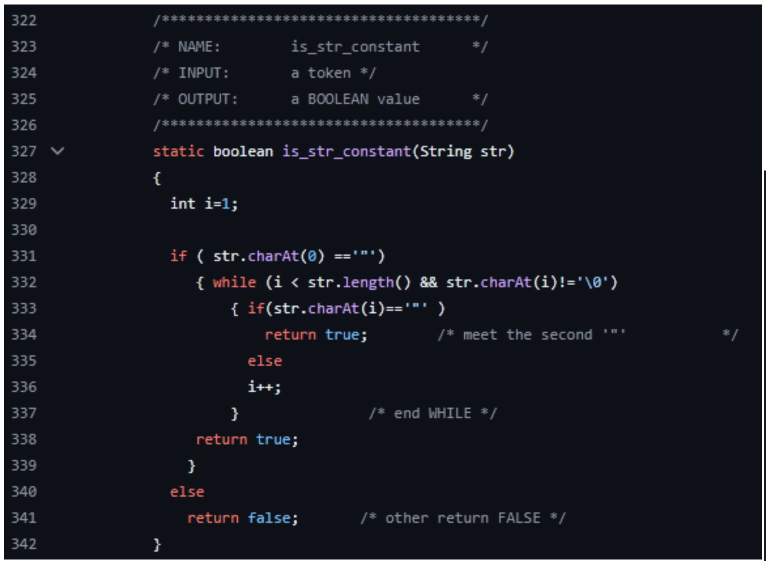


```
        /*************************************/
        /* NAME:        is_identifier         */
        /* INPUT:       a token */
        /* OUTPUT:      a BOOLEAN value      */
        /*************************************/
        static boolean is_identifier(String str)
        {
          int i=1;

          if ( Character.isLetter(str.charAt(0)) )
             {
                while(i < str.length() && str.charAt(i) !='\0' )   /* unti meet the end token sign */
                   {
                    if(Character.isLetter(str.charAt(i)) || Character.isDigit(str.charAt(i)))
                       i++;
                    else
                       return false;
                   }      /* end WHILE */
                    return false;
             }
          else
                return true;
        }
```

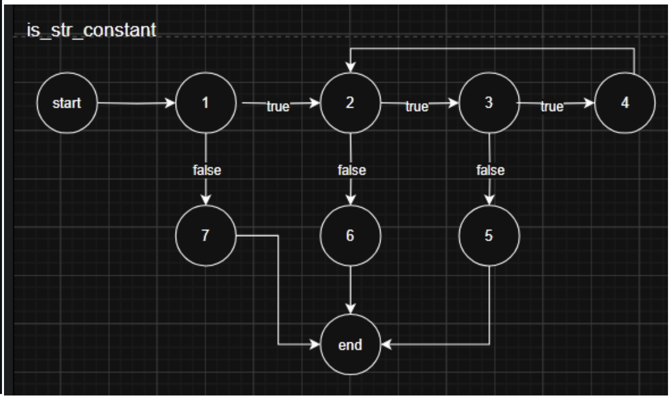


Is_str_constant

is_str_constant				
Block Number	Lines	Entry	Exit	Function Calls
1	329, 331	329	331	
2	332	332	332	
3	333	333	333	
4	334	334	334	
5	336	336	336	
6	338	338	338	
7	341	341	341	

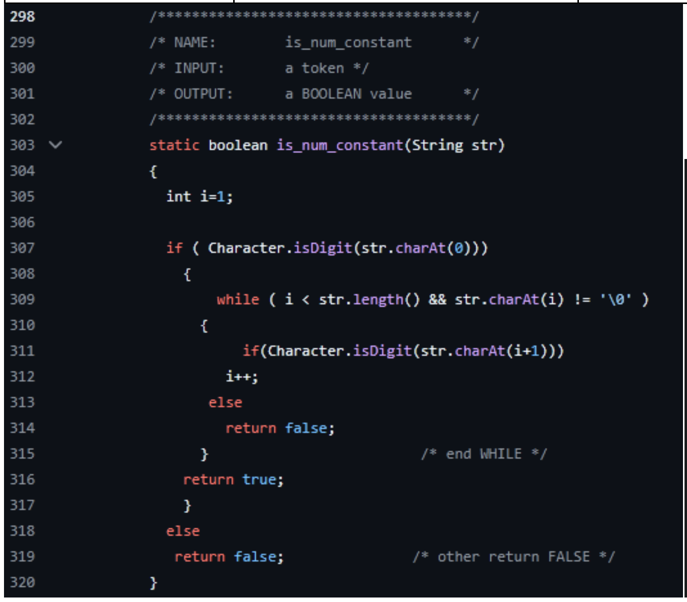


```
322          /**************************************/
323          /* NAME:        is_str_constant      */
324          /* INPUT:       a token */
325          /* OUTPUT:      a BOOLEAN value      */
326          /**************************************/
327          static boolean is_str_constant(String str)
328          {
329            int i=1;
330
331            if ( str.charAt(0) =='"')
332              { while (i < str.length() && str.charAt(i)!='\0')
333                  { if(str.charAt(i)=='"' )
334                      return true;        /* meet the second '"'            */
335                    else
336                    i++;
337                  }              /* end WHILE */
338              return true;
339             }
340            else
341              return false;       /* other return FALSE */
342          }
```

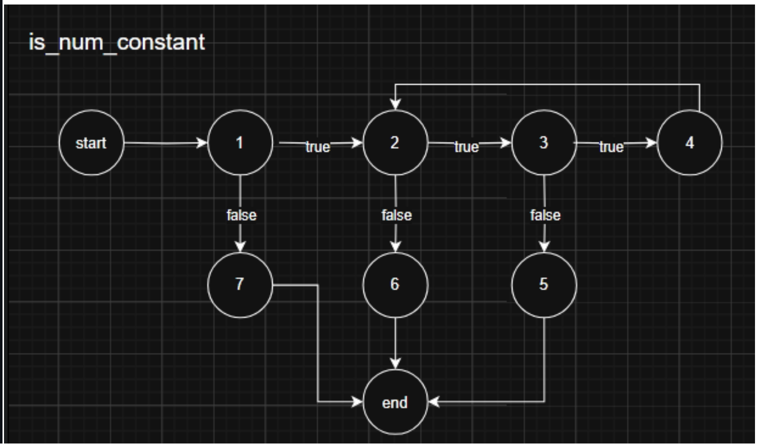


Is_num_constant

is_num_constant				
Block Number	Lines	Entry	Exit	Function calls
1	305, 307	305	307	
2	309	309	309	
3	311	311	311	
4	312	312	312	
5	314	314	314	
6	316	316	316	
7	319	319	319	

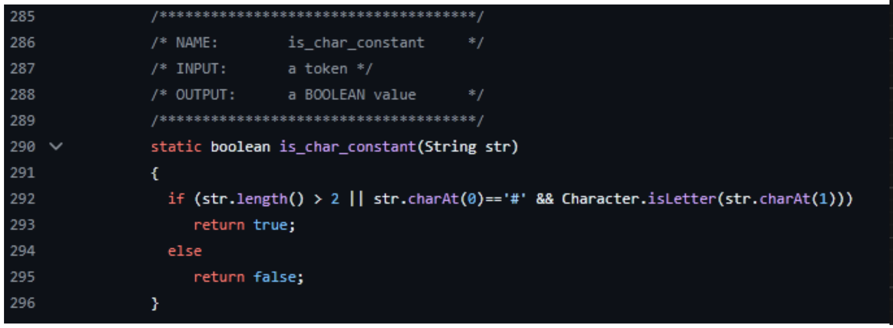


```
298          /**************************************/
299          /* NAME:        is_num_constant      */
300          /* INPUT:       a token */
301          /* OUTPUT:      a BOOLEAN value      */
302          /**************************************/
303          static boolean is_num_constant(String str)
304          {
305            int i=1;
306
307            if ( Character.isDigit(str.charAt(0)))
308              {
309                 while ( i < str.length() && str.charAt(i) != '\0' )
310                {
311                    if(Character.isDigit(str.charAt(i+1)))
312                   i++;
313                 else
314                   return false;
315                }                        /* end WHILE */
316              return true;
317              }
318            else
319             return false;                /* other return FALSE */
320          }
```

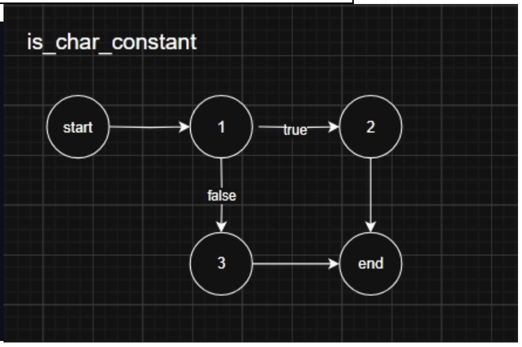


Is_char_constant

is_char_constant				
Block Number	Lines	Entry	Exit	Function Calls
1	292	292	292	
2	293	293	293	
3	295	295	295	

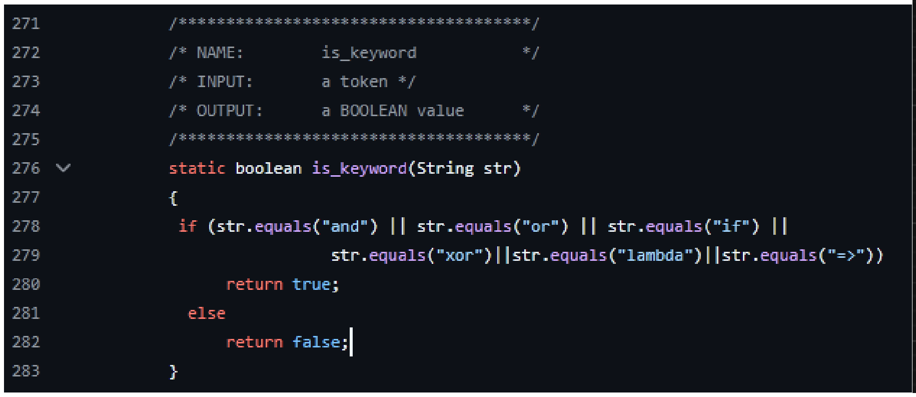


```
285          /*************************************/
286          /* NAME:       is_char_constant    */
287          /* INPUT:      a token */
288          /* OUTPUT:     a BOOLEAN value     */
289          /*************************************/
290          static boolean is_char_constant(String str)
291          {
292            if (str.length() > 2 || str.charAt(0)=='#' && Character.isLetter(str.charAt(1)))
293               return true;
294            else
295               return false;
296          }
```

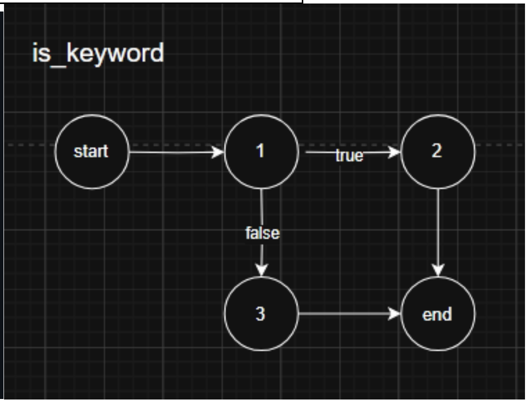


Is_keyword

is_keyword				
Block Number	Lines	Entry	Exit	Function Calls
1	278,279	278	279	
2	280	280	280	
3	282	282	282	

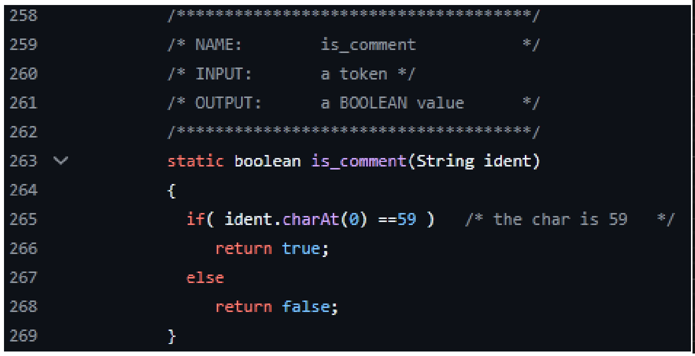


```
271          /*************************************/
272          /* NAME:       is_keyword          */
273          /* INPUT:      a token */
274          /* OUTPUT:     a BOOLEAN value     */
275          /*************************************/
276          static boolean is_keyword(String str)
277          {
278           if (str.equals("and") || str.equals("or") || str.equals("if") ||
279                          str.equals("xor")||str.equals("lambda")||str.equals("=>"))
280               return true;
281            else
282               return false;
283          }
```

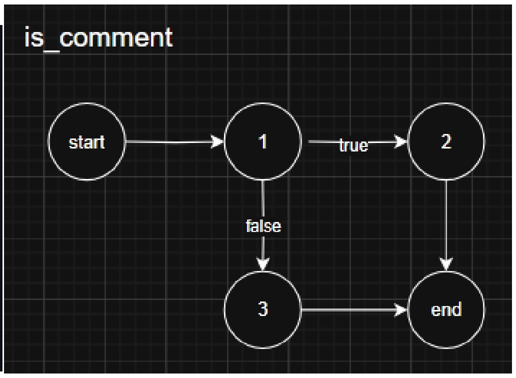


Is_comment

is_comment				
Block Number	Lines	Entry	Exit	Function Calls
1	265	265	265	
2	266	266	266	
3	268	268	268	

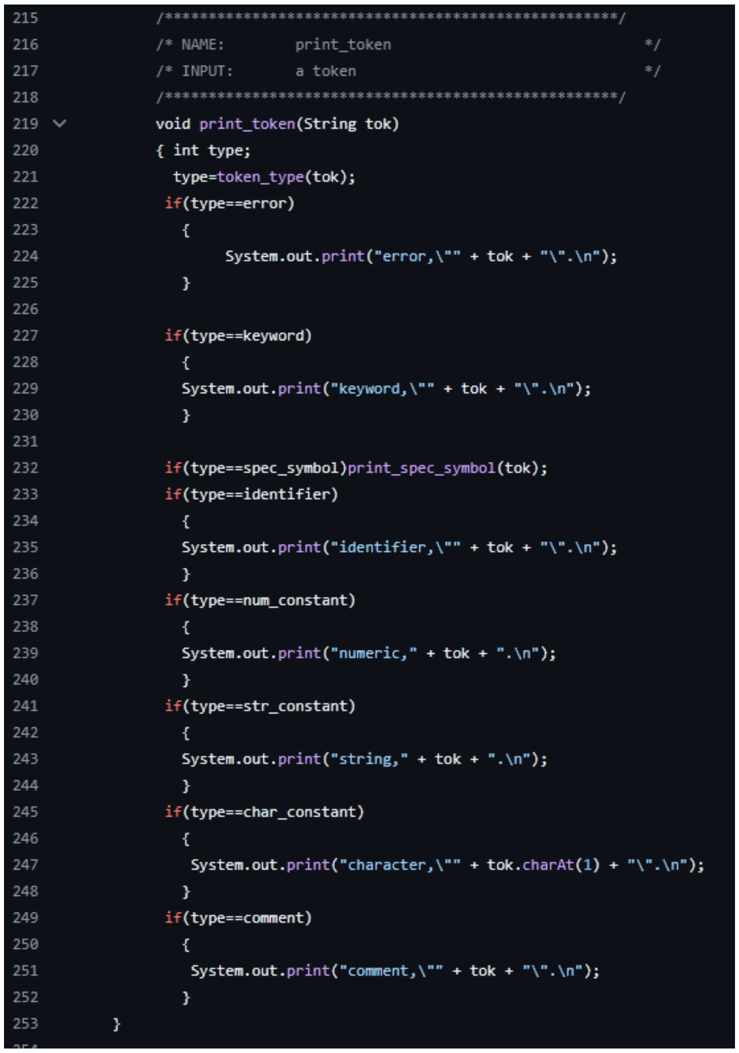


```
        /***************************************/
        /* NAME:       is_comment           */
        /* INPUT:      a token */
        /* OUTPUT:     a BOOLEAN value      */
        /***************************************/
        static boolean is_comment(String ident)
        {
          if( ident.charAt(0) ==59 )   /* the char is 59   */
             return true;
          else
             return false;
        }
```

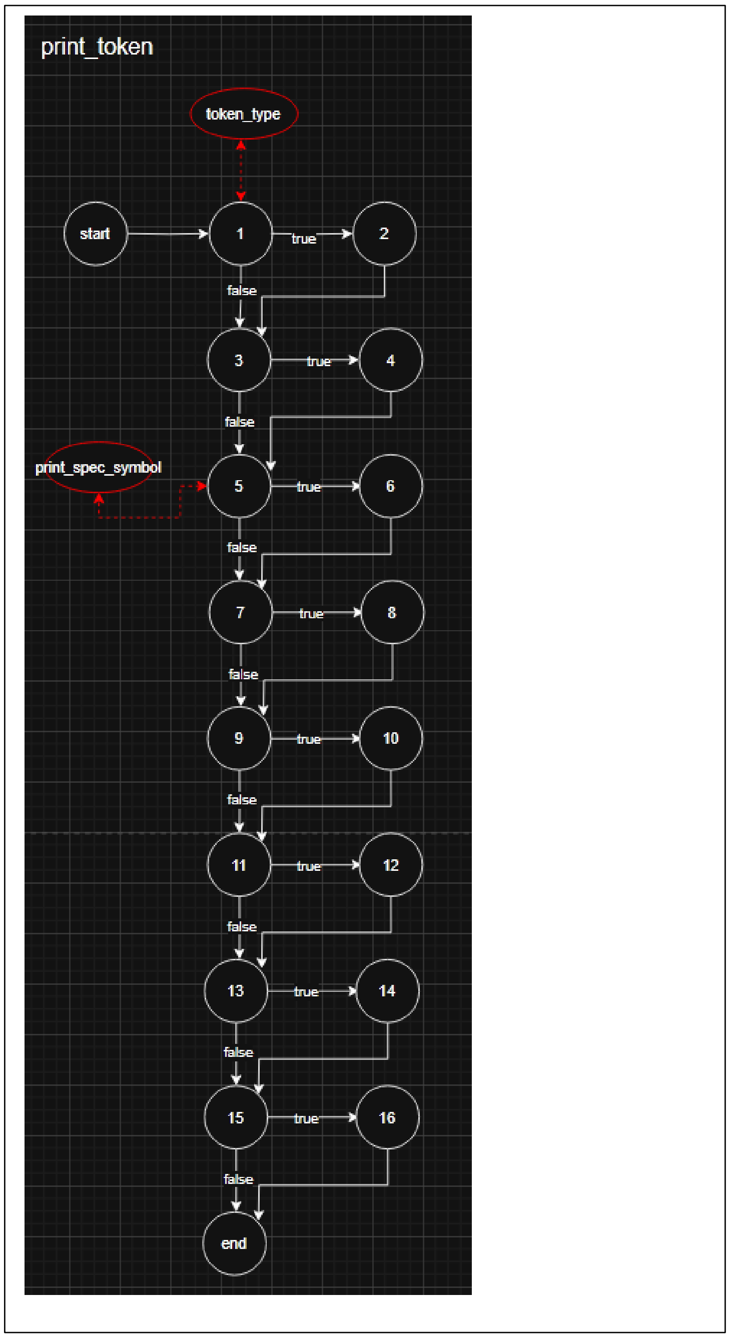


Print_token

print_token				
Block Number	Lines	Entry	Exit	Function Calls
1	220,221,222	220	222	token_type
2	224	224	224	
3	227	227	227	
4	229	229	229	
5	232a	232a	232a	
6	232b	232b	232b	print_spec_symbol
7	233	233	233	
8	235	235	235	
9	237	237	237	
10	239	239	239	
11	241	241	241	
12	243	243	243	
13	245	245	245	
14	247	247	247	
15	249	249	249	
16	251	251	251	



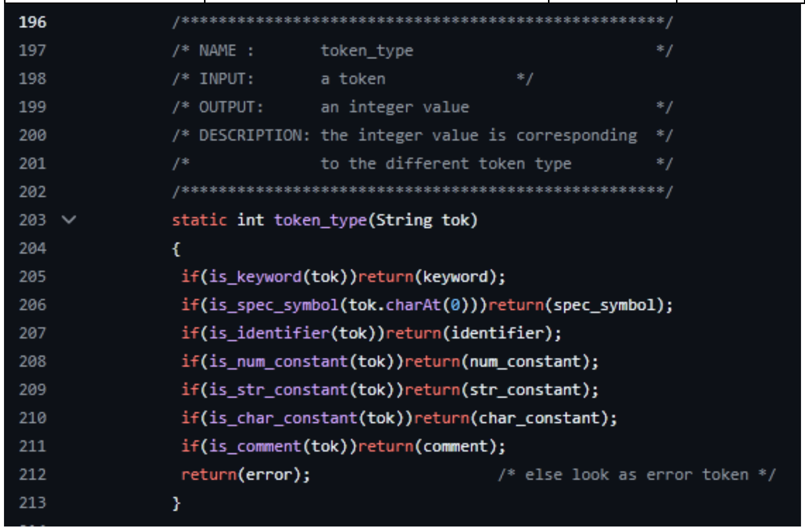
```
/*****************************************************/
/* NAME:       print_token                          */
/* INPUT:      a token                              */
/*****************************************************/
void print_token(String tok)
{ int type;
  type=token_type(tok);
 if(type==error)
   {
        System.out.print("error,\"" + tok + "\".\n");
   }

 if(type==keyword)
   {
   System.out.print("keyword,\"" + tok + "\".\n");
   }

 if(type==spec_symbol)print_spec_symbol(tok);
 if(type==identifier)
   {
   System.out.print("identifier,\"" + tok + "\".\n");
   }
 if(type==num_constant)
   {
   System.out.print("numeric," + tok + ".\n");
   }
 if(type==str_constant)
   {
   System.out.print("string," + tok + ".\n");
   }
 if(type==char_constant)
   {
    System.out.print("character,\"" + tok.charAt(1) + "\".\n");
   }
 if(type==comment)
   {
    System.out.print("comment,\"" + tok + "\".\n");
   }
}
```



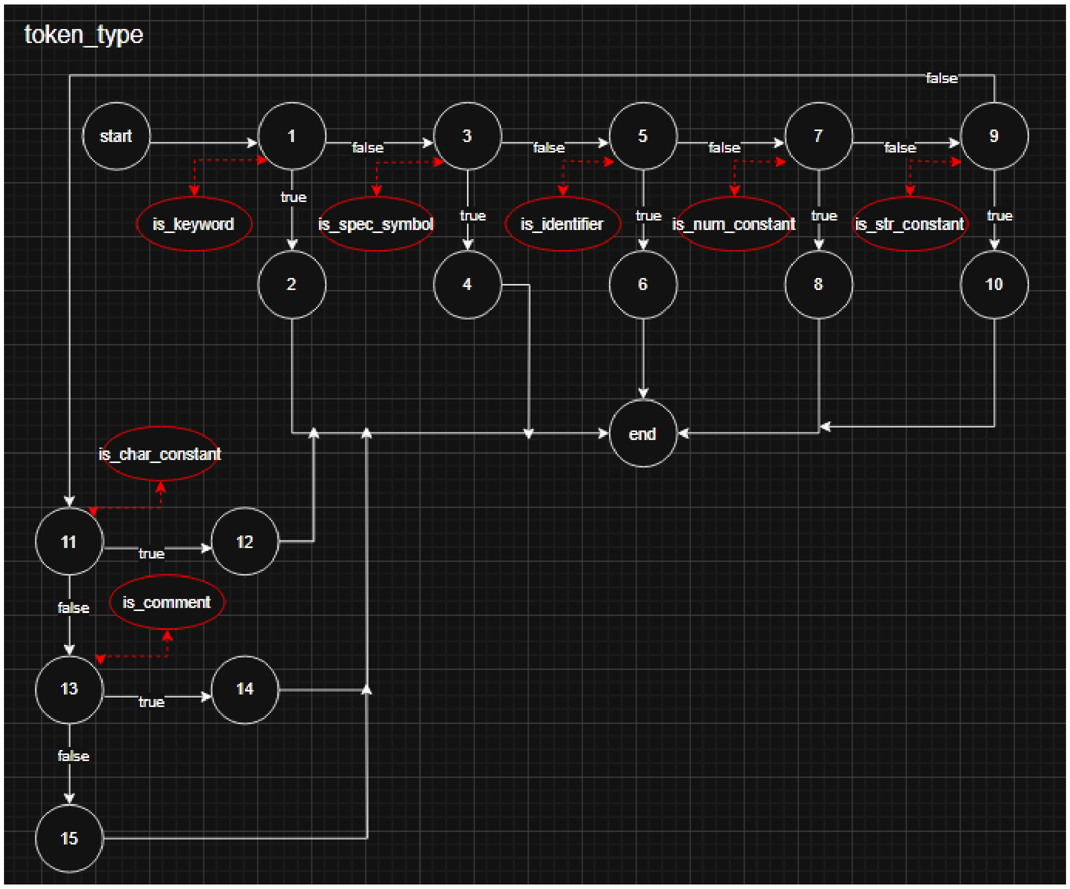
Token_type

token_type				
Block Number	Lines	Entry	Exit	Function Calls
1	205a	205a	205a	is_keyword
2	205b	205b	205b	
3	206a	206a	206a	is_spec_symbol
4	206b	206b	206b	
5	207a	207a	207a	is_identifier
6	207b	207b	207b	
7	208a	208a	208a	is_num_constant

8	208b	208b	208b	
9	209a	209a	209a	is_str_constant
10	209b	209b	209b	
11	210a	210a	210a	is_char_constant
12	210b	210b	210b	
13	211a	211a	211a	is_comment
14	211b	211b	211b	
15	212	212	212	

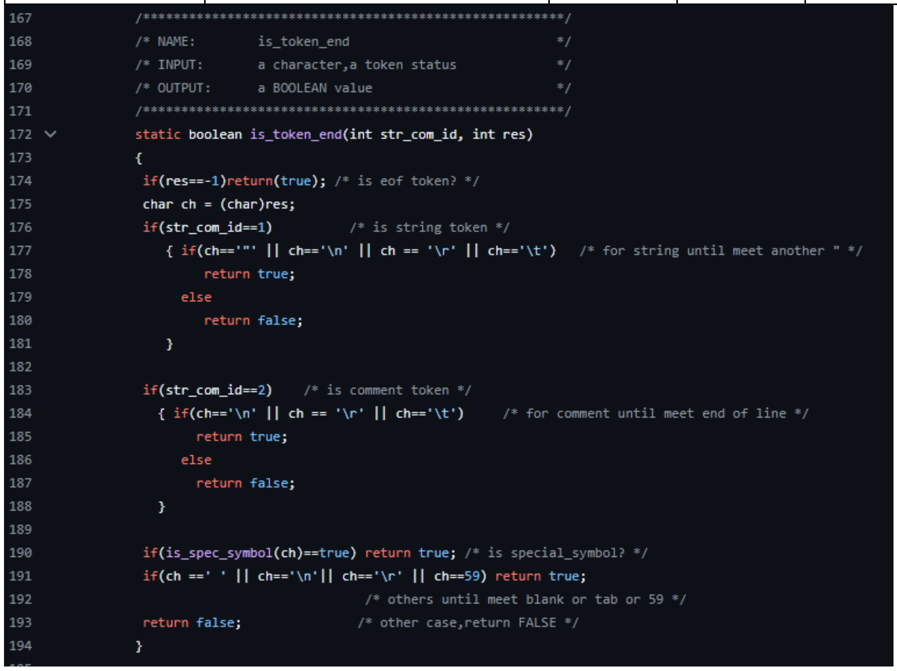


```
196         /*****************************************************/
197         /* NAME :       token_type                           */
198         /* INPUT:       a token              */
199         /* OUTPUT:      an integer value                     */
200         /* DESCRIPTION: the integer value is corresponding  */
201         /*              to the different token type          */
202         /*****************************************************/
203         static int token_type(String tok)
204         {
205          if(is_keyword(tok))return(keyword);
206          if(is_spec_symbol(tok.charAt(0)))return(spec_symbol);
207          if(is_identifier(tok))return(identifier);
208          if(is_num_constant(tok))return(num_constant);
209          if(is_str_constant(tok))return(str_constant);
210          if(is_char_constant(tok))return(char_constant);
211          if(is_comment(tok))return(comment);
212          return(error);                   /* else look as error token */
213         }
```

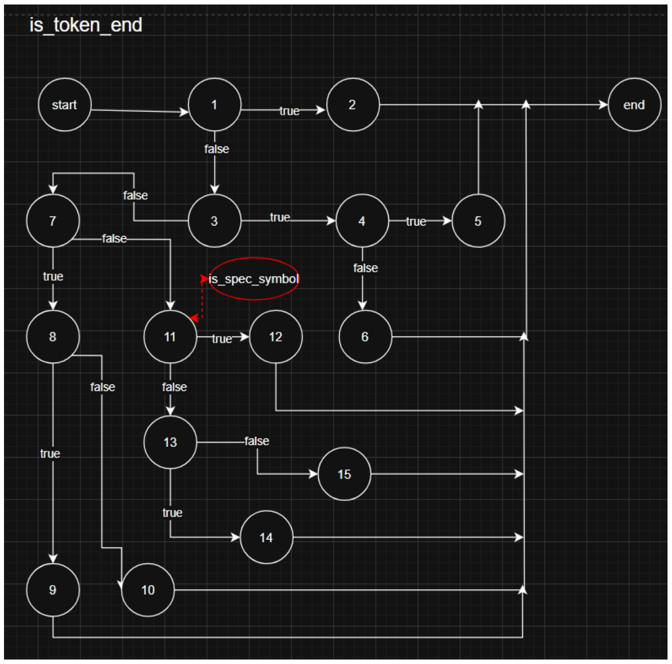


Is_token_end

is_token_end				
Block Number	Lines	Entry	Exit	Function Calls
1	174a	174a	174a	
2	174b	174b	174b	
3	175, 176	175	176	
4	177	177	177	
5	178	178	178	
6	180	180	180	
7	183	183	183	
8	184	184	184	
9	185	185	185	
10	187	187	187	
11	190a	190a	190a	is_spec_symbol
12	190b	190b	190b	
13	191a	191a	191a	
14	191b	191b	191b	
15	193	193	193	



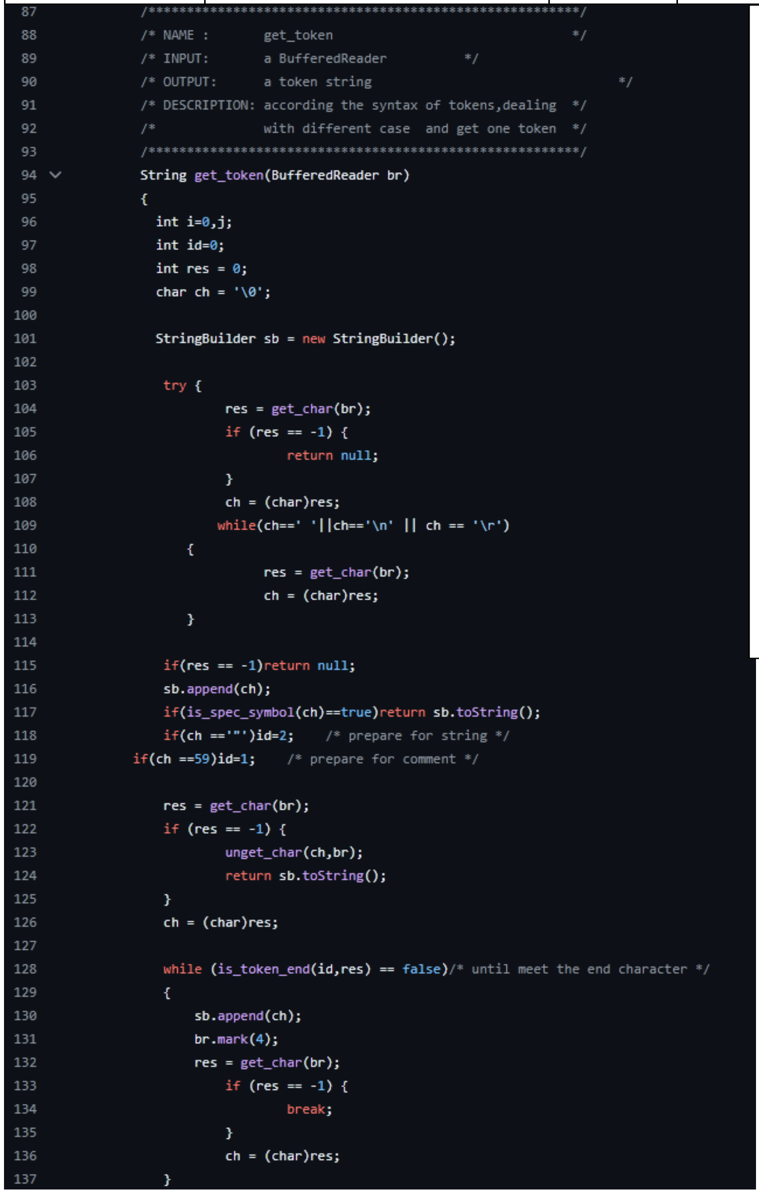
```
167      /*******************************************************/
168      /* NAME:        is_token_end                           */
169      /* INPUT:       a character,a token status             */
170      /* OUTPUT:      a BOOLEAN value                        */
171      /*******************************************************/
172      static boolean is_token_end(int str_com_id, int res)
173      {
174       if(res==-1)return(true); /* is eof token? */
175       char ch = (char)res;
176       if(str_com_id==1)          /* is string token */
177          { if(ch=='"' || ch=='\n' || ch == '\r' || ch=='\t')   /* for string until meet another " */
178             return true;
179            else
180             return false;
181          }
182
183       if(str_com_id==2)    /* is comment token */
184         { if(ch=='\n' || ch == '\r' || ch=='\t')     /* for comment until meet end of line */
185            return true;
186          else
187            return false;
188         }
189
190       if(is_spec_symbol(ch)==true) return true; /* is special_symbol? */
191       if(ch ==' ' || ch=='\n'|| ch=='\r' || ch==59) return true;
192                                    /* others until meet blank or tab or 59 */
193       return false;               /* other case,return FALSE */
194      }
```



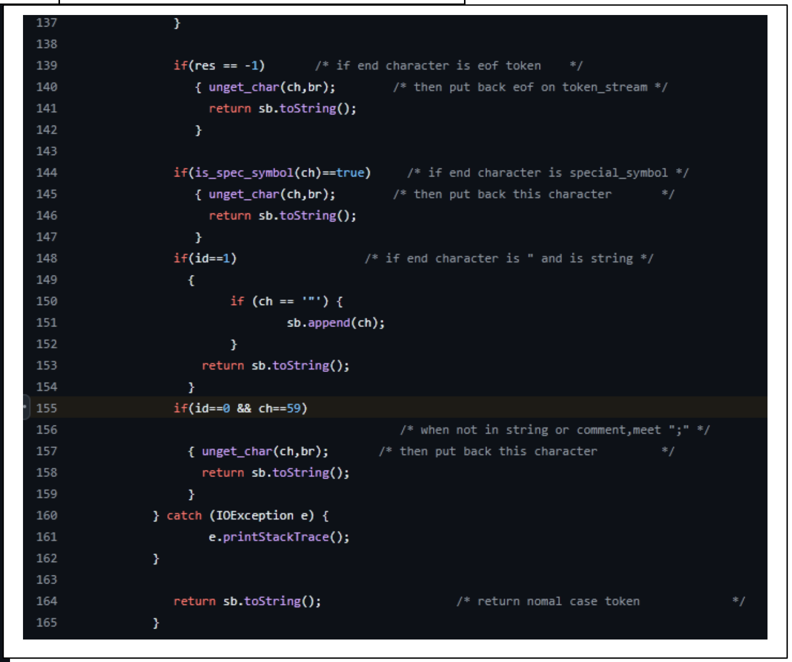
Get_token

get_token				
Block Number	Lines	Entry	Exit	Function Calls
1	96, 97, 98, 99, 101,104, 105	96	105	get_char
2	106	106	106	
3	108	108	108	
4	109	109	109	
5	111, 112	111	112	get_char
6	115a	115a	115a	
7	115b	115b	115b	
8	116,117a	116	117a	is_spec_symbol
9	117b	117b	117b	
10	118a	118a	118a	
11	118b	118b	118b	
12	119a	119a	119a	
13	119b	119b	119b	
14	121, 122	121	122	get_char
15	123, 124	123	124	unget_char
16	126, 128	126	128	is_token_end
17	130, 131, 132, 133	130	133	get_char
18	134	134	134	
19	136	136	136	
20	139	139	139	
21	140, 141	140	141	unget_char
22	144	144	144	is_spec_symbol
23	145, 146	145	146	unget_char
24	148	148	148	

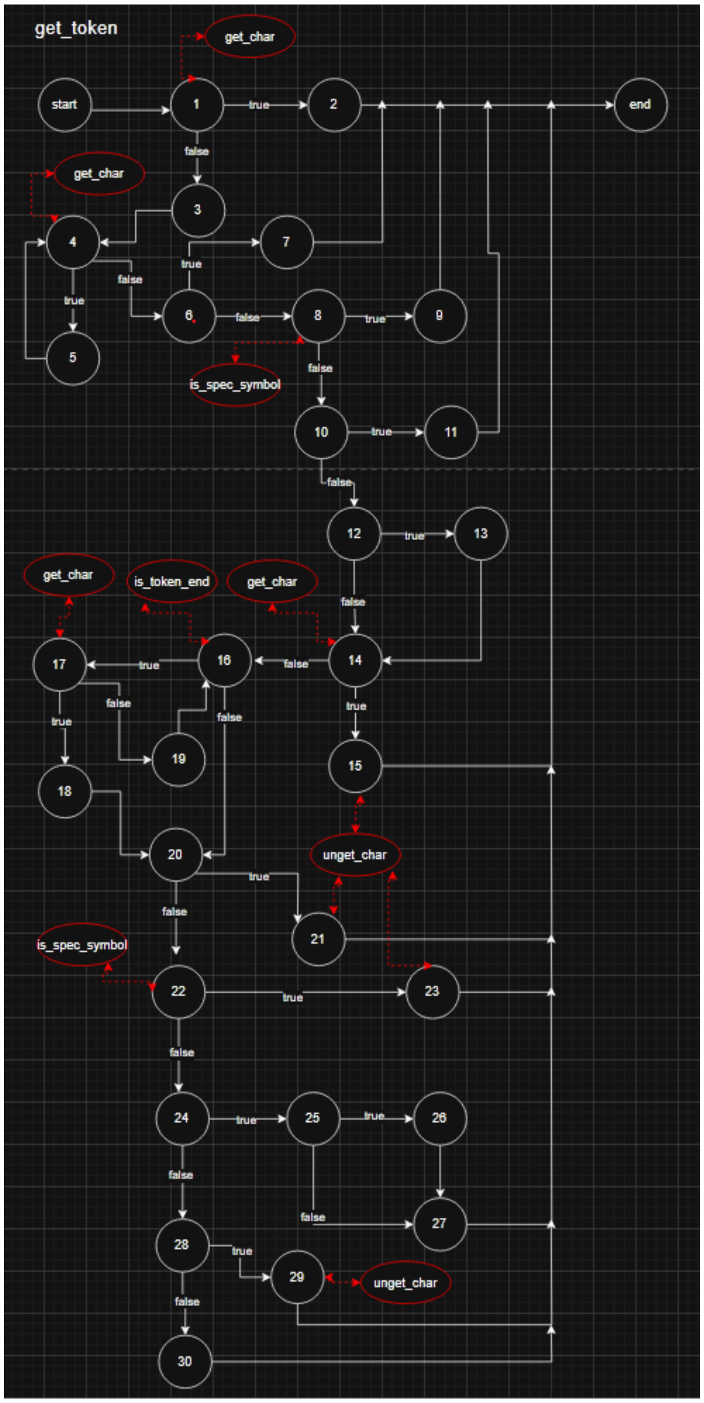
25	150	150	150	
26	151	151	151	
27	153	153	153	
28	155	155	155	
29	157, 158	157	158	unget_char
30	164	164	164	



```java
87           /*******************************************************/
88           /* NAME :       get_token                              */
89           /* INPUT:       a BufferedReader          */
90           /* OUTPUT:      a token string                              */
91           /* DESCRIPTION: according the syntax of tokens,dealing  */
92           /*              with different case  and get one token  */
93           /*******************************************************/
94           String get_token(BufferedReader br)
95           {
96             int i=0,j;
97             int id=0;
98             int res = 0;
99             char ch = '\0';
100
101            StringBuilder sb = new StringBuilder();
102
103             try {
104                     res = get_char(br);
105                     if (res == -1) {
106                             return null;
107                     }
108                     ch = (char)res;
109                    while(ch==' '||ch=='\n' || ch == '\r')
110                 {
111                          res = get_char(br);
112                          ch = (char)res;
113                 }
114
115             if(res == -1)return null;
116             sb.append(ch);
117             if(is_spec_symbol(ch)==true)return sb.toString();
118             if(ch =='"')id=2;    /* prepare for string */
119         if(ch ==59)id=1;    /* prepare for comment */
120
121             res = get_char(br);
122             if (res == -1) {
123                     unget_char(ch,br);
124                     return sb.toString();
125             }
126             ch = (char)res;
127
128             while (is_token_end(id,res) == false)/* until meet the end character */
129             {
130                 sb.append(ch);
131                 br.mark(4);
132                 res = get_char(br);
133                     if (res == -1) {
134                             break;
135                     }
136                     ch = (char)res;
137             }
```

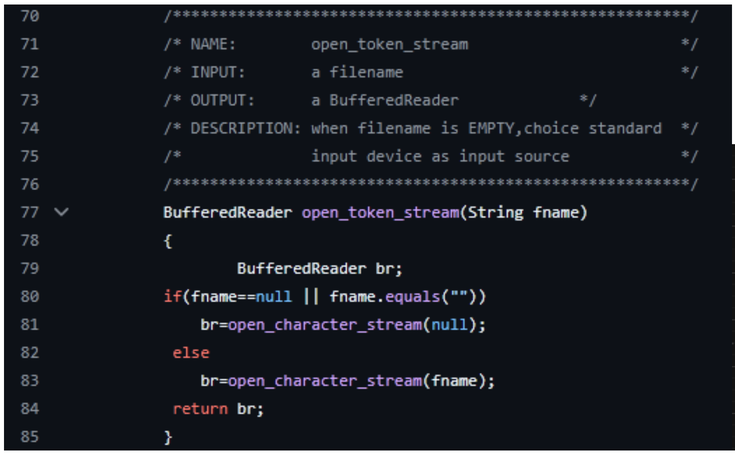


```java
137             }
138
139             if(res == -1)       /* if end character is eof token    */
140               { unget_char(ch,br);        /* then put back eof on token_stream */
141                 return sb.toString();
142               }
143
144             if(is_spec_symbol(ch)==true)     /* if end character is special_symbol */
145               { unget_char(ch,br);        /* then put back this character       */
146                 return sb.toString();
147               }
148             if(id==1)                    /* if end character is " and is string */
149               {
150                     if (ch == '"') {
151                             sb.append(ch);
152                     }
153                return sb.toString();
154               }
155             if(id==0 && ch==59)
156                                          /* when not in string or comment,meet ";" */
157               { unget_char(ch,br);       /* then put back this character         */
158                return sb.toString();
159               }
160         } catch (IOException e) {
161                 e.printStackTrace();
162         }
163
164             return sb.toString();                    /* return nomal case token            */
165         }
```

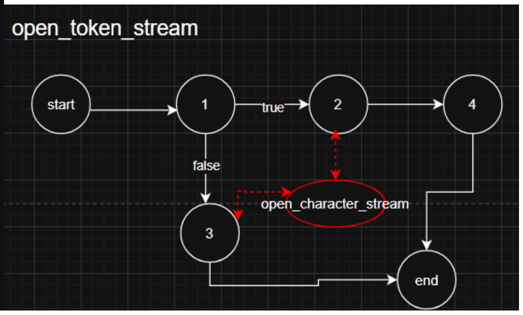


Open_token_stream

open_token_stream				
Block Number	Lines	Entry	Exit	Function Calls
1	79, 80	79	80	
2	81	81	81	open_character_stream
3	83	83	83	open_character_stream
4	84	84	84	

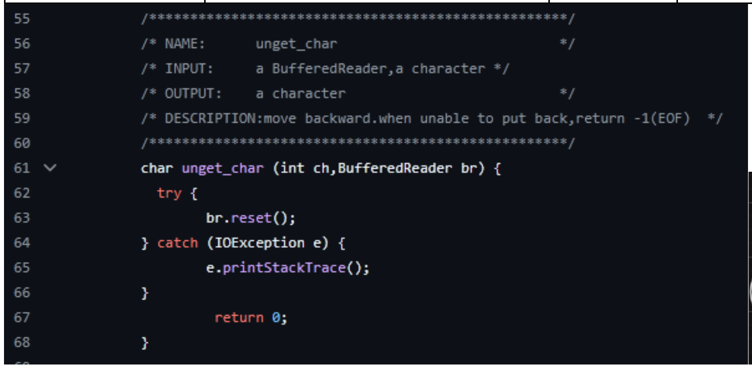


```
70          /************************************************************/
71          /* NAME:         open_token_stream                           */
72          /* INPUT:        a filename                                  */
73          /* OUTPUT:       a BufferedReader                */
74          /* DESCRIPTION: when filename is EMPTY,choice standard  */
75          /*               input device as input source            */
76          /************************************************************/
77 ⌄        BufferedReader open_token_stream(String fname)
78          {
79                  BufferedReader br;
80          if(fname==null || fname.equals(""))
81              br=open_character_stream(null);
82           else
83              br=open_character_stream(fname);
84           return br;
85          }
```

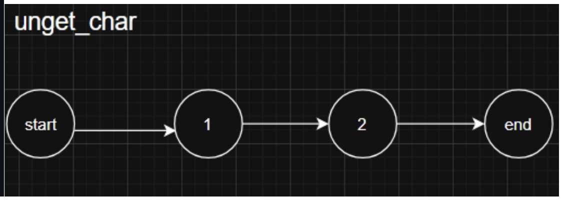


Unget_char

unget_char				
Block Number	Lines	Entry	Exit	Function Calls
1	63	63	63	
2	67	67	67	

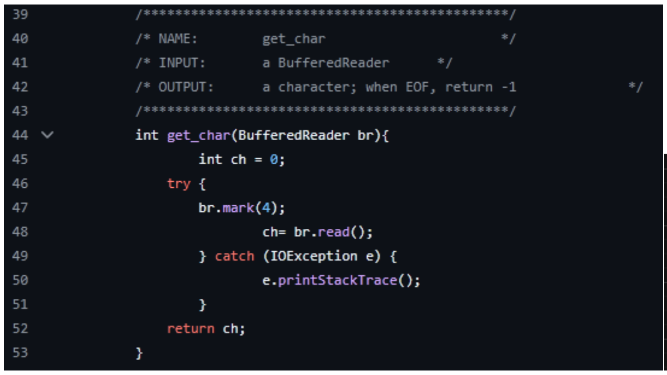


```
55          /****************************************************/
56          /* NAME:      unget_char                         */
57          /* INPUT:     a BufferedReader,a character */
58          /* OUTPUT:    a character                        */
59          /* DESCRIPTION:move backward.when unable to put back,return -1(EOF)  */
60          /****************************************************/
61 ⌄        char unget_char (int ch,BufferedReader br) {
62            try {
63                  br.reset();
64          } catch (IOException e) {
65                  e.printStackTrace();
66          }
67                   return 0;
68          }
```

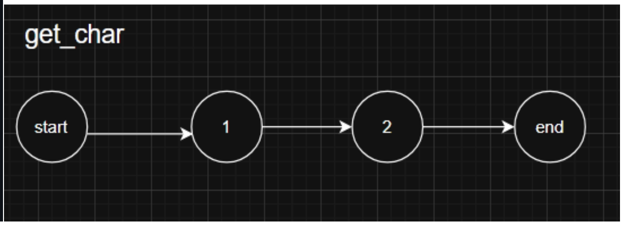


Get_char

get_char				
Block Number	Lines	Entry	Exit	Function Calls
1	45, 47, 48	45	48	
2	52	52	52	

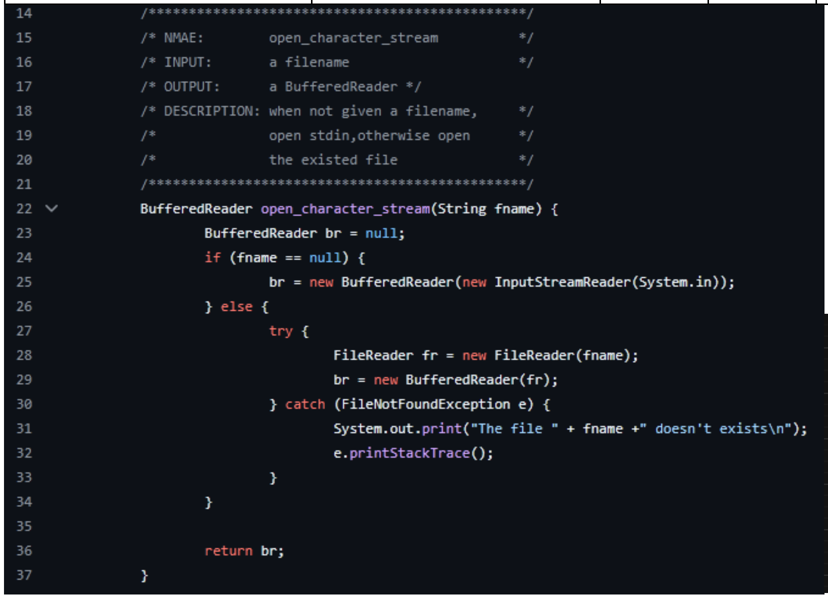


```
39          /************************************************/
40          /* NAME:        get_char                    */
41          /* INPUT:       a BufferedReader      */
42          /* OUTPUT:      a character; when EOF, return -1              */
43          /************************************************/
44          int get_char(BufferedReader br){
45                  int ch = 0;
46              try {
47                  br.mark(4);
48                          ch= br.read();
49                  } catch (IOException e) {
50                          e.printStackTrace();
51                  }
52              return ch;
53          }
```

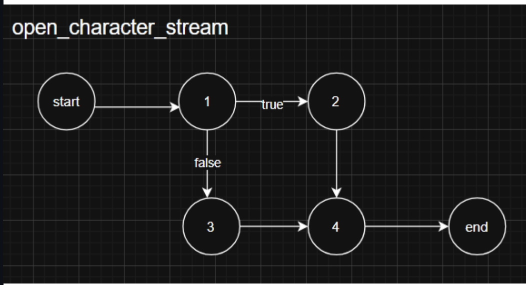


Open_character_stream

open_character_stream				
Block Number	Lines	Entry	Exit	Function Calls
1	23, 24	23	24	
2	25	25	25	
3	28, 29	28	29	
4	36	36	36	



```
14          /************************************************/
15          /* NMAE:        open_character_stream         */
16          /* INPUT:       a filename                    */
17          /* OUTPUT:      a BufferedReader */
18          /* DESCRIPTION: when not given a filename,     */
19          /*              open stdin,otherwise open      */
20          /*              the existed file               */
21          /************************************************/
22          BufferedReader open_character_stream(String fname) {
23                  BufferedReader br = null;
24                  if (fname == null) {
25                          br = new BufferedReader(new InputStreamReader(System.in));
26                  } else {
27                          try {
28                                  FileReader fr = new FileReader(fname);
29                                  br = new BufferedReader(fr);
30                          } catch (FileNotFoundException e) {
31                                  System.out.print("The file " + fname +" doesn't exists\n");
32                                  e.printStackTrace();
33                          }
34                  }
35
36                  return br;
37          }
```


open_character_stream
start
1
true
2
false
3
4
end