



Abstract Parsers Generator Based on a Modified RNGLR Algorithm

Author: Semyon Grigorev

JetBrains

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- String-embedded languages:
 - ▶ Embedded SQL (in C#, Java, C++)
 - ▶ Dynamic SQL
 - ▶ HTML pages generation
 - ▶ Other textual DSLs
- Static analysis of embedded statements.
 - ▶ Syntax errors checking and other analysis:
 - ▶ IDE support
 - ★ Syntax highlighting
 - ★ Refactorings
 - ★ Errors notification

String-embedded languages: examples

- Dynamic SQL

```
IF @X = @Y
    SET @TABLE = '#table1'
ELSE
    SET @TABLE = 'table2'
EXECUTE
    ('SELECT x FROM' + @TABLE + ' WHERE ISNULL(n,0) > 1')
```

- JavaScript in Java

```
String script =
    "function hello(name)  print('Hello, ' + name); ";
engine.eval(script);
Invocable inv = (Invocable) engine;
inv.invokeFunction("hello", "Scripting!!!" );
```

Abstract parsing

Main points of “classical” abstract parsing

- Based on (G)LR algorithm
 - ▶ Tables generator could be reused.
- Additional data structures
 - ▶ “Abstract” stack
 - ▶ Parsing forest

There is a set of tools based on it.

- Alvor: Eclipse plug-in for SQL ebedded into Java checking.
- Java String Analyzer: tool for analyzing the flow of strings and string operations in Java programs.
- PHP String Analyzer: static program analyzer that approximates the string output of a PHP program.

- For ambiguous CFG processing.
- Shift\Reduce and Reduce\Reduce conflicts.
- Graph Structured Stack – GSS.
 - ▶ Branches on conflicts.
 - ▶ States merging.

Our approach

- We work with RNLGR – Right Nulled GLR.
- Shift\Shift conflicts — branches in input “stream”. Impossible for sequential input.
 - ▶ RNLGR should be extended for process this conflicts.
- Reusing of inner structures: GSS and parsing result (graph-structured also).
 - ▶ Shift\Shift conflicts — new branches in GSS.
 - ▶ Parsing result is a graph which contains all possible trees.

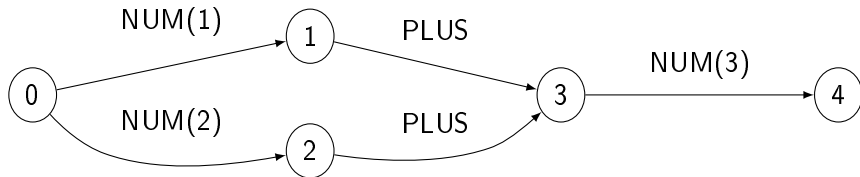
Example: input

- Grammar:

$s: \text{NUM PLUS } e$

$e: \text{NUM}$

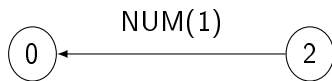
- Input graph:



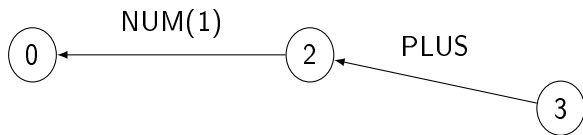
Example: stack

0

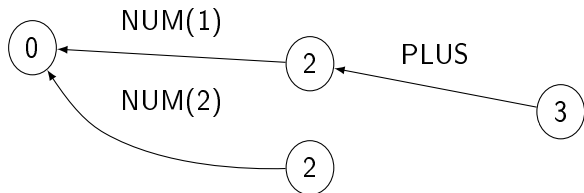
Example: stack



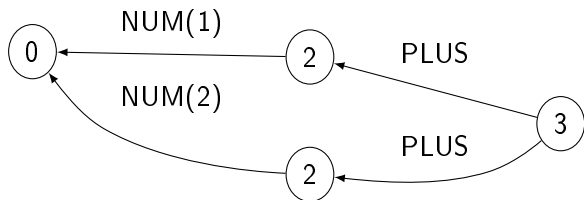
Example: stack



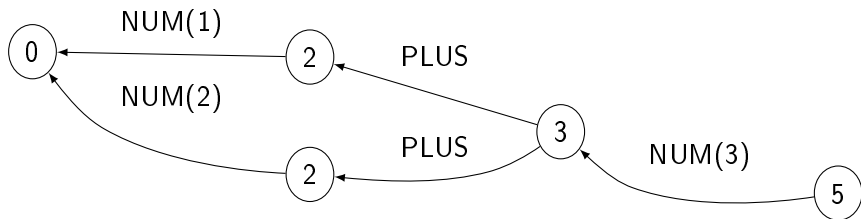
Example: stack



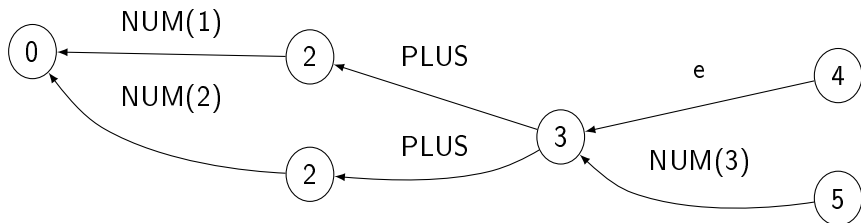
Example: stack



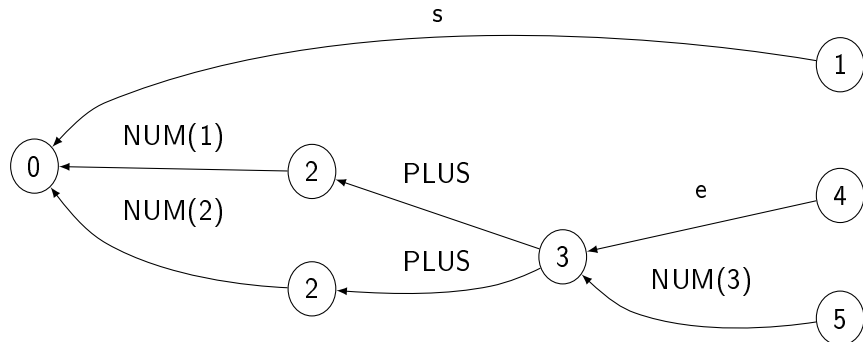
Example: stack



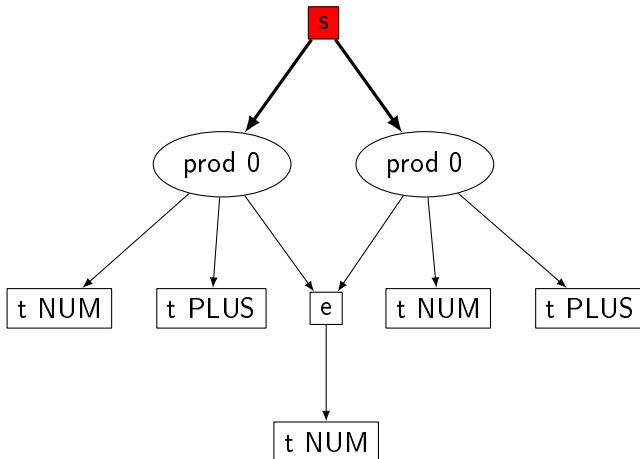
Example: stack



Example: stack



Example: parsing result



- Abstract parsing algorithm based on modified RNLGR is implemented.
 - ▶ GSS is reused.
 - ▶ Compact inner representation of parsing results with node reusing is used.
 - ▶ Parsers generator is implemented.
- Plug-in for ReSharper in active development.
 - ▶ Modular architecture is allow to create extensions for any string-embedded language.

Demo

```
public void Select(int cond)
{
    var baseQuery = "select x, y + 1, z " ;
    string fields;
    switch (cond)
    {
        case 1:
            fields = "alias1";
            break;
        case 2:
            fields = "alias1";
            break;
        default:
            fields = "fld3 alias1";
            break;
    }
    var tableName = "defaultTable";
    if (cond == 1) tableName = "table2";
    Program.ExecuteImmediate(baseQuery + fields + "from" + tableName);
}
```

Syntax error. Unexpected token "IDENT"("alias1fromdefaultTable")

Syntax error. Unexpected token "IDENT"("alias1fromtable2")

- Semyon Grigorev:
 - ▶ Semen.Grigorev@jetbrains.com
 - ▶ rsdpisuy@gmail.com
- YaccConstructor: <http://recursive-ascent.googlecode.com>