

```

1 import java.util.*;
2
3 /**
4  * This class transforms Grammar rules into Random sentences.
5  *
6  * <ul>
7  * <li> Name: GrammarSolver.java
8  * <li> Description: Grammar Solver
9  * <li> Class: Java 145
10 * <li> Instructor: Ken Hang && Janet Ash
11 * <li> Date: March 1 2015
12 * </ul>
13 *
14 * @author Hai H Nguyen (Bill)
15 * @version Winter 2015
16 */
17 public class GrammarSolver {
18     private static final String TERM_SEPARATOR = "::=";
19
20     private static final String NON_TERM_REGEX = "<|>+";
21
22     private static final String RULE_REGEX = "(\\|\\B)|(\\|\\b)+";
23
24     private static final String TOKEN_REGEX = "[ \\t]+";
25
26     private Map<String, String[]> grammarRulesMap = new TreeMap<String, String[]>();
27
28     /**
29      * Constructor, given a rule set, does the Following:
30      * <ul>
31      * <li> If rule set is null or empty, throw IllegalArgumentException
32      * <li> If the grammar definition is duplicated, throw IllegalArgumentException
33      * <li> Initializes a new grammar solver
34      * </ul>
35      * @param rules BNF grammar rules
36      */
37     public GrammarSolver(List<String> rules) {
38         if (rules == null || rules.isEmpty()) {
39             throw new IllegalArgumentException("List is Empty!");
40         } else {
41             for(String str : rules){
42                 extractGrammarRule(str);
43             }
44         }
45     }
46
47     /**
48      * Helper method used to extract data from rule string
49      * @param rule The Rule String to be Extracted
50      */
51     private void extractGrammarRule(String rule){
52         String[] data = rule.split(TERM_SEPARATOR);
53
54         String key = bracketedSymbol(data[0]);
55
56         String[] value = data[1].replaceFirst("^\\|", "").trim().split(RULE_REGEX);
57
58         if(contains(key)){
59             throw new IllegalArgumentException("Duplicated Non-terminal!");
60         } else {
61             grammarRulesMap.put(key, value);
62         }
63     }
64
65     /**
66      * Check if a Symbol is non-terminal or not.
67      * @param symbol Symbol to be check
68      * @return True if symbol is a non-terminal, False otherwise

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69     */
70     public boolean contains (String symbol) {
71         if (symbol.isEmpty()) {
72             throw new IllegalArgumentException("Symbol is Empty!");
73         } else {
74             return getSymbols().contains(bracketedSymbol(symbol));
75         }
76     }
77
78     /**
79     * Surround Symbols inside Alligator brackets
80     * @param symbol      Symbol to be Formatted
81     * @return            A Formatted symbol surrounded by '<' and '>'
82     */
83     private String bracketedSymbol(String symbol){
84         return "<" + simplifiedSymbol(symbol) + ">";
85     }
86
87     /**
88     * Simplify Symbols, pretty handy
89     * @param symbol      Symbol to be Simplified
90     * @return            A Simplified symbol without '<' or '>'
91     */
92     private String simplifiedSymbol(String symbol){
93         return symbol.replaceAll(NON_TERM_REGEX, "").trim();
94     }
95
96     /**
97     * @return            A set of Symbols from the maps
98     */
99     public Set<String> getSymbols() {
100         return grammarRulesMap.keySet();
101     }
102
103     /**
104     * @param bound        The Upper bound of the Random
105     * @return            A random int within the bound
106     */
107     private int randomIndex (int bound){
108         Random randomVault = new Random();
109
110         return randomVault.nextInt(bound);
111     }
112
113     /**
114     * Generate Sentences from the Symbol which indicates the flavor
115     * @param symbol      Symbol indicating sentence flavor
116     * @return            A random sentence
117     */
118     public String generate(String symbol){
119         if (contains(symbol)){
120             String[] values = grammarRulesMap.get(bracketedSymbol(symbol));
121
122             String[] symbols = values[randomIndex(values.length)].trim().split(TOKEN_REGEX);
123
124             String out = generate(symbols[0]);
125
126             for (int i = 1; i < symbols.length; ++i ) {
127                 out += " " + generate(symbols[i]);
128             }
129
130             return out;
131         } else {
132             return symbol;
133         }
134     }
135 } // IS29

```