Automata Theory

Homework 2: due 23 November 2017

1. Topdown Parsing

   - You are to write a program for topdown parsing: `dpa file`
     where `file` is a file name. Each line of the file contains a string that looks like an arithmetic expression. Your program should check if each string in `file` is a string generated by the following grammar. Your program should implement a deterministic pushdown automaton that performs topdown parsing for the grammar.

$$
\begin{aligned}
E &\rightarrow E + T \mid E - T \mid T \\
T &\rightarrow T * F \mid T/F \mid F \\
F &\rightarrow (E) \mid A \\
A &\rightarrow a \mid b \mid c \mid d \mid x \mid y \mid z \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7
\end{aligned}
$$

   - Input: a string that looks like an arithmetic expression. Do not use blanks in an input string.
   - Output: If the input string is accepted, your program prints its leftmost derivation in the transformed grammar; otherwise, print "reject". For example, if the input string is `x-3`, the output should be

```
E
=> ...
...
=> x-3
```

2. In your report,

   - write down the transformed grammar,
   - find the parsing table for the grammar, and
   - explain how your deterministic pushdown automaton works.

3. Implementation

   - Run your program with at least two "accept" strings and at least two "reject" strings.
   - Hand in your report, programs, executable files, and an example running (with at least two "accept" strings and at least two "reject" strings) by email to `sghong@theory.snu.ac.kr`.
   - Write down the environment you run your program.
   - Write comments appropriately in your program.