U.PORTO FEUP FACULDADE DE ENGENHARIA UNIVERSIDADE DO PORTO

MESTRADO INTEGRADO EM ENGENHARIA INFORMÁTICA E COMPUTAÇÃO | 2º ANO
EIC0022 | TEORIA DA COMPUTAÇÃO | 2017/2018 - 1º SEMESTRE

Challenge 8 – Context-Free Grammars (CFGs) and Push Down Automata (PDAs)

We need to translate regular expressions (assume that they can be formed with symbols: (,), +, *, ε and with ∑={a,b,c}) to context-free grammars (CFGs).

a) One possible technique is to think about an algorithm that receives a syntax tree (also known as analysis tree) corresponding to the input regular expression and generates a CFG. Considering the CFG1 below representing the language of regular expressions, describe an algorithm to translate the syntax tree to a CFG and show the main steps of the algorithm and the resultant CFG for the following regular expression: (ba*+b*)*(c+ε)ab*.

   CFG1: E→ E+E | EE | E* | (E) | a | b | c | ε

b) Another technique is to translate each input regular expression to a DFA and then to translate the DFA to a CFG. Show a possible CFG obtained using this technique and considering the regular expression (ba*+b*)*(c+ε)ab* as input.

c) Show a non-deterministic PDA for the language L={ $(ba^n+b^k)^m(c+\varepsilon)ab^t$ | n, k, m, t ≥ 0}.