COMPSCI 250 Discussion #8: Boolean Expressions

Group Response Sheet

David Mix Barrington and Morcecai Golin
19 April 2024

Writing Exercise

Construct a regular expression for the set EE ("even-even") of strings in $\{a, b\}^*$ that have both an even number of a's and an even number of b's. Justify your answer carefully – explain why your expression generates only even-even strings and why it generates all even-even strings. Note that all even-even strings have even length, so you may think of the whole string as being broken up into two-letter blocks.

Here are some more hints. You are not required to use them to solve the main problem, but they will probably be useful.

Define the language EEP ("even-even-primitive") of nonempty strings that are in EE and have no proper prefix in EE. (That is, if $w \in EEP$ and $w = uv$ with both u and v in EE, then either $u = \lambda$ or $v = \lambda$.) It turns out that while EEP is harder than EE to describe in English, it has a simpler regular expression.

- Explain why $EE = (EEP)^*$
- Which strings of up to six letters are in EEP?
- Construct a regular expression for EEP, and explain why this solves the main problem.

Solution:

[(a)]each natural y can be represented as a product of primes, this means that each possible factor will be represented as its atomic components of prime numbers, and by definition they must be multiples of y, if the prime natural x is not present in that prime factorization, then by definition they must also be relatively prime, because they share no numbers in their prime factorization besides 1. 34 and 57, 34 can be prime factorized to 2 and 17, 57 can be prime factorized to 19 and 3, they are relatively prime

n locations and k iteration size are relatively prime so their GCD $\equiv 1$ so on every wrap around case, it will iterate by 1 space, so if it started on 0 and wrapped around we would be on space 1, in the case where n and k are not relatively prime, their GCD$\neq 1$ so on each wrap around, it will iterate by a number not equal to one, therefore missing spaces