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Tutorial 5 for COMP 526 – Applied Algorithmics, Winter 2020

Problem 1 (Periodicity lemma)

Prove the periodicity lemma:

If string $S = S[0..n-1]$ has periods p and q with $p + q \leq n$, then it has also period $\gcd(p, q)$.

Problem 2 (Parallel And)

We consider the problem of computing the logical *and* of an array $B[0..n-1]$ of n Boolean values (n bits), i.e., the result should be *true* if and only if all n entries are true. (We assume here that each bit is stored as a full word.)

a) Design a CREW-PRAM parallel algorithm for computing the "logical and" of $B[0..n-1]$. Your algorithm should have $\mathcal{O}(\log n)$ time (span) and $\mathcal{O}(n \log n)$ work.

b) Can you make the algorithm work-efficient?

c) Now consider a CR**C**W-PRAM; you can choose a write-conflict resolution rule that is convenient for your purposes. Design a *constant-time* parallel algorithm for computing the logical and.