**Goal**

The goal of this lab is to implement a simple but non-trivial parallel algorithm.

**Requirement**

Perform the multiplication of 2 polynomials. Use both the regular *O(n2)* algorithm and the Karatsuba algorithm, and each in both the sequential form and a parallelized form. Compare the 4 variants.

**Algorithms**

**Regular multiplication algorithm**

For the sequential variant a for in for approach is used. For the parallelized variant each thread receives a list of position that need to be computed. This way the threads compute separate data and don’t need synchronization.

**Karatsuba algorithm**

The sequential form uses the Karatsuba algorithm in which each polynomial is split into 2 and the following formula is used:

P(X)\*Q(X) = (P1(X)\*X^n+P2(X)) \* (Q1(X)\*X^n+Q2(X)) =  
= P1(X)\* Q1(X)\*X^2n + (P1(X)+P2(X)) \* (Q1(X)+Q2(X)) - P1(X)\* Q1(X) - P2(X)\*Q2(X)\*X^n + P2(X)\*Q2(X)

For the parallel variant each multiplication is applied recursively if there are enough threads available. The synchronization is made through joins.

Chart, line chart

Description automatically generated**Performance**