**Goal**

The goal of this lab is to implement a distributed algorithm using MPI.

**Requirement**

Perform the multiplication of 2 polynomials, by distributing computation across several nodes using MPI. Use both the regular *O(n2)* algorithm and the Karatsuba algorithm. Compare the performance with the "regular" CPU implementation from lab 5.

**Algorithms**

**Regular multiplication algorithm**

Each thread receives a list of position that need to be computed.

**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 processes available.

In both cases, all the communications is done through send and receive MPI calls.

**Performance**

**Chart, line chart

Description automatically generated**