

Lab 5 - Parallelizing techniques

	Sequential Form (Basic)	Sequential Form (Karatsuba)	Parallelized Form (Basic)	Parallelized Form (Karatsuba)
6 elements polynomials	0.0 seconds	0.0 seconds	0.032 seconds	0.016 seconds
10 elements polynomials	0.0 seconds	0.016 seconds (await 1 ms/task)	0.336 seconds (await 1 ms/task)	0.016 seconds (await 1 ms/task)
100 elements polynomials	0.016 seconds	0.0624 seconds (await 100 ms/task)	32.592 seconds (await 1 ms/task)	0.048 seconds (await 1 ms/task)

$$X = 1 + 2x + 3x^2 + 4x^3 + 5x^4 + 6x^5$$

$$Y = 7 + 8y + 9y^2$$

$$\begin{aligned}
 X*Y = & 7 + 8y + 9y^2 + \\
 & 14x + 16xy + 18xy^2 + \\
 & 21x^2 + 24x^2y + 27x^2y^2 + \\
 & 28x^3 + 32x^3y + 36x^3y^2 + \\
 & 35x^4 + 40x^4y + 45x^4y^2 + \\
 & 42x^5 + 48x^5y + 54x^5y^2
 \end{aligned}$$

X*Y - on tasks normal Multiplication

number of tasks – 18 (length of X * length of Y)

length of X - 6

length of Y - 3

$$\text{Task 1} \rightarrow 1 * 7$$

$$\text{Task 4} \rightarrow 2x * 7$$

$$\text{Task 7} \rightarrow 3x^2 * 7$$

$$\text{Task 2} \rightarrow 1 * 8y$$

$$\text{Task 5} \rightarrow 2x * 8y$$

$$\text{Task 8} \rightarrow 3x^2 * 8y$$

$$\text{Task 3} \rightarrow 1 * 9y^2$$

$$\text{Task 6} \rightarrow 2x * 9y^2$$

$$\text{Task 9} \rightarrow 3x^2 * 9y^2$$

$$\text{Task 10} \rightarrow 4x^3 * 7$$

$$\text{Task 13} \rightarrow 5x^4 * 7$$

$$\text{Task 16} \rightarrow 6x^5 * 7$$

$$\text{Task 11} \rightarrow 4x^3 * 8y$$

$$\text{Task 14} \rightarrow 6x^5 * 8y$$

$$\text{Task 17} \rightarrow 6x^5 * 8y$$

$$\text{Task 12} \rightarrow 4x^3 * 9y^2$$

$$\text{Task 15} \rightarrow 6x^5 * 9y^2$$

$$\text{Task 18} \rightarrow 6x^5 * 9y^2$$

X*Y - on tasks with Karatsuba

number of tasks – 3 (length of Y *because it's the polynomial with the smaller length*)

length of X – 6

length of Y – 6

$$X = 6x^5 + 5x^4 + 4x^3 + 3x^2 + 2x + 1$$

$$Y = 7x^5 + 8x^4 + 9x^3 + 10x^2 + 11x + 12$$

$$p1 = 6x^2 + 5x + 4 * x^3$$

$$q1 = 7x^2 + 8x + 9 * x^3$$

$$p2 = 3x^2 + 2x + 1$$

$$q2 = 10x^2 + 11x + 12$$

$$X * Y = (p1 * x^n + p2) * (q1 * x^n + q2) = p1 * q1 * x^{2n} + (p1 * q2 + p2 * q1) * x^n + p2 * q2$$

Task 1 → $p1 * q1$

Task 2 → $p2 * q2$

Task 3 → $\text{Karatsuba}(\text{add}(p1 * q2, p2 * q1))$

Task 4 → $\text{add}(Task1 * x^{2n}, Task3 * x^n, Task2)$