Algorithms for Polynomials

Research Coursework:
Introduction to Programming and Data Structures

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November 10, 2022

Polynomial Operations

Topic to be covered

- Representation
- Computing a polynomial
- Addition
- Subtraction
- Multiplication
- Division

We will discuss polynomial of the form $P(x) = \sum_{i=0}^{n} a_i x^i$, i.e., polynomials with one varible.

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Representation of Polynomials

$$P(x) = \sum_{i=0}^{n} a_i x^i$$

Different ways

How to store a polynomial?

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Different ways

How to store a polynomial?

1. Array: Useful when most of the coefficients are present
2. Linked List: Useful when very few coefficients are present
3. Any disadvantage?
4. Which is better

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How to compute a polynomial

$$P(x) = \sum_{i=0}^{n} a_i x^i$$

How many multiplication and additions are required? Can We reduce multiplication further.

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Can We reduce # multiplications further?

Adding two polynomials

What will be the algorithm?

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Problem of over computation. Solution?

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What will be the algorithm?

What happen to the degree of new polynomial?

Problem of over computation. Solution?

Keep the degree stored.
Structure is required.

Division of a polynomial with another

Consider two polynomials:

$$f(x) = \sum_{i=0}^{n} a_i x^i,\ g(x) = \sum_{i=0}^{m} b_i x^i$$

Multiplication of two polynomials

Consider two polynomials:

$$f(x) = \sum_{i=0}^{n} a_i x^i,\ g(x) = \sum_{i=0}^{m} b_i x^i$$