

Principles of Computer Science II

Abstract Data Types

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Lecture 17



Initial Assumptions

- ▶ We attempt to formulate a solution.
- ▶ The formulation is done in an abstract way.
- ▶ A problem may be differentiated from its original version if the initial assumptions are modified:
 - ▶ either making it easier, or more difficult,
 - ▶ or totally different.
- ▶ Our first step is to identify and understand all the initial assumptions stated by the problem.
- ▶ We need to understand why an initial assumption is made (or not).



Initial Input

- ▶ What is available to us ?
- ▶ We need to understand how to use each piece of information that is provided to us (or not).



Problem to solve

- ▶ Usually we need to design of a new algorithm
- ▶ What is the problem at hand ?
 - ▶ What is the system goal ?
 - ▶ Do we need all processes to acquire some specific knowledge ?
- ▶ Does it fit to one of the problems studied ?
 - ▶ How does the initial input differentiate the problem ?
 - ▶ Do we need to employ an additional initial step ?
 - ▶ Do we know of any best-case/worst-case input scenarios ?



Methodology: Understand the question

- ▶ Identify & Understand assumptions
- ▶ Initial input
- ▶ Understand the problem statement
- ▶ Identify similar problems/solutions in the bibliography



Methodology: Initial solution

- ▶ Do we have a rough idea of a solution ?
- ▶ Do we have identified an approach to solving the problem ?
 - ▶ think again !
 - ▶ go through the assumptions – maybe we overlooked something ?
- ▶ Write down a solution sketch
 - ▶ check if it adheres to the initial assumptions
 - ▶ does it use all the available input ?
- ▶ Is the solution correct ? can we provide some arguments ?
- ▶ What is the complexity (time, memory) ?
- ▶ Can we think of a more efficient solution ?



Write-down the solution

- ▶ Definition of variables
 - ▶ state the purpose – scope of use
 - ▶ type of variable
 - ▶ initial value
- ▶ Initialization phase
- ▶ Basic round of execution
- ▶ Special cases



Final document

1. Short description
2. Description of the basic process
3. Basic algorithm – description of execution
 - ▶ “simple” / “typical” round of execution
 - ▶ special cases
4. Pseudocode (maybe for specific parts)
5. Correctness – Some arguments ... full proof
6. Time Complexity – Some arguments ... full proof
7. Message Complexity – Some arguments ... full proof

