

Algorithms and Data Structures

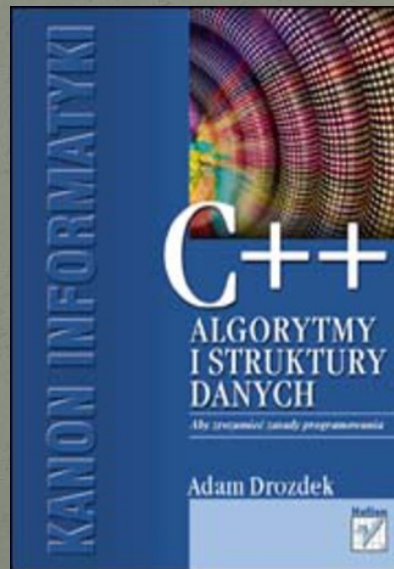
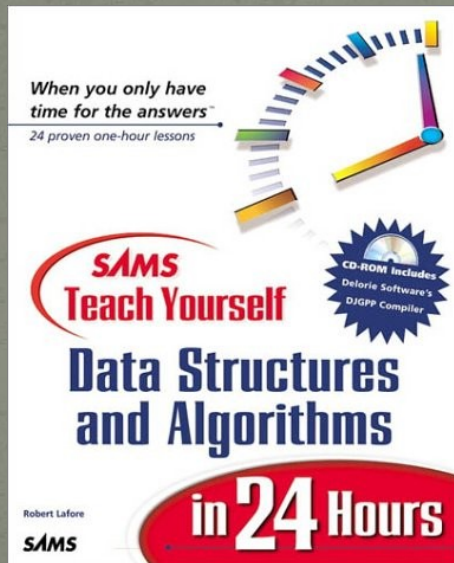
Andrzej Pisarski

Plan of the lecture

- Books
- About exam
- What is an algorithm?
- A few examples...
- Algorithm - notations:
 1. List of steps.
 2. Pseudocode.
 3. Block Diagrams.
 4. Compact schemes NS (Nassi-Shneiderman)

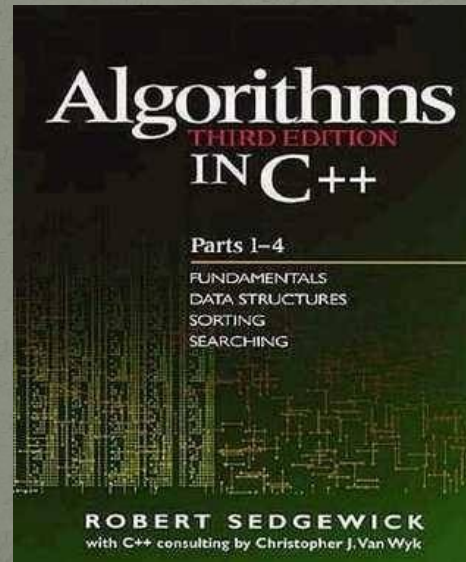
Books

1. Rober Lafore – „Data Structures and Algorithms”
(*available in the library*),
2. Adam Drozdek– „Algorytmy i Struktury Danych”.



Books

1. Robert Sedgewick, Kevin Wayne – „Algorithms”,
2. Robert Sedgewick – „Algorithms in C++”.



About exam

- The final grade consists of the result of **credit laboratory** and the result of the **written examination**.
- **Credit laboratory (2022-06-20):**
On the basis of two written programs (C ++)
2 correctly written (with commentary) - rating: 5
1 correctly written (with commentary) - rating: 4
activity in the laboratory - rating: 3.
- **A written exam (2022-06-27).**

What is an algorithm?

- In computer science an algorithm is a set of steps for a computer to accomplish a task

What is an algorithm?

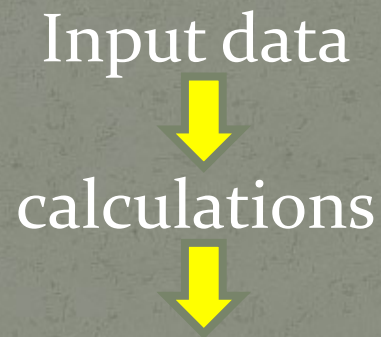
- In computer science an algorithm is a set of steps for a computer to accomplish a task

Input data



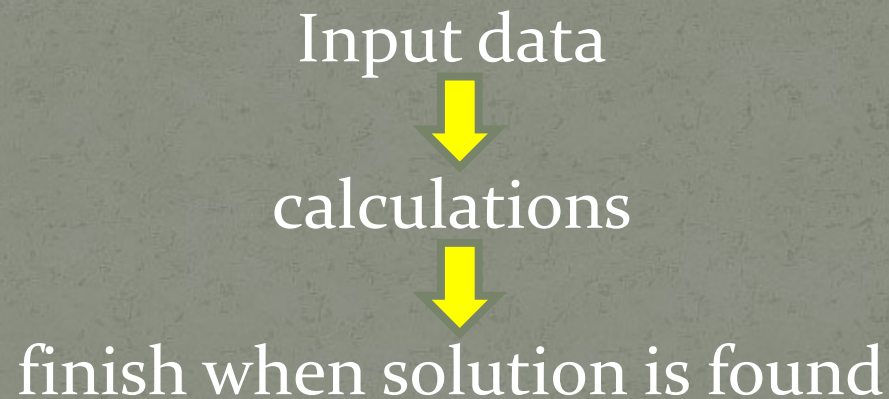
What is an algorithm?

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What is an algorithm?

- In computer science an algorithm is a set of steps for a computer to accomplish a task



A few examples...

- Skype – video and audio compression algorithms,

A few examples...

- Skype – video and audio compression algorithms,
- Google Maps – how does Google Maps figure out how to get from one city to another one?

They use a route finding algorithm

Algorithm - notations

1. List of steps.
2. Pseudocode.
3. Block Diagrams.
4. Compact schemes NS (Nassi-Shneiderman)

Algorithm - notations

1. List of steps.

❖ Making a bread: **The 10 Steps of Bread Making**

(<http://www.lepainquotidien.com/editorial/the-10-steps-of-bread-making>)

1) Ingredient Selection & Scaling



Algorithm - notations

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Algorithm - notations

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- 3) Primary Fermentation



Algorithm - notations

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- 1) Ingredient Selection & Scaling
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- 4) Divide and Pre-Shape



Algorithm - notations

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- 5) Bench Rest



Algorithm - notations

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- 4) Divide and Pre-Shape
- 5) Bench Rest
- 6) Final Shaping



Algorithm - notations

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- 4) Divide and Pre-Shape
- 5) Bench Rest
- 6) Final Shaping
- 7) Final Fermentation



Algorithm - notations

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- 6) Final Shaping
- 7) Final Fermentation
- 8) Scoring



Algorithm - notations

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- 8) Scoring
- 9) Baking



Algorithm - notations

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- 1) Ingredient Selection & Scaling
- 2) Mixing
- 3) Primary Fermentation
- 4) Divide and Pre-Shape
- 5) Bench Rest
- 6) Final Shaping
- 7) Final Fermentation
- 8) Scoring
- 9) Baking
- 10) Cooling



Algorithm - notations

1. List of steps.
 - ❖ Getting to school
 - 1) Walk to the bus stop



Algorithm - notations

1. List of steps.
 - ❖ Getting to school
 - 1) Walk to the bus stop
 - 2) Go by bus



Algorithm - notations

2. Pseudocode.

❖ greatest common divisor (Euclidean algorithm):

procedure gcd(a, b: positive integers)

 x:=a

 y:=b

while y≠0

 r:= x **mod** y

 x:=y

 y:=r

return x {gcd(a,b) is x}

Algorithm - notations

2. Pseudocode.

❖ square root finding (Babylonian method):

$x_{\{0\}} := \sim \sqrt{S}$

$\epsilon = 0.001$

$x_{\{1\}} := (x_{\{0\}} + S/x_{\{0\}})/2$

while $\text{abs}(x_{\{n+1\}} - x_{\{n\}}) > \epsilon$

$x_{\{n+1\}} := (x_{\{n\}} + S/x_{\{n\}})/2$

return $x_{\{n+1\}}$

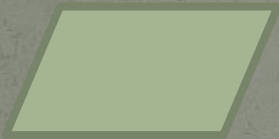
Algorithm - notations

3. Block Diagrams.

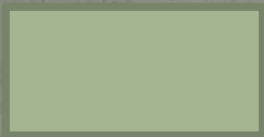
Flowchart:



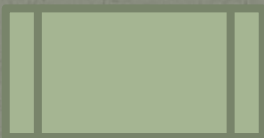
Start - Finish



Data: input, output



Processing



Subprograms



Choice statements
(decisions)



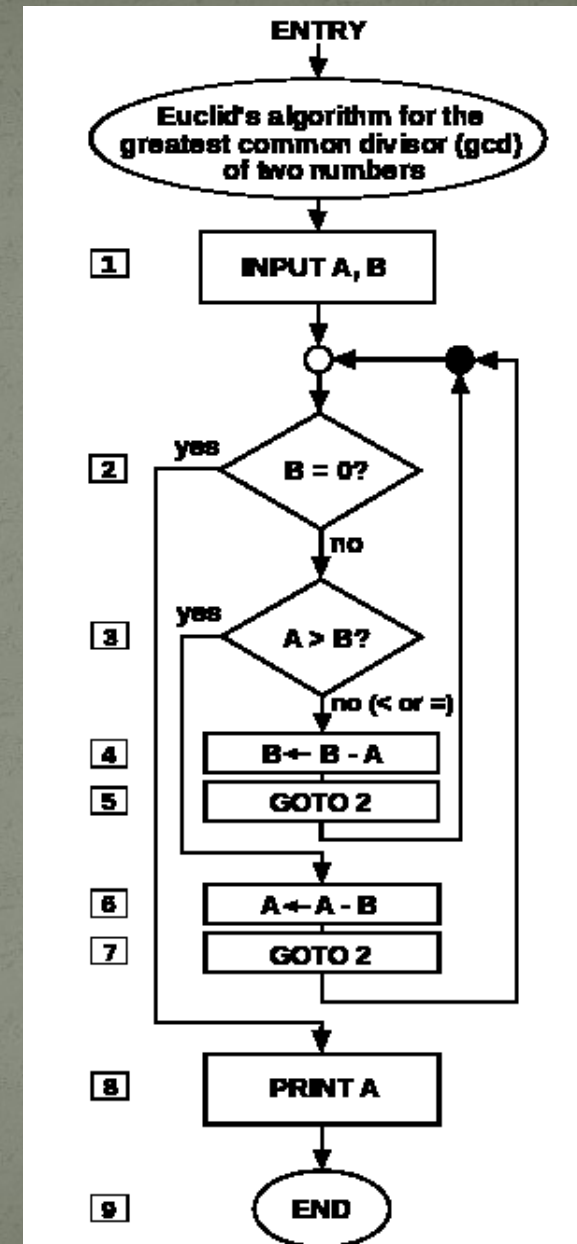
Flow



Comments

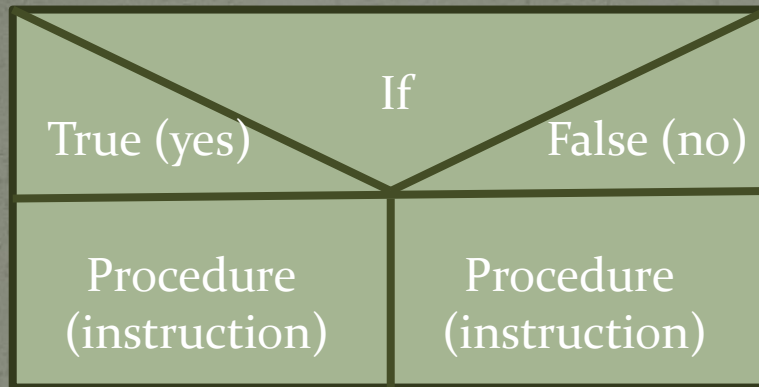
Algorithm - notations

3. Block Diagrams. Greatest Common Divisor:



Algorithm - notations

4. Schemes NS (Nassi-Shneiderman).



Laboratory problems and tasks

<http://212.33.71.131/~apis/erasmus/aads/> [en]

<http://212.33.71.131/~apis/aisd/> [pl]