



# Programming

## Basic problem solving techniques

# Summary ...

- How (to start) to think like a programmer?
- Problem solving strategy
- How to describe a problem at all? -  
Descriptive language
- How to cook coffee?



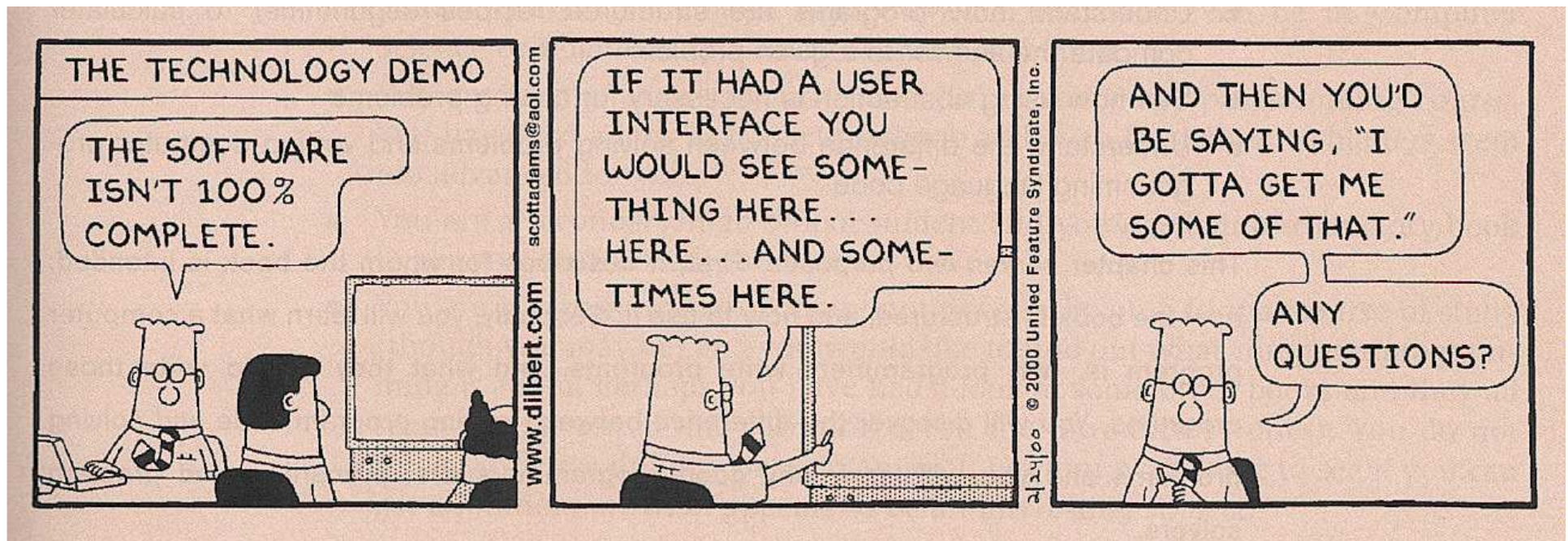
# Thinking like programmers

## ■ HTTLAP?

(How to think like a programmer? – **HTTLAP**)

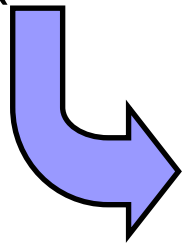
- Problem understanding and problem solving
- Write the solution in structured form (**algorithm**)
- Write the algorithm in (a) programming language (JAVA)

# Thinking like a programmer 😊



# What is an algorithm?

- The algorithm is a rule - a finite number of steps - which brings us to the solution of a (mathematical) problem



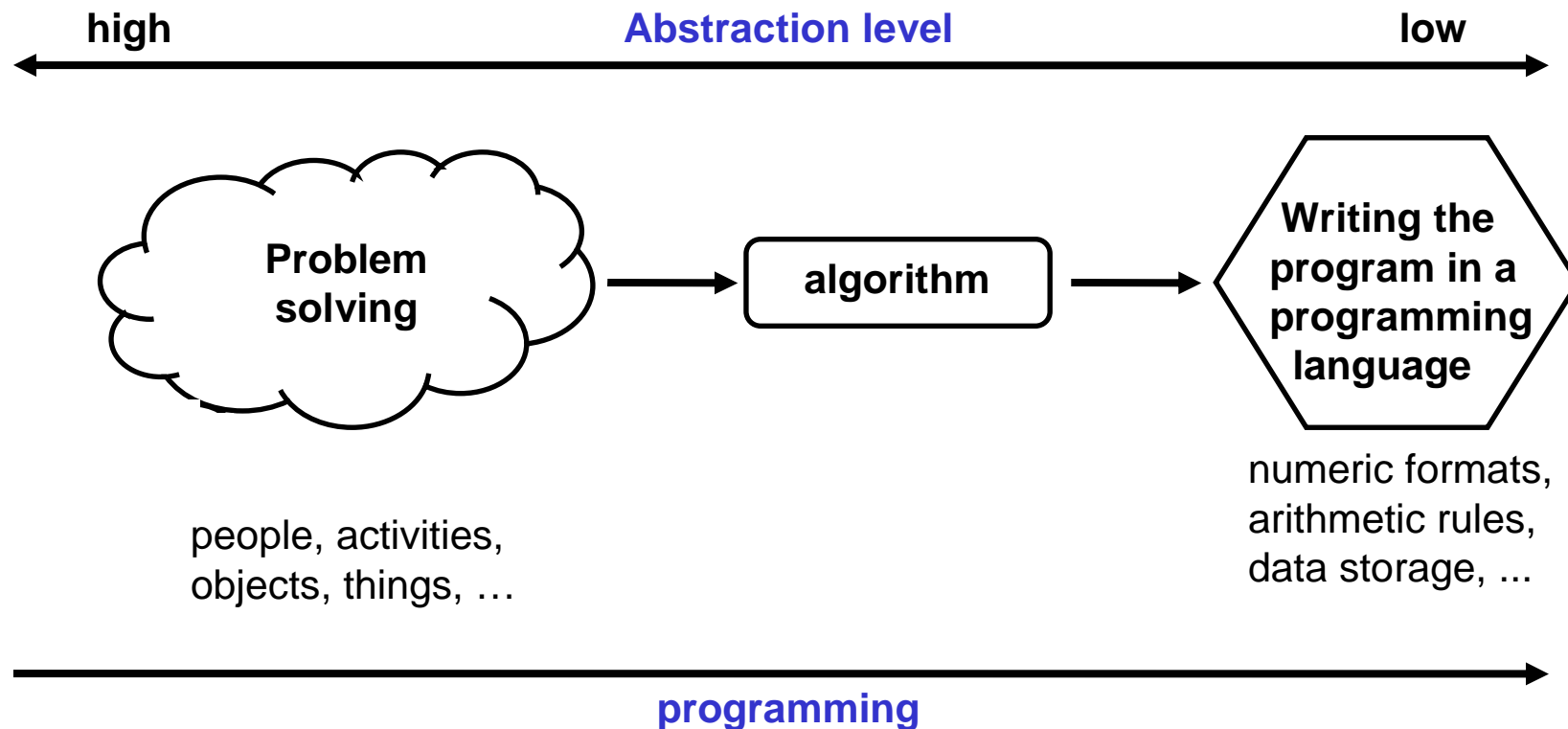
**It always stops !!!**



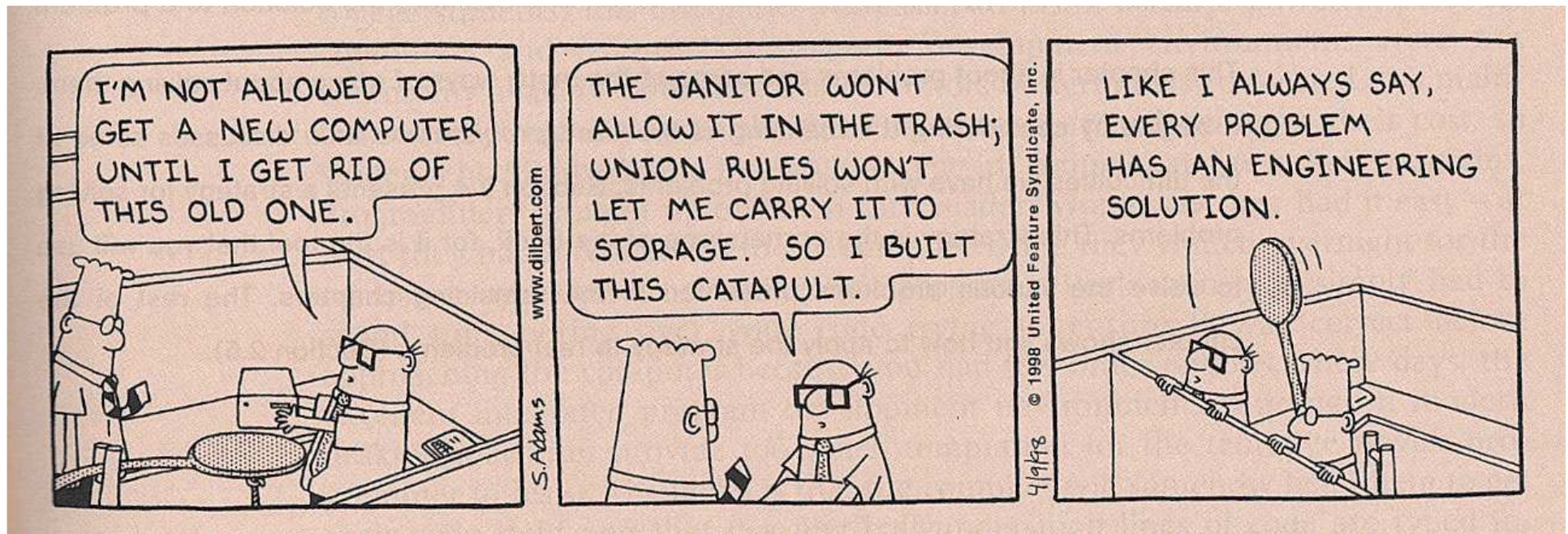
- The origin of the word algorithm:

Abu Ja'far Mohammed ibn-Musa (a.k.a. **al-Khwarizmi**)

# Problem-solving process



# How do we solve the problem? 😊



# Problem solving strategy

## ■ HTTLAP strategy:

- Understand the problem
- Develop a plan to solve the problem
- Realize plan
- Evaluate the solution (what we might have forgotten?)

- 
- Describe what we have to learned in the process of solving (this particular) problem
  - Explain/document solutions



# Ways of describing problems

- In natural language
- Tackle the real problem? (third level failure)
- With diagrams, photographs, ... → visual
- By using mathematical approaches (formulae, ...) → algebraic
- With the help of physical models (in architecture, construction, engineering, ...)
- **Pseudo-code** (structured natural language)

# Ways of describing problems 😊



# Examples of problems + description modes

- Car driving
- Ant and crumbs
- A fly and spilt juice
- Another ... mathematical task:
  - morning wake up

# Let's brew some coffee ...

## ■ Problem:

- Let us brew some coffee and pore it in a cup with the help of "kafetjera"

## ■ Descriptive language:

- Pseudo-code

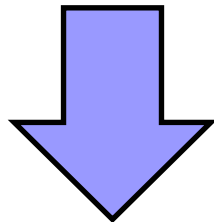
## ■ Solving strategy:

- HTTLAP



# Summary

- Kaj smo je pravkar naučili?
  - What did we just learn?
  - Describe a (concrete) problem
  - Use (HTTLAP) strategy for problem solving



- Think like programmers
- Cook (good) coffee

# References

- Paul Vickers: *How To Think Like A Programmer: Problem-solving for the Bewildered*. Course Technology, 2008.
- <http://www.bbc.co.uk/dna/h2g2/alabaster/A632990>
- <http://www.mathsisgoodforyou.com/people/alkhwarizmi.htm>  
(slika Abu Ja'far Mohammed ibn-Musa al-Khwarizmi)

# Homework

- Use HTTLAP solving strategy for the following problem:
  - “Refueling at the service station.”
- Which descriptive language did you use to describe the problem and why?
- How many "steps" do you have in your solution?
- Did you you deliberately simplify in you solution / released?