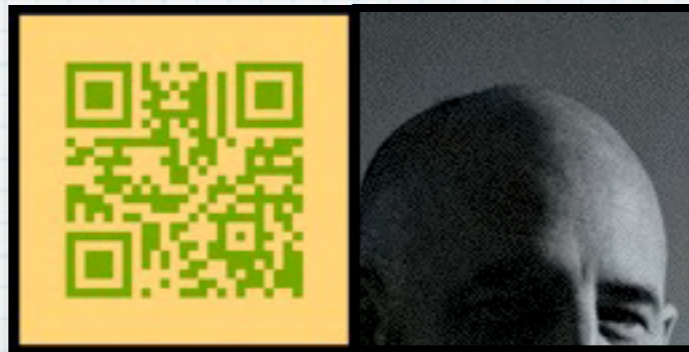


# Algorithms

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Procedures, Flow Charts, Pseudo-Code



# Algorithms

- \* **What** is an algorithm ?
- \* **Why** do we need them ?
- \* **How** do we describe one ?
- \* **Specify** vs. **implement** !

# Algorithm

from the Arabic **al-Kuwārizmī**, the native of **Kwārazm**, surname of the **Arab mathematician** Abu Ja'far Mohammed Ben Musa, who flourished early in the 9th cent., and through the translation of whose work on **Algebra**, the Arabic numerals became generally known in Europe.

-- Oxford English Dictionary

# What is an algorithm?

- \* A **procedure** for doing something
- \* A **list of steps** to accomplish a task
- \* A **structured method** for solving a problem

# Algorithm examples

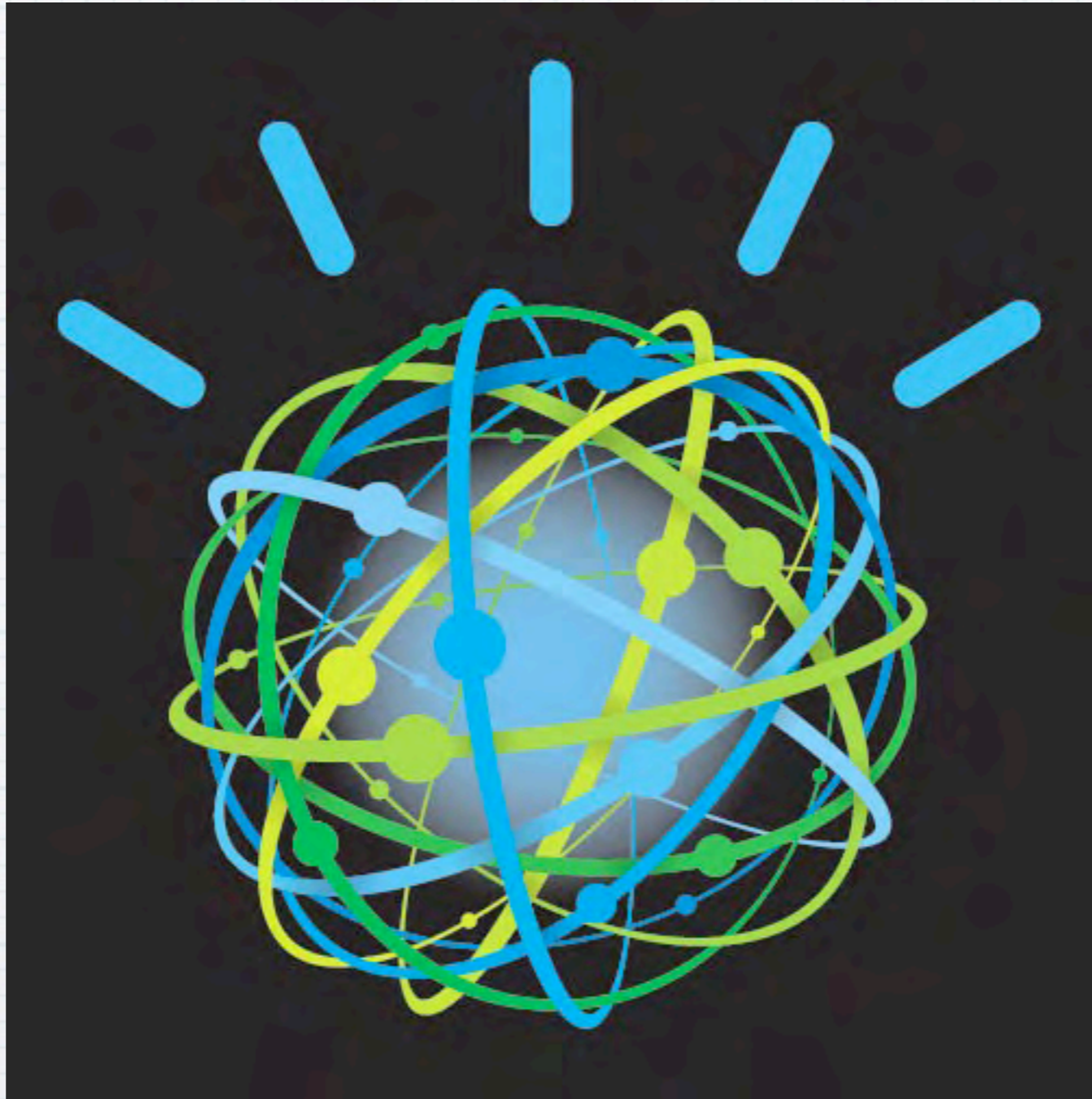
- \* **Recipes** for cooking
- \* **Instructions** to assemble a product
- \* **Description** of a sports play
- \* **Strategy** for searching the internet
- \* **Scheme** for solving a problem

# Step-by-step

- \* 1. Do this
- \* 2. Do that
- \* 3. Do another thing
- \* 4. Do something else

# Complexity

- \* **Simple** algorithms are generally **linear**
- \* But what happens when there are **alternative choices** ?
- \* Or **unanticipated** possibilities ?
- \* Things can get more **complex**...





# Specify vs. implement

\* **Specify**: plan and design

\* **Implement**: execute or run

# Specifying an algorithm

- \* **Natural language** (narrative text)
- \* **Flow chart** (visual schematic)
- \* **Pseudo-code** (shorthand text)
- \* **But not programming languages**

# Natural language recipe

## Grilled Salmon with Maple Balsamic Glaze

**SERVES 4**

**4 salmon steaks or fillets, 5 or 6 oz each**  
**1/4 cup grapefruit or orange juice**  
**1/4 cup maple syrup**  
**3 tablespoons balsamic vinegar**  
**2 cloves garlic, minced**  
**1 tablespoon olive oil**

Light a charcoal fire and make sure the grate is clean. Season the salmon steaks or fillets with salt and pepper and place in a shallow pan or bowl. Combine juice, maple syrup, balsamic vinegar, and garlic in a small sauté pan. Bring to a boil and cook for 5 or 6 minutes, stirring so the ingredients are well blended, and then add the oil. Pour over the salmon and let it marinate in the glaze for at least half an hour. When the fire is hot, grill the salmon for 5 minutes on each side, or until done, brushing frequently with the glaze.



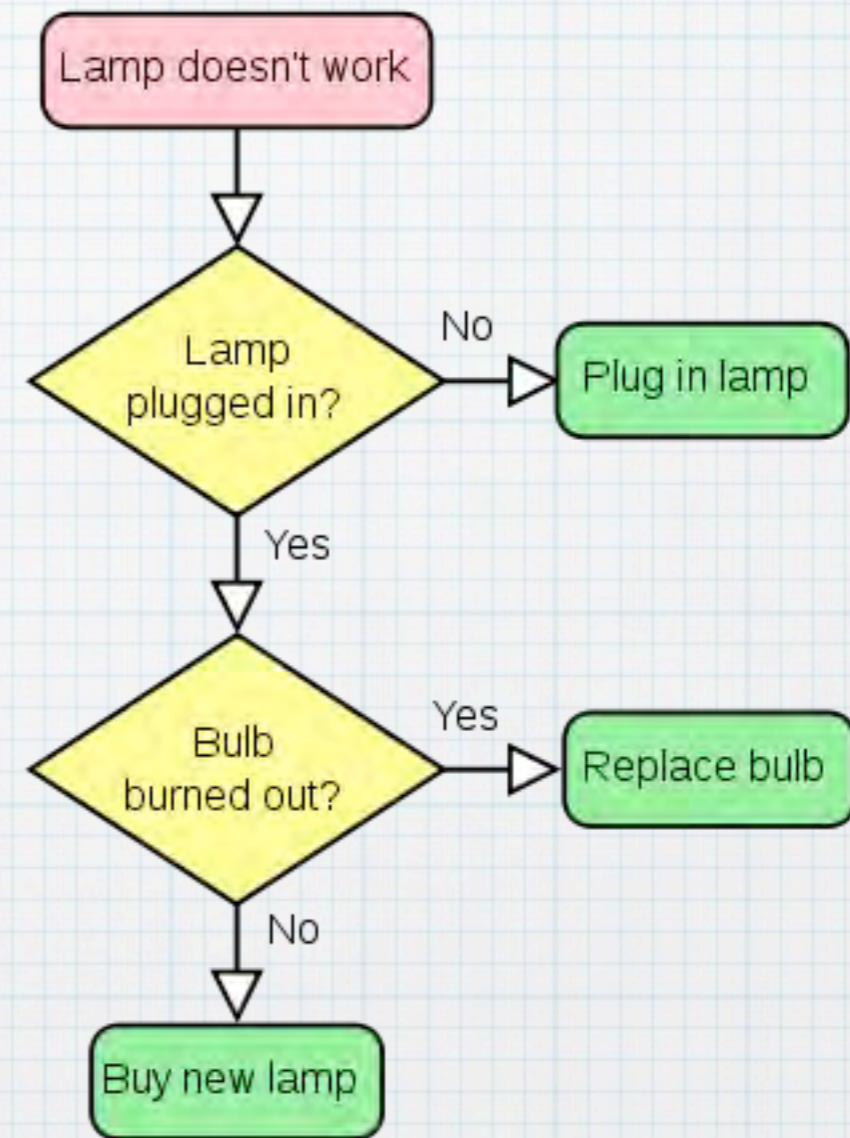
-- The Cape Cod Fish & Seafood Cookbook

# Flow chart procedure

How many engineers does it take to fix a broken lamp?



-- <http://en.wikipedia.org/wiki/File:LampFlowchart.svg>



# Pseudo-code

**Start the cat at the center of the stage**

**When the green flag is clicked:**

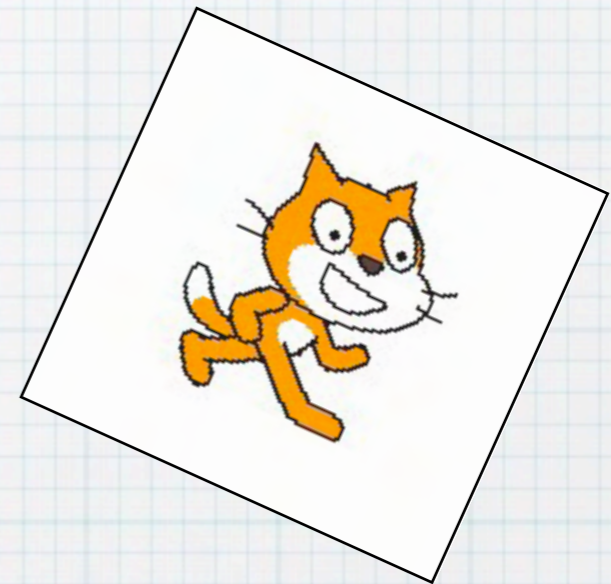
**Repeat 10 times:**

**Move the cat right 10 steps**

**Change its costume**

**Rotate it 10 degrees clockwise**

**Stop everything**



# Pseudo-code for planning

- \* Main **design tool** for planning software
- \* Capture the **logic and flow** of the algorithm
- \* Design is **independent** of implementation
- \* Can be **translated into many** languages
- \* **Polyglottous** programmers !!!

# Implementing an algorithm

\* **World** (cook the salmon)



\* **Software** (run the code)



Algorithms  
are  
Everywhere



# BEHOLD THE AWESOME SCIENCE OF MINDMAPPING

## AN INSTRUCTIONALICIOUS GUIDE

