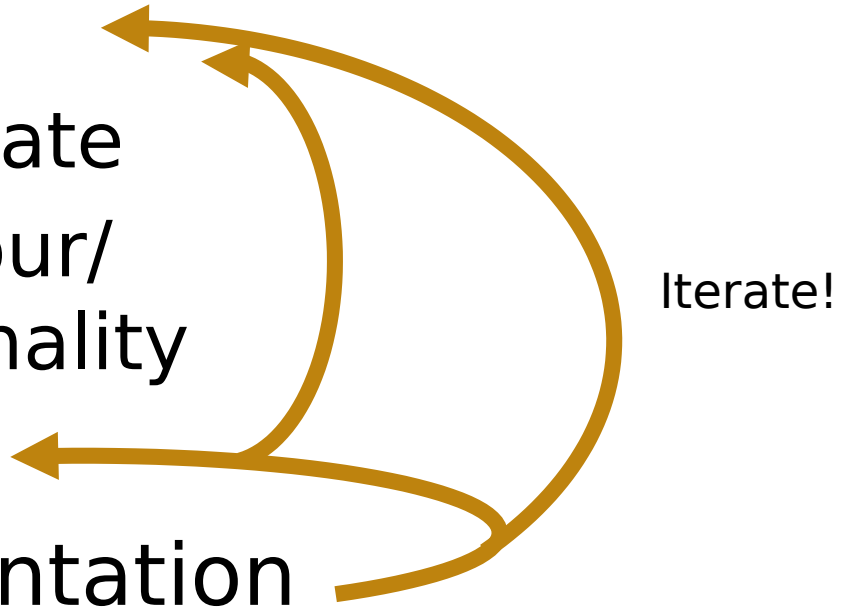
Australian National University

Software design

S5

Steps to working software

1. Design
   a) Data, state
   b) Behaviour/ Functionality
2. Tests
3. Implementation



Think before you code, and write down what you were thinking.

Data + Functionality

- What distinct things do we care about?
- What aspects of them do we care about?

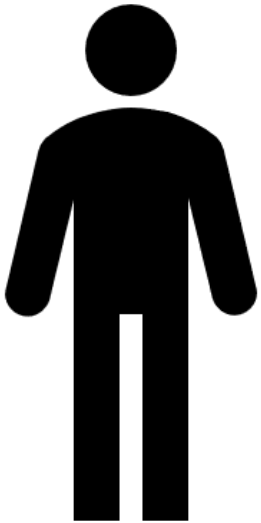
- How can we interact with those things?
- What can they do?

- Are there any subtype relationships?

Context matters

University ID

Credit score



Genes

Demerit points

Privacy settings

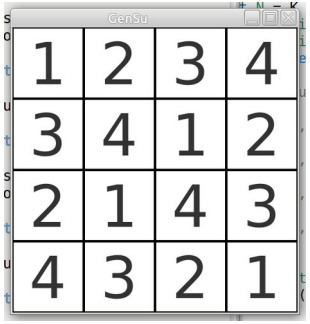
Address

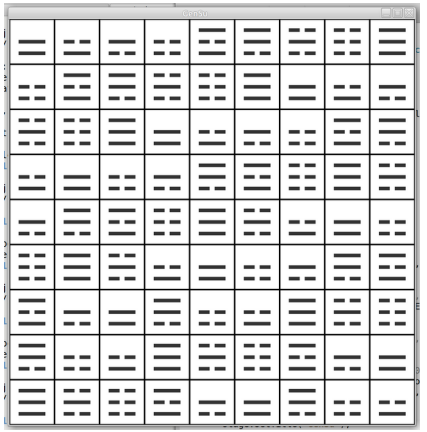
Interests

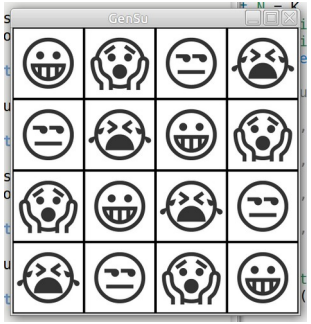
Tax File Number

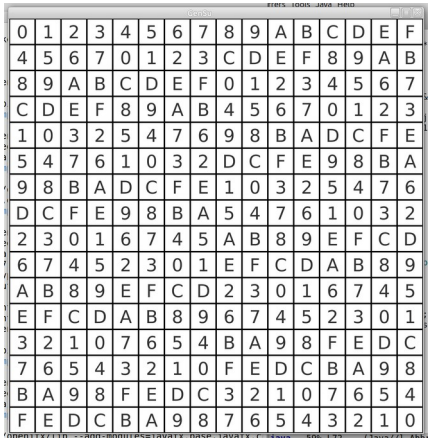
Example

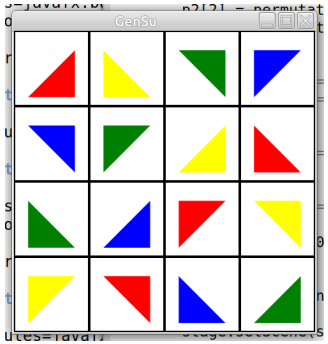
The puzzle consists of an n × n grid (n = k^2) of squares. The goal is to fill each square with one of n symbols, such that the symbols in each row, column and (non-overlapping) k × k box are all different.





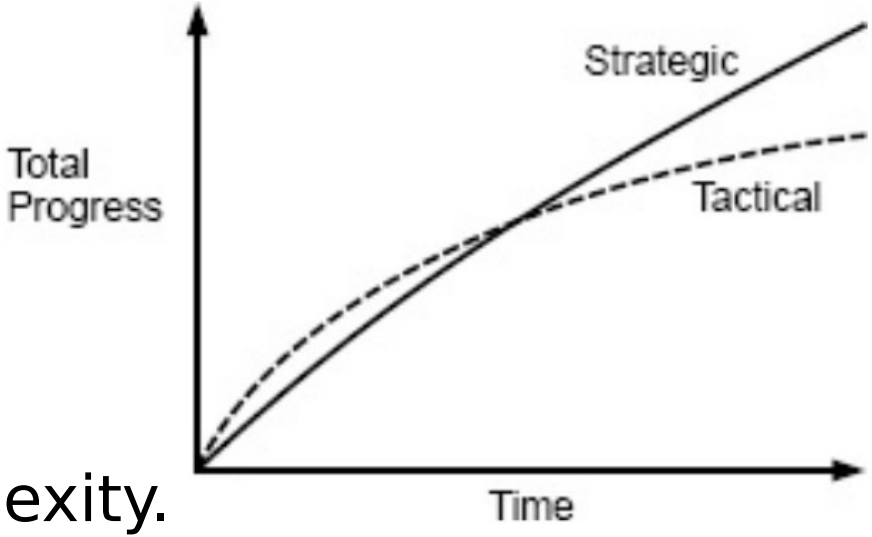






Simplicity

- Avoid *unnecessary* complexity.
- What is “complex” depends on perspective.
- Isolate/encapsulate complexity.
  - Classes: Interface vs. implementation.
- Make code readable and maintainable for other programmers (including your future self).



(Figure 3.1, Ousterhout, 2018)

Some Principles (Ousterhout)

- **Deep “modules”** (method, class, package, or module)
  - Simple “interfaces”* (narrow)
  - Encapsulate lots of complexity (depth)
  - General-purpose
- Prefer **simple interface** over simple implementation
- Design **errors out of existence**
- Design for **ease of reading**, not ease of writing
- Extra: Don’t Repeat Yourself (**DRY**)

* Interfaces in the broad sense, not just the Java keyword

Documentation

- The name of a class/method/variable is the (shortest) description of what it does, but that is often not enough.
- Abstract: describe what, not how.
  - The larger the unit, the more abstract the description.
- Make assumptions and limitations explicit!
  - Is the value of a field tied to some other value?
  - Is a number assumed to be non-zero/within a certain range?
  - Is a reference assumed to always be non-null?
  - Can a String be empty?