CSC407

Concluding remarks

Is that all there is?

- Design and Architecture is about communicating between people.
- The machine doesn't much care..
- Clean, elegant abstractions are easier to describe, modify, reuse.
- Sometimes subtle.

OO is a good thing?

- OO might represent progress because:
  - OOA allows us to (crudely and informally) model the world.
  - OOP helps us build software that incorporates a model of the world.
  - Thus, the innards of our software reflects the concepts that experts use to relate to their world.

UML is a good thing?

- UML represents progress because:
  - It standardizes many competing bubble and line diagram formats and tools.
    - Programmers like bubbles and lines.
  - You can use it for concepts (OOA) as well as software specification (OOD)

OOA

- Use UML to model the static concepts that a analyst deems important to understanding the domain.
  - Static, not time varying.
- Write use cases to record the interactions various actors have with the system.
  - Use cases "drive" the concepts through the (time varying) transformations that occur as the system is used to get real work done.

UML is really big

- (In the sense that it contains many different diagrams already.)
- But nevertheless I follow Rosenberg's suggestion to draw yet another diagram for preliminary design.
- Robustness diagrams lets the use cases take the concepts through real required workflows.
  - Eases jump to sequence diagrams.
- We discover new concepts, messages and attributes in the process.

Design is really hard

- ..so hard that a tremendous proportion of engineers don't even *try* to do it.
- We need to save our strength for the unique designs we must create by reusing other people's designs when possible.
- Patterns help us use designs created by good engineers who preceded us.

Composition

- Creating complicated objects by composing potentially many simple objects seems to be a critical feature of good designs.
- Hence we focused on patterns that helped us do this.
- Linton et al invented several important patterns.
- Frameworks rely on composition.

Patterns

		Purpose				
		Creational	Structural	Behavioral	Storage	Distributed
Scope	Class	Factory method	Adapter Template Base	Interpreter Template Method	Object File RDB Direct	
	Object	Abstract Factory Builder Prototype Singleton	Adapter Bridge Composite Decorator Façade Proxy	Chain of Responsibility Command Iterator Mediator Memento Flyweight Observer State Strategy Visitor	OODB Proxy	Attribute Factory

lexi

- Is interesting because it was an extreme example of how objects can be lightweight, abstract and get the work done.
  - Shows how flyweight can work
    - Points out importance of thinking about extrinsic vs intrinsic state
  - Puts creational patterns to work
  - Shows visitor at work

Creational Patterns

- are important because:
- Now that we propose composing complex objects out of many abstract ones it is a complex task to connect them all up!

Behavioral Patterns

- Are important because they illustrate how to allow parts to work together
  - Observer
  - Visitor
- Yet how to avoid tying pieces together so closely that reuse won't be possible.

Architecture

- Our understanding of architecture is less developed (even) than design.
- Architectural Design Languages are research projects at the moment
- Experience has shown that if a system is described from several perspectives a reasonable understanding can be conveyed.
- Logical, implementation, process, deployment, data, performance, quality, etc

Architecture styles

- Shaw tutorial points out that a similar approach can be used to reuse architecture as design
- *Architecutural styles* are to *architecture* as *patterns patterns* are to *design*.
- Data flow, call-and-return, data centred, vm, independent communicating components are examples

Common business system architecture

- This course compares monolythic, client-server and triple-tier systems.
  - Not as general as Shaw's styles but a very pragmatic classification that distinguishes many modern systems
    - And most business systems..
  - Many IT practitioners probably imagine that's all there is..

The exam

- Quite different style than historical
- Q1 5 x 5 mark small answers
- Q2 3 x 5 mark really small answers
- Q3 30 mark OOD (&robustness)
- Q4 30 mark pattern and design

The End

- Thanks for your patience and good humor.
- I particularly enjoyed the conversations with the office hours "regulars".
- Please fill in the review form.
  - The results, especially constructive comments or astute criticisms, are typed in (by a service bureau) and carefully studied.