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Software Engineering Design & Construction

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Design Patterns

A design pattern describes:

- *A problem that occurs over and over again in our environment.*
- *The core of the solution to that problem,*
- *in such a way that you can use this solution a million times over, without ever doing it the same way twice.*

– Christopher Alexander, professor of architecture.

What is a Design Pattern?

Aggressive disregard for originality.

Rule of three:

- Once is an event.
- Twice is an incident.
- Thrice is a pattern.

Motivation for Software Design Patterns

- Designing reusable software is hard
(Originality is Overrated)
- Some design solutions reoccur; understanding their core is beneficial
- Systematic software-development



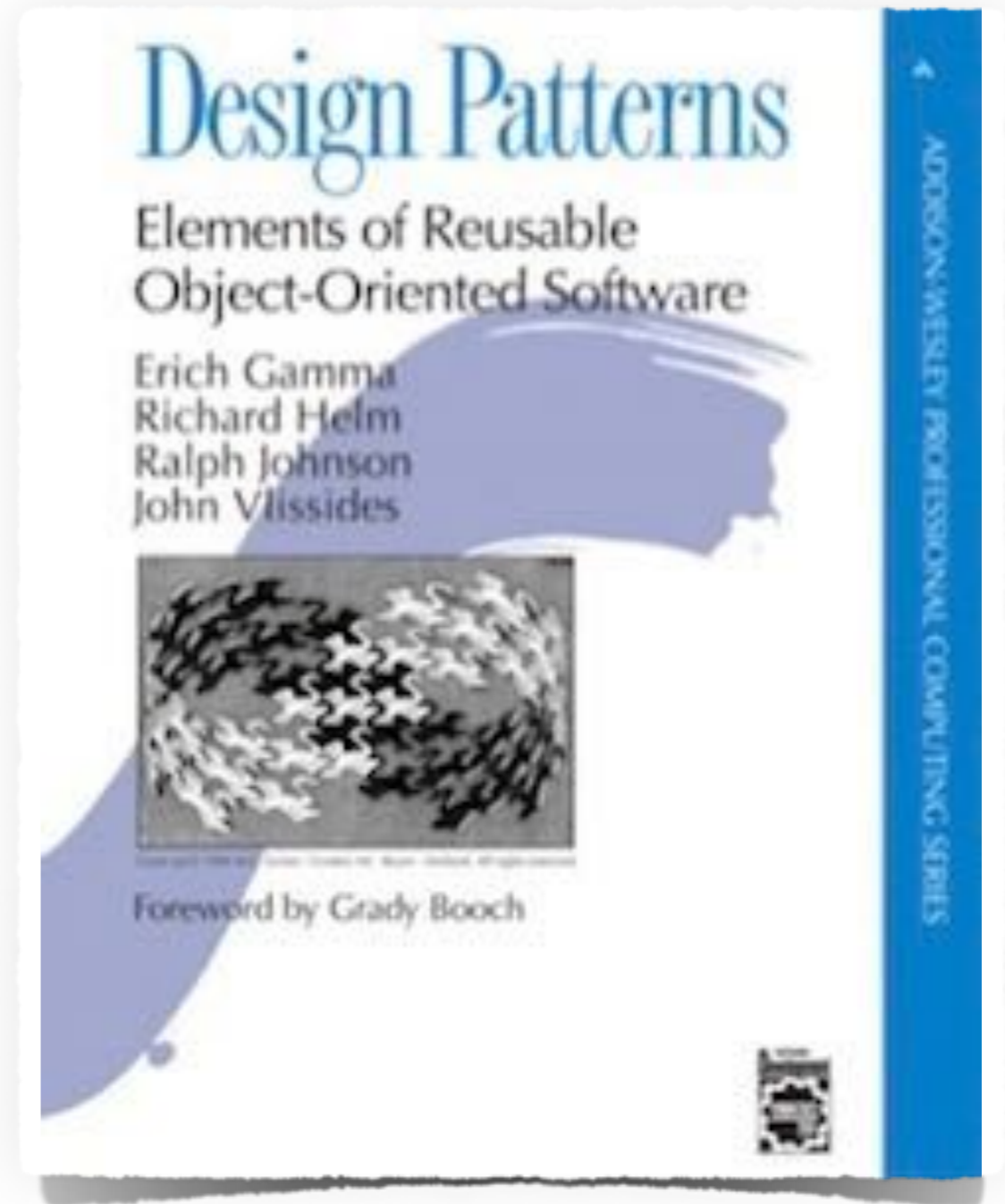
Design Patterns and Change

- Most patterns address issues of software change/evolution
- **Most patterns allow some part of the system to vary independently** of the other parts
- We often try to identify what varies in a system and encapsulate it



Elements of Design Patterns

- Pattern Name
- Intent
- Solution
- Consequences



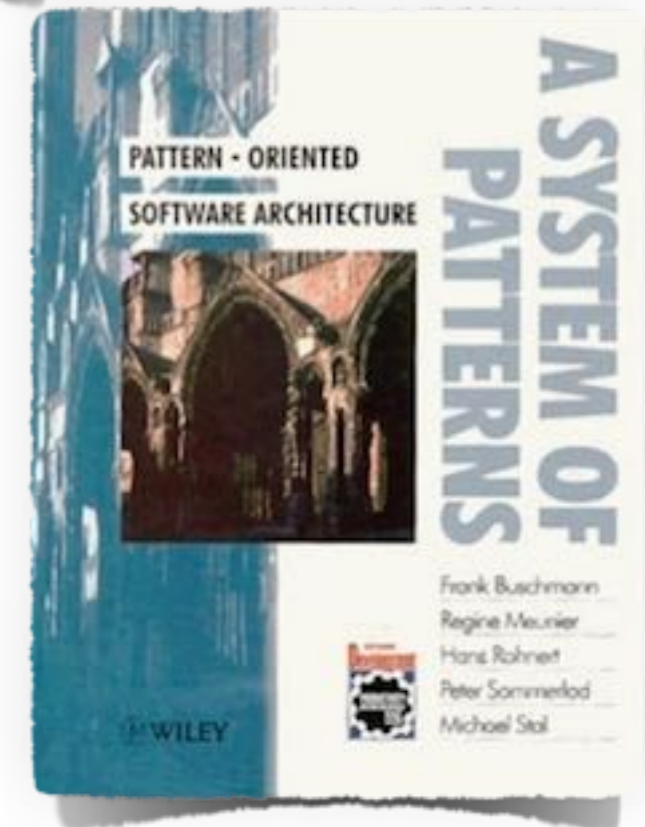
R. Martin's Chess Analogy

- When people begin to play chess they learn the rules and physical requirements of the game.
 - As they progress, they learn the principles.
 - However, to become a master of chess, one must study games of other masters.
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- So it is with software. First one learns the rules. The algorithms, data structures, and languages of software.
- Later, one learns the principles of software design.
- But to truly master software design, one must study the designs of other masters.

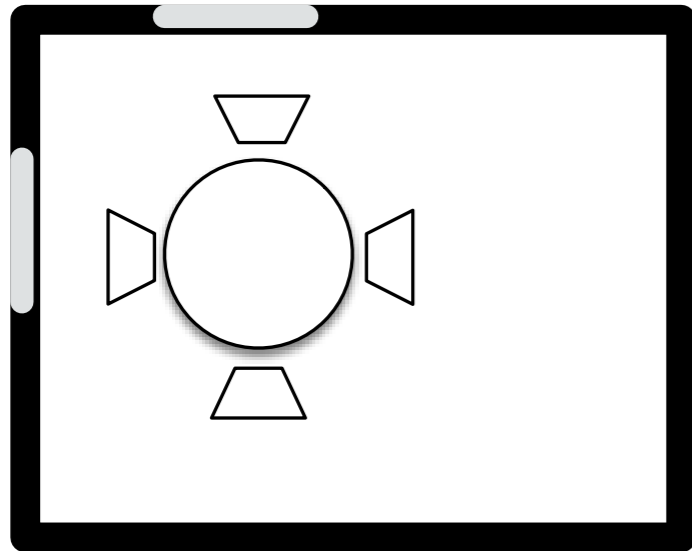
Software Design Patterns

Selected Books

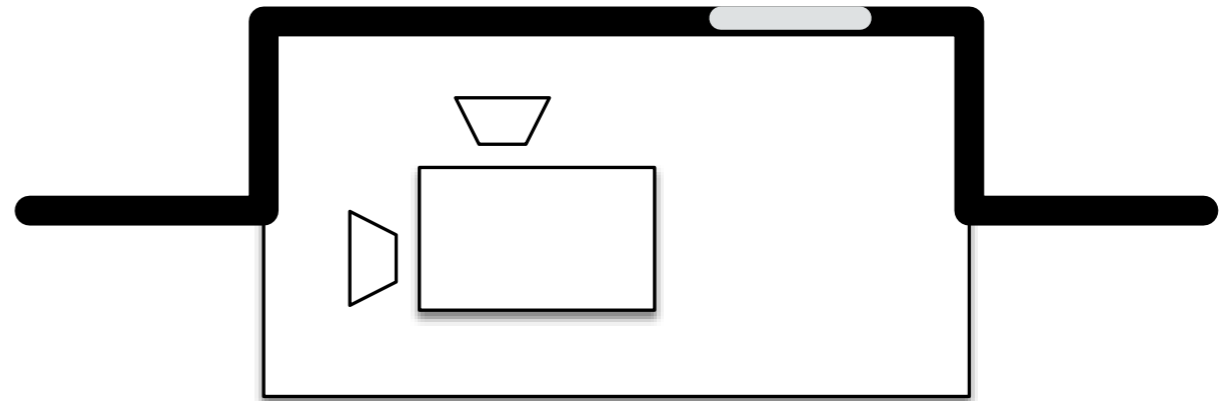


Patterns in Architecture

Light from two sides



Deep terrace



Discussed Patterns

- Quick warm up with the Template Method Pattern
- The Strategy Pattern
- The Decorator Pattern
- The Proxy Pattern
- The Visitor Pattern
- The Bridge Pattern
- The Adapter Pattern
- The Builder Pattern
- The Command Pattern