CS 535 Object-Oriented Programming & Design
Fall Semester, 2000
Doc 1 Intro Lecture
Contents

References

Object-Oriented Software Construction, Bertrand Meyer, Prentice Hall, 1988

Object-Oriented Software Development: A Practical Guide, Mark Lorenz, Prentice Hall, 1993

Introduction
History and Languages

1967	Simula
1970 to 1983	Smalltalk developed
1979	Common LISP Object System
1980	Stroustrup starts on C++
1981	Byte Smalltalk issue
1983	Objective C
1986	C++
1987	Actor, Eiffel
1991	C++ release 3.0
199x	Volumes of OO books/articles
1992	Refactoring thesis at UIUC
1995	Design Patterns, Squeak
1996	Java
1998	Extreme Programming
2000	Camp Smalltalk, C#

Other OO Languages

Self
Python
Perl 5
Prograph
Modula 3
Oberon
Scheme
Ruby
Smalltalk Venders
    Cincom, IBM, Quasar, Disney
Prolog++
Ada 95
Object Pascal (Delphi)
Object X, X = Fortran, Cobol, etc.

Methodologies

Approach to developing software

Methodologies encompass
- Step-by-step methods
- Graphical notation
- Documentation techniques
- Principles, guidelines, policies

Object-Oriented Design (OOD) Booch

Object-Oriented Systems Analysis (OOSA) Shlaer & Mellor

Object Modeling Technique (OMT) Rumbaugh ***et al.***

Object-Oriented Analysis (OOA) Coad & Yourdon

Hierarchical Object Oriented Design (HOOD) European Space Agency, HOOD Working Group

Responsibility-Driven Design (CRC) Wirfs-Brock ***et al.***

Object-Oriented Software Engineering (Objectory) Jacobson

Fusion

Rational Unified Process (RUP) Booch, Jacobson, Rumbaugh

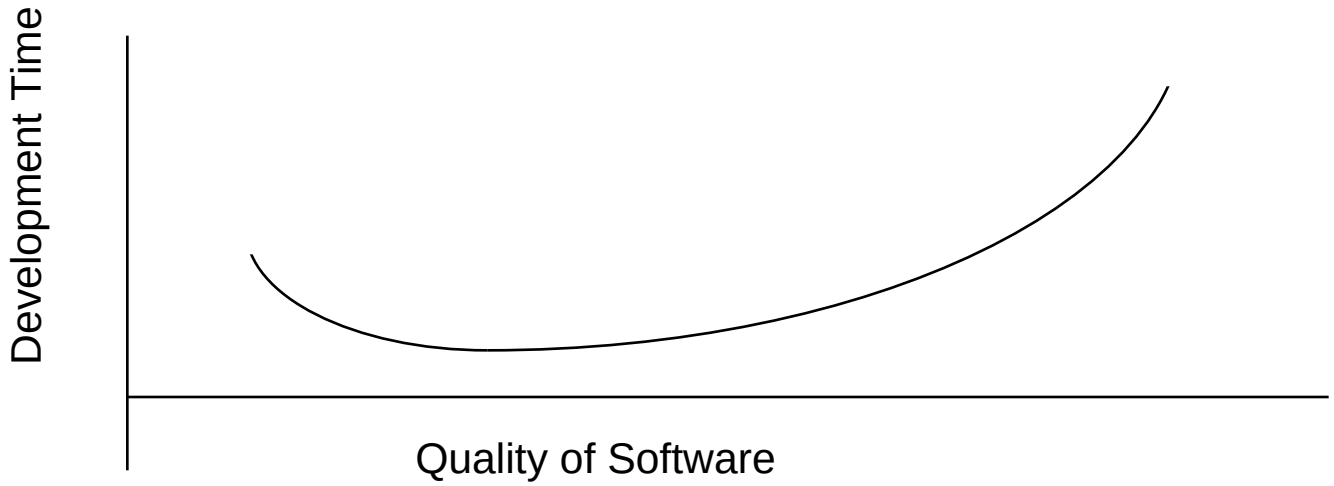
Extreme Programming (XP) Kent Beck, Ron Jeffries

Goals of the Course

Learn how to program using classes and objects

Produce quality software

Quality and Development Time



The right end of the graph with high quality and high development time is found in projects like the Space Shuttle. The software on the shuttle has to work correctly all the time. One cannot reboot while the shuttle is in orbit. Most students and many(most?) companies are on the left side of the graph. They could reduce development by producing better software.

The University is not a Software Development Company

Faculty and Students

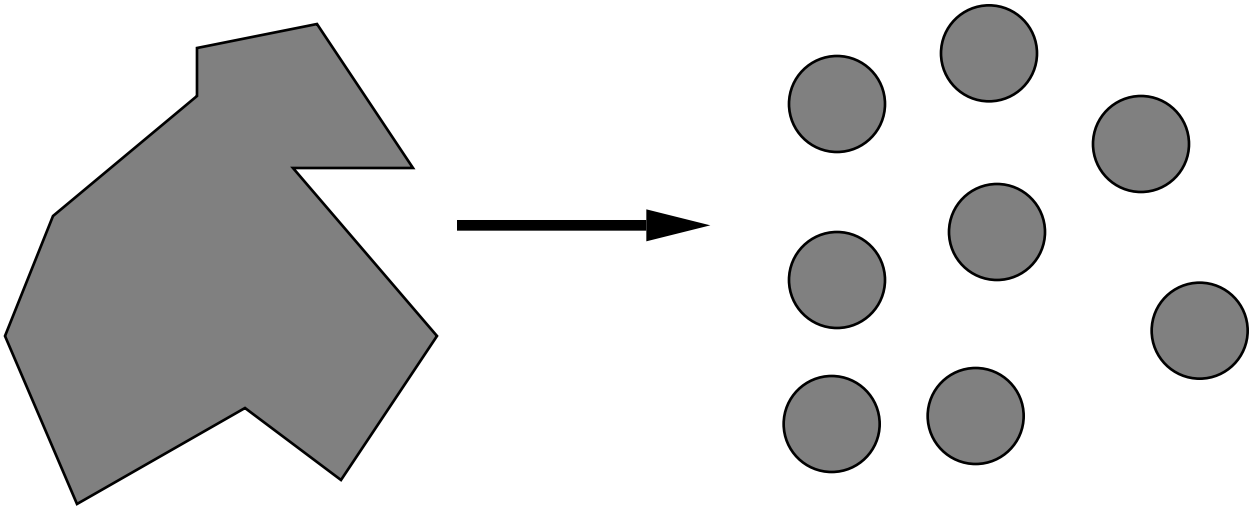
- Cut corners when developing software
- Don't pay attention to software development

Meyer's Criteria for Evaluating for Modularity
Decomposability

Decompose problem into smaller subproblems
that can be solved separately

Example: Top-Down Design

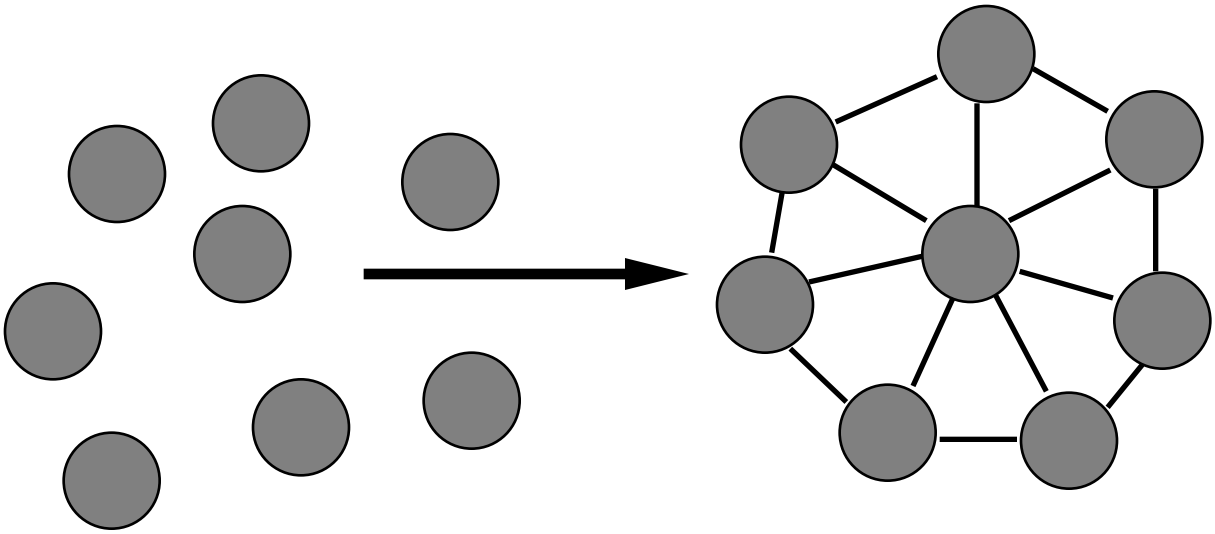
Counter-example: Initialization Module



Meyer's Criteria for Evaluating for Modularity Composability

Freely combine modules to produce new systems

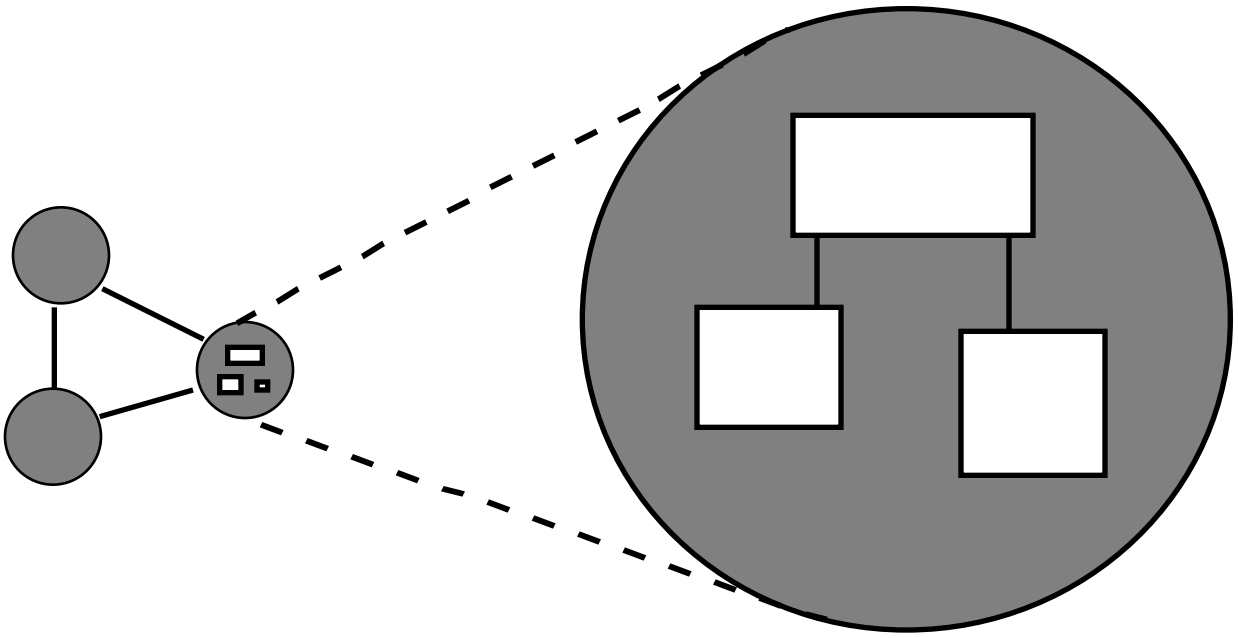
Examples: Math libraries
Unix command & pipes



Meyer's Criteria for Evaluating for Modularity Understandability

Individual modules understandable by human reader

Counter-example: Sequential Dependencies



Meyer's Criteria for Evaluating for Modularity Continuity

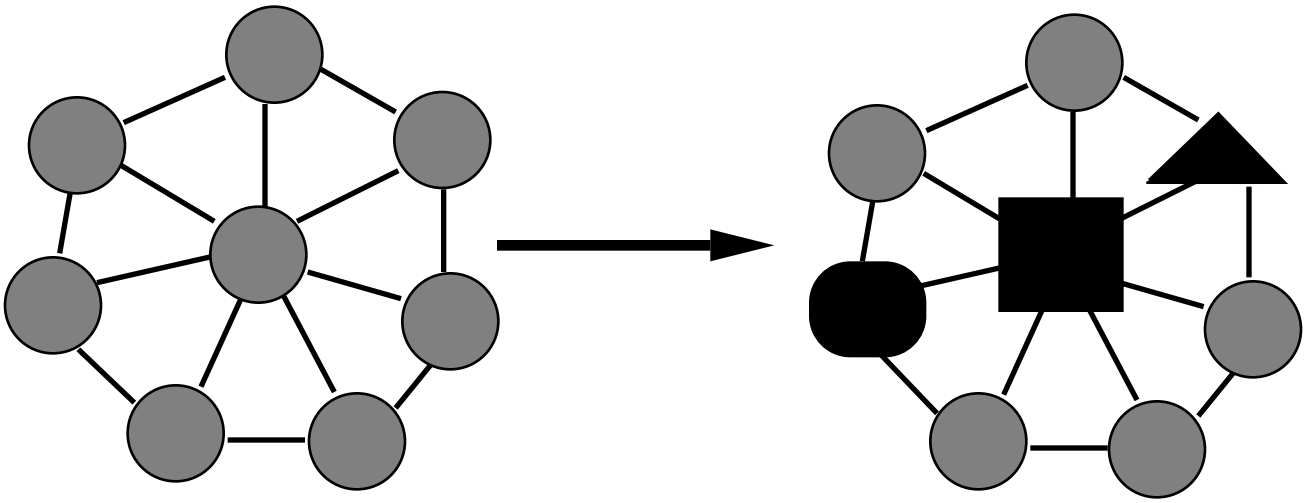
Small change in specification results in:

Changes in only a few modules

Does not affect the architecture

Example: Symbolic Constants

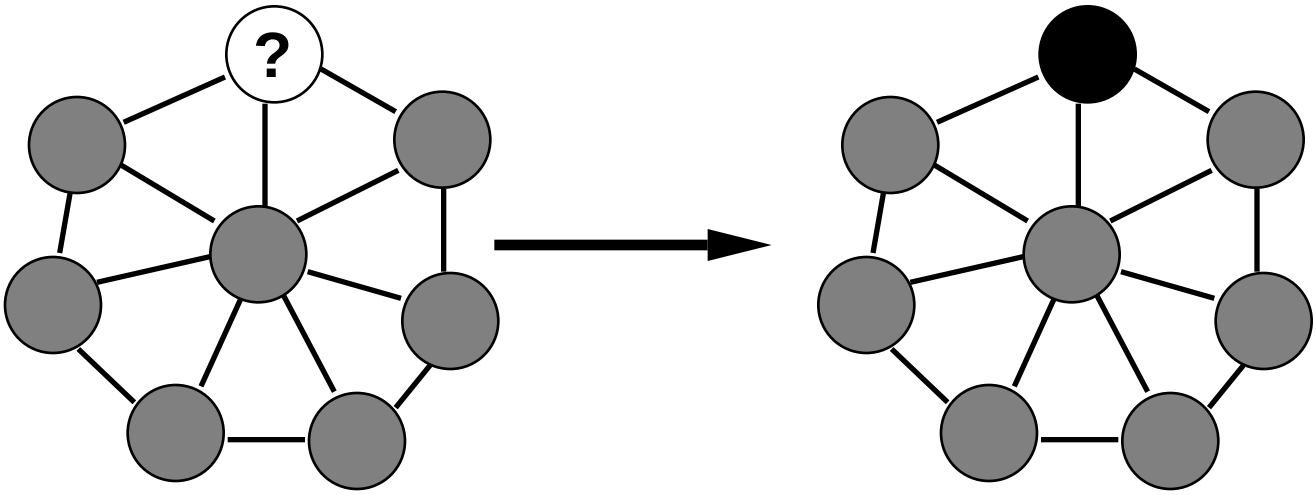
const MaxSize = 100



Meyer's Criteria for Evaluating for Modularity Protection

Effects of an abnormal run-time condition is confined to a few modules

Example: Validating input at source



Principles for Software Development
KISS
Keep it simple, stupid

The simplest thing that could possible work

Supports:

- Understandablity
- Composability
- Decomposability

Small is Beautiful

See page 185 of ***Object-Oriented Software Development: A Practical Guide*** more information about these guidelines.

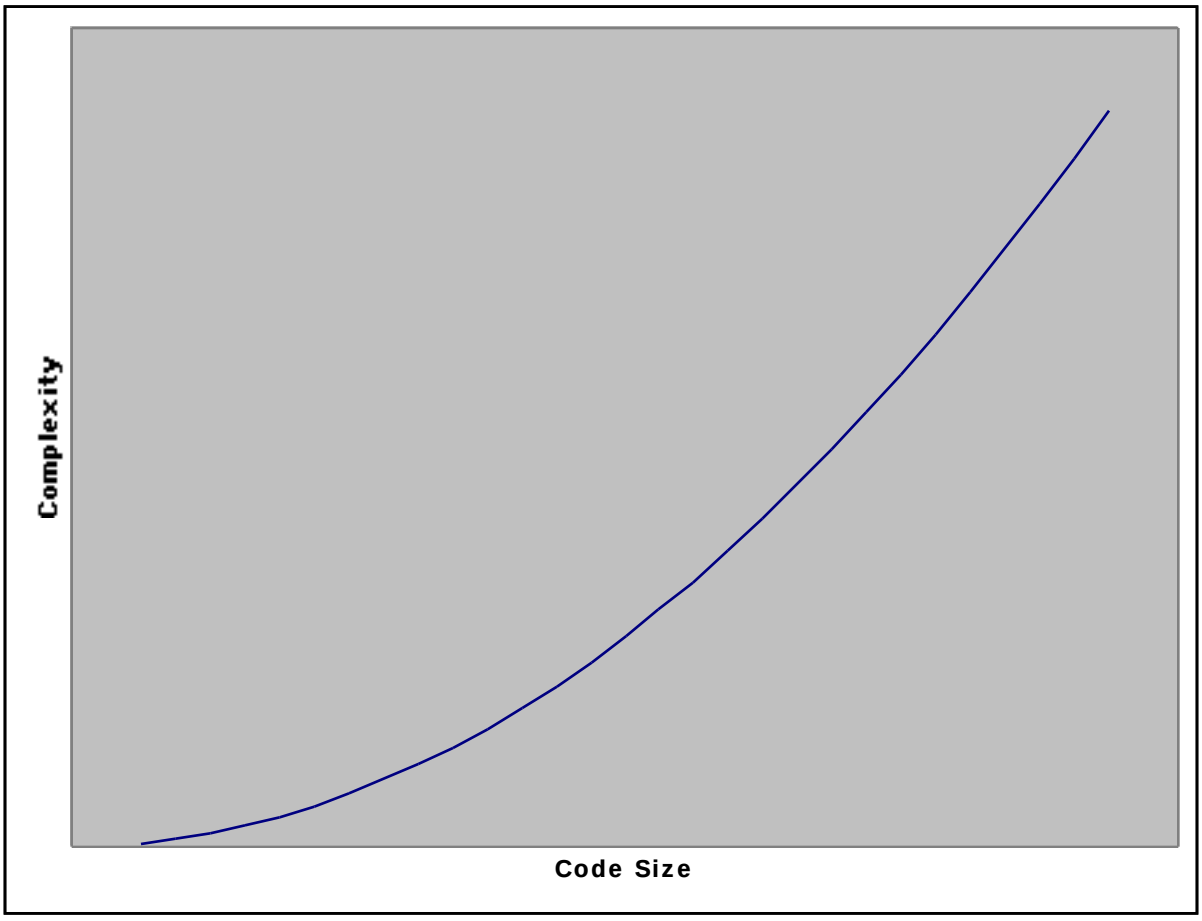
Upper bound for average size of an operation

Language	Lines of Code
Smalltalk	8
C++	24

Supports:

Decomposability
Composability
Understandability

Code Size and Complexity



Applications of Principles

First program:

```
class HelloWorldExample
{
   public static void main( String args[] )
   {
      System.out.println( "Hello World" );
   }
}
```

Some Defintions

- Abstraction
- Encapsulation
- Information Hiding
- Coupling
- Cohesion

Abstraction

"Extracting the essential details about an item or group of items, while ignoring the unessential details."

Edward Berard

"The process of identifying common patterns that have systematic variations; an abstraction represents the common pattern and provides a means for specifying which variation to use."

Richard Gabriel

Example

Pattern: Priority queue

Essential Details: length
items in queue
operations to add/remove/find item

Variation: link list vs. array implementation
stack, queue

Encapsulation

Enclosing all parts of an abstraction within a container

Information Hiding

Hiding parts of the abstraction

Coupling

Strength of interaction between objects in system

Cohesion

Degree to which the tasks performed by a single module are functionally related