

Final Exam

Thursday, Apr 23

3:30-5:30pm

ES 443 (Here)

March 30, 2009

Slides by Mark Hancock
(adapted from notes by Craig Schock)

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Design Patterns Summary

- Introduction
- Structure of Design Patterns
- Categories of Design Patterns

- Singleton Pattern
- Strategy Pattern

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By the end of this lecture, you will be able to describe what a **design pattern** is.

You will also be able to identify a **singleton** design pattern and a **strategy** design pattern.

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“Each pattern describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use the solution a million times over.”

Christopher Alexander (Architect)
A Pattern Language, Oxford University Press, 1977

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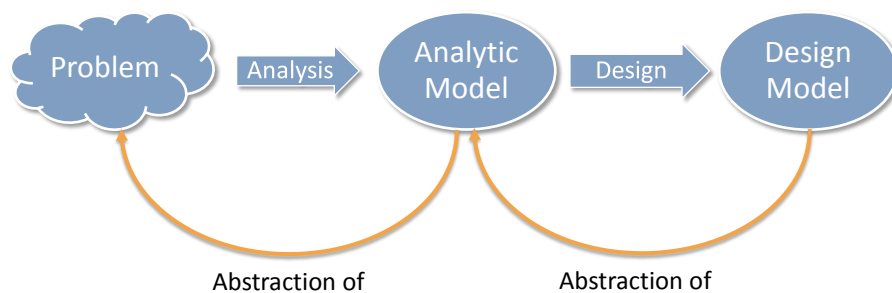
Discussion:

What is knowledge and understanding?
How does it relate to analysis and Design?

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Discussion: How does this quote apply to our understanding of analysis and design?

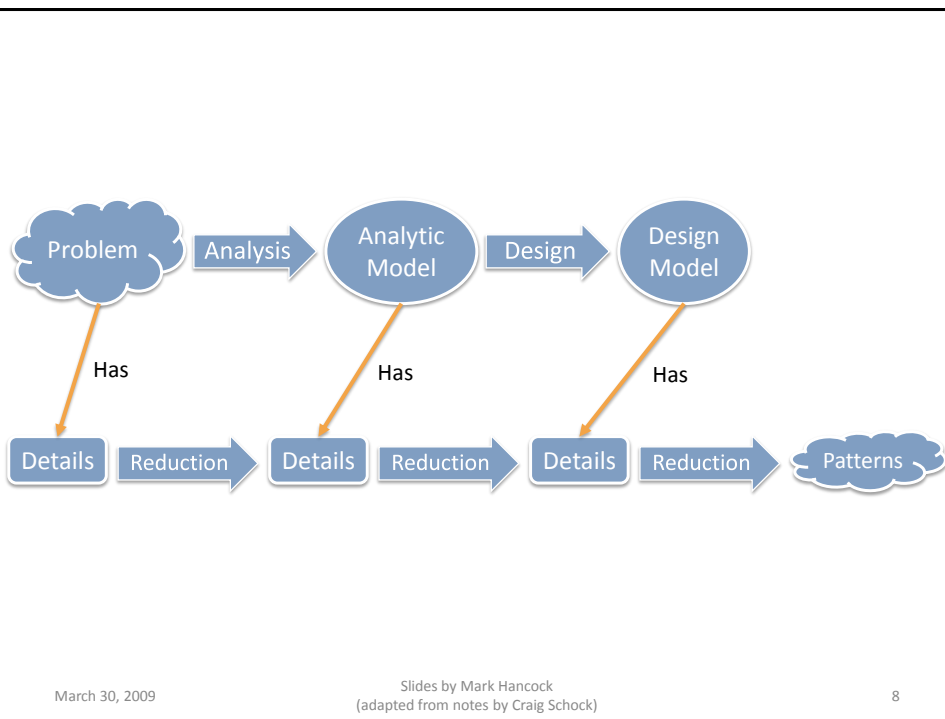
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Discussion:

How can Design Patterns be applied within multiple contexts?

What is your responsibility as a designer/programmer when you use design patterns?

What work has been done for you, what work has not been done?

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Structure of Design Patterns

- Name
- Problem they solve
- Solution
 - elements, relationships, responsibilities, collaborations
- Consequences
 - constraints, tradeoffs

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From *Design Patterns* Textbook

- Pattern name and Classification
- Intent
- Also Known As
- Motivation
- Applicability
- Structure
- Participants
- Collaborators
- Consequences
- Implementation
- Sample Code
- Known Uses
- Related Patterns

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Categories of Design Patterns

- Creational
- Structural
- Behavioural

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Singleton Design Pattern

```
public class Singleton
{
    private static Singleton theInstance = null;

    // instance variables defined here

    public static Singleton getInstance()
    {
        if (theInstance == null)
        {
            theInstance = new Singleton();
        }
        return theInstance;
    }

    private Singleton()
    {
    }

    // instance methods implemented here.
}
```

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Strategy Design Pattern

```
public abstract class AssertIA
{
    private static AssertIA current
        = new AssertIANormal();

    public static void set(AssertIA assertion)
    {
        if (assertion != null)
        {
            current = assertion;
        }
    }

    // cont'd on next slide
}
```

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Strategy Design Pattern (cont'd)

```

public static void assertTrue(boolean assertion,
                               String message)
{
    current.assertTrueImpl(assertion, message);
}

public static void assertFalse(boolean assertion,
                                 String message)
{
    current.assertFalseImpl(assertion, message);
}

public abstract void assertTrueImpl(boolean cond,
                                     String message);
public abstract void assertFalseImpl(boolean cond,
                                     String message);
}

```

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Strategy Design Pattern (cont'd)

```

public class AssertIANormal extends AssertIA
{
    public void assertTrueImpl(boolean assertion,
                               String errorMessage)
    {
        if (!assertion)
            throw new IllegalArgumentException(errorMessage);
    }

    public void assertFalseImpl(boolean assertion,
                                 String errorMessage)
    {
        if (assertion)
            throw new IllegalArgumentException(errorMessage);
    }
}

```

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Strategy Design Pattern (cont'd)

```
public class AssertIADebug extends AssertIA
{
    public void assertTrueImpl(boolean assertion,
                               String errorMessage)
    {
        System.out.println("Assert True: " +
                           assertion + " " + errorMessage);
        if (!assertion)
            throw new IllegalArgumentException(errorMessage);
    }

    public void assertFalseImpl(boolean assertion,
                                 String errorMessage)
    {
        System.out.println("Assert False: " +
                           assertion + " " + errorMessage);
        if (assertion)
            throw new IllegalArgumentException(errorMessage);
    }
}
```

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References

The material in these notes is based on *Design Patterns: Elements of Reusable Object-Oriented Software* by Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides. Addison-Wesley, 1995.

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Assignment #4 Discussion

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Next Class

- HCI
- Demo

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