CSSE 374:
Persistent Frameworks with GoF Design Patterns & Deployment Diagrams

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Plan for Today

Thursday: In-class project work day

- **Some final perspectives on Software Architecture and Design**

- **Course Recap**

- **Design Studio: Team 2.1**

- **Course evaluations**

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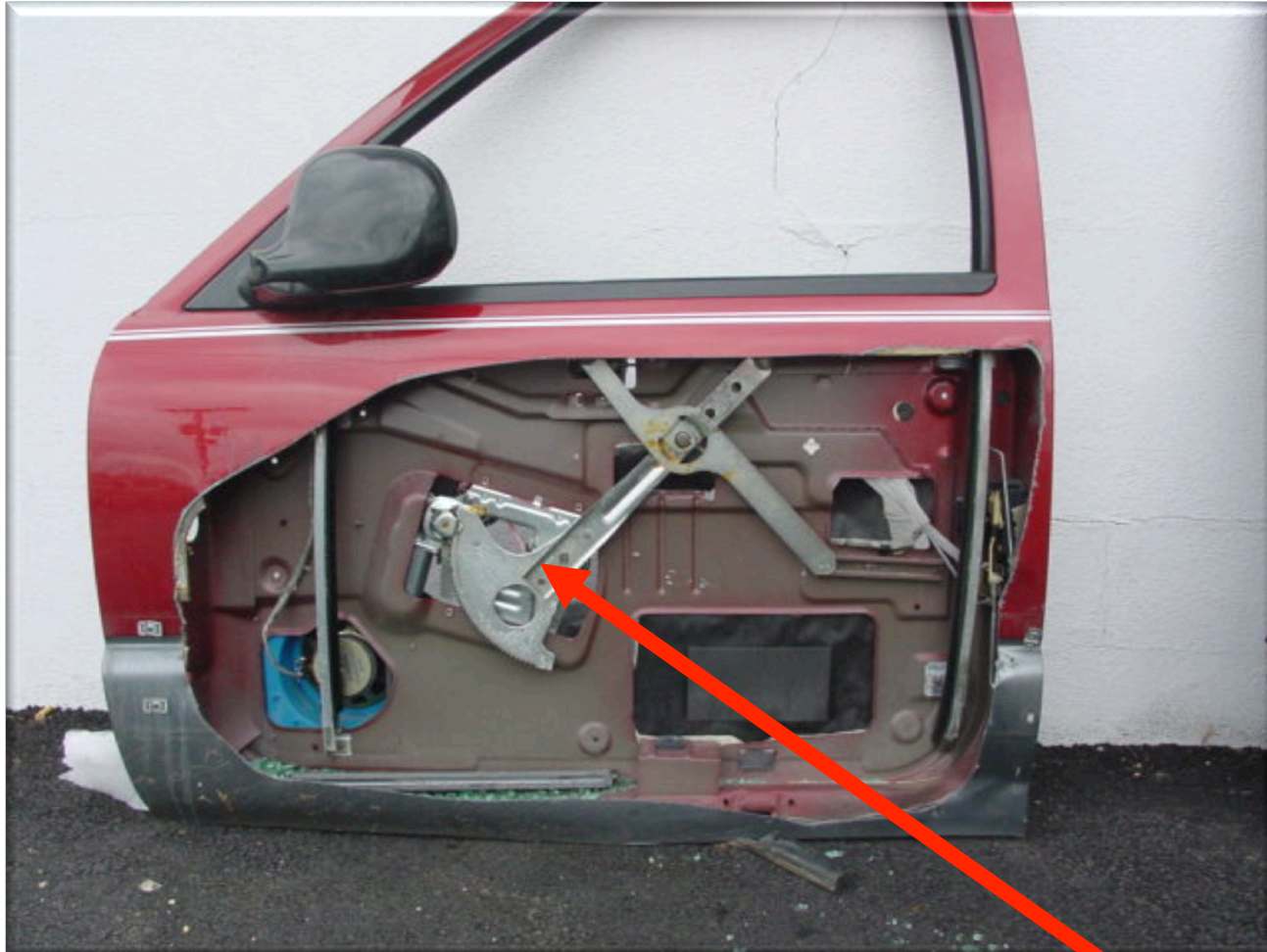# Should you start development by modeling the existing system?

Why would this be a good idea?
Why would this be a bad idea?

☐ Think for 15 seconds…

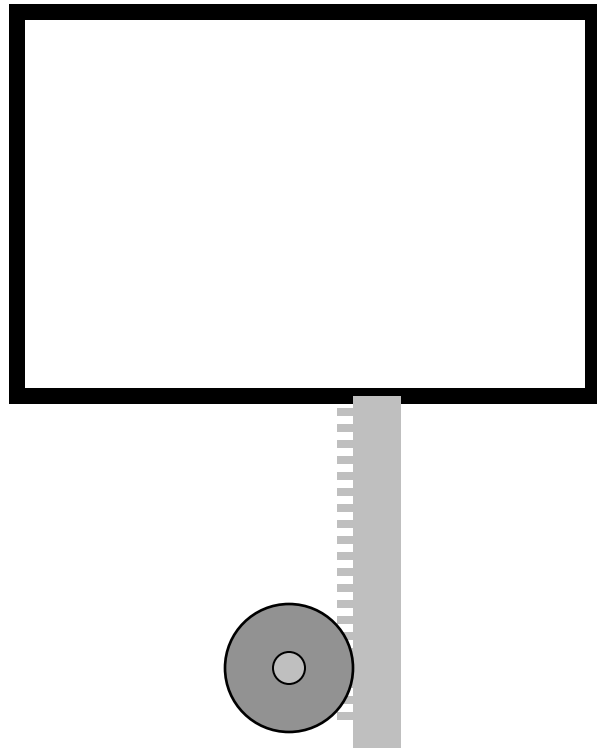☐ Turn to a neighbor and discuss it for a minute

Example of Saving the Old
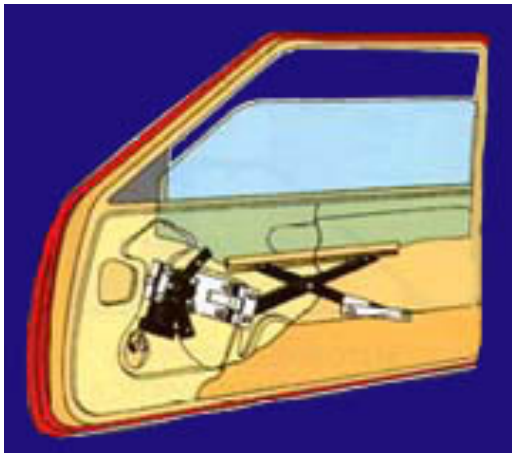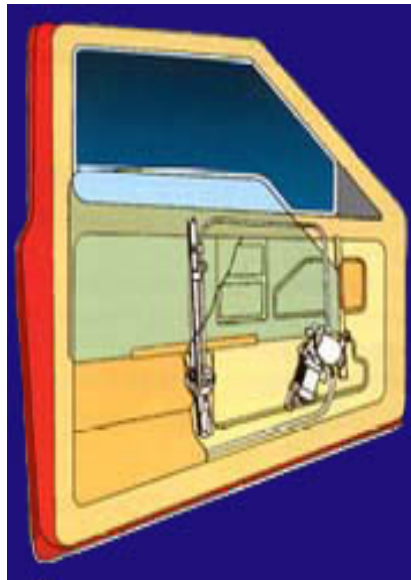
In Comes Power Windows...

A Better Design?

- **With a straight toothed lever, you could use a smaller motor, save weight, save money, use less leverage, and have more reliability and better gas mileage.**

- **By saving 10 pounds per car, you could save the equivalent of one car for every 350 cars made.**

Source: George Blank

Actual Power Window Types

Scissors type	Cable type	Bowden type
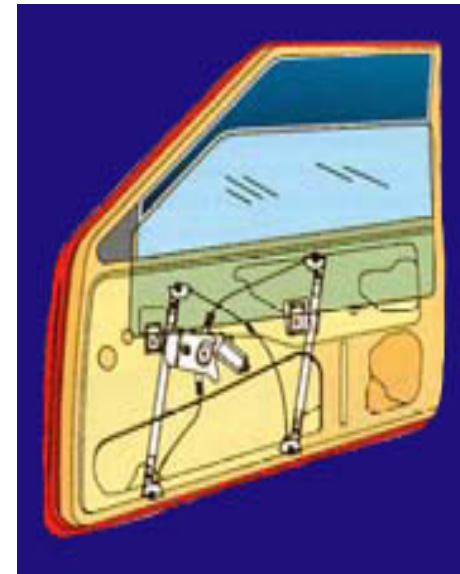
Examples from Italian Manufacturer ElectricLife Windows

What are some Design Examples from Software Engineering?

Source: George Blank

What makes a Great Automobile?

- **Good styling and technology? Speed, reliability? Cheapness?**

- **Consider quality from the standpoint of fitness for a purpose…**
  - ☐ **Family Cars: Minivans**

  - ☐ **Budget Cars: Hyundai and Kia**

  - ☐ **Luxury Cars: Mercedes and Rolls Royce**

Minivans

- Minivans have **embarrassed more teenage males** than any others (borrowed for a date)

- Minivans are average, ordinary, family cars, with nothing exciting about their styling

- Precisely because they fit the needs of many families, they are some of the best selling models in Detroit's history

- That is fitness for a purpose

Budget Cars: Hyundai and Kia

- **Hyundai and Kia are very hard to describe as quality products**

- **But these Korean cars have a very definite market niche.**
  - □ **They offer people who otherwise could only afford used cars the opportunity to buy a new car**

- **That is fitness for a purpose**

Rolls Royce and Mercedes

- **Built to burn money, not just gas or diesel!**

- **Have high reliability records because dealers are trained to replace parts before they fail**
  - **This results in very high service costs**

- **However, they also tend to have the most luxury, convenience, gadgets, and performance…**

Fit for someone's purpose…

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What's it take to be a good Designer?

- Don't model the current system

- Focus on Goals

- Study the Problem before you think about a solution

- Fitness for a Purpose

- Defer decisions

- Use good Design Patterns

- Design as an artist, not a mechanic

Good Design, Happy Cats?

Course Recap

Course Themes

- Object-oriented design as assignment of responsibilities

- Using design principles and patterns to think about object-oriented designs

- Using design principles, patterns, and notations to communicate design ideas

- Begin practicing the art and science of object-oriented design

Notations Used

Analysis

- **Domain models (DM)**

- **System sequence diagrams (SSD)**

- **Operation Contracts**

Architecture

- **Logical architecture diagrams**

- **Package diagrams**

Logical Design

- **Design class diagrams (DCD)**

- **Interaction diagrams (ID)**

  - ☐ **Sequence diagrams (SD)**

  - ☐ **Communication diagrams (CD)**

Bus. Process Modeling

- **Activity diagrams**

Physical Design

- **Deployment diagrams**

GRASP Principles

1. **Low Coupling**

2. **High Cohesion**

3. **Information Expert**

4. **Creator**

5. **Controller**

6. **Polymorphism**

7. **Pure Fabrication**

8. **Indirection**

9. **Protected Variations**

Gang of Four (GoF) Design Patterns

- **Behavioral**
  - ☐ **Strategy**
  - ☐ **Observer**
  - ☐ **Template Method**
  - ☐ **State**
  - ☐ **Command**
- **Creational**
  - ☐ **Factory Method**
  - ☐ **Abstract Factory**
  - ☐ **Singleton**

- **Structural**
  - ☐ **Adapter**
  - ☐ **Composite**
  - ☐ **Façade**
  - ☐ **Proxy**
  - ☐ **Decorator**

Others:
Interpreter, Chain of Responsibility, Iterator, Mediator, Memento, Visitor, Builder, Bridge, Prototype, Flyweight

Examples of Change and Patterns

What Varies	Design Pattern
Algorithms	Strategy, Visitor
Actions	Command
Implementations	Bridge
Response to change	Observer
Interactions between objects	Mediator
Object being created	Factory Method, Abstract Factory, Prototype
Structure being created	Builder
Traversal Algorithm	Iterator
Object interfaces	Adapter
Object behavior	Decorator, State

Learning Outcomes: Teamwork

Work effectively with a team of software project stakeholders, including customers and members of the development team.

Learning Outcomes: Object-Oriented Design

Demonstrate object-oriented design basics

like domain models, class diagrams,

and interaction (sequence and communication) diagrams.

http://enterprisegeeks.com/blog/2009/07/

Learning Outcomes: Problems and Solutions

Recognize the differences between problems and solutions and deal with their interactions.

http://www.geekologie.com/2007/02/rubiks_cube_for_the_lazy_perso.php

Learning Outcomes: Fundamental Design

Use fundamental design principles, methods, patterns and strategies in the creation of a software system and its supporting documents.

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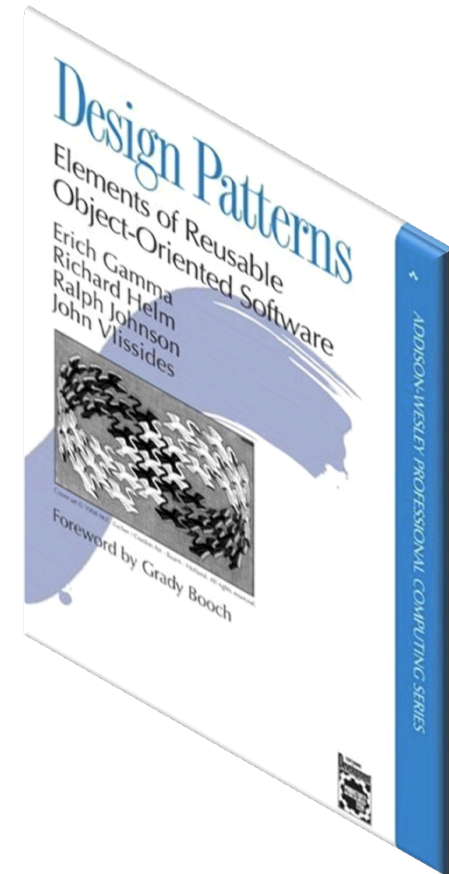
Learning Outcomes: Patterns, Tradeoffs

Identify criteria for the design of a software system and select patterns, create frameworks, and partition software to satisfy the inherent trade-offs.

You've come a long way

You're beginning to talk and think like software designers and architects!

Design Studio Calendar

	Monday	Tuesday	Thursday
8th week		Team 2.4	Team 2.1
9th week	Team 2.2	Team 2.3	Team 2.5
10th week	Team 2.4	Today Team 2.1	Course Wrap-up

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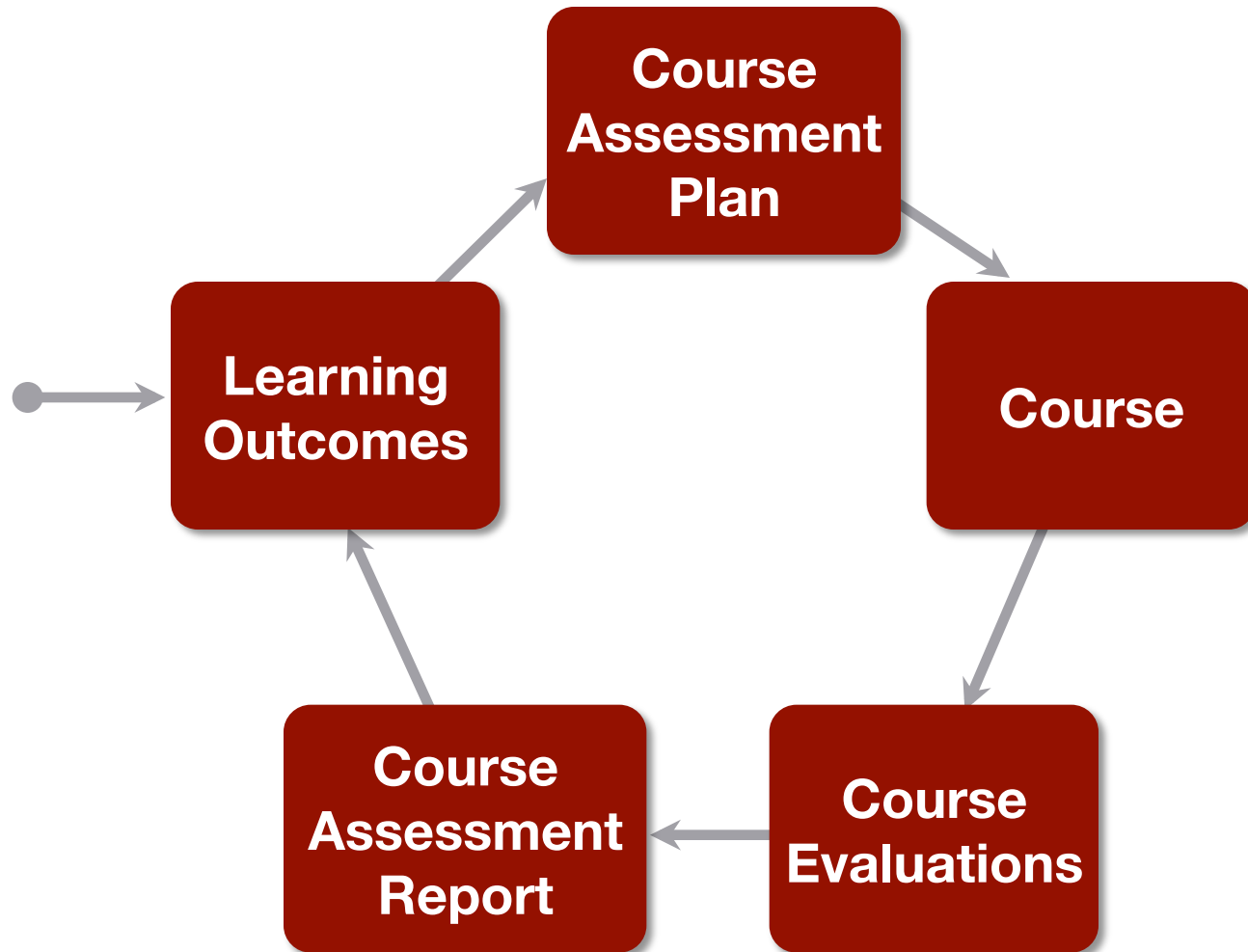INSTITUTE OF TECHNOLOGY

Course Evaluations

A Mechanism for Improvement

What are Course Evaluations used for?

- **Improve Courses and Curriculum**

- **Improve Instructor Performance**

- **Input for Promotion and Tenure**

Improve Courses and Curriculum

Source: Curt Clifton

Improve Instructor Performance

- **Comments and summary to instructor**
  - ☐ **Read carefully and considered**

- **Instructor adds response:**
  - ☐ **Plan for improvement**
  - ☐ **Explanation for key comments**

- **Package goes to department head for review**

Source: Curt Clifton

Promotion and Tenure Input

- **Full set of course evaluations (and 200+ pages of supporting information) goes to Dean and PTR committee**

- **Dean and PTR committee make separate recommendations to President**

- **President has final decision on promotion an tenure**

Source: Curt Clifton

How You Can Be Most Helpful?

TO ME,   TO ROSE-HULMAN,   TO FUTURE STUDENTS, …

- **Consider your audience**
  - ☐ Instructor (primary)
  - ☐ Department head
  - ☐ Dean
  - ☐ PTR committee

- **Give specific and constructive feedback**
  - ☐ What worked well
  - ☐ What didn't work, and how that could be fixed
  - ☐ Make the feedback actionable
    – a few key, better than a long list

Some examples...

- **Encouraging remarks**
  - ☐ **"Project assignments greatly reinforced the class material."**
  - ☐ **"While the material was sometimes difficult, Shawn was always willing to help when I was feeling overwhelmed."**

- **Hard to use examples**
  - ☐ **"I didn't learn anything in this course."**
  - ☐ **"Ditch the exams, they do not work for me. I hate exams…"**

- **Actionable examples**
  - ☐ **"I like Shawn's teaching approach, but he would be even more effective if he tried more active learning exercises."**
  - ☐ **"Shawn's use of Design Studios was effective in class, and he should introduce these earlier in the course."**

Homework and Milestone Reminders

- **Milestone 5 – Final Jr. Project System & Design**
  - ☐ Work with your PM to review what you have
  - ☐ Manage expectations of Client this week
  - ☐ Thursday a Project Focus Day in Class
  - ☐ Final due by 11:59pm on Friday, February 18th, 2011

- **Go to Senior Project Expo at the Student Union Building in Lobby outside of Kahn Room**

- **Team member peer evaluations –**
  - ☐ Distributed Friday, Due Monday
  - ☐ One half of a Homework Grade