



Not your Grandfather's Architecture

Taking Architecture into the
Agile World

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What is architecture?

- Architecture is the essence of structure:
form
 - Structure obfuscates form!
- Lean architecture: just-in-time delivery of functionality, just-in-time pouring material into the forms
- Agile architecture: one that supports change, end-user interaction, discovery, and ease of comprehension (of *functionality*)

What is its value?

- Architecture supports “what happens there”
- Habitable code — by the people who develop it and the people who use it
- Architecture is what makes code feel familiar
- A good architecture reduces waste and inconsistency — muda and mura
 - Less rework
 - System consistency

Architecture and OO

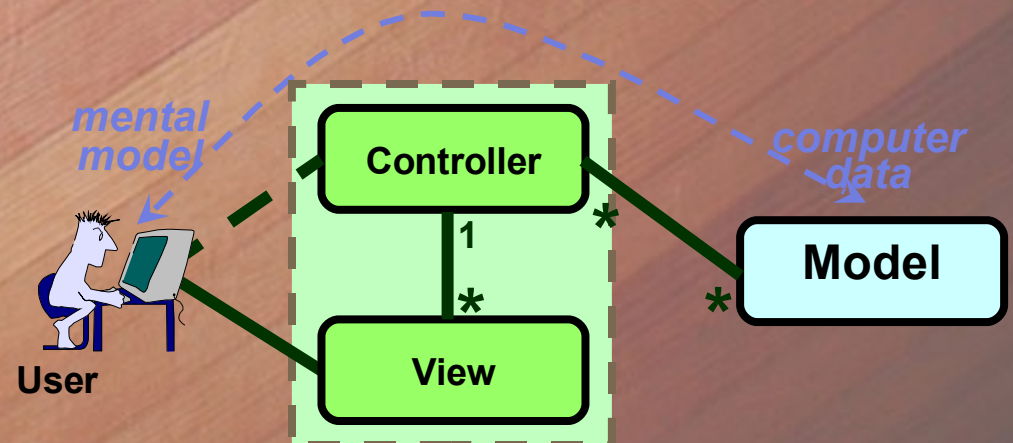
- OO is a paradigm — a way of talking about form
- OO's foundations: to capture the end user's mental models in the code
- OO captures
 - The entities (objects) that users know about
 - The classes that serve as sets of such objects

MVC: The Embodiment of the OO Vision

- User model -> into the code -> presented back to the user
- The goal of *views* is direct manipulation

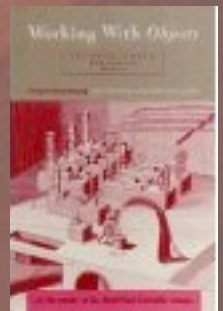
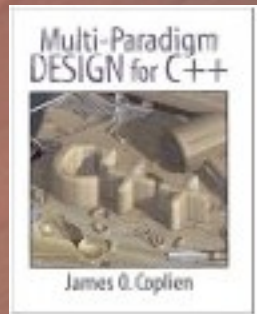
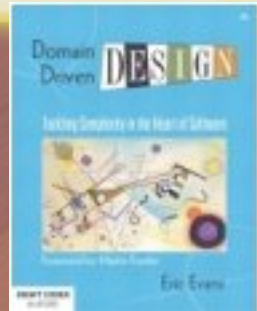


The goal of the *controller* is to coordinate multiple views



Architecture is more than that

- The form of the business domain
 - What the system *is*
 - Domain *model* (as in *MVC*)
 - What the programmer cares about
 - Deliver as abstract base classes
 - Eric Evans' *Domain-Driven Design, Multi-Paradigm Design for C++*
- The form of the system interactions
 - What the system *does*
 - *Role* models: *OORAM*
 - What the end user cares about
 - Has long eluded the OO crowd



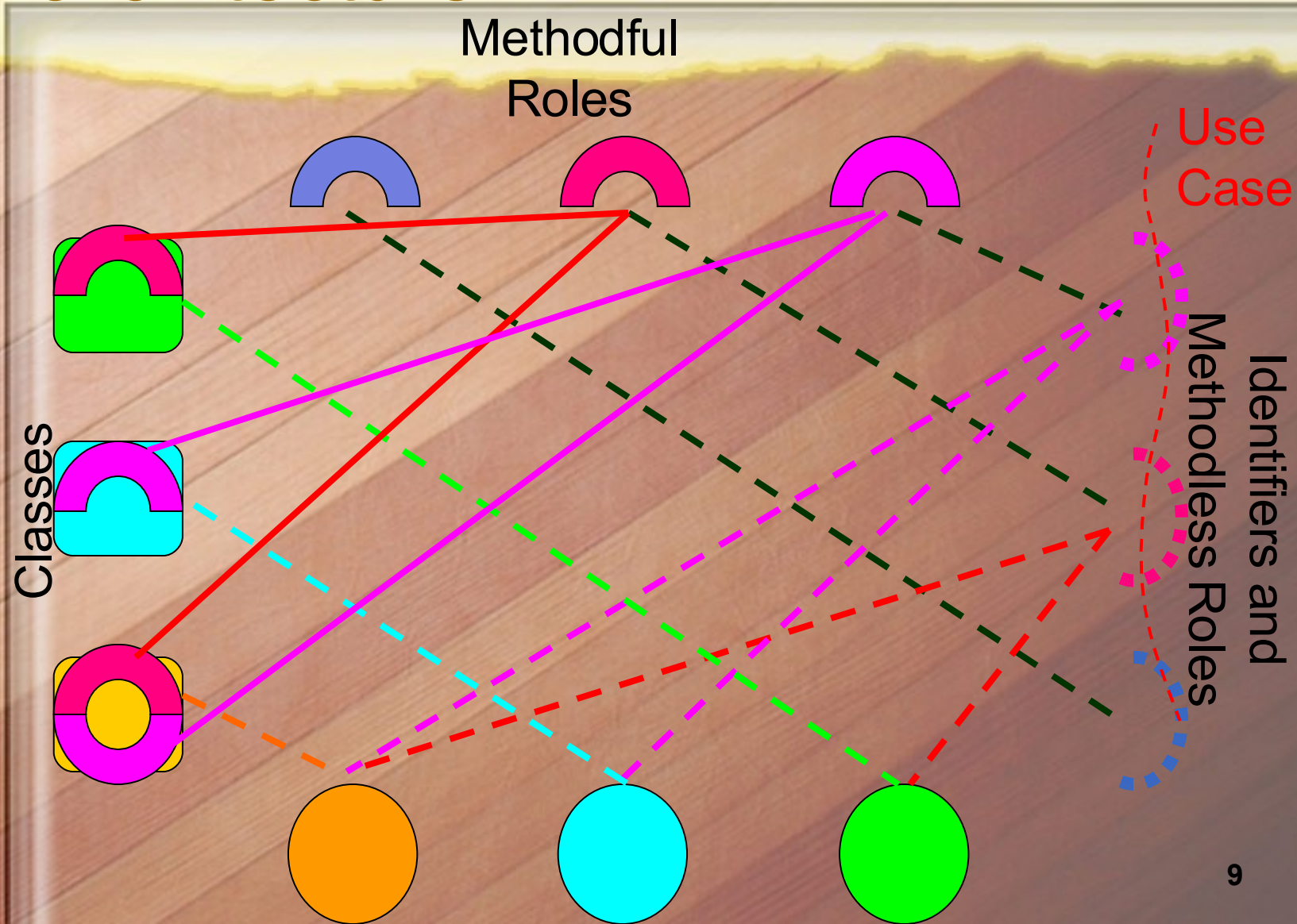
Back to OO: Other forms in the end-user's head

- Users think more about the *roles* played by the objects than the objects
 - What-the-system-does again!
 - Money transfer from a bank account: the roles are Source Account and Destination Account
 - Savings, checking, investment account objects can all take on these roles — so can your phone bill
- The association from roles to objects, for a given use case, is also part of the end user model

Yet a few more forms!

- How about the algorithm?
 - The algorithm also has form in the user's head
 - | Start transaction
 - | Debit Source Account
 - | Credit Destination Account
 - | End transaction
 - In FORTRAN I could argue the correctness of program functionality; I can't do that in Java
 - Object orientation has served the programmers (the discovery process, architecture) but not the end users and customers — and not quality (Hoare)

These forms beg a new architecture



Tricks with Traits

- Need to compose the generic algorithms of method-ful roles with the classes whose objects play those roles
- This is a simple class composition
- Can use Traits (à la Schärli) to glue classes together
 - Extra “hidden” field in Smalltalk classes
 - Current Squeak implementation maps the method name into every class using it
 - Trivial application of templates in C++

The Code

```
template <class ConcreteDerived>
class TransferMoneySink: public MoneySink
{
public:
    void transferFrom(double amount,
MoneySource *src) {
        deposit(amount);
        updateLog("Transfer in", DateTime(),
amount);
    }
};
```

```
template <class ConcreteDerived>
class TransferMoneySource: public MoneySource
{
public:
    // Parameters
    typedef double Currency;
    virtual Currency availableBalance(void) = 0;
    virtual void withdraw(Currency) = 0;
    virtual void updateLog(string, DateTime,
Currency) = 0;
};
```

```
// Role behaviors
void transferTo(Currency amount,
class MoneySink *recipient) {
    // This code is reviewable and testable!
    beginTransaction();
    if (availableBalance() < amount) {
        endTransaction();
        throw InsufficientFunds();
    } else {
        withdraw(amount);
        recipient->deposit(amount);
        updateLog("Transfer Out",
DateTime(), amount);
        recipient->updateLog("Transfer In",
DateTime(), amount);
    }
    gui->displayScreen(
SUCCESS_DEPOSIT_SCREEN);
    endTransaction();
}
```

Injecting the roles into classes

```
class SavingsAccount:
    public Account,
    public TransferMoneySink<
        SavingsAccount> {
public:
    typedef double Currency;
    Currency availableBalance(void);
    void withdraw(Currency);
    void deposit(Currency);
    void updateLog(
        string, DateTime, Currency);
    Currency interest(void) const;
};
```

```
class InvestmentAccount:
    public Account,
    public TransferMoneySource<
        InvestmentAccount> {
public:
    typedef double Currency;
    Currency availableBalance(void);
    void withdraw(Currency);
    void deposit(Currency);
    void updateLog(
        string, DateTime, Currency);
    Currency dividend(void) const;
};
```

(dumb)

What do I get?

- Polymorphism is gone
- All objects that play the same role process the same messages with the same methods
- Algorithms read like algorithms rather than fragments
- Rapidly evolving functionality is separated from stable domain logic
- Can reason about system state and behavior, not just object state and behavior

Or, from an Agile perspective:

- Allows me to connect with the user mental model
 - Users & interactions instead of processes and tools
- Can employ shared customer vocabulary
 - Customer collaboration, not contracts
- Can reason about form of task sequencing
 - More likely to deliver working software
- Exposes the changing part for ready update
 - Embracing change

Learn more at:

- Baby IDE:
 - <http://heim.ifi.uio.no/~trygver/themes/babyide/babyide-index.html>
- Agile Architecture, the book manuscript:
 - <http://sites.google.com/a/gertrudandcope>
- Two Grumpy Old Men:
 - ROOTS 2008



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