



Structural Design Patterns

Eduardo Figueiredo

<http://www.dcc.ufmg.br/~figueiredo>

[Structural Patterns]

- Adapter
- Bridge
- **Composite**
- **Decorator**
- Facade
- Flyweight
- Proxy



Composite

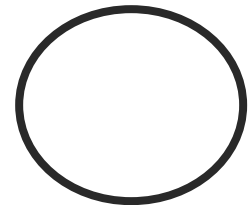
[Motivating Example]

- Some applications let users build complex diagrams out of simple components
- Example: Drawing Application

Simple Figures



line

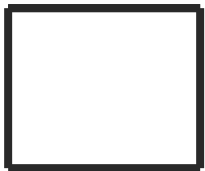


circle

Motivating Example

- The user can group components to form larger components
 - Simple figures: line and circle

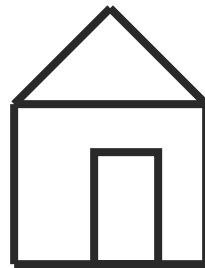
Complex Figures



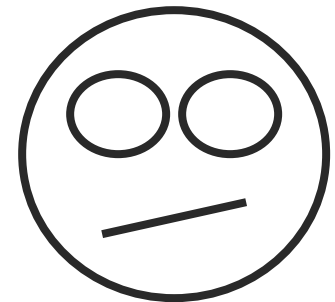
box



triangle

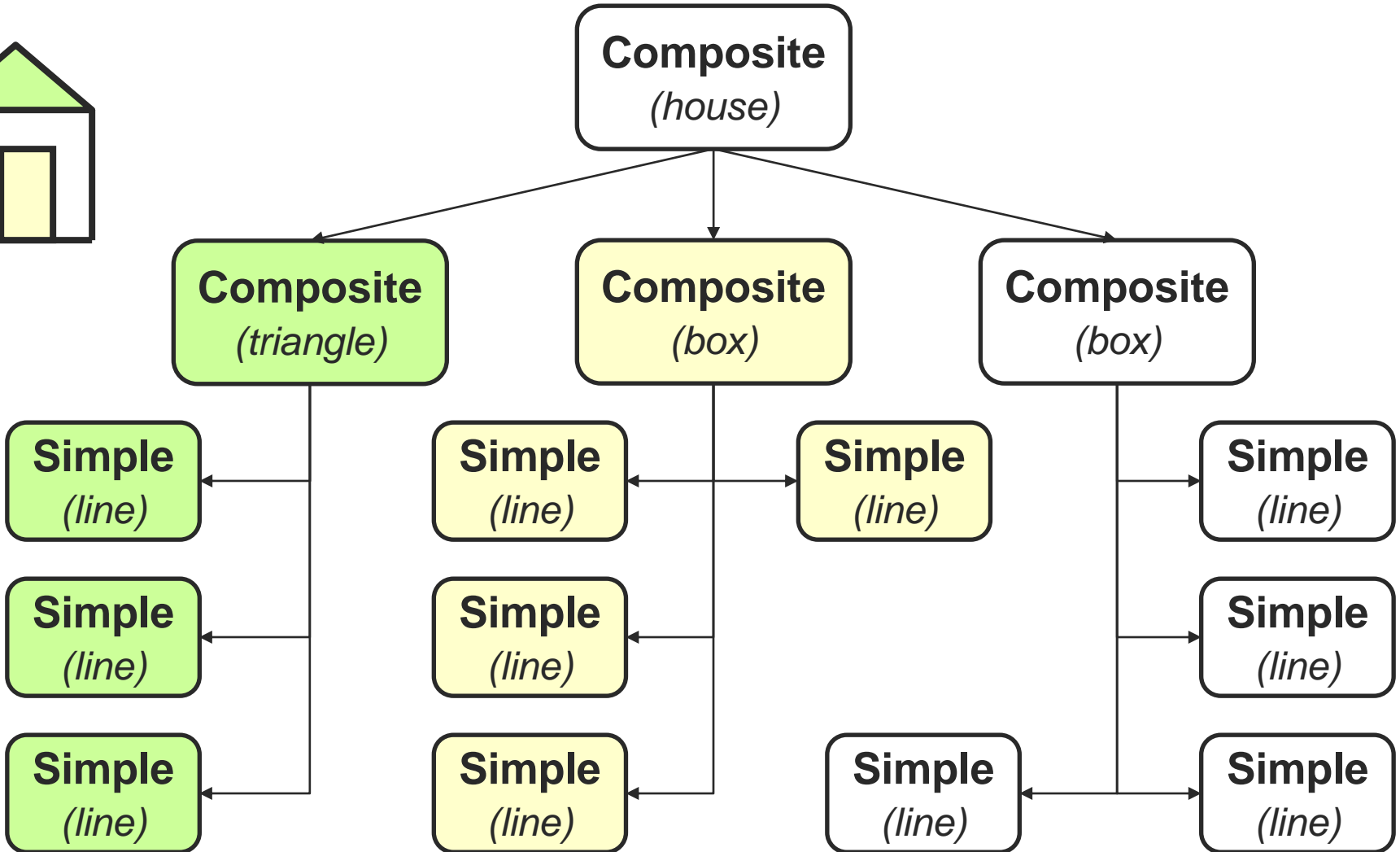
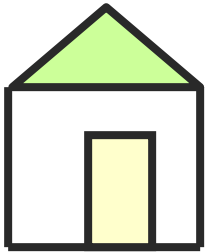


house



face

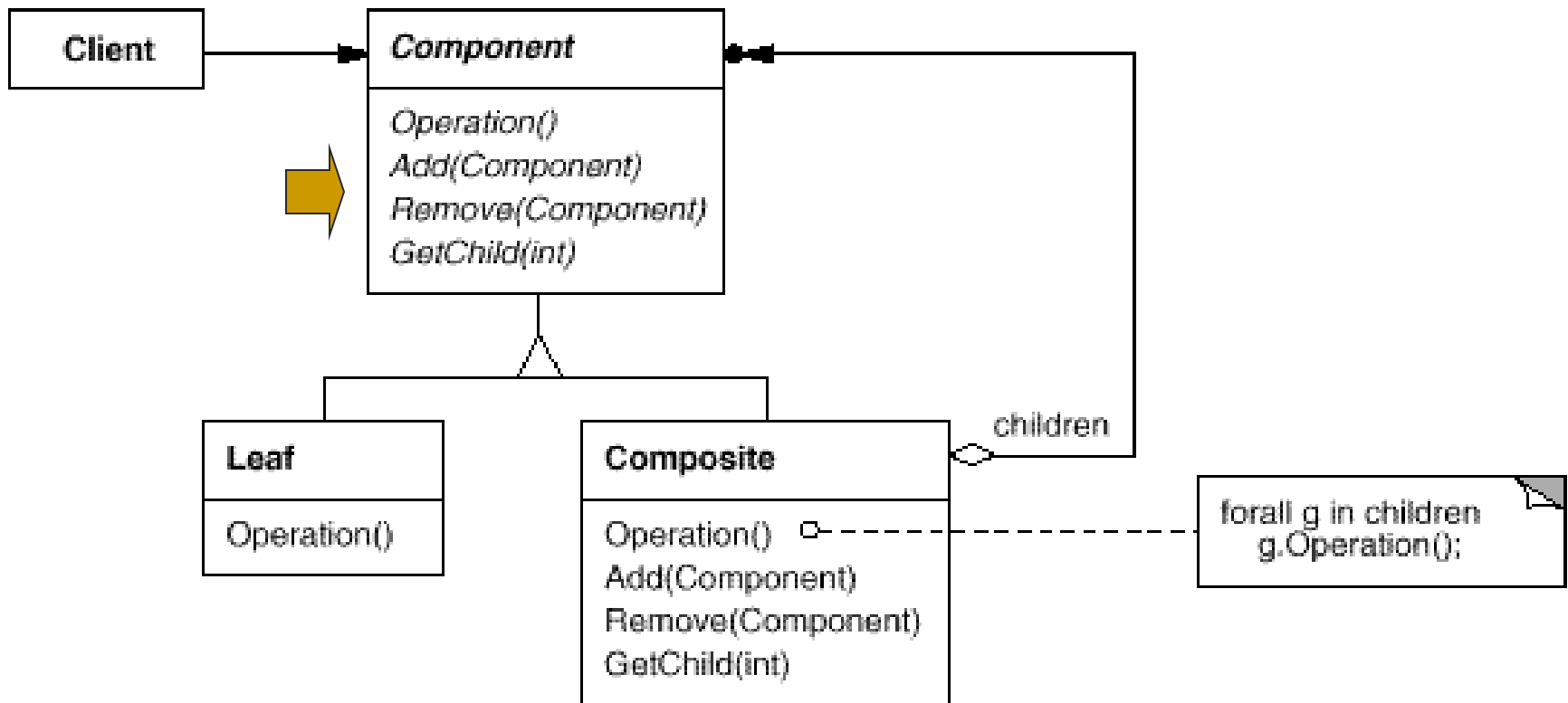
[House Object]



[Composite]

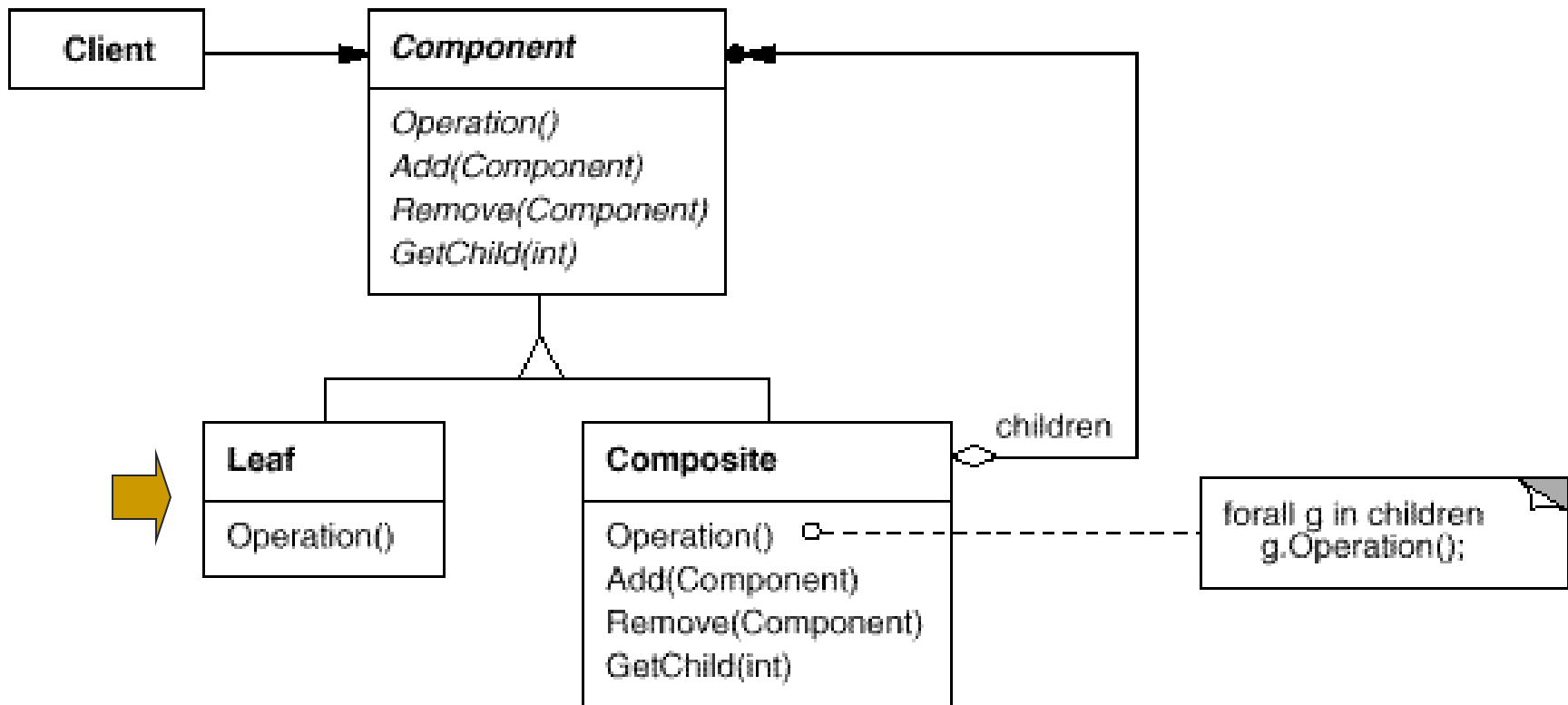
- Name
 - Composite
- Problem Description
 - Compose objects into tree structures to represent part-whole hierarchies
- Solution (*next slide*)
- Consequences
 - Clients will treat all objects uniformly
 - It makes easier to add new components

[Composite Solution]



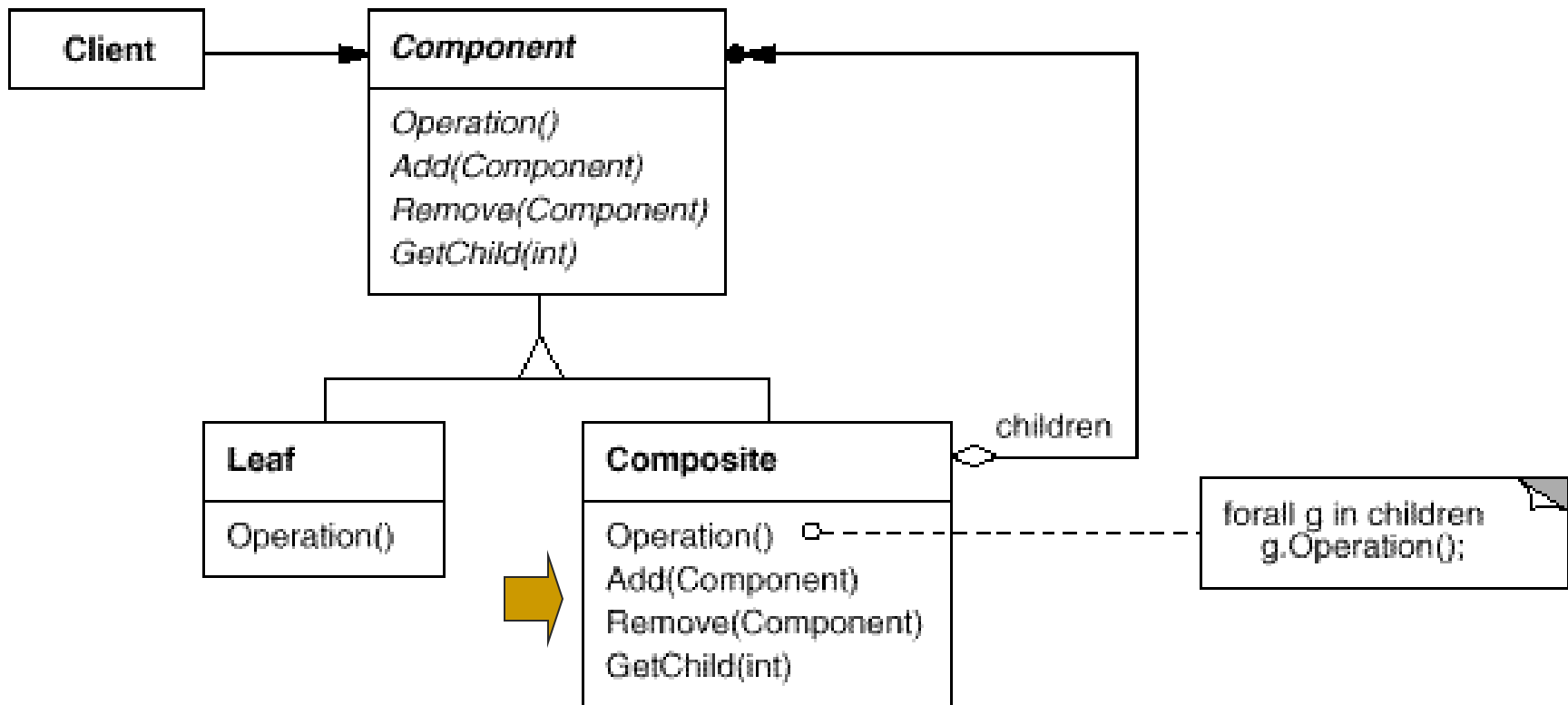
***Component* defines generic methods.**

[The Leaf Class]



Leaf overrides methods to give concrete implementations.

[The Composite Class]



Composite represents complex objects.

A decorative graphic consisting of a thin gold arc at the top and bottom, with a thick black bracket on the left and a thick gold bracket on the right, framing a horizontal bar.

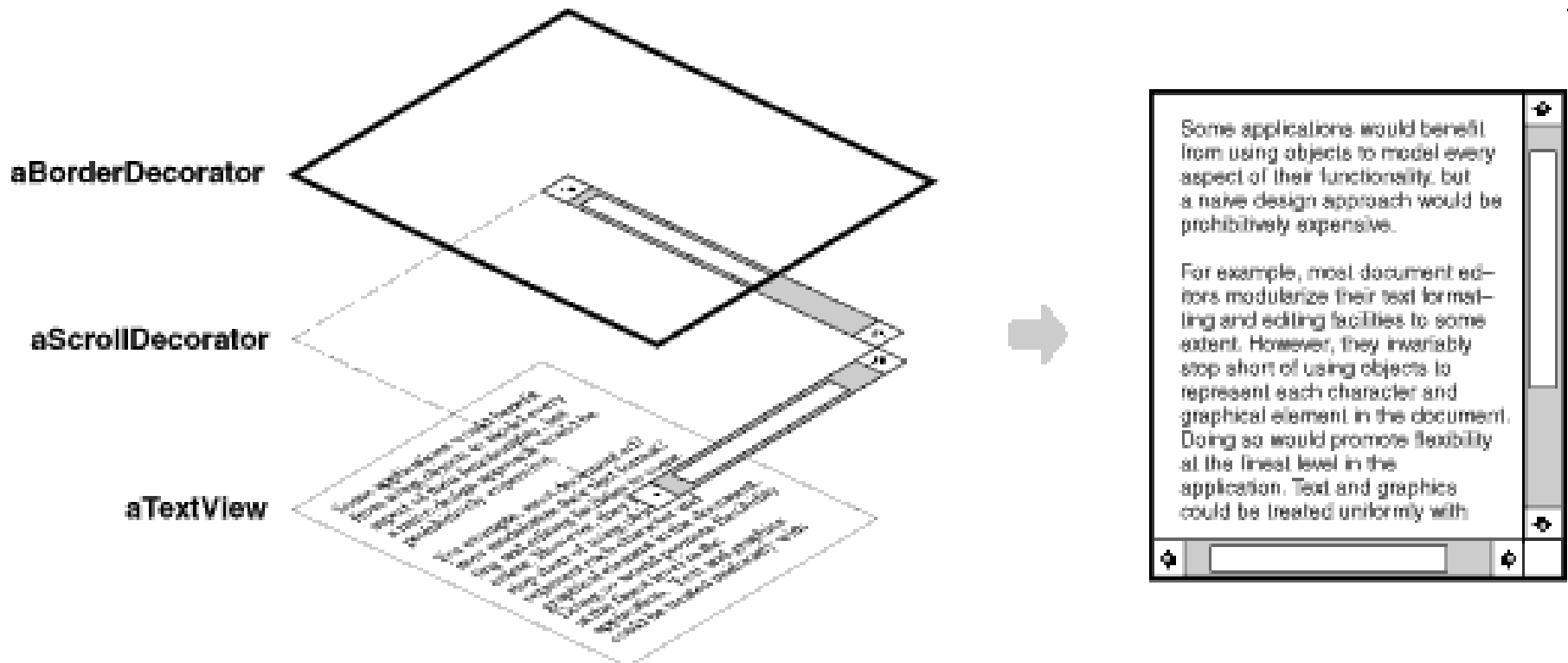
Decorator

[Motivation]

- We may want to add responsibilities to individual objects
 - But, not to an entire class
- One way to add responsibilities is with inheritance
 - Decorator is a smarter way of using inheritance

Motivating Example

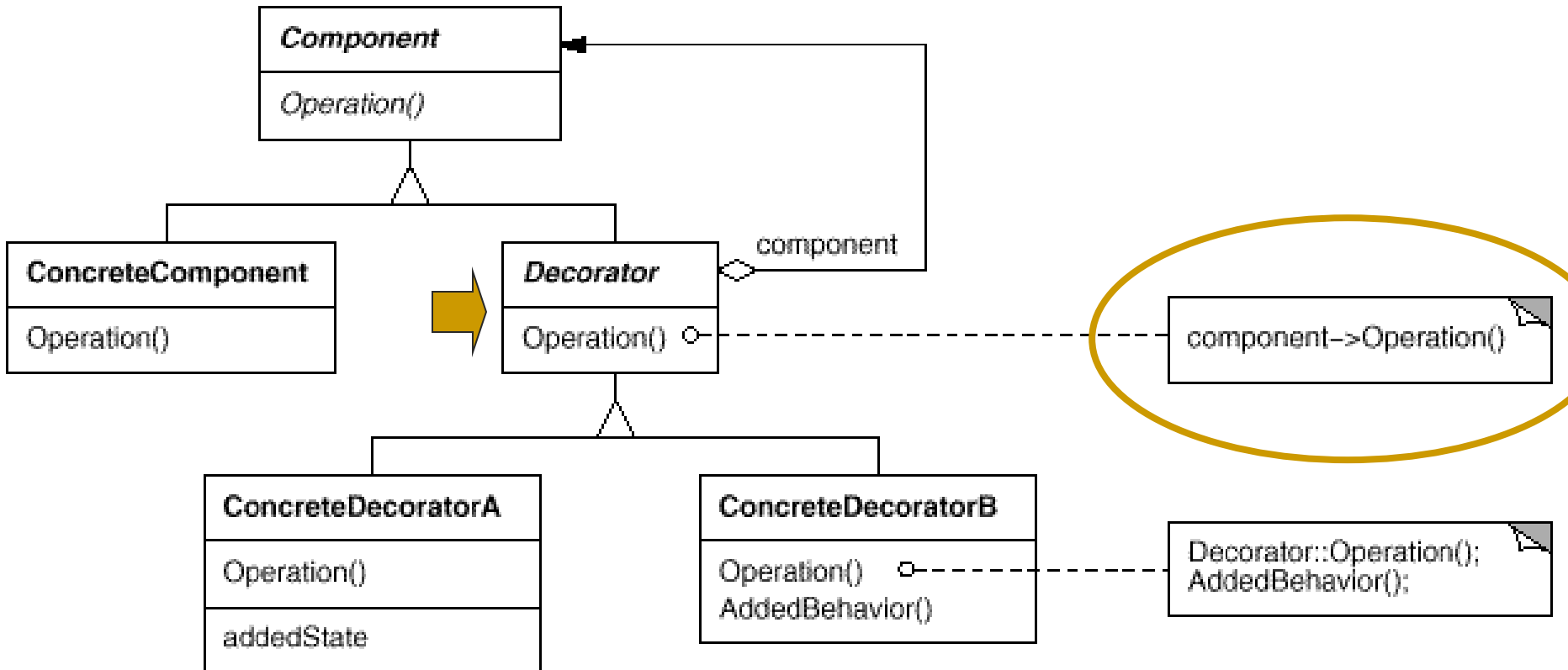
- A graphical user interface toolkit
 - Borders and scrolling are dynamic properties



[Decorator]

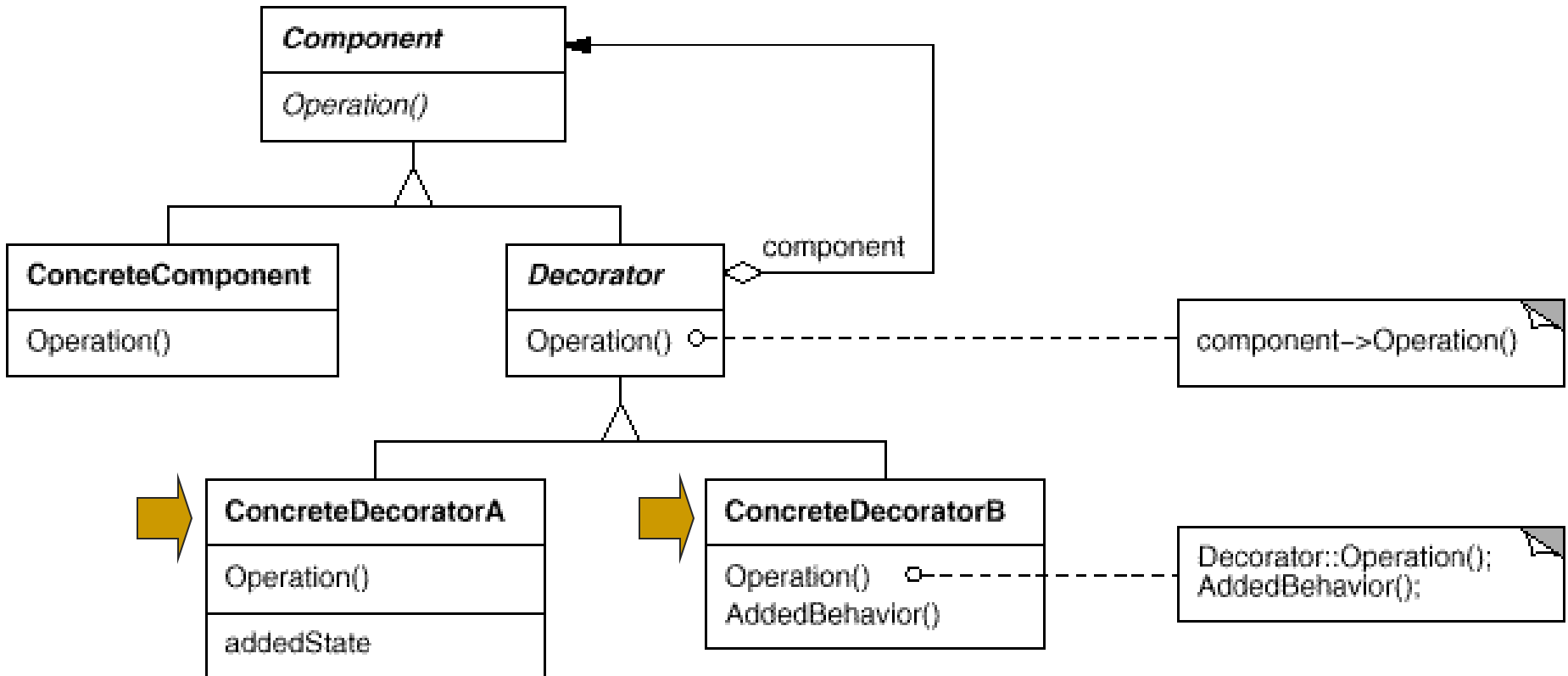
- Name
 - Decorator
- Problem Description
 - Attach additional responsibilities to an object dynamically
- Solution (*next slide*)
- Consequences
 - More flexibility than static inheritance
 - Responsibilities can be withdrawn

Decorator Solution



A Decorator knows the component to decorate

As Classes ConcreteDecorator



Many concrete decorators are possible

[Bibliography]

- E. Gamma, R. Helm, R. Johnson, J. Vlissides. **Design Patterns**, 1st. Edition. Addison Wesley, 1994.
 - Composite and Decorator