

CSCI 4448: Homework 4

Design Patterns

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3/13/2014

1 Structural Problems

1.1 Structural Problem 3: Decorator

Structural Problem 3 gives the description of a Mario character who starts as a plain, small Mario, and can pick up various power-ups. The decorator pattern is most applicable for this application, since the desire is to have a base character (the plain Mario), and to be able to customize that Mario by giving him power-ups.

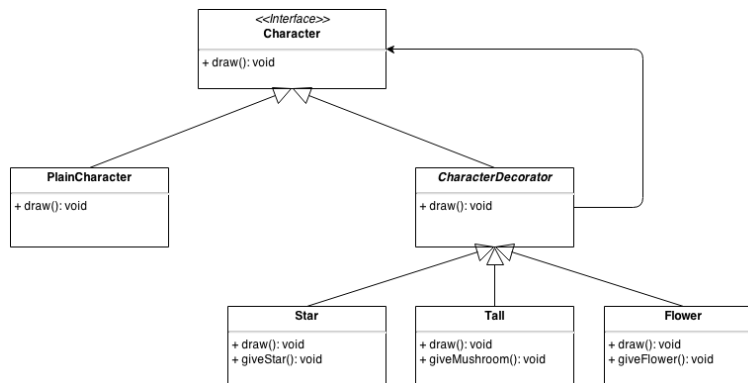


Figure 1: Class diagram of Decorator pattern implementation

- Component interface is implemented by **Character**.
- The concrete component is implemented by **PlainCharacter**.
- The decorator component which provides the ability to decorate Mario with different states of being powered up is implemented by **CharacterDecorator**
- The different concrete decorators which provide the ability to add different power-ups to the plain Mario are provided by **Star**, **Tall** and **Flower**

1.2 Structural Problem 5: Proxy

Structural Problem 5 describes a bank that needs to access an SQL database, but would like the commands for the SQL database to be executed after the database has been closed for the day. The Proxy pattern best solves this problem, because it allows for the proxy to stand in for the actual database, and the bank will issue commands to the proxy which will send the commands to the actual database once the bank closes for the day.

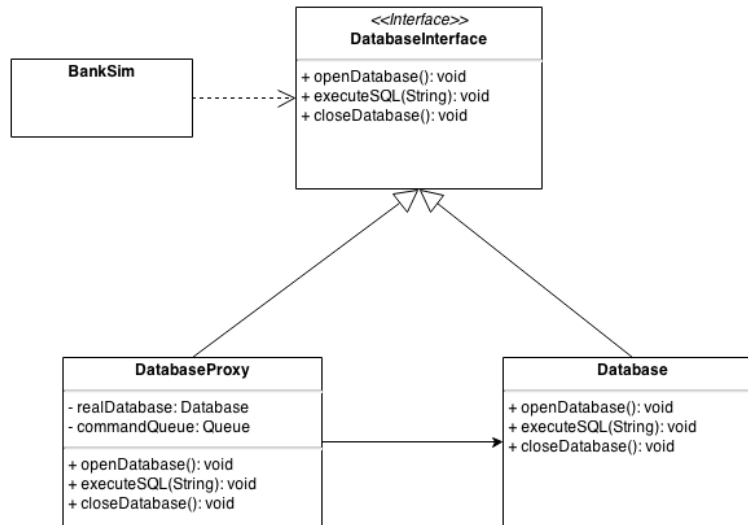


Figure 2: Class diagram of Proxy pattern implementation

- The role of the subject interface is played by **DatabaseInterface**, which both the real database and the proxy implement allowing for a consistent interface between the two.
- RealSubject is implemented by **Database** which is the actual instance of the database that the bank interacts with through the proxy
- The Proxy is implemented by **Proxy** which allows the bank to interact with it as if it were the bank, but issues the SQL commands to the real database after the bank closes
- The Client is provided by **BankSim** which simulates the bank interacting with the database

2 Creational Problems