Memento DP

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Problem

- A game has many levels.
  - We want a facility so that the user can store the current state of the game.
  - The user can later on start from the saved state of the game.
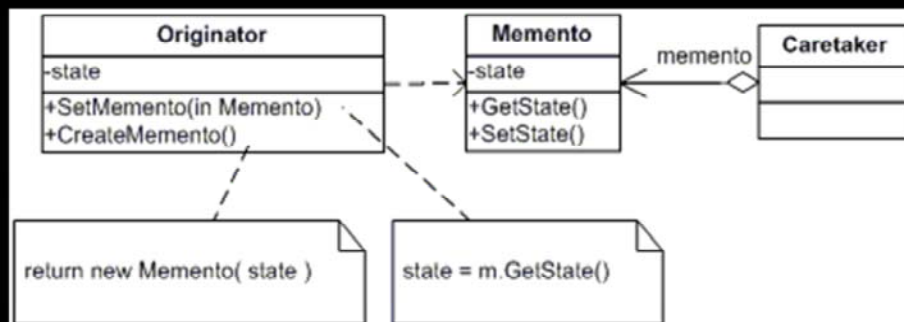 - In general, we need "undo" or "rollback" kind of operations.

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Serialization is built in Java and C#. For C++, a library like boost can be used.

Code example with C++ boost library present.

Memento

- The caretaker is responsible for memento's safekeeping. It never operates on or examines the contents of memento.

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Use memento when

A snapshot of object's state must be saved so that it can be restored to that state later and

A direct interface to the obtaining the state would expose implementation details and break the object's encapsulation.

Consequences:

It simplifies the code for Originator.

It provides easy to implement undo / recovery capability.

In Java, this DP is easy. Serialization can be used to save a system's state.

Keeping the saved state external from the key object helps to maintain cohesion.

Saving and Restoring states can be time consuming unless carefully designed.

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It captures and externalizes an object's internal state so that the object can be restored to that state later.

It does not violate encapsulation

A memento is an object that stores a snapshot of the internal state of another object – memento's originator.

The Originator creates a memento for its current internal state.

Memento

- How does it differ from Command Design Pattern?

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Command and Memento act as magic tokens to be passed around and invoked at a later time.

> In Command, the token represents a request; in Memento, it represents the internal state of an object at a particular time.

> Polymorphism is important to Command, but not to Memento.

> Command can use Memento to maintain the state required for an undo operation.

Serialization is built-in Java and C#. For C++, a library like protocol buffers from google can be used.

Usage of Memento

- undo/redo
- database transactions

It is used extensively to support undo/redo operations.

It is used in database transactions, where it is necessary to restore the data if the transaction fails or is incomplete.

How to use a Memento here?

- Design and implement a Java applet that allows users to design a customized wedding gown.

  - A preview of the dress should be displayed with default settings. Users should be able to select from a set of different neck and sleeve types. After every selection, the preview image should be updated.

  - Users should be able to undo a selection to go back to their previous selection and the preview should get updated accordingly.

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Apply the Memento pattern in designing the undo operation.

Assignment

- Create one million objects of a simple class C1
  - C1 has instance variables int, long, double, String, StringBuilder, Instant.
  - Assign random values to instance variables in constructor
- Serialize and Deserialize the list of one million objects.