
DESIGN PATTERN

Assignment- Implementation of Composite Pattern || CSE 4851

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Problem:

Build part of a game named Age of Villagers. The game is about people from different parts of the world trying to build their villages. The village can have several types of objects like house, tree, and water source. The main task is to create house, tree or water sources by adding different types of simple shapes.

Solution:

Composite Design Pattern:

Composite pattern is used where we need to treat a group of objects in similar way as a single object. Composite pattern composes objects in term of a tree structure to represent part as well as whole hierarchy. This type of design pattern comes under structural pattern as this pattern creates a tree structure of group of objects. This pattern creates a class that contains group of its own objects. This class provides ways to modify its group of same objects.

The project is implemented using the composite design pattern. Here, simple shapes like Square, Rectangle, Circle and Triangles are used to create complex structures like House, Tree and Water Source.

House is composed of the following:

- Roof built using Triangle shape
- Walls built using Rectangle shape
- Windows built using Square shape
- Doors built using Rectangle shape

Tree is composed of the following:

- Stem built using the Rectangle shape
- Leaf built using the Circle shape

Water Source is composed of the following:

- Pond built using the Circle shape
- Bubbles built using the Circle shape

The main method calls the buildHouse(), buildTree() and buildWaterSource() methods to create House, Tree and Water Source respectively. The user can choose to create as many objects as they wish and can exit the game at any moment.

In the code, we create an interface called Shape which is implemented by the class Square, Rectangle, Circle and Triangle. The composite class Building is used to keep a list of the shapes needed to create the object (House, Tree, and Water Source). The Main class is used to create the objects as per the user inputs. The hierarchy of the object creation logic can be displayed as below:

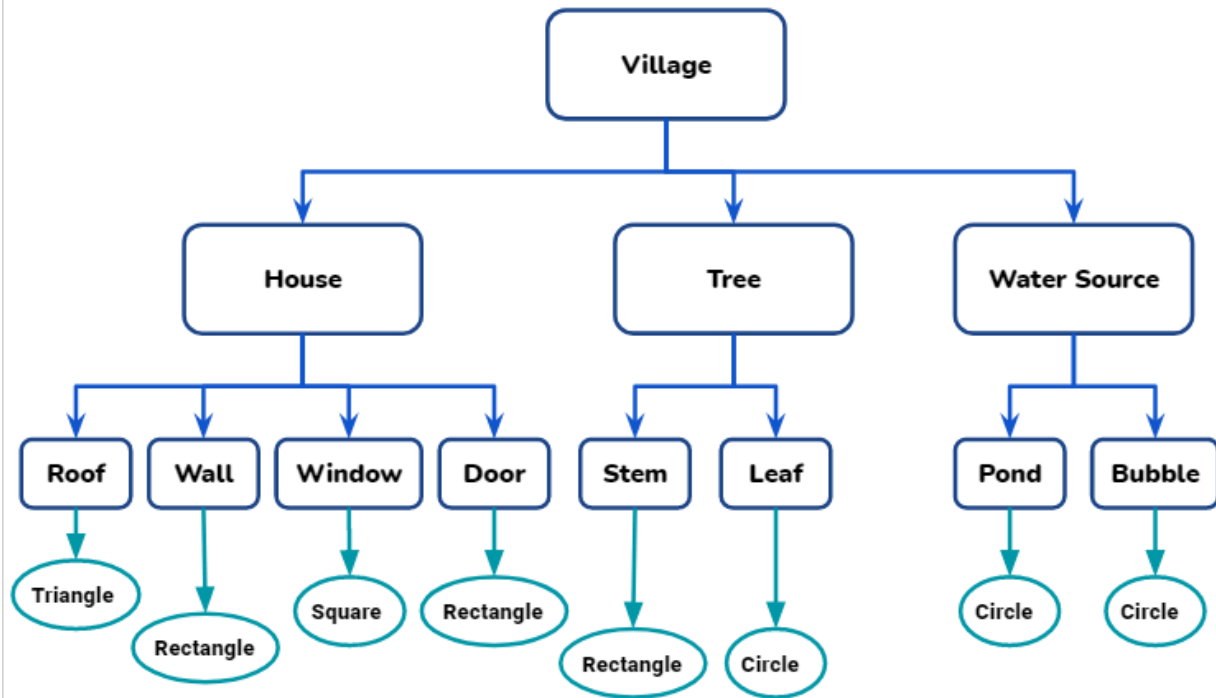


Figure: Object creation using composite pattern.

Thus, the user can input 1, 2 or 3 to create House, Tree or Water Source respectively or exit the game with input 0. The composite pattern is used to create these composite patterns in this code.