Bird Activity Simulator

LEARNING OBJECTIVE

Create a small software system using at least three classic OO design patterns.

PROBLEM DESCRIPTION

You are to create a bird simulator that simulates, at a high level, the life of a bird over the course of a year. The simulator starts with a bird migrating north to a breeding area in spring, finding a mate, building a nest, and spending the summer raising offspring. In fall, the bird migrates south for the winter and spends the winter fattening up before migrating north once again. The simulator allows for the specification of a geographic region (e.g., North America) in the `main()`, and the simulator will use birds from that region. The region can be easily changed, and a different bird species will be used for the next yearly simulation.

INSTRUCTIONS

- Select two types of birds native to two different geographic areas. The simulator implementation uses two different species of each bird type. For example:

Region	Hawk	Finch
North America	Red-tailed Hawk	House Finch
Europe	Eurasian Sparrowhawk	European Goldfinch

  - The implementation uses a design pattern to make adding more regions and types of birds easy in a future version of the simulator.
  - As there are many different possibilities for region, type and species, there is no reason that two students should have the same birds in their simulator, including using the set in the example (i.e. do some research and learn about four different birds).

- Choose one or more activities that birds do during each season. Ignore activities that overlap between all seasons (e.g. birds feed during all seasons). The activities must only occur in specific seasons. The following is an example set of activities to use as a starting point:

Season	Activity
Spring	Migrate north Build a nest Find a mate
Summer	Raise children
Fall	Migrate south
Winter	Fatten up

  - Each activity outputs a different string for each species.
  - The implementation uses a design pattern to make adding activities to the seasons easy in a future version of the simulator.

- Determine the set of materials all of your species use to create a nest. The set must include at least five different materials.
  - Use a design pattern to simulate the construction of a nest in spring from some of the materials.

- Each nest must be made from a different combination of materials.

OTHER NOTES

- Use additional instances of design patterns if appropriate. This may mean that your design:
  - Contains more than one instance of a specific design pattern.
  - Uses more than three different design patterns.

DELIVERABLES

1. A UML class diagram in **`docs/design/birdSimulator.jpg`** showing the design of your system. The diagram must show:
   a. Class names (italicized if abstract).
   b. Method names (italicized if abstract).
   c. Variables.
   d. Visibility modifiers.
   e. Relationships (inheritance, composition, aggregation, dependency)
2. A `README.md` file with the following:
   a. Section describing the bird species
      i. A subsection for each geographic region.
      ii. Bulleted list of bird species for the region.
   b. Section describing the bird activities
      i. A subsection for the season
      ii. Bulleted list of activities for the season.
   c. Section that identifies the design patterns used in the system.
      i. A subsection for each design pattern used.
      ii. A bulleted list of pairs explaining the role of each class and relevant methods in the design pattern.

      Example:
      Adapter
      - Target : T7000
      - Adapter : SuperTempAdapter
      - Adaptee : SuperTemp
      - Adapter.request() : calls SuperTemp.calculate()

3. A `compilable` and runnable simulation that shows:
   - Names of the different birds and their region
   - Unique actions for each bird in the different seasons.
   - What materials are used for building the nest of each species.

EXAMPLE OUTPUT

```
----- Red-tailed Hawk -----
Season: Spring
Migrating to Alaska
The nest is built of: Twigs (1-2 cm in diameter), Bark, Grass, Catkins
Red-tailed Hawk is looking for a mate with the reddest tail.

Season: Summer
Red-tailed Hawk is raising hawks with red tails.
```

```
Season: Fall
Migrating to Mexico

Season: Winter
Red-tailed Hawk is looking for their next meal of rabbit.

----- House Finch -----
Season: Spring
Migrating to Oregon
The nest is built of: Twigs (very thin), String, Grass, Wool, Feathers
House Finch is looking for a mate with the reddest head.

Season: Summer
House Finch is raising redheads (with no souls).

Season: Fall
Migrating to Mexico

Season: Winter
House Finch is looking for fruit and seeds.

----- Eurasian Sparrowhawk -----
Season: Spring
Migrating to the British Isles
The nest is built of: Twigs (60 cm in length)
Eurasian Sparrowhawk is looking for a mate with sleek wings.

Season: Summer
Eurasian Sparrowhawk is raising the next generation of rodent killers.

Season: Fall
Migrating to Morocco

Season: Winter
Eurasian Sparrowhawk is perched, waiting for a tit, finch, sparrow, or bunting to
eat.

----- European Goldfinch -----
Season: Spring
Migrating to Germany
The nest is built of: Spider webs, Grass, Wool, Feathers
European Goldfinch is looking for a red, white and black-faced mate.

Season: Summer
European Goldfinch is teaching their children a beautiful song.

Season: Fall
Migrating to Spain

Season: Winter
European Goldfinch is looking for seeds and some insects.
```