CSIS0396A/COMP2396A - Assignment 2

Due: 28th Sep, 2013 23:30

Introduction

This assignment tests your understanding of **inheritance** and **polymorphism** in Java.

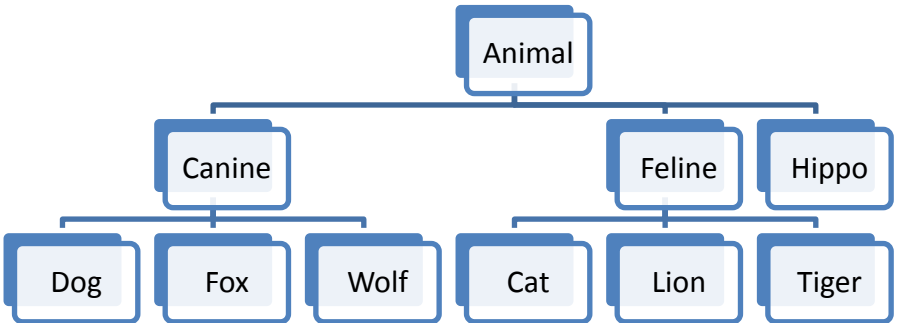
You are required to simulate the wild life in a forest. Program design **will be evaluated** in this assignment. You must make good use of **inheritance** and **polymorphism** to get all the marks for this assignment.

You are also required to write **JavaDoc** for all non-private classes and non-private class members. **Programs without JavaDoc will not be marked.**

Task

You need to implement the main program, `Forest.java`, which simulate a forest. A forest is represented by a 2D array of cells. Each cell can be used to hold **one animal** (an object of **Animal** class or a sub-class of **Animal** class).

Similar to the **Animal** class hierarchy in the lecture, you are required to implement a hierarchy of animals, as shown below:



When the program starts (i.e., the `main()` method inside `Forest.java`), it will create a forest of size **10x10**, populate it randomly with **7 animal objects**, namely a **Dog**, a **Fox**, a **Wolf**, a **Cat**, a **Lion**, a **Tiger** and a **Hippo**.

Once the forest is generated, print the layout of the forest as follow:

```
..c.......
...t......
..........
.........d
..........
..........
..f.......
.l........
h.........
.....w....
```

A **dot** indicates an empty space, and a letter indicates an animal at that location. **The first letter** of each of the 7 animals is used to label them.

The program than ask the user **press enter** to run a cycle of simulation, or type "**exit**" to leave:

```
Press enter to iterate, type 'exit' to quit:
```

Refer to the tutorial slides on how it can be done.

In every cycle of simulation, all animals in the forest will take turns to move. If the target location is already occupied by another animal, the moving animal will perform an attack. Either one of the animal involved will die at the end of the attack.

The program should ask for user input after every cycle. The program terminates only when user type "**exit**".

Animal moving

In every cycle of simulation, animals will be moved in **row major order**, i.e., animals in the upper rows will be moved before those in the lower rows; and animals on the left will be moved before those on the right in the same row. For example, in the layout shown in the above forest, the moving order will be: cat, tiger, dog, fox, lion, hippo, and wolf.

Different animals move **randomly** in a different manner:

- **Feline** moves in all **eight directions**, **one** step a time.
- **Canine** moves in **four directions**, **one or two** steps a time.
- All other animals move in **four directions**, **one** step a time.

Note that the animals should **not** move out of the forest. When an animal moves from one location to another, your program should print the following information:

```
Animal_type moves from ?, ? to ?, ?
```

For example:

```
Fox moved from 2, 0 to 0, 0
Hippo moved from 3, 0 to 4, 0
...
```

Animal attacking

When an animal moves to a location that is occupied by another animal, the moving animal will **attack** the occupying animal **before moving**. The result of an attack follows the following rules:

- If a **Feline** attacks a **Canine**, **Feline** wins and **Canine** dies.
- If a **Canine** attacks a **Feline**, there is a 50% chance that one wins and the other dies.
- If a **Lion** attacks a **Hippo**, **Lion** wins and Hippo dies.
- If a **Fox** attacks a **Cat**, **Fox** wins and **Cat** dies.
- For all other cases, the **attacker loses and dies**.

When an animal attacks another animal, your program should print the following information:

```
Attacker_type from ?, ? attacks occupant_type at ?, ? and wins/loses
The Loser dies at ?, ?
```

For example:

```
Tiger from 2, 1 attacks Cat at 2, 2 and loses
Tiger dies at 2, 1
Lion from 4, 6 attacks Hippo at 3, 5 and wins
Hippo dies at 3, 5
Lion moved from 4,6 to 3, 5
```

Note that an animal will move if attack is successful. An animal will not move anymore if it dies.

Sample run

A sample run is provided as `sampleRun.txt` and is available on Moodle.

Marking

- **40% marks** are given to the **program design.**
  - You will be awarded all the marks if you are implementing the **move** and **attack** of the animals by making use of **inheritance** and **polymorphism**.
  - You can check it by avoiding code duplication as much as possible.
  - **Economy is valuable in coding: the easiest way to ensure a bug-free line of code is not to write the line of code at all.**
- **40% marks** are given to the **functionality** of your program.
  - You may add **additional classes, instant variables and methods** to the class.
  - Your program output must be **identical** to what is described in this document, with the exception of the trailing spaces at the end of each line of output.
- **20% marks** are given to your **JavaDoc**. A complete JavaDoc includes documentation of every classes, member fields and methods that are not private. JavaDoc for the main method may be omitted.

Submission:

Please submit all source files (`*.java`) in a single compressed file (in `.zip` or `.7z`) to Moodle. **Late submission is not allowed**.

Do not submit *.class* file.

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