FIT2099 Assignment 1

Tutorial 9 Team 9

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Inheritance

Inheritance is used in the design. When one class extends from another class, it becomes the child class of the class it is extending from. By extending from the parent class, the child class will be able to inherit the attributes and methods from the parent class. As there will be similarities between the child and parent class, these methods and attributes can be reused, thus reducing repetitive code which complies to the *Don't Repeat Yourself* principle.

Classes involved in inheritance:

Child class	**Parent class**
Bush	Ground
Dirt	Ground
Tree	Ground
Fruit	Item
Corpse	PortableItem
MealKitsItem	PortableItem
Egg	PortableItem
LaserGun	WeaponItem
BuyAction	Action
BreedingAction	Action
LayEggAction	Action
PlayerFeedAction	Action
SearchItemAction	Action
DinoActor	Actor
Allosaur	DinoActor
Brachiosaur	DinoActor
Stegosaur	DinoActor
Player	Actor

Enum

Enum classes are used in the design. There are a lot of fixed sets of constants used throughout the program which include attributes and methods. By using Enums, attributes are not needed to store the fixed values in certain classes. It is also more type-safe compared to using constants as it gives a more descriptive type name. Methods that are constant can also be accessed easily through the Enum class instead of needing to go through each class to find a method we need. It is cleaner, more readable and more maintainable to use Enum classes.

Enum classes:

- DinoEncyclopedia
- FoodType
- BreedingCapability
- PregnancyStatus
- Sex

DinoActor - extends Actor
Stegosaur, Brachiosaur and Allosaur – extends DinoActor

All dinosaurs share a lot of common characteristics, such as feeding, breeding etc.
Hence, to adhere to the *Don't repeat yourself* principle and improve maintainability, we will create an abstract class DinoActor that inherits from Actor. In turn, all Actors which are dinosaurs, namely *S*tegosaur, Brachiosaur and Allosaur, will inherit from DinoActor. These three classes will inherit all methods from dinosaurs and only override the getAllowableActions method or the playTurn method if necessary

New attributes with appropriate setters and getters will be added to this base class for simulating the dinosaur Actor's functionality, which will be specified in the corresponding sections later for clarity. However, there are two important methods of DinoActor that will be highlighted. As rule of thumb, the roles of the two methods will be as such:

1. getAllowableActions method

Returns Actions that mimic interactions between two Actors on adjacent squares only. This is because this method will only be called every turn when another actor is on adjacent squares to the other actor. In this situation, we **benefit from polymorphism** by **overriding this method in DinoActor's child classes to return an Actions object that contains BreedingAction and / or AttackAction (by calling getAction on BreedingBehaviour and AttackBehaviour classes respectively) and / or PlayerFeedAction .**

Note that actions will always be added in the order BreedingAction, AttackAction, then PlayerFeedAction - its importance will be explained in the playTurn method.

2. playTurn method

When the playTurn method is called for the dinosaur actors, the playTurn method in their respective classes will call the base class DinoActor's playTurn method.
The playTurn method in DinoActor has the responsibilities to:

- Update the state of Actor: increment age, decrement food level, display hungry message
- Given all possible actions the Actor can take, determine and return the actual action taken by the NPC

In order to fulfill the second responsibility, i.e. returning the actual action taken by the NPC, we will create classes that implement Behaviour interface:

- **Behaviour-implementing classes** are **utilized for doing necessary processing of Actor state** and **reduces clutter in the playTurn method,** by having all the condition checking statements (of whether an Action can be done by an Actor) inside the getAction of a Behaviour. An action is returned when calling the getAction method if all conditions are satisfied, otherwise null is returned.

Implementation of the decision making on which action to return will be as such:

- Whenever creating a new instance of DinoActor, Initialize the ***behaviour*** attribute with Behaviour-implementing classes in an decreasing order of priority, i.e: first one to be added is the most important. The following example is the priority we have decided on in the preliminary design:

```
private void initializeDinoBehaviour(){
    behaviour = new ArrayList<>();
    behaviour.add(new PregnancyBehaviour());
    behaviour.add(new FeedingBehaviour());
    behaviour.add(new FollowMateBehaviour()
    behaviour.add(new WanderBehaviour());
}
```

Then, In the playTurn method of DinoActor:

1) Receives *actions* argument, which in the case of dinosaurs will only have BreedingAction and / or AttackAction and / or PlayerFeedAction. As mentioned above, they will always be in order.

2) Loops through all Behaviour objects in the behaviour call getAction, but only stores the first non-null outcome in a local variable. Since our behaviours attribute is initialized based on a priority, it will help us to get the Action of highest priority in behaviours.

   Note that it is important to loop through the *behaviour* attribute and call getAction for each and every one, since we can do some necessary processing of an Actor's state. For example,
   - If the Actor is pregnant but not due to lay egg yet, in the getAction method it will help update the number of turns the Actor has to wait, then return null

3) Decide which is the actual Action taken
   - If the lastAction has a next action (checked by calling getNextAction), that Action will be chosen
   - Otherwise, if the actions argument received has at least one Action, the first action is chosen. (refer 1)
   - Otherwise, the first non-null result that we obtained from looping through all behaviours is chosen. (refer 2)
   - If the *lastAction* argument has no next action, the *actions* argument has no Action objects and all Behaviour-implementing class in *behaviours* return null when getAction is invoked on them, return DoNothingAction.

DinoEncyclopedia Enum class

There are a lot of values that we need to keep track of for dinosaur Actors, such as: number of turns till the pregnant dinosaur lays an egg, number of turns till a baby dinosaur reaches adulthood, initial food level etc.

These values are constants and belong to their corresponding dinosaur classes, not to a specific any object. Hence, in order to have **a standardized set of values** necessary for initialization or any other usage, they will be stored in the DinoEncyclopedia class.

Note that the following code snippet is only an illustrative example, not all enum keys or other values to keep track of are included:

```
public enum DinoEncyclopedia {
    STEGOSAUR('S', "Stegosaur", 50, 100, 90, 30);

  // field declaration here


DinoEncyclopedia(char displayChar, String name, int initialHitPoints, int maxHitPoints, int
matureWhen, int pregnancyPeriod) {
        this.displayChar = displayChar;
        this.name = name;
        this.initialHitPoints = initialHitPoints;
        this.maxHitPoints = maxHitPoints;
        this.matureWhen = matureWhen;
        this.pregnancyPeriod = pregnancyPeriod;
    }

  // necessary getters here

}
```

A private static final field of type DinoEncyclopedia, say *DINO_TYPE* will be declared and initialized to their corresponding Enum values for Stegosaur, Brachiosaur and Allosaur classes. Whenever a new dinosaur object is created, the constructor simply needs to access the appropriate values in this Enum class for initializing instance variables.

The motivation behind this:

- Cleaner code in Stegosaur, Brachiosaur and Allosaur due to less fields needed to store constants
- Standardized values, can be access by other classes apart from dinosaur Actors too
- Separation of concerns and single point of change, whenever we want to change a value simply look into this class
- Hence, easier maintenance

Dinosaurs growing up

The dinosaur actors shall be represented in the console with the first letter of their names, whereby the lowercase form represents a baby dinosaur and the uppercase form represents a grown up dinosaur, eg: ‘a’ - baby Allosaur, ‘B’ - adult Brachiosaur, ‘S’ - adult Stegosaur Dinosaurs added to the map at the beginning of the game are adult dinosaurs. Dinosaurs that hatch from eggs are baby dinosaurs.

Required instance variable for DinoActor:

- age – an integer that represents the age of the dinosaur

To simulate the process of baby dinosaurs growing up:

- In the *playTurn* method for dinoActor base class, have a method that increments *age*, and check if *age* has reached target for maturity for that dinosaur, if matured, change the display character to uppercase form to indicate adulthood

Note that maturity age is an example of what can be stored in the DinoEncyclopedia class mentioned above.

Breeding

Sex Enum Class

- Has values MALE, and FEMALE
- Used as possible values for an instance variable in DinoActor to indicate the sex of the dinosaur
- Defined to **make code less error prone** by preventing using literals to represent sex

BreedingCapability Enum class

- Has value CAN_BREED
- Used as a capability, whenever the DinoActor is mature enough, has the appropriate food level to breed and not pregnant yet, the capability will be added to the DinoActor
- Benefits include reducing instance variables needed in DinoActor since we don’t need an extra variable to check if able to breed, instead we reuse the existing code’s functionality to achieve the same objective

BreedingBehaviour - extends Behaviour

Check the following conditions of whether breeding is possible to take place by defining corresponding getter methods in the DinoActor class:

1. Actor and target of same species and different sex
2. Has the capability to breed – checked using hasCapability(BreedingCapability.CAN_BREED)
3. If all conditions are met, breeding takes place, otherwise null is returned.

BreedingAction - extends Action

- Should be returned in getAllowableActions method for all dinosaurs since it involves two actors interacting at adjacent squares
- When object is created, constructor takes in a DinoActor object as the target

In the execute method, use the static method in Probability class to generate a probability to simulate the chance of whether the female dinosaur will become pregnant.

If the female dinosaur should be pregnant, a setter method that will be in DinoActor, say *setPregnant* that takes in a boolean, should be called.
If true is passed in as an argument, the method will:

- Use addCapability() to add the PregnancyStatus.PREGNANT (see below) to the female dinosaur
- Initialize a pregnancyPeriod instance variable the female dinosaur

Either the female dino is pregnant or not in the end, breeding has occurred hence the execute method will return a descriptive message by calling menuDescription method

Pregnancy and laying eggs

Classes involved include:

PregnancyStatus Enum class

- Has value PREGNANT
- Used as a capability to keep track of whether the DinoActor is pregnant or not

PregnancyBehaviour - extends Behaviour
Required instance variables:

- pregnancyPeriod - represents the time left for it to lay egg

In this class's getAction method, two things to model include:

- If a female dinosaur is pregnant but not due to lay egg yet
    - Decrement pregnancyPeriod and return null
- Time for female dinosaur to lay egg
    - Set the dinosaur as not pregnant using setPregnant method declared in DinoActor - see above BreedingAction section
    - Return a *LayEggAction*

We will determine whether the actor is pregnant by using a method defined in the dinoActor class that will return true if the actor has the capability of PregnancyStatus.PREGNANT (use hasCapability() method).

LayEggAction - extends Action
This class simply adds an Egg object to the location of the pregnant actor in the execute method. When creating the object, the actor's display character is passed to Egg class's constructor to be utilized by the object to identify what species of dinosaur will be born.

Egg class - extends PortableItem
Extends PortableItem since can be picked up by player and kept in inventory
Required instance variables:

- *waitTurn* - integer to keep track of the number of turns left to wait till egg hatches.
- *parent* - char type to identify the species of the parent by

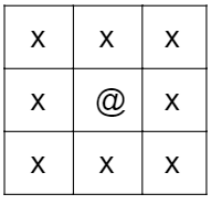
Two things to model in Egg class, both of which should be implemented by overriding the tick function, include:

- Waiting to be hatched
    - *waitTurn* initialized based on the type of dinosaur and will be decremented by one in the tick method until it reaches zero eventually
- Hatch
    - Detect if ready to hatch by checking if *waitTurn* has reached zero.
    - When ready, remove the Egg item from that location (using removeItem() from Location class) and add a DinoActor object corresponding to the species of the parent (using addActor of Location class). Ecopoints will also be added by calling the ecopoints.incrementEcopoints method.

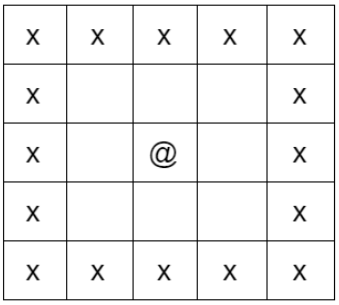
FollowMateBehaviour - extends Behaviour

This class is modified from the FollowBehaviour class given in the codebase. The reason for doing so is that the original code was only able to detect actors from the immediate adjacent squares to be able to follow them - but when the actors are already beside each other, they can perform any interactions necessary, defeating the need to follow them.

Hence, in an attempt to **make the behaviour more meaningful**, we will allow the actor to detect and follow actors that are two squares away from it. To visualize this, images below illustrate a portion of the GameMap, where @ represents the actor and x represents the squares that it can detect other actors:



Original



After modified

This can be done by utilizing the getExits() method appropriately on the immediate diagonal squares to the actor. In essence, we can define a method to get all the Exits that are two squares away, we will use the modify the getAction method to do the following:

For all exits, if another actor is detected on that location (with isAnActorAt method in GameMap)

- Check necessary conditions, namely both dinosaurs must be of the same species, different sex and the female dinosaur must not be already pregnant
- If all conditions are met, reuse a portion of the FollowBehaviour code to check which adjacent square the player has to move to in order to get closer to the target, and finally return a moveCloser action

If there are no exits that have an Actor and fulfills all conditions to be a potential target to follow, return null.

In effect, the FollowMateBehaviour can help a DinoActor to detect and follow other DinoActor two squares away that it can breed with.

FeedingBehaviour - extends Behaviour

This class was created to check if every immediate adjacent square around the actor has specific types of foods. There are two types of food which can be seen in the FoodType enum class where a items/foods with FoodType.CARNIVORE capability are the egg and corpse which can only be eaten by Allosaurs which also have FoodType.CARNIVORE capability as they are carnivorous.

On the other hand, items/foods which have the FoodType.HERBIVORE capability is a fruit which can be eaten by the Stegosaurs and Brachiosaurs which also have FoodType.HERBIVORE capability as they are herbivorous dinosaurs.

To implement this, we first identify the location of the actor using the **locationOf(actor)** method. With the returned location, we utilize the **getExits()** method in a for each loop to loop all exits around the actor.

In the **getExits()** loop, the **getItems()** method is then used to get a list of all items in the current exit. In this loop, below are implemented:

- Another for each loop is used to loop through all items in the list from **getItems().** In this loop, an if….else if statement is used. In this loop:
    - The if condition checks if the current item is of FoodType.HERBIVORE capability AND the actor is of FoodType.HERBIVORE capability too, then another if statement is implemented where it checks if the item has the instance of the Fruit class. If true, a FeedingAction instance is instantiated and returned. The parameters of the instantiated FeedingAction instance are:
        - foodOnGround = true (identifies if the food is on the ground)
        - item = item (the item found on the ground)
        - x = destination.x() (the x coordinate of the current exit)
        - y = destination.y() (the y coordinate of the current exit)

    - The else if condition checks checks if the current item is of FoodType.CARNIVORE capability AND the actor is of FoodType.CARNIVORE capability too, then another if statement is implemented where it checks if the item has the instance of the Egg class OR the Corpse class. If true, a FeedingAction instance is instantiated and returned. The parameters of the instantiated FeedingAction instance are:
        - foodOnGround = true (identifies if the food is on the ground)
        - item = item (the item found on the ground)
        - x = destination.x() (the x coordinate of the current exit)
        - y = destination.y() (the y coordinate of the current exit)

    - Another if statement is implemented which checked if the item is of instance of Tree class OR Bush class AND the actor is of FoodType.HERBIVORE capability. If true, a FeedingAction instance is instantiated and returned. The parameters of the instantiated FeedingAction instance are:
        - foodOnGround = false (identifies if the food is on the ground)
        - item = null (the item found on the ground)

- x = destination.x() (the x coordinate of the current exit)
- y = destination.y() (the y coordinate of the current exit)

If no FeedingAction instances were returned, then null is returned

FeedingAction - extends Action

The purpose of this class is to allow the player to search a specific location if there is food on the ground such as egg, corpse, or fruit. If not on the ground, check if there are trees or bushes in that location.
The method implemented includes:

1. execute method

After eating the edible item by the respective dinosaur type (Herbivore or Carnivore), it is immediately removed from the location. After the dinosaur eats the food, it is healed by the decided amount of points.

Fruits and eggs heal by 10 points, corpses heal by 50 points for Allosaurs and Stegosaurs corpses, and Brachiosaur corpses heal by 100.

If the dinosaur searches for fruits in a tree, every fruit in the tree has a 50% chance to be found by the dinosaur whereas in the bush a fruit is eaten and heals the dinosaur by 10 points.

This method then returns the String “<Actor’s Name> eats <Food Name>”

Corpse - extends PortableItem

The Corpse class was created to instantiate dead dinosaurs as pickable items on the ground. There are three types of Corpse items which are the Stegosaur, Brachiosaur and Allosaur. A Map is created which holds the corpse’s dinosaur class type and its number of turns until it is removed from the map. A Corpse has the FoodType of CARNIVORE as only the Allosaurs can eat it. The display character for a corpse is the percent symbol, “%”

The “nature” part of the game:

Dirt – extends Ground

The display character of Dirt is ‘.’. This class does not have any additional attributes and overrides only one method from Ground:

1. tick method

The role of this method is to let the Dirt experience the passage of time through updating the state of every piece of Dirt every turn. The Dirt can have two states – it either remains as a Dirt, or it grows a Bush.

To have the chance to grow into a Bush, it must not have trees on any square next to it. This can be done by using the input location to acquire the Exit, which is a List containing all the location of the adjacent squares, and check for their type. If there is an instance of Tree as we loop through all the exits, the loop breaks and the Dirt stays the same. This way of checking for the location of the surrounding squares is cleaner and reduces duplicate as we are reusing the methods that have been already provided for us.

If there are no Tree present in any of the adjacent squares, it will have the initial probability of 1% to grow a Bush. A higher chance of 10% to grow a bush can happen when there are two or more bushes surrounding the square. Therefore, as the loop checks for the presence of trees, it also keeps track of the number of bushes (if any) in any of the exits. The probability is generated randomly and will be introduced later on in the Probability class.

Since the number of loops will be known when the exits are checked and we will be directly working with the elements in the exits list, “for each” loops are used to ease the access of each elements as we do not need to bother with the indices. This reduces the chance of getting indexing errors.

Bush – extends Ground

Display character of the Bush is ‘~’ when it is still young and will change into ‘*’ when it is fully grown. This class have two additional attributes which are the age, that is used to keep track of how old is the bush, and an ArrayList of bushFruits that stores Fruit item grown on the bush. Two methods are overridden in this class:

1. tick method

The role of this method is to let the Bush experience the passage of time through updating the state of the Bush every turn. Two situations can happen in this method.

The first thing to model is the Brachiosaur stepping on the Bush and having a 50% chance of killing it. At every turn, if there is a Brachiosaur actor on the location of the Bush (detected using getActor method of Location class), and if the probability meets the 50% chance (using the generateProbability method from Probability class to decide randomly), the Bush object of that location is replaced with a Dirt object using setGround method of Location class, simulating the death of the bush as the Brachiosaur walks on it.

If there is no Brachiosaur in the Bush square and the 50% chance is not met, the second situation happens. When the bush is not killed, it grows and, on every turn, the age attribute is incremented. Once it reaches the age of 10, it will be fully grown and is then capable of growing fruits. It has a 10% chance to grow a Fruit. The overall EcoPoints of the player will be incremented by 1 each time a Fruit object is created and the Fruit object is added to the bushFruit ArrayList.

If-else condition is used here so that the two situations do not overlap. ArrayList is used to store the Fruit object instead of Java array because ArrayList is mutable. A Bush can have unlimited number of Fruit 'grown' on it so it is only logical to use ArrayList instead of Java array.

2. decrementBushItem method

Removes the first item in the ArrayList when the method is called and returns the removed item. The item is removed using index rather than immediately removing the item itself because removal through index will automatically shift any subsequent elements to the left thus reducing the risk of index error. Removing the item in such a way reduces privacy leaks as the classes calling this method will not have access to the original list and will not be able to make changes outside of this method.

3. allowableActions method

Returns a list of Actions that is allowed to be done to the current Bush object. A SearchItemAction is added to the list to allow the action of the player searching for fruits from this Bush.

Tree – extends Ground

Display character of the Tree is '+' when it is still young, the character will be 't' and will change into 'T' when it is fully grown. This class have two additional attributes which are the age, that is used to keep track of how old is the bush, and an ArrayList of treeFruits that stores Fruit item grown on the tree. One of the methods overridden in this class is:

1. tick method

The role of this method is to let the Tree to experience the passage of time through updating the state of the Tree every turn. At every turn, the age of the Tree object will increase by 1. Once it reaches the age of 10, the character '+' will grow into 't' and when the age of 20 is reached, it will change into 'T' which represents a fully grown tree. This also means that the tree can now bear fruits. A tree will have a 50% chance of bearing a fruit, a Fruit object will be created and when the 50% chance is reached the EcoPoints will increment by 1. Each of the Fruit item will be stored in the treeFruits ArrayList.

The Fruit that is now in treeFruits will have a 5% chance of falling to the ground. If that chance is reached, the Fruit will now be portable and added to the ground as an item. It will be removed from the treeFruits ArrayList as it is no longer on the Tree.
The length of time all Fruit that stay on ground will be monitored and increased every turn. Once the groundTime of the Fruit reaches 15, it will be removed from the ground to mimic

the rotting of a fruit. If condition is used here so to make sure the Tree can only bear fruits when the age is over 20.

One note to be taken is that items are allowed to be added to the Ground. The reason for creating a new ArrayList instead of using the existing method to add the fruit to the ground is because a fruit can have two states, one is fallen to the ground, and one is still on the Tree (or Bush). One condition check will need to be done to differentiate the two states. Items on the ground can be of any type other than Fruit which leads us to a second condition check to differentiate the types of items. Therefore, separating the fruit on the ground and fruit on Tree/Bush into two different lists will be able to reduce the need for condition checks which results in a cleaner code and it is more maintainable.

Fruit – extends Item

This class have one additional attribute which is the groundTime that is used to keep track of the how long the Fruit has been on the ground. Excluding the constructor used to initialize the attributes, there are three methods implemented in this class:

1. setPortability method

As the name suggests this method is just to set the portability of the item. When a Fruit object is created, the portability will be false. This method is called only when the Fruit meets certain conditions and falls to the ground, the portability is then set to be true.

2. getGroundTime method

Returns the current groundTime of Fruit object.

3. tick method

The role of this method is to let the item on the ground to experience the passage of time through updating the state of the item every turn. groundTime is increased by 1 every time this method is called.

Utility:

Probability

This class only has one method:

1. generateProbability method

As the name suggests, it generates a probability. This is done through getting a random float number and check if it is less the input value. This method is declared as static as there is no need to create a new instance every time this method is needed. This results in a cleaner and less convoluted code. Having a class to specifically check for probability of whether certain code should run is useful in a way such that duplicate code can be reduced as it is needed throughout different classes.

Player actions and related classes:

EcoPoints (currency used in the game to buy items)

All of the methods and attributes are declared as static in this class. Some motivations behind this are:

- All the instances of the class share the same static variable. This allows the ecoPoints used by the player to be updated consistently as changes to the ecoPoints value happen in several different classes at every turn.
- There is no need to create a new instance every time a method from this class is needed as it will be the same for all instances of the class. This makes the code cleaner and readable.

FoodType - enum class

Values: CARNIVORE, HERBIVORE

As mentioned above, Enum classes are used to make the code cleaner and more maintainable as values are also standardized so they are the same and can be used in different classes. The two values above are given to the edible items and dinosaurs as a capability. This allows the food and dinosaurs to be easily matched. When comparison is needed, the hasCapability method can be used to check for the category the item or dinosaur is in which reduces the risk of getting type errors.

BuyAction – extends Action

The purpose of this class is to simulate the action of buying from the vending machine. An important method in this class is the following method:

1. execute method

In this method, a menu of items will be shown to allow the player to choose from to buy and input a number corresponding to the item on the menu shown. Once the choice is made the VendingMachine is called to process the input, update the player's EcoPoints (the currency used in the game), and add the item to the player's inventory.

The menu is shown in a table – like form. System.out.format is used because it allows a formatted string to be returned by given locale, format and arguments. It is a convenient way to output strings in the format we need.

LaserGun – extends WeaponItem

Here, the only method used is the constructor. As the specifications require the player to be able to kill the Stegosaur in one or two hits, the attributes of the LaserGun is initialized to have a damage of 50. The initialization is done through using the keyword super to get a superclass constructor with a matching parameter list and entering the values for each parameter to initialize them.

MealKitsItem – extends PortableItem

Only the constructor is used here and it only used to call the superclass constructor with a parameter list. There will be two different types of meal kits - Carnivore meal and Vegetarian meal kit, which will be differentiated through the usage of the values from the FoodType Enum (see FoodType class above).

VendingMachine

This class is to simulate a vending machine that sells a list of items. It is used together with the BuyAction class. This class contains only one method and has no attributes:

1. choose method

The main implementation of this method is through using if-else conditions. If the condition matches the input (the choice made by the player) and there are enough ecoPoints, the operations under that condition will be executed. The main thing that will happen when the conditions are met is that a new instance of the item chosen will be created, set to portable, and added to the player's inventory. EcoPoints will be decremented. If the item is edible, the capability FoodType.HERBIVORE or FoodType.CARNIVORE will be added accordingly. Same as the previous classes, this method is declared as static to increase readability and make the code cleaner. Furthermore, no initializations are required so it would be redundant to create a new instance of the classes.

Player – extends Actor

There is one important method in this class:

1. playTurn method

This method selects and return an action to perform on the current turn. The BuyAction is added into the list of Actions. This way of adding an action is different from the way actions such as AttackAction, PlayerFeedAction and so on is due to the fact that the VendingMachine is not an object that would appear in the GameMap, so there are no such things as allowable actions for the VendingMachine. Thus, it needs to be added directly via the playTurn method in the Player. At the same time, the current EcoPoints is also printed here as we need to know the EcoPoints for every turn and having it placed before the actions menu can allow the Player to decide whether they want to buy an item or continue with other actions.

PlayerFeedAction – extends Action

This class has an additional attribute called target, which is set to final as this value will never change. The purpose of this class is to allow the Player to feed the Dinosaurs. Method used here is:

1. execute method

In terms of feeding, the dinosaurs are placed in two different categories: Stegosaurs and Brachiosaurs are Herbivores and Allosaurs are Carnivores. Therefore, to feed the dinosaurs, we must first determine the type of dinosaurs they are. Once that is determined, the Player needs to go through their inventory to look for the right food to feed them. This is where the FoodType class will come in handy. Rather than checking for which instance they belong such as MealKitsItem or Fruits which are both herbivore food, the hasCapability method is used to check which food type they belong, i.e. FoodType.HERBIVORE or FoodType.CARNIVORE. This is definitely a more concise and clean way to compare the types and is less error prone.
Once the correct food is matched with the correct dinosaur, that item will be removed from the inventory and the dinosaurs will have their hitPoints healed (if it is not max). If a fruit is fed, the EcoPoints will increase by 10.

SearchItemAction – extends Action

SearchItemAction class extends the Action class. As mentioned above, the main reason for extending from another class is to reuse the attributes and methods that are similar between the classes.
The purpose of this class is to allow the player to search a bush or a tree to harvest a fruit.
The method implemented includes:

1. execute method

To search for fruits in adjacent bushes and trees, the instance of this class is added into the allowableActions list in the Tree and Bush classes. The player will have a 40% chance of finding a fruit on a tree or a bush. Once the 40% is reached, it means that the player found a fruit. It will be added into the player's inventory and removed from the tree or bush.
EcoPoints will increase by 10 each time a fruit is harvested.