CECS 277 HOMEWORK TERM PROJECT

OBJECTIVE: Get some experience working with several design patterns at once.

INTRODUCTION: Please remember the coding standards here.

In deference to the Covid 19 crisis taking out a week and a half of the semester, and other difficulties that we've had this semester, I'm removing two of the design patterns from the assignment. To make it clearer where those requirements no longer apply, I have used the strikethrough text. Please be sure to ask questions along the way.

Quite often you will need to use more than one design pattern in the same application. For this assignment you will build an application that simulates a sleazy establishment called the Roach Motel. The design patterns that you will use are:

- Singleton
- Decorator
- Factory
- ~~Observer~~
- Strategy
- ~~Visitor~~

The requirements are:

- There will only be one roach motel. When you create the motel, you specify the capacity which is the number of rooms and the name of the motel.
- When the motel is full, turn on the "No Vacancy" sign. Otherwise, the "Vacancy" sign should be shown.
- Each of the rooms start out at a base rate, but when the customer checks in, they can opt for various amenities.
    - A food bar – add $10 per night
    - A spa – add $20 per night
    - Auto refill of the food bar – add $5 per night
    - Spray resistant shower – add $25 per night.
        - The spray resistant shower comes in handy when an exterminator comes through.
- Each customer is an entire roach colony. The colony has:
    - A name
    - An initial population (how many roaches in the colony)
    - The growth rate
- Roaches are fond of throwing parties. Every time they throw a party, the number of occupants in the room increases by the growth rate.
    - Whenever the roaches throw a party, management responds by spraying the room.

        - If the room has a spray resistant shower, the roach population only loses 25% of its members.
        - If the room does **not** have the spray resistant shower, the roach population loses fully 50% of its members.
    - For your part, the party method in the RoachColony class calls the RoachMotel.spray function. Sounds oddly suicidal, but remember, these are just roaches.
- ~~If a Customer (roach colony) tries to check in and the hotel is full, the Customer gets waitlisted.~~
- When the Customer checks out, they get charged the room rate (including all of the amenities) times the number of days that they stayed. The room then becomes available.
    - ~~Any Customers who are on the waitlist get notified that there is a vacancy.~~
- ~~When the colony receives the notification, they display a message that they received the notification and the name of the Roach Motel that sent it.~~
- When a colony checks out of the motel, they will either use RoachPal or their MasterRoach credit card to pay the bill. Roach Pay requires the name and email of the colony paying the bill. The MasterRoach credit card requires a name, a security code, a card number and an expiration date.
- All payments made will be written to a transaction log. This log will contain the name of the colony, the type of payment made and the amount.
- You will need a method to display the contents of the transaction log before you exit the program.
- ~~The motel is very concerned with cleanliness. Every day the maid staff cleans each of the rooms. The different types of rooms are cleaned differently:~~
    - ~~All rooms have their linens changed on every bed.~~
    - ~~For the basic room, only towels that are on the floor are replaced.~~
    - ~~For the deluxe room, all towels are changed.~~
    - ~~For the suite, all towels are changed and there is a hamburger placed on each pillow.~~
- ~~However, if the room has put out the "Do Not Disturb" sign, the room will not be cleaned.~~

PROCEDURE:

1. Look through the description and figure out what design pattern seems to fit the circumstances best.
    a. Singleton supports a single instance of a class. In the above description the roach motel fits that requirement.

b. The challenge with the pricing here is that the price is impacted by all of the amenities that the roach colony opts to include. That should remind you of Starbuzz coffee and the different toppings that you can order for your coffee. This calls for a decorator pattern.
c. Remember that we talked about the **Abstract Factory** pattern as a two-step process: create an instance of the FactoryProvider, then use the factory that it provides you to create object. In our case it was Geometric Objects that came in those two different families of object. In this case, we're going to use a dumbed down version of that, and just create an instance of Room, based on the room type, sort of like the Factory Provider, except there is no intermediate factory involved.
~~d. The Observer Pattern allows the Observers to subscribe to any number of Subjects, and the Subjects to have any number of Subscribers. I admit, this is a little strained here, but the Roach Motel itself is the Subject, and our waitlisted Roach Colonies are the Observers.~~
e. The Strategy Pattern allows you to change the behavior of an object based on a supplied object. The payment strategy will fit nicely into that pattern.
~~f. And, of course, by now it should be clear who/what visits the rooms as a use of the Visitor design pattern.~~

2. I would resign myself to writing several driver programs as you add one design pattern after another to the mix. Each time you add a new pattern, write a fresh driver that will exercise all of the functionality of the application as it exists by that point in your development process.
3. I am including the generated UML class model that came out of my implementation of the original scope for this project. You don't have to follow this to the letter, but I wanted to give you a start on the project. **Please realize that this shows the Visitor and Observer patterns. Do not try to implement them into your term project**.

SAMPLE OUTPUT:

```
motel: The only motel in town Room roster: Available rooms: [101, 102, 103, 104, 105]
Checkin - available Rooms: [101, 102, 103, 104, 105]
CheckIn - The colony: first colony 100 was assigned room: Room Number: 101 BasicRoom,
FoodBar, Spa, RefillBar, Shower Cost: 110.0
First room: Room Number: 101 BasicRoom, FoodBar, Spa, RefillBar, Shower Cost: 110.0
Our first roach colony is: first colony 100
motel: The only motel in town Room roster:
Room: Room Number: 101 BasicRoom, FoodBar, Spa, RefillBar, Shower Cost: 110.0
Is hosting: first colony 100
Available rooms: [102, 103, 104, 105]
Trying to add duplicate amenity.
Message from exception: Error, you used the amenity FoodBar twice.
Room r1 minus the foodbar is: [Spa, RefillBar, Shower]
After removing foodbar again: [Spa, RefillBar, Shower]
Checkin - available Rooms: [102, 103, 104, 105]
CheckIn - The colony: Second colony 1000 was assigned room: Room Number: 102
DeluxeRoom, FoodBar Cost: 85.0
Second colony 1000
motel: The only motel in town Room roster:
Room: Room Number: 101 BasicRoom, Spa, RefillBar, Shower Cost: 100.0
Is hosting: first colony 100
Room: Room Number: 102 DeluxeRoom, FoodBar Cost: 85.0
Is hosting: Second colony 1000
```

```
Available rooms: [103, 104, 105]
Spray colony: Second colony 1200- amenities for this room are: [FoodBar]
Our second roach colony is: Second colony 600
A customer is checking out.  Right now we have available Rooms: [103, 104, 105]
255.0 paid with credit/debit card
cost:255.0
motel: The only motel in town Room roster:
Room: Room Number: 101 BasicRoom, Spa, RefillBar, Shower Cost: 100.0
Is hosting: first colony 100
Available rooms: [103, 104, 105, 102]
Checkin - available Rooms: [103, 104, 105, 102]
CheckIn - The colony: third colony 300 was assigned room: Room Number: 103 BasicRoom,
FoodBar Cost: 60.0
Checkin - available Rooms: [104, 105, 102]
CheckIn - The colony: fourth colony 400 was assigned room: Room Number: 104
BasicRoom, FoodBar Cost: 60.0
~~Time to clean the rooms today motel: The only motel in town Room roster:~~
~~Room: Room Number: 103 BasicRoom, FoodBar Cost: 60.0~~
~~Is hosting: third colony 300~~
~~Room: Room Number: 101 BasicRoom, Spa, RefillBar, Shower Cost: 100.0~~
~~Is hosting: first colony 100~~
~~Room: Room Number: 104 BasicRoom, FoodBar Cost: 60.0~~
~~Is hosting: fourth colony 400~~
~~Available rooms: [105, 102]~~
~~Cleaning Basic Room: 103~~
~~Do Not Disturb sign out, bypassing this room.~~
~~Cleaning Basic Room: 101~~
~~Do Not Disturb sign out, bypassing this room.~~
~~Cleaning Basic Room: 104~~
~~the floor towels have been replaced.~~
Checkin - available Rooms: [105, 102]
CheckIn - The colony: fifth colony 500 was assigned room: Room Number: 105
DeluxeRoom, FoodBar Cost: 85.0
Room Number: 105 DeluxeRoom, FoodBar Cost: 85.0 has Do not Disturb set to: true
Checkin - available Rooms: [102]
CheckIn - The colony: sixth colony 600 was assigned room: Room Number: 102
DeluxeRoom, FoodBar Cost: 85.0
Checkin - available Rooms: []
~~Checkin - We're full.  Observers: [Seventh colony 700]~~
~~Checkin - available Rooms: []~~
~~Checkin - We're full.  Observers: [Seventh colony 700, eigth colony 800]~~
~~Time to clean the rooms today motel: The only motel in town Room roster:~~
Room: Room Number: 102 DeluxeRoom, FoodBar Cost: 85.0
Is hosting: sixth colony 600
Room: Room Number: 103 BasicRoom, FoodBar Cost: 60.0
Is hosting: third colony 300
Room: Room Number: 101 BasicRoom, Spa, RefillBar, Shower Cost: 100.0
Is hosting: first colony 100
Room: Room Number: 104 BasicRoom, FoodBar Cost: 60.0
Is hosting: fourth colony 400
Room: Room Number: 105 DeluxeRoom, FoodBar Cost: 85.0
Is hosting: fifth colony 500
Available rooms: []
~~Cleaning Delux room: 102~~
```

~~all towels have been changed.~~
~~Cleaning Basic Room: 103~~
~~Do Not Disturb sign out, bypassing this room.~~
~~Cleaning Basic Room: 101~~
~~the floor towels have been replaced.~~
~~Cleaning Basic Room: 104~~
~~the floor towels have been replaced.~~
~~Cleaning Delux room: 105~~
~~Do Not Disturb sign out, bypassing this room.~~
A customer is checking out. Right now we have available Rooms: []
180.0 paid with credit/debit card
~~The Seventh colony colony received the notification from The only motel in town~~
~~The eigth colony colony received the notification from The only motel in town~~
~~cost:180.0~~
Checkin - available Rooms: [103]
CheckIn - The colony: ninth colony 900 was assigned room: Room Number: 103 BasicRoom, FoodBar Cost: 60.0
~~Cleaning Delux room: 102~~
~~all towels have been changed.~~
~~Cleaning Basic Room: 101~~
~~the floor towels have been replaced.~~
~~Cleaning Basic Room: 104~~
~~the floor towels have been replaced.~~
~~Cleaning Basic Room: 103~~
~~the floor towels have been replaced.~~
~~Cleaning Delux room: 105~~
~~Do Not Disturb sign out, bypassing this room.~~
Dumping the log file:
2019-12-29 20:46:41.770 Colony: first colony 100 safely registered with amenities: [foodbar, spa, refillbar, shower]
2019-12-29 20:46:41.772 Colony: Second colony 1000 safely registered with amenities: [foodbar]
2019-12-29 20:46:41.773 Colony: Second colony 600 checking out of room: Room Number: 102 DeluxeRoom, FoodBar Cost: 85.0 for: 255.0 using: MasterRoach card - name: second zz colony Number ending in: 1333 cvv: 222 Expiration date: 2/12/2034
2019-12-29 20:46:41.773 Colony: third colony 300 safely registered with amenities: [foodbar]
2019-12-29 20:46:41.774 Colony: fourth colony 400 safely registered with amenities: [foodbar]
2019-12-29 20:46:41.775 Colony: fifth colony 500 safely registered with amenities: [foodbar]
2019-12-29 20:46:41.776 Colony: sixth colony 600 safely registered with amenities: [foodbar]
2019-12-29 20:46:41.776 No room at the inn for: Seventh colony 700
2019-12-29 20:46:41.777 No room at the inn for: eigth colony 800
2019-12-29 20:46:41.777 Colony: third colony 300 checking out of room: Room Number: 103 BasicRoom, FoodBar Cost: 60.0 for: 180.0 using: MasterRoach card - name: third q. colony Number ending in: 4666 cvv: 321 Expiration date: 10/25/2030
2019-12-29 20:46:41.778 Colony: ninth colony 900 safely registered with amenities: [foodbar]
Completed Satisfactorily.

WHAT TO TURN IN:

- Each of the class files that you created for the project.
- Your console output, named console.txt
- The UML class diagram for this project
- Your collaboration.docx file.