

assignment 3.1 Design patterns

Natural language description

The Pacman game implements three design patterns namely the factory, the template method and the observer pattern, of which the factory and observer pattern will be described in this document.

1. The template method

The pacman game revolves around Pacman eating pellets while trying to avoid collision with any of the ghosts. Each ghost has its own strategy to move around and find pacman. For example some ghosts will simply move around randomly and some ghosts will calculate and follow the shortest path to get to pacman. Besides moving the behaviour of every ghost class is the same. In order to keep code duplication to a minimum and keep a uniform interface between all ghosts, the game implements the template method. it does by having an abstract ghost class which implements all the methods for the ghosts except for an abstract move method which each specific ghost class must implement by itself.

2. The observer method

In order to move around the ghost must be aware of each others position and that of Pacman. Because of the uncertainty of how many different type of ghosts must be aware of each other and the desire to keep coupling between classes to a minimum. The game implements the Observer pattern. The observer pattern is implemented by having two interfaces available, the observer and observable interface.

Observer

Each class that wants to allow other classes to be able to subscribe to their location, should implement the observer interfaces which holds three methods. registerObserver, deregisterObserver and notifySubscribers. Of which the first two take a class that implements the observer interface and should store it somewhere internally for reference inside the notifySubscribers method. Each time the Observable class want to notify its observers it calls the notifySubscribers method and chooses what is broadcasted.

Observable

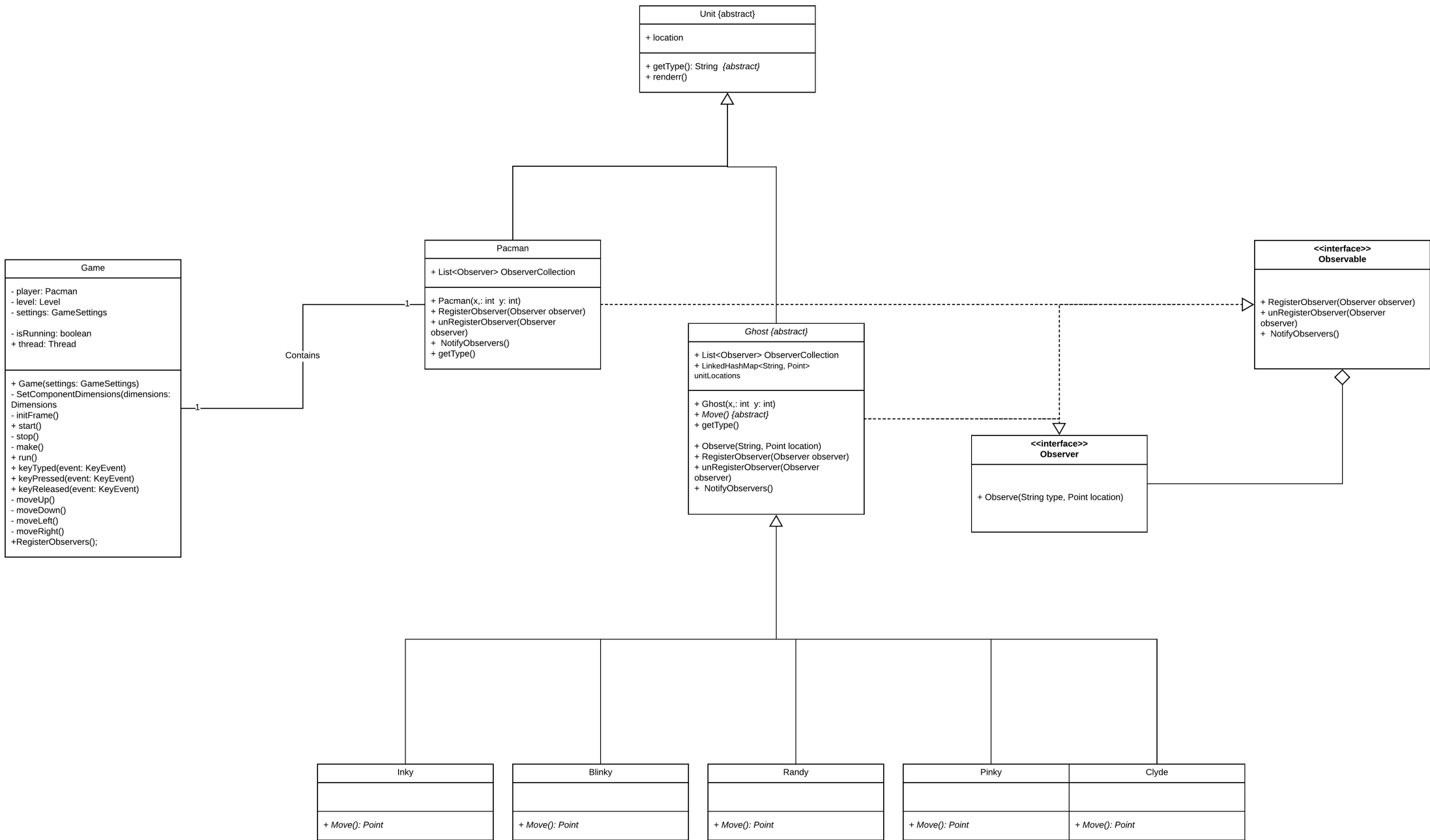
Each class that wants to be able to get subscribe to other classes should implement the observer interface which has one Observer method which takes the type of the sender and a Point.

Implementation in the game

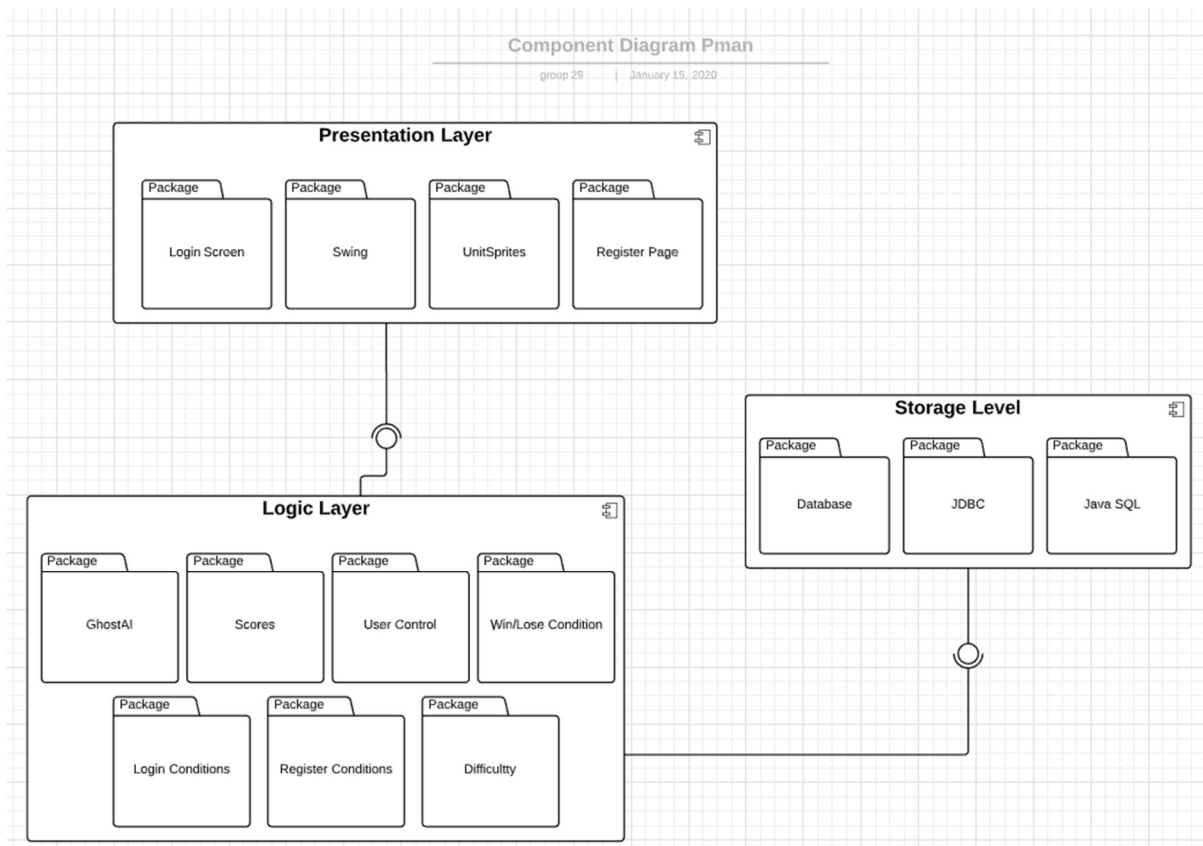
The pacman class implements the observable interface and keeps a list of Observer objects internally. Each time notifySubscribers is called, the list is iterated and each observer's observe method is called receiving pacman's type and location as a Point.

The abstract ghost class implements both the observable and observer interface. For the Observable interface the Implementation is the same as for pacman. For the observer interface an internal hashMap is kept with the type of the sender as key and the location as value.

When the game is started all ghosts are added to pacmans list of subscribers and to each desired other ghost.



Exercise 2



When the application starts, the first thing you see is the login screen. The login screen functions in this case as a main menu and it is provided with a few buttons and two text fields. For this GUI we used Swing.

One of those buttons is the register button. If you are new to the game or maybe want a new account, you can click this button in order to get to the register page. Here you can create a new user account by filling in a username and password of your choice in the provided text fields. If the database doesn't contain that username yet, the registration should succeed and your username and password get stored in the database. Otherwise the registration fails and another username has to be chosen. For the GUI we use Swing here as well.

Once you have registered successfully, you have the option to login. As mentioned before, the login screen contains two text fields, one for the username and one for the password. After you fill them in, the system will check if the database indeed contains that specific username and if so, it then also checks if the password matches. The System is able to access the database by connecting to it with a JDBC-driver and the URL of the database. After the connection is made, Queries are executed to see if the username and password

are present. If all of this is correct then you enter the game. Otherwise you have to try logging in again or register with another username first and then login again.

The game is the main component and it consists of levels (at least one level). A level is a gameboard with walls, pellets, ghosts and the player. We represent those units with sprites. Besides that there are also extra features like fruit that gives you bonus points when you eat them. In a level you can move Pacman around and you are supposed to eat every pellet in the game while you avoid the ghosts.

A ghost is a unit with a specific movement algorithm and every ghost has a different one. Whenever you eat a pellet, you increase your score. And when you eat bonus fruit your score increases even more. The level is won when you have eaten all the pellets. When you hit a ghost, the game is lost. The game is won when all the levels are won. If even one level is lost, the game is also lost. We make the gameboard GUI with a map parser. Our map parser turns # into wall, chars like R or B (first letter of ghost names) into ghosts and P into Pacman.

At the end of the game your score get stored in the database. Your score is determined by the amount of pellets and bonus fruit you have eaten in the game. If your score is one of the top 10 highest scores in the database, your username and score gets to be on the leaderboard. You can access the leaderboard but clicking on the leaderboard button on the login screen (the main menu).

In the Login Screen also has 3 buttons to choose a difficulty. The 3 options are easy, normal and hard. The easy one could have a smaller map and only 1 or 2 ghosts. That way there are fewer pellets to eat (because of the smaller map) and less ghosts to avoid.

In normal mode the map would be of normal size and there would be 2 or 3 ghosts. Also the speed of the ghost will be fitting to the game mode.

In hard mode the map will be extra big and there will be the 3 ghosts of the normal mode plus some extra ghost that or just chase Pacman or move random.

For every difficulty, the same winning and losing game conditions as mentioned before hold.

