**Final Project Description**

**Group Members:**

Mohammed Alotaibi, Reem Naqvi, Ziteng Guo

**5 Design Patterns Used:**

* **Observer Design Pattern:**

Columbus is subject, Pirate(s) are observers. Columbus will notify Pirate(s) when it changes its location, and Pirate(s) will use their chasing strategy to get to Columbus.

* **Singleton Design Pattern:**

OceanMap is singleton, and can only be referenced by “*getInstance()*”. This is responsible for creating the Grid.

* **Decorator Design Pattern:**

Columbus can have multiple lives using “*addLifeToColumbus()*”, the function can be called multiple times, each time adding 1 to Columbus’ life. Every time Columbus get caught by Pirate,

* if it has more than 1 life, its life will be deducted by 1, then it will be put at a random place on map and go on play the game
* if it has only 1 life left, game over
* **Strategy Design Pattern:**

Pirate can have different search strategies

* one is normal, move 1 grid at a time, chase Columbus in a very efficient way
* one is insane, move up to 2 grids at a time, chase Columbus in an insane speed, and it ignores any island.
* **Multi-Thread:**

There will be several sharks swimming in the sea, which cause no damage to any ship. They move in the ocean and are the sea Monsters.