**Project 4 - Tunnel Man Game**

**Description and ideas**

I choose to put isProtester() in Actor class and make it virtual. I let the virtual function in base class return false, and let the virtual function in Protester class return true. Then we can use this function to determine if an Actor pointer in m\_actors vector is a protester. I put getAnnoyed() and findGold() in Actor class and make them virtual because both TunnelMan and Protesters can get annoyed and find gold nuggets, and they each have their different version of it. I make doSomething() in Actor class pure virtual because actor is abstract and each derived class (Boulder, Goodie, Protester, etc) has their own virtual version of doSomething(). I choose to define a pure virtual version of the function informWorld() in Goodie class, because each goodie (Barrel, Sonar, Water, Gold) has a different way to inform the world to update player’s inventory. I choose to define a pure virtual version of functions playerEarnsPoints() and findGold() in Protester class because player earns different points when Regular and Hardcore Protester gives up, and the two kinds of protesters have different reactions towards a bribe.

**Bugs and solutions**

* When Tunnel Man picked up a sonar, the number of sonar displayed on the top of the screen didn't update and I didn’t know the reason at first. Then, I found out that the updated m\_sonar was not retrieved in setGameStat(), so I wrote a function numSonar() which allowed setGameStat() to retrieve the updated value of m\_sonar.
* When Tunnel Man was get annoyed by protesters, I met the problems that the interval of getting annoyed was too short and protesters can pass through the Tunnel man and make him annoyed. After thinking over them, I set the request of m\_shoutTick as 60, and the interval of getting annoyed was roughly the same as the sample.
* When Protester was hit by Boulder, the program would crash because of the existence of null pointer. After analysis, I found the reason is that the falling rock would not naturally fall to the ground and disappear. Then, getLocation() could not reach the position of Protester, resulting in the existence of null pointer, causing a breakpoint. The problem can be solved by Dividing the original getLocation() function into getExitLocation() and getTunnelManLocation(), and set different labyrinth pathfinding algorithms for the two functions.

**My classes**

**class Actor**

* New objects from the derived classes can be added to game world properly using setWorld(). Can reflect if the actor is alive or dead properly. Can set the actor’s state to dead.

**class Earth**

* Earth objects are visible and a size of 1\*1. There is a mine shaft in the middle of the field and Earth objects are not visible in the mine shaft.

**class TunnelMan**

* Can take keyboard command and move up, down, right, left within the field, when it tries to go out of bounds or go through boulder, it doesn’t move. Earth objects which overlaps with TunnelMan are set invisible and make a digging sound so that TunnelMan can dig through the field. When player presses spacebar, the player can fire a squirt, which appears 4 squares in front of TunnelMan. If the squirt’s starting location is occupied by earth or boulder, it doesn’t get added to the field, but water count still decreases by 1. If TunnelMan doesn’t have water in its inventory, nothing happens. When player presses “z” or “Z”, all hidden objects (Gold and Barrel) within 12.0 radius of TunnelMan become visible. When player presses tab, drop a Gold object at player’s current location and cannot be picked up again by TunnelMan. When TunnelMan gives up, it loses a life and the level restarts if it still has lives left, otherwise game is over.

**class Boulder**

* Its location is not within radius of 6.0 of other boulders and barrels of oil. When all 4 Earth objects directly below Boulder is dead, Boulder waits for 30 ticks and starts falling until it reaches the earth or the bound or another boulder. It can bonk TunnelMan or Protesters along the way, which causes TunnelMan to lose a life or Protesters to give up. When boulder is falling, it cannot overlap with any Earth objects.

**class Squirt**

* Can travel at the direction it’s facing for at most 4 squares, then disappears. If it reaches Earth or Boulder, it disappears immediately. If it reaches a protester, it also disappears immediately, and the protester freezes for a certain amount of ticks. If the protester gets shot at by squirts repeatedly, it will give up.

**class Goodie**

* Can make goodie visible when TunnelMan comes within a radius of 4.0, can remove goodie when TunnelMan comes within a radius of 3.0 and make the appropriate reaction.

**class Barrel of Oil**

* Its location is not within radius of 6.0 of boulders and other barrels of oil. It starts off as invisible and hidden within earth. Can be discovered and picked up by TunnelMan, and when TunnelMan has collected all the barrels in the current level, the game moves to the next level.

**class Sonar Kit**

* Always appears at top left corner. Can be discovered and picked up by TunnelMan and TunnelMan’s sonar inventory increases number of sonar kits by 1. Can disappear after a certain number of ticks. When player presses “z” or “Z”, if the player has sonar in his inventory, all hidden objects (Gold and Barrel) within 12.0 radius of TunnelMan become visible, then decrease number of sonar kits by 1.

**class Water Pool**

* Always appears at earth-less and boulder-less locations. Can be discovered and picked up by TunnelMan and TunnelMan’s water inventory gets updated by 5. Can disappear after a certain number of ticks.

**class Gold Nugget**

* Its location is not within radius of 6.0 of boulders, barrels of oil and other gold nuggets. It starts off as invisible and hidden within earth. Can be discovered and picked up by TunnelMan and TunnelMan’s gold inventory gets updated by 1. When player presses tab, if the player has gold in his inventory, add a gold that’s visible and only pickup-able by protesters to the current location of player, then decrease the gold inventory by 1.

**class Protester**

* When it’s annoyed, it speed walks to the exit, which is at the top right corner, and leaves. If it’s leaving, it cannot shout at TunnelMan or be annoyed. If it can see TunnelMan without earth or boulder blocking his sight, it moves towards TunnelMan. Can make a turn at intersections. Can change current direction randomly after a certain amount of ticks. It changes to a viable direction when trying to move through boulder or earth or go out of bounds. Can get bribed.

**class Regular Protester**

* Can perform all actions in Protester class. When it receives a bribe, it immediately transitions to leaving state, and increase player’s score by 25. When it gives up, player earns 100 points.

**class Hardcore Protester**

* Can perform all actions in Protester class. When it receives a bribe, player earns 50 points, and it freezes for a certain amount of ticks, then resume normal actions. If TunnelMan is not within a radius of 4.0, it can search for the shortest path to player’s location. If it can get to player within 16 viable steps, it will move along the path. When it gives up, player earns 250 points.