A Mini Case Study by Rev. Dr. Douglas R Oberle

Mash, Mangle & Munch includes 4 monsters. Read the game description in "Mash Mangle Munch.txt".

The notable files are:

MMMDriver.java - has the main function that runs.

MMMPanel.java - this is the file where you, the student, will enter much of the code for the assignment. The panel has several subclasses that are access utility files. That means that they are not subclasses in a traditional sense: they contain utility methods that have access to the static data fields in MMMPanel.java, which feeds access to AIMovement.java, ImageDisplay.java, MapBuilder.java, Ordinance.java, Spawner.java and Utilities.java. This helps keep commonly themed methods in a separate file (like random map building tools can be found in MapBuilder.java), and keeps the main panel from being excessively long.

The hierarchy of players, both human controlled and AI are:

Entity.java <- Player.java <- Monster.java <- (Gorilla.java, Dinosar.java, Robot.java, Insect.java)

Entity.java <- Player.java <- Vehicle.java

Other subclass entities are as follows:

Entity.java <- (Bullet.java, Explosion.java, Structure.java)

Mash Mangle Munch.txt- description of the program with keyboard controls and hints.

THE ASSIGNMENT.txt - lists and describes the assignment to be completed (this very file)

Your assignment is to add a 5th monster:

DESCRIPTION:

The Blop: the offspring of the Bird Flu and the Superbug, the Blop was disposed of by the CDC in a vat of toxic waste. Growing to enormous size with an insatiable appetite, the amorphous mass is out to punish its makers. The Blop leaves a trail of toxic sludge wherever it goes, so it must be careful when making tracks. It can trap victims to eat, but lay waste to too much space and the food will never come back.

If the Blop is at full health, it can split into two, but at the expense of damaging itself. If it gets close enough to its twin, it can recombine into a single monster to regain health.

Modifications will be made in MMMPanel.java. You will want to create a new subclass of Monster, called Blop.java. The program runs from MMMDriver.java.

1) Create the monster with the following specifications

name: "The-Blop"

animation images: playerImages[4]

stomp power: 20 -this is how much damage is done to a building when stomped on

speed penalty: 1 -affects player speed

reload time: 0 -The-Blop only shoots a projectile in EARTH\_INVADERS game mode

walk damage: 90 -this is how much damage is done just by walking on a structure

projectile type: “GLOP” –only used for EARTH\_INVADERS game mode for The-Blop

burn damage: 50 -this is how much damage the monster takes by standing in a fire

ABILITIES:

swimmer: yes -we move faster in water

can split: yes -we can split into an AI controlled twin at the expense of health

impervious to bullets: yes -bullets do no damage, but shells and flame do double damage

slime trail: yes -we leave a trail of toxic slime behind us (Blop-Glop)

can eat all: yes -we can grab and eat any type of unit

NOTE: monsters are created in several places in MMMPanel.java (for player1, player2, AI player, etc) as well as in Spawner.java (which spawns AI monsters in the game mode CITY\_SAVERS). To make the game activate when you select the Blop, search for the variable ***needToStart*** in MMMPanel.

2) Complete the code in MMMPanel to add the functionality for creatures that are impervious to bullets:

2a) Any monster that is impervious to bullets takes no damage from bullets (Projectile of type “BULLET”), but takes double damage from all others. Note: this rule should NOT be applied in EARTH\_INVADERS mode, and should be applied to any kind of monster that has this feature. Press ‘Y’ in-game to increase the threat level to test your code.

2b) If Projectile of type “BULLET” hits a creature that is impervious to bullets, there should not be an explosion image produced (the bullet is absorbed).

3) For any ground unit that The-Blop runs over, it should produce a smoke puff explosion instead of a fireball explosion. Exclude this rule for trains, boats and aircraft.

4) The-Blop can grab any type of unit to eat.

5) The-Blop gains 5-10 health points for any type of unit that is eaten, and its hunger level decreases by one level.

6) For any creature with the slime trail ability, with each space that the monster moves, it leaves a trail of toxic slime called "Blop-glop".

Blop-glop takes the form of a Structure (like buildings, trees or rubble).

This way, vehicles and crowds should not be able to pass over it.

The only entities that can pass over Blop-Glop are monsters, tanks (and aircraft that fly over it).

***board*** is the array of terrain, ***structures*** is the array of Structure objects.

A terrain element in ***board*** that contains a “**~**” (tilde) has water.

Blop-glop cannot be dropped in the water or over another structure (even rubble).

Blop-glop does property damage by destroying roads and parks, between $0-$2999 damage.

STRUCTURE –

name: "Blop-glop"

images: blopGlopImages

animationDelay:15

is passable: true (passable by monsters/tanks/aircraft, impassable by everyone else)

is destroyable: true (not destroyable by stomp, but should be destroyed by tank shells or fire)

height: 1

health: -1 (-1 health means it can be shot over by projectiles)

image index: pick a random one from blopGlopImages (random 0-3)

property value: 0

For leaving the trail of Blop-glop, look into Structure.java to see how the constructor of Structures are defined, and MapBuilder.java for insight as to how to create instances of Structures. You will also find in MapBuilder.java the means in which water is defined in the world, so that you can keep Blop-glop from being dropped over water.

7) The Blop can't shoot projectiles (outside of the EARTH\_INVADERS game mode), but if the player tries to hit the shoot key (or mouse button), make the Blop separate into two entities, the original player controlled monster and an AI controlled twin. The Blop can only separate if its health is 100. When it separates, the original Blop should lose a random number of health points between 25 and 75. The Blop cannot separate again if its twin is active, even if its health gets back up to 100. If the Blop is close to its twin (within one space), hitting the shoot key will recombine them into a single monster. When the Blop recombines, it gains between 50 and 100 health points. NOTE: this rule should not be applied for EARTH\_INVADERS game mode. (there is a boolean data field called blopSplit that can be used to flag whether or not it has split yet)

8) The highScores array is read from (and writes into) a text file for each game mode. These files are vulnerable to shenanigans: someone could just open it up in a text editor and insert their fake high score. Change the name of the file to something more cryptic, drop the file extension so the user doesn't know to open it in a text editor. Then have a means of encrypting the data when it is written into the file, and decrypt it when it is read from the file. If a user were to open it with a text editor, they should not be able to tell that it is the high score data. But from the scope of the program, it should work the same.

Extra credit: create a 6th monster type - Wormoid.

DESCRIPTION:

Wormoid: while fracking for natural gas, the Shadow Government Energy Conglomerate (SGEC) disturbed the subteranian nest of Wormoid. Agitated by the noise pollution from SGEC's drilling and pounding, Wormoid is out to silence her noisy neighbors upstairs. Wormoid can not jump, but she sure can dig: rendering her invisible to unsuspecting civilians or the pesky military machines. But be careful not to dig under electrical towers, gas stations or water: Wormoid can't swim, and is vulnerable to electricity and fire. Wormoid has no arms, but she can spit a sticky web to trap food for later. Her web has another nifty function: Chain a web between two close towers to create a trap for low-flying aircraft.

1) Create the monster with the following specifications in Worm.java

name: "Wormoid"

animation images: playerImages[5] with a delay of animation\_delay/2

stomp power: 30 -this is how much damage is done to a building when stomped on

speed penalty: 0 -affects player speed

reload time: 100 -amount of time to recharge a web

walk damage: 5 -this is how much damage is done just by walking on a structure

projectile type: “WEB” -traps ground units or sets a trap between tall towers

burn damage: 50 -this is how much damage the monster takes by standing in a fire

ABILITIES:

digger: yes -we can dig underground

shooter: yes -we can shoot a projectile

can’t grab: yes -we have no arms to grab and hold food with

NOTE: monsters are created in several places in MMMPanel.java (for player1, player2, AI player, etc) as well as in Spawner.java (which spawns AI monsters in the game mode CITY\_SAVERS).

2) The Wormoid has no arms, so she cannot grab and hold on to any ground units. This is true for any monster with the cantGrab feature. When this kind of monster initiates a grab attempt, she should just eat the unit within snatching range:

-Wormoid can grab all units except aircraft (AIR) and boats (BOAT).

-eating any type of unit will reset her hunger level back to zero.

-eating a unit of type CROWD restores 5 health points.

-eating a bus will restore 4 health points.

-eating any other unit will restore 2 health points.

3) Wormoid should only be able to shoot a web if she has met her reload time and is not weakened from hunger.

4) When any digger initiates a stomp command, she digs a hole and goes underground (or resurfaces if already underground). Both digging and resurfacing should leave a "hole" structure on that location.

Digging holes is not allowed in EARTH\_INVADERS or BOMBER\_DODGER game modes.

STRUCTURE –

name: "hole"

images: holeImages

is passable: true (passable by monsters/aircraft, impassable by everyone else)

is destroyable: false

height: 1

health: -1 (-1 health means it can be shot over by projectiles)

image size: cellSize/3

image index: pick a random one from holeImages

property value: 0

For leaving the hole, look into Structure.java to see how the constructor of Structures are defined, and MapBuilder.java for insight as to how to create instances of Structures. You will also find in MapBuilder.java the means in which water is defined in the world, so that you can keep holes from being dropped over water.

Also look for where the code allows for the WoeMantis to fly when the stomp command is issued. You will find this in MMMPanel and Utilites.java.

Any human, vehicle or player 2 spawn points at the location of the hole should be removed from the list of spawn points.

$3000 additional property damage should be dealt for the hole left in the ground.

4b) there is no collision between any vehicles and a digger if she is underground.

4c) Diggers cannot shoot a web while underground.

4d) While underground, diggers are invisible except for a small smoke puff that appears any time the digger initiates or completes a move command. Use a water explosion if digging under water and and electrical explosion if under an electric tower.

4e) While underground, the digger should be able to traverse to a location above or below her even if there is a structure there.

4f) Diggers only moves at 1/3 speed when underground.

5) A digger surfacing from under an electrical tower or water causes instant death. Look to MatBuilder.java to see how board locations store strings to denote electrical towers and water.

6) A digger initiating a stomp to dig or surface should cause a large explosion (the same as the one caused by a WoeMantis that is landing). The resulting radius damage should do 50 points of damage with a 5% chance of causing a fire.

7) Every 100 frames, a digger will take a random amount of damage when under water:

25-75 points of damage when in water but digging underneath it, and 50-150 points of damage if in the water but not digging underneath it. Check in Utilities.java for damage done over time due to drowning.

8) Every 100 frames, a digger will take 25-75 points of damage if digging under an electric tower.

9) Diggers takes half damage from any radius damage when digging underground. Check Ordinance.java for radius damage.

10) AI units should not be able to see diggers when digging underground. Check AImovement.java for AI vision of monsters.

11) If a unit is struck by a web (excluding trains, other monsters and air vehicles), set the stun time to 4 times the messageTime.

12) Any player struck by a web should produce a small smoke puff explosion

LUCKY 13) Any monster with the web projectile can set traps for high flying aircraft by stringing a web between two towers that are within 3 square cellSize blocks of one another. Currently, code exists in Ordinance.java's outOfBounds method that records information about each web trap that is set (for use in displaying the trap and collision checking). There is an array of ArrayLists (one ArrayList for each of the 9 panels) called webs. Each element of each List contains an array of 8 integers: the first two values record the x & y position of the first web node, followed by the x & y position of the second web node. The last 4 values record the row and columns for the two buildings that are the supports for the web trap. For example, lets say the center panel has a webs List with the following values:

[124, 43, 49, 213, 4, 5, 7, 6]. That means that there is one web trap between (124, 43) and (49, 213) in pixel space, chained between buildings at (4,5) and (7,6) in row/column space. In AImovement.java's makeEnemyMove method, this information is used to see if there is a collision between an aircraft and a web trap that calls Utilities.isPointOnRay.

In Utilities.java,

//pre: x1 - x2 != 0

//post: returns true if the point (x,y) is within (cellSize/2) units from the ray defined by (x1,y1) & (x2, y2)  
public static boolean isPointOnRay(int x, int y, int x1, int y1, int x2, int y2)

Consider this: given point (x,y) and a ray defined by (x1,y1) and (x2,y2), how could you determine if the point is on the ray? How could you determine if the point is close to the ray? Draw a few pictures, and note that there is a useful helper method defined right above isPointOnRay in Utilities.java.