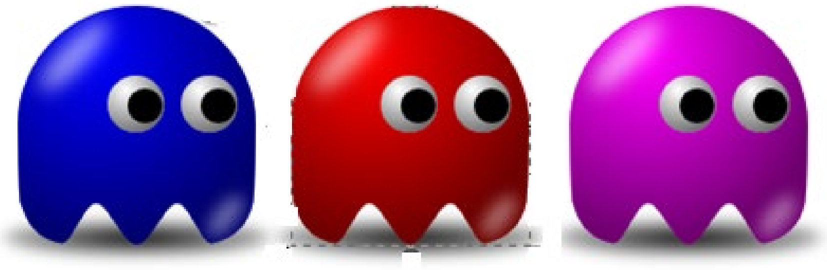
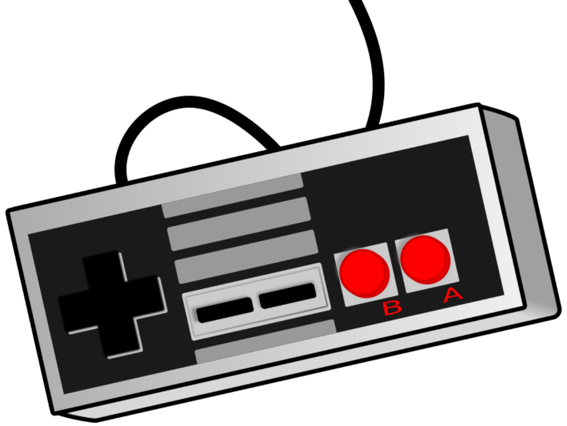




# Lab_10

## Greenfoot Simulation (Part 3)

420-141-VA - GAME PROGRAMMING 1 - VANIER COLLEGE

# Outline

- Step 1: Greenfoot Simulation (Part3) Instructions
- Step 2: Accept the Assignment from Github Classroom to **Remote Repository**
- Step 3: Clone the Project from **Remote Repository** to **Local Repository**
- Step 4: Open Greenfoot Simulation from **Local Repository**
- Step 5: Extend **MyWorld** from **SimulationWorld**
- Step 6: Extend **CannonBall**, **Cannon and Targer** from **SimulationActor**
- **Step 7: Commit your changes and push to github (1)**
- Step 8: Moving Camera in **MyWorld**
- **Step 9: Commit your changes and push to github (2)**
- Step 10: Submission through LEA OMNIVOX

# Step 4: Open Greenfoot Simulation from Local Repository

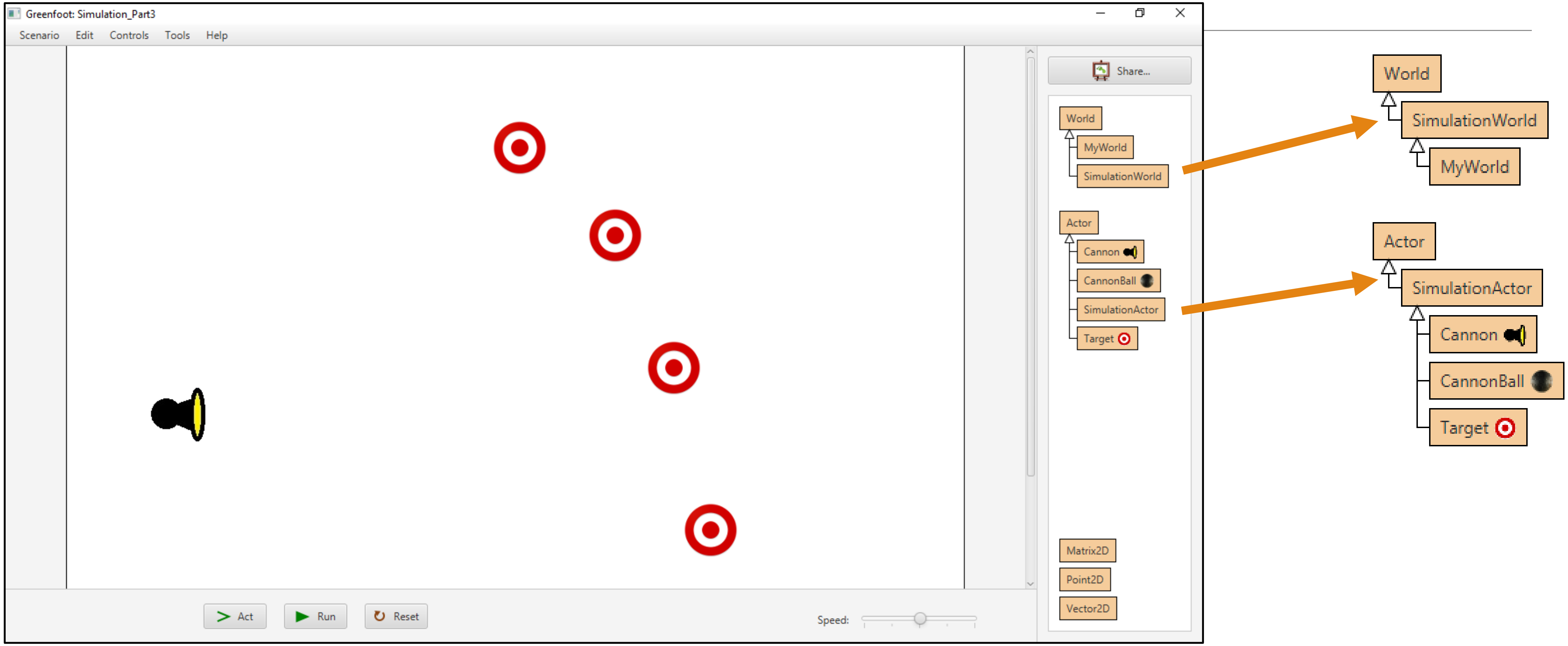


Figure 7

# Notice the new files

## SimulationWorld

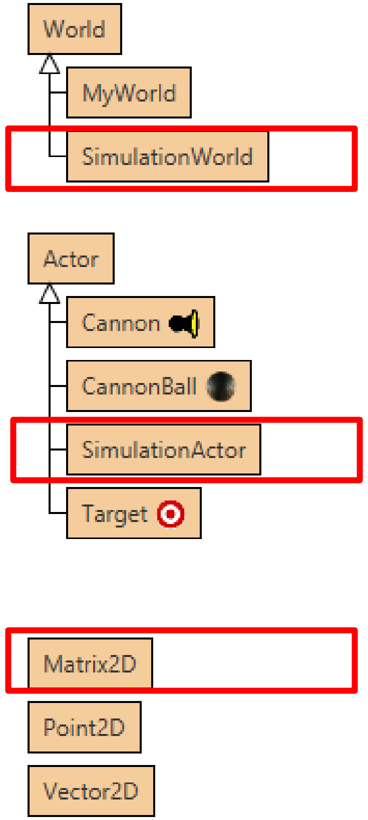
- This will be the world class going forward, it contains  a lot of code that should be common to any game doing simulation.
- More code coming soon (music track, gif background, …)

## SimulationActor

- This will be the actor class going forward.

## Matrix2D

- This allows transforming vectors and points
- It allows converting between **World** and **Window** coordinates given camera parameters.



# A bit on Inheritance

Whenever we have many classes sharing similar behaviors (or parts of the same code), it is advisable to **refactor** the code, so they all inherit from the same superclass.

In our cases, we need to modify actors and worlds so that they support two reference units (**pixels for the window, and meters for the world**).

Using inheritance limits the amount of code to write when we create a new sub class. **All the common code between classes is moved to the super class.**

## Keywords related to inheritance

**extends**

- It specifies the superclass for a subclass
- The example below states that **cannon** is a subclass of **Actor**, actor is the super class

```
class Cannon extends Actor
```

**super**

- It invokes something defined in the super class
- For examples:

```
// constructor of super class
super(parameters)
// invoke act in the super class
```

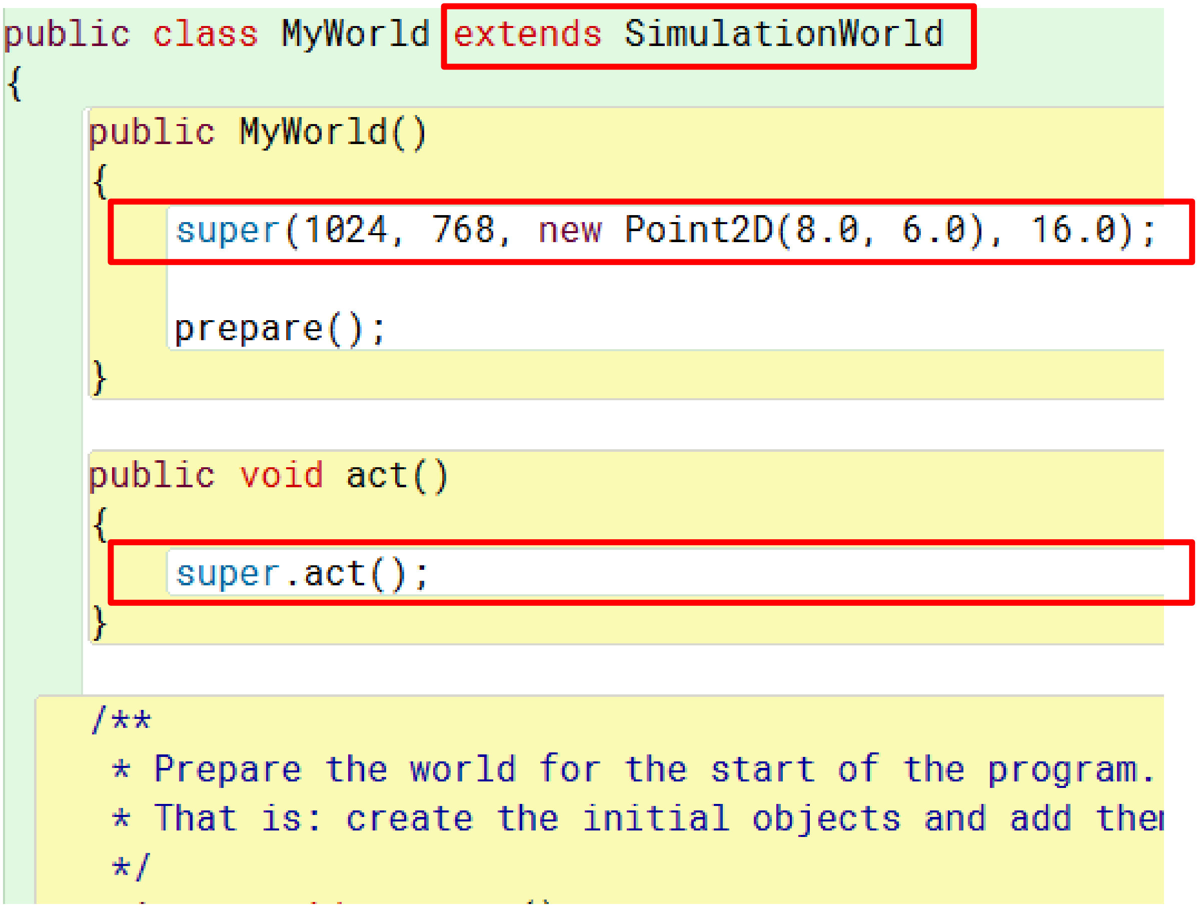
# Step 5: Extend MyWorld from SimulationWorld

1. Make the class extend **SimulationWorld** instead of **World**

2. The constructor in the superclass has new parameters
   - width and height of window
   - virtual camera position (in world units)
   - virtual camera width (in world units)

3. **SimulationWorld** contains everything related to the time step duration. You should remove all of this code in the **MyWorld** class.

4. In the act() method, make sure the act() method of the superclass (the one we inherit from) is invoked.



```
public class MyWorld extends SimulationWorld
{
    public MyWorld()
    {
        super(1024, 768, new Point2D(8.0, 6.0), 16.0);

        prepare();
    }

    public void act()
    {
        super.act();
    }

    /**
     * Prepare the world for the start of the program.
     * That is: create the initial objects and add the
     */
```

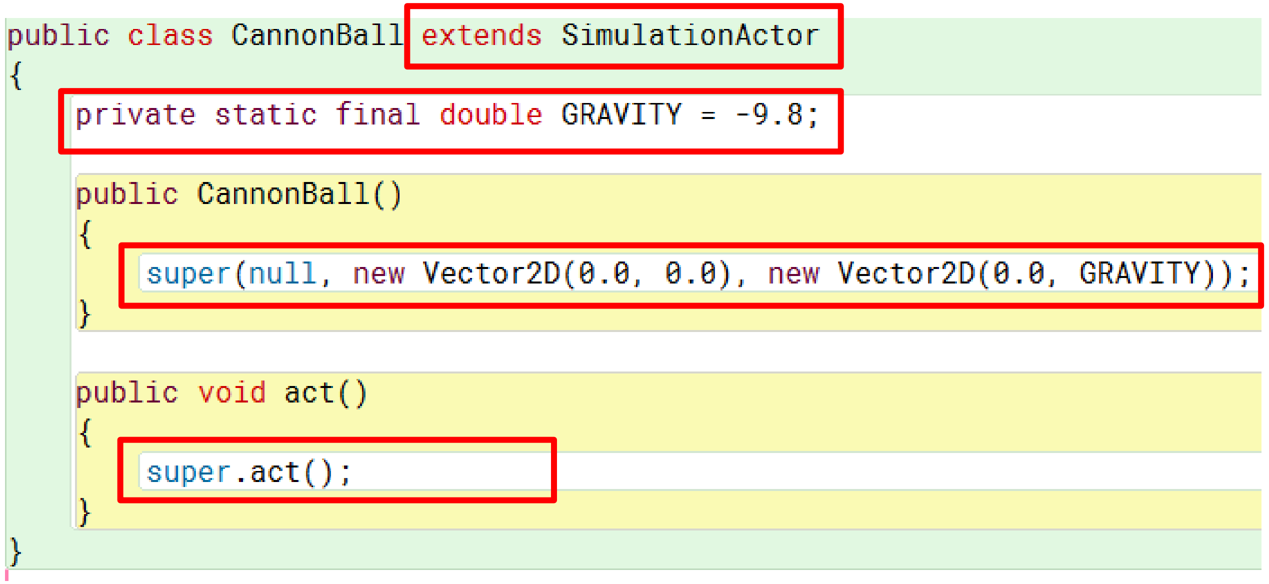
# Step 6.a: Extend CannonBall from SimulationActor

You can remove all the code related to physics because it is all implemented in the simulation actor.

The gravity can now be converted to $m/s^2$

The superclass' constructor requires an initial position (or null), velocity and acceleration

Act must be invoked every frame in the super class.



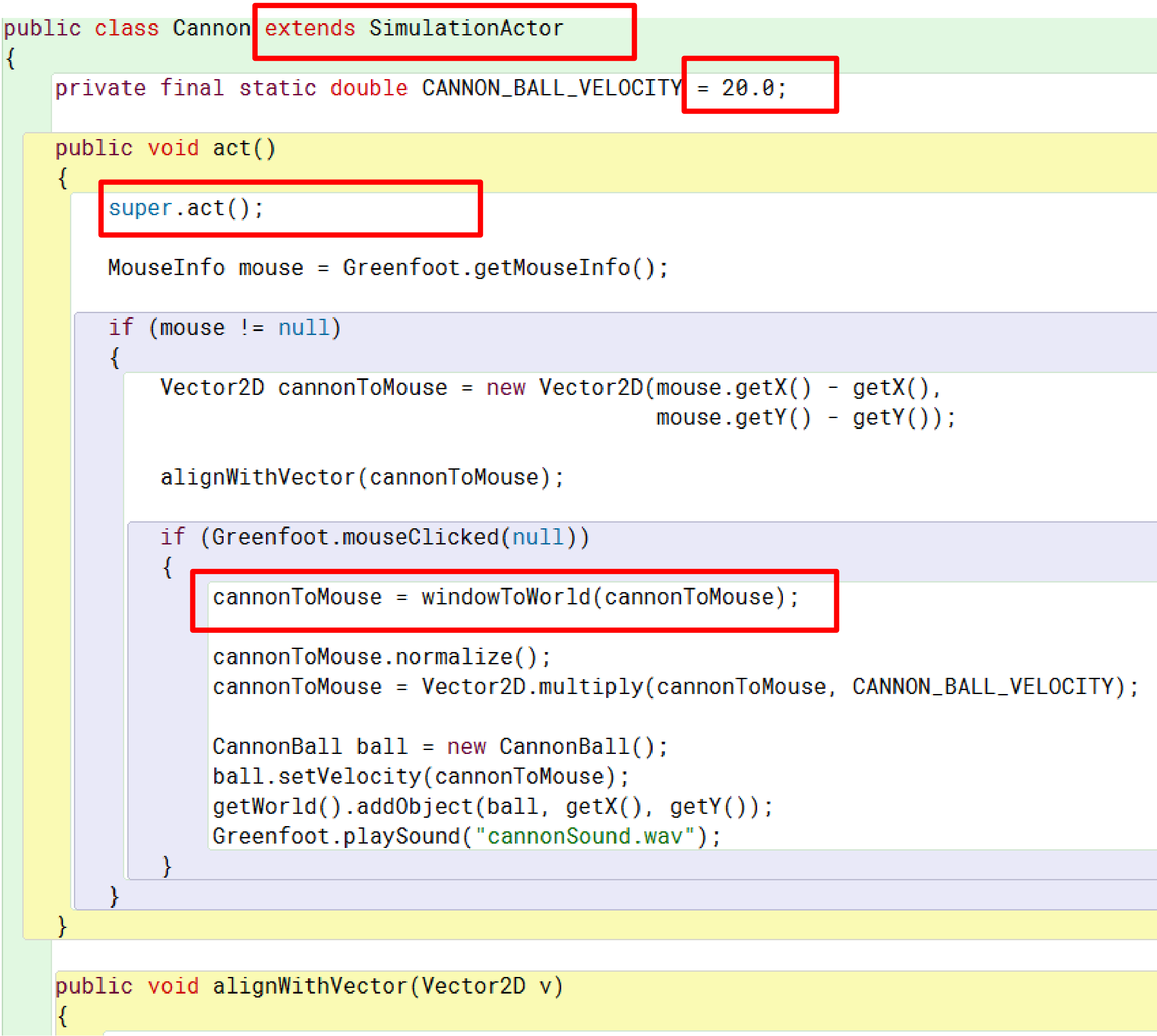
```
public class CannonBall extends SimulationActor
{
    private static final double GRAVITY = -9.8;

    public CannonBall()
    {
        super(null, new Vector2D(0.0, 0.0), new Vector2D(0.0, GRAVITY));
    }

    public void act()
    {
        super.act();
    }
}
```

# Step 6.b: Extend Cannon from SimulationActor

Act must be invoked every frame in the super class.

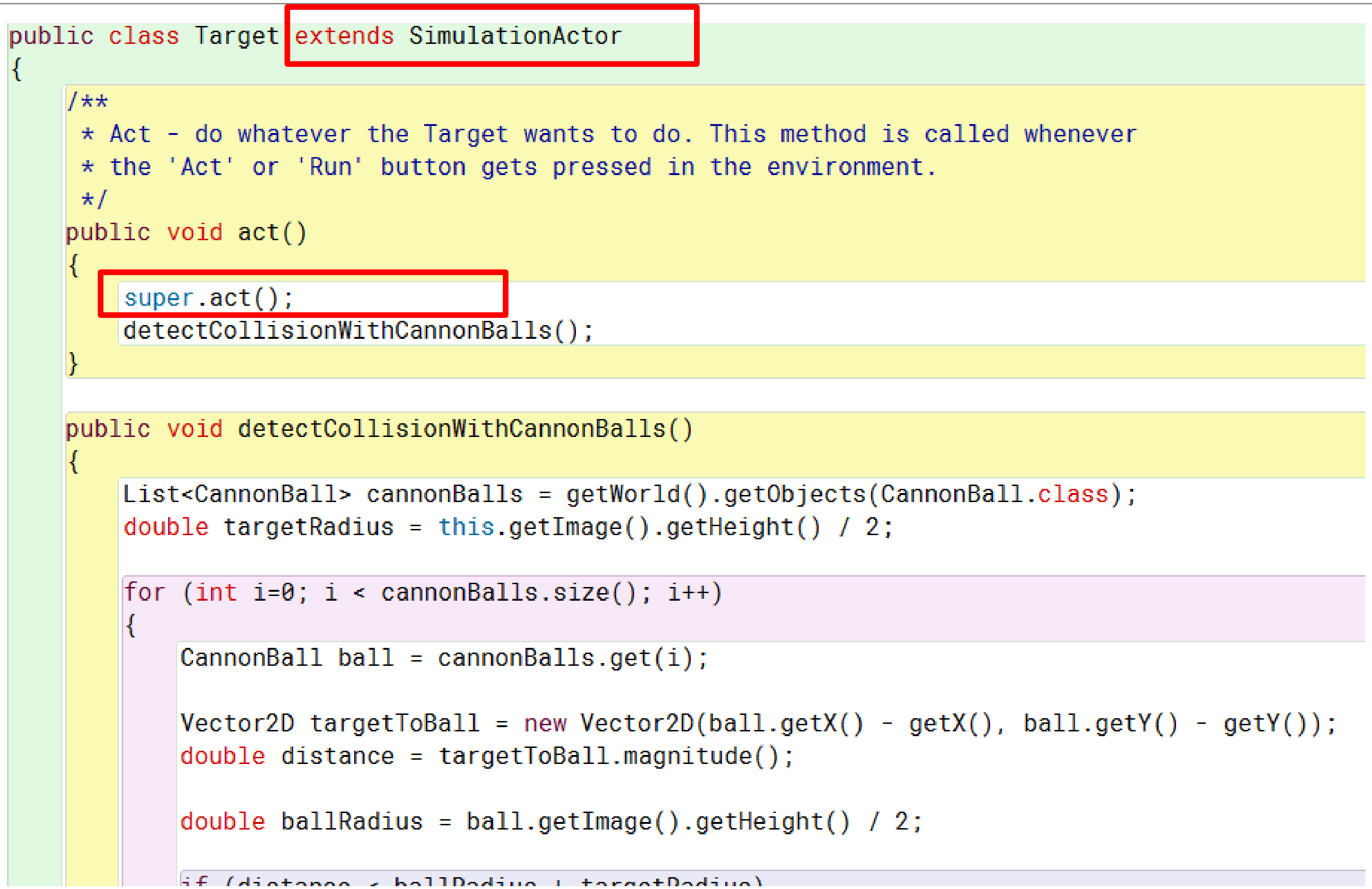
The **velocity** can now be converted to $\frac{m}{s}$

The vector to shoot must be converted to world units before



```
public class Cannon extends SimulationActor
{
    private final static double CANNON_BALL_VELOCITY = 20.0;

    public void act()
    {
        super.act();

        MouseInfo mouse = Greenfoot.getMouseInfo();

        if (mouse != null)
        {
            Vector2D cannonToMouse = new Vector2D(mouse.getX() - getX(),
                                                  mouse.getY() - getY());

            alignWithVector(cannonToMouse);

            if (Greenfoot.mouseClicked(null))
            {
                cannonToMouse = windowToWorld(cannonToMouse);

                cannonToMouse.normalize();
                cannonToMouse = Vector2D.multiply(cannonToMouse, CANNON_BALL_VELOCITY);

                CannonBall ball = new CannonBall();
                ball.setVelocity(cannonToMouse);
                getWorld().addObject(ball, getX(), getY());
                Greenfoot.playSound("cannonSound.wav");
            }
        }
    }

    public void alignWithVector(Vector2D v)
    {
```

# Step 6.c: Extend Target from SimulationActor



```
public class Target extends SimulationActor
{
    /**
     * Act - do whatever the Target wants to do. This method is called whenever
     * the 'Act' or 'Run' button gets pressed in the environment.
     */
    public void act()
    {
        super.act();
        detectCollisionWithCannonBalls();
    }

    public void detectCollisionWithCannonBalls()
    {
        List<CannonBall> cannonBalls = getWorld().getObjects(CannonBall.class);
        double targetRadius = this.getImage().getHeight() / 2;

        for (int i=0; i < cannonBalls.size(); i++)
        {
            CannonBall ball = cannonBalls.get(i);

            Vector2D targetToBall = new Vector2D(ball.getX() - getX(), ball.getY() - getY());
            double distance = targetToBall.magnitude();

            double ballRadius = ball.getImage().getHeight() / 2;

            if (distance < ballRadius + targetRadius)
```

# Step 7: Commit your changes and push to github (1)

Try to remember the following commands (see Figure 8a and Figure 8b)

- git add *
- git status /*check that files are there*/
- git commit -m "Extend CannonBall, Cannon and Targer from SimulationActor"

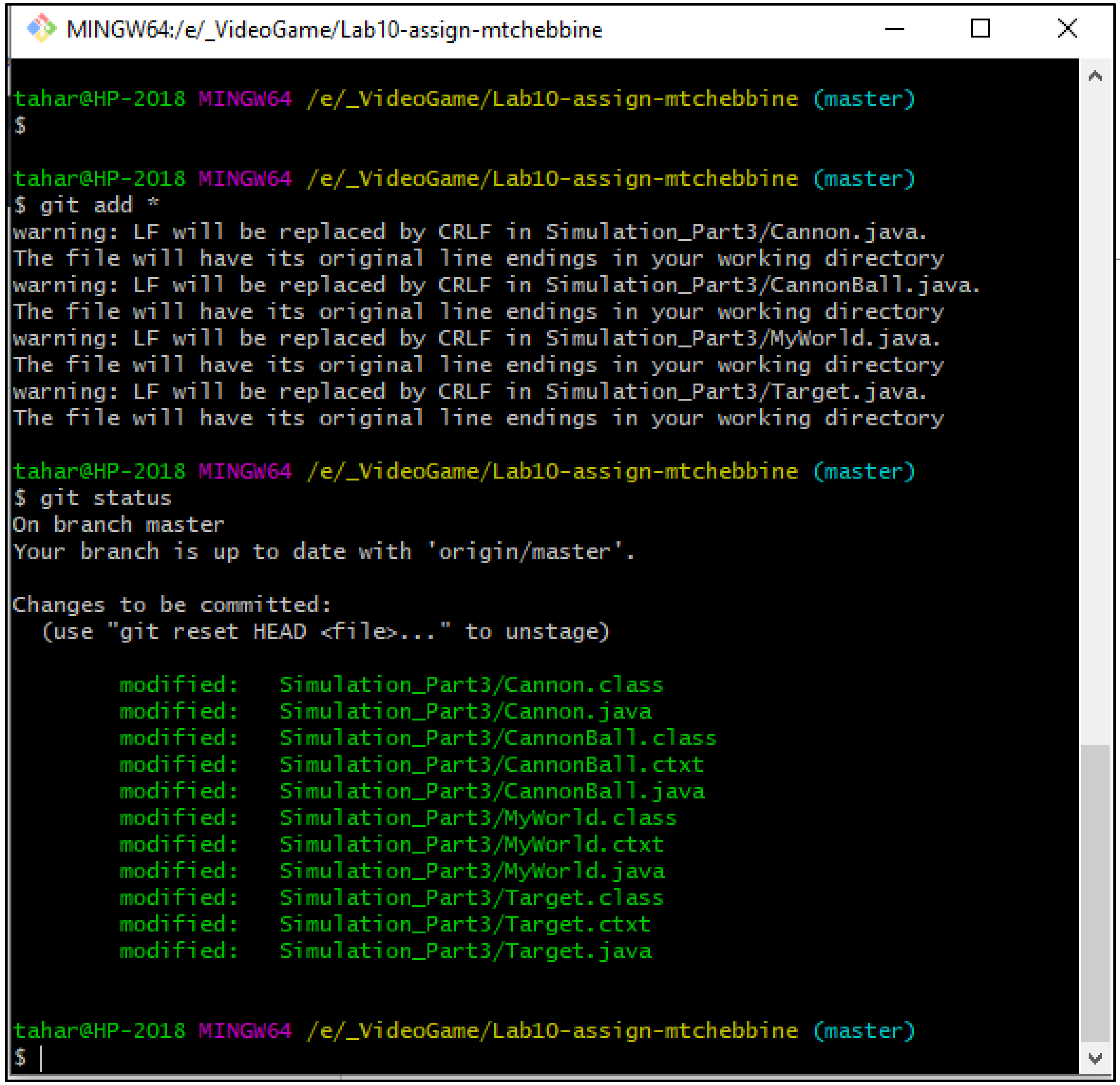
(if you need to enter your name and email, just use the setup commands and commit again)

And then push your commit to Github

- git push

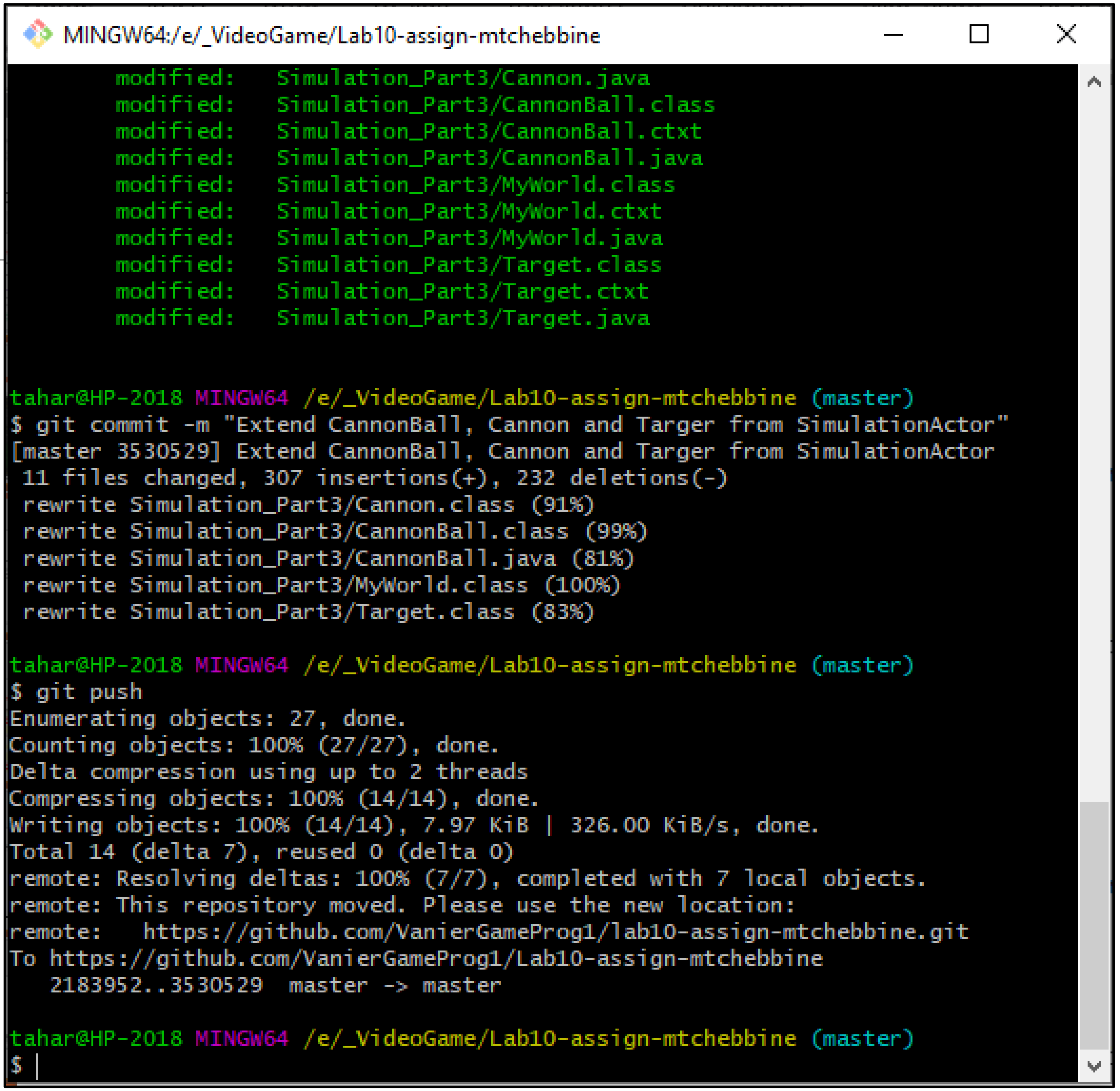
  /* Push the files to your repository, if you don't do this step, your files will not be saved online */

Double-check Github.com for your commit



```
tahar@HP-2018 MINGW64 /e/_VideoGame/Lab10-assign-mtchebbine (master)
$

tahar@HP-2018 MINGW64 /e/_VideoGame/Lab10-assign-mtchebbine (master)
$ git add *
warning: LF will be replaced by CRLF in Simulation_Part3/Cannon.java.
The file will have its original line endings in your working directory
warning: LF will be replaced by CRLF in Simulation_Part3/CannonBall.java.
The file will have its original line endings in your working directory
warning: LF will be replaced by CRLF in Simulation_Part3/MyWorld.java.
The file will have its original line endings in your working directory
warning: LF will be replaced by CRLF in Simulation_Part3/Target.java.
The file will have its original line endings in your working directory

tahar@HP-2018 MINGW64 /e/_VideoGame/Lab10-assign-mtchebbine (master)
$ git status
On branch master
Your branch is up to date with 'origin/master'.

Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

        modified:   Simulation_Part3/Cannon.class
        modified:   Simulation_Part3/Cannon.java
        modified:   Simulation_Part3/CannonBall.class
        modified:   Simulation_Part3/CannonBall.ctxt
        modified:   Simulation_Part3/CannonBall.java
        modified:   Simulation_Part3/MyWorld.class
        modified:   Simulation_Part3/MyWorld.ctxt
        modified:   Simulation_Part3/MyWorld.java
        modified:   Simulation_Part3/Target.class
        modified:   Simulation_Part3/Target.ctxt
        modified:   Simulation_Part3/Target.java


tahar@HP-2018 MINGW64 /e/_VideoGame/Lab10-assign-mtchebbine (master)
$ |
```

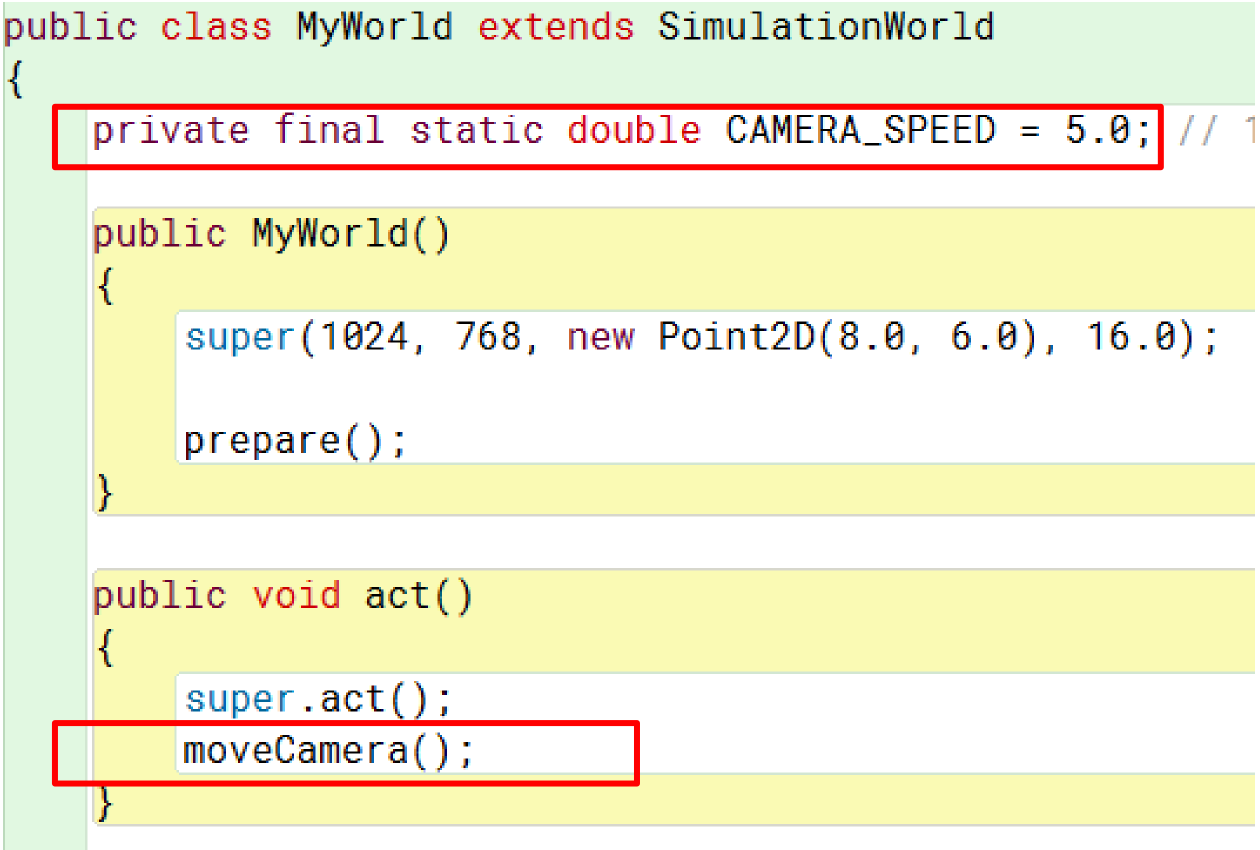
Figure 8a



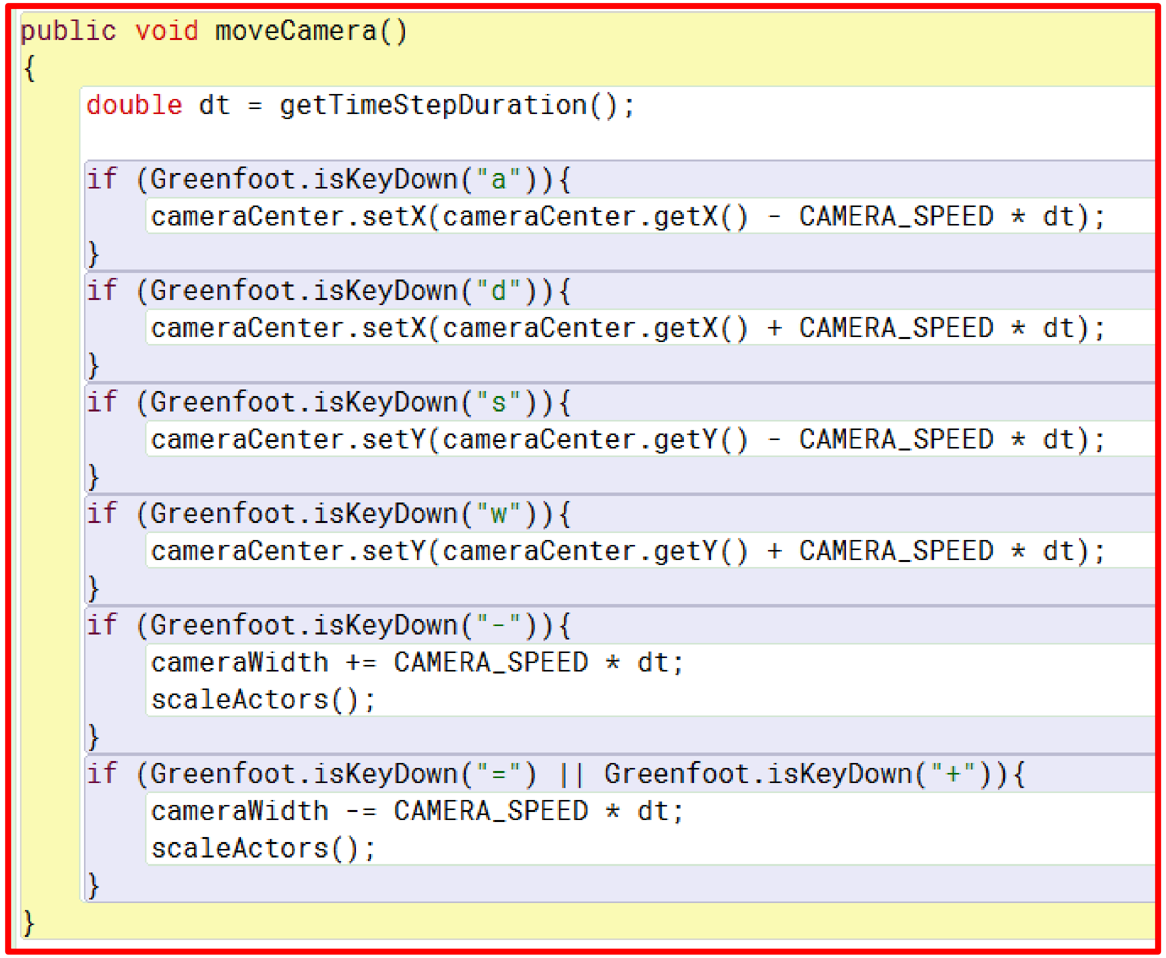
```
        modified:   Simulation_Part3/Cannon.java
        modified:   Simulation_Part3/CannonBall.class
        modified:   Simulation_Part3/CannonBall.ctxt
        modified:   Simulation_Part3/CannonBall.java
        modified:   Simulation_Part3/MyWorld.class
        modified:   Simulation_Part3/MyWorld.ctxt
        modified:   Simulation_Part3/MyWorld.java
        modified:   Simulation_Part3/Target.class
        modified:   Simulation_Part3/Target.ctxt
        modified:   Simulation_Part3/Target.java


tahar@HP-2018 MINGW64 /e/_VideoGame/Lab10-assign-mtchebbine (master)
$ git commit -m "Extend CannonBall, Cannon and Target from SimulationActor"
[master 3530529] Extend CannonBall, Cannon and Target from SimulationActor
 11 files changed, 307 insertions(+), 232 deletions(-)
 rewrite Simulation_Part3/Cannon.class (91%)
 rewrite Simulation_Part3/CannonBall.class (99%)
 rewrite Simulation_Part3/CannonBall.java (81%)
 rewrite Simulation_Part3/MyWorld.class (100%)
 rewrite Simulation_Part3/Target.class (83%)

tahar@HP-2018 MINGW64 /e/_VideoGame/Lab10-assign-mtchebbine (master)
$ git push
Enumerating objects: 27, done.
Counting objects: 100% (27/27), done.
Delta compression using up to 2 threads
Compressing objects: 100% (14/14), done.
Writing objects: 100% (14/14), 7.97 KiB | 326.00 KiB/s, done.
Total 14 (delta 7), reused 0 (delta 0)
remote: Resolving deltas: 100% (7/7), completed with 7 local objects.
remote: This repository moved. Please use the new location:
remote:   https://github.com/VanierGameProg1/lab10-assign-mtchebbine.git
To https://github.com/VanierGameProg1/Lab10-assign-mtchebbine
   2183952..3530529  master -> master

tahar@HP-2018 MINGW64 /e/_VideoGame/Lab10-assign-mtchebbine (master)
$ |
```

Figure 8b

# Step 8: Moving Camera in MyWorld



```java
public class MyWorld extends SimulationWorld
{
    private final static double CAMERA_SPEED = 5.0; // 1

    public MyWorld()
    {
        super(1024, 768, new Point2D(8.0, 6.0), 16.0);

        prepare();
    }

    public void act()
    {
        super.act();
        moveCamera();
    }
```



```java
public void moveCamera()
{
    double dt = getTimeStepDuration();

    if (Greenfoot.isKeyDown("a")){
        cameraCenter.setX(cameraCenter.getX() - CAMERA_SPEED * dt);
    }
    if (Greenfoot.isKeyDown("d")){
        cameraCenter.setX(cameraCenter.getX() + CAMERA_SPEED * dt);
    }
    if (Greenfoot.isKeyDown("s")){
        cameraCenter.setY(cameraCenter.getY() - CAMERA_SPEED * dt);
    }
    if (Greenfoot.isKeyDown("w")){
        cameraCenter.setY(cameraCenter.getY() + CAMERA_SPEED * dt);
    }
    if (Greenfoot.isKeyDown("-")){
        cameraWidth += CAMERA_SPEED * dt;
        scaleActors();
    }
    if (Greenfoot.isKeyDown("=") || Greenfoot.isKeyDown("+")){
        cameraWidth -= CAMERA_SPEED * dt;
        scaleActors();
    }
}
```

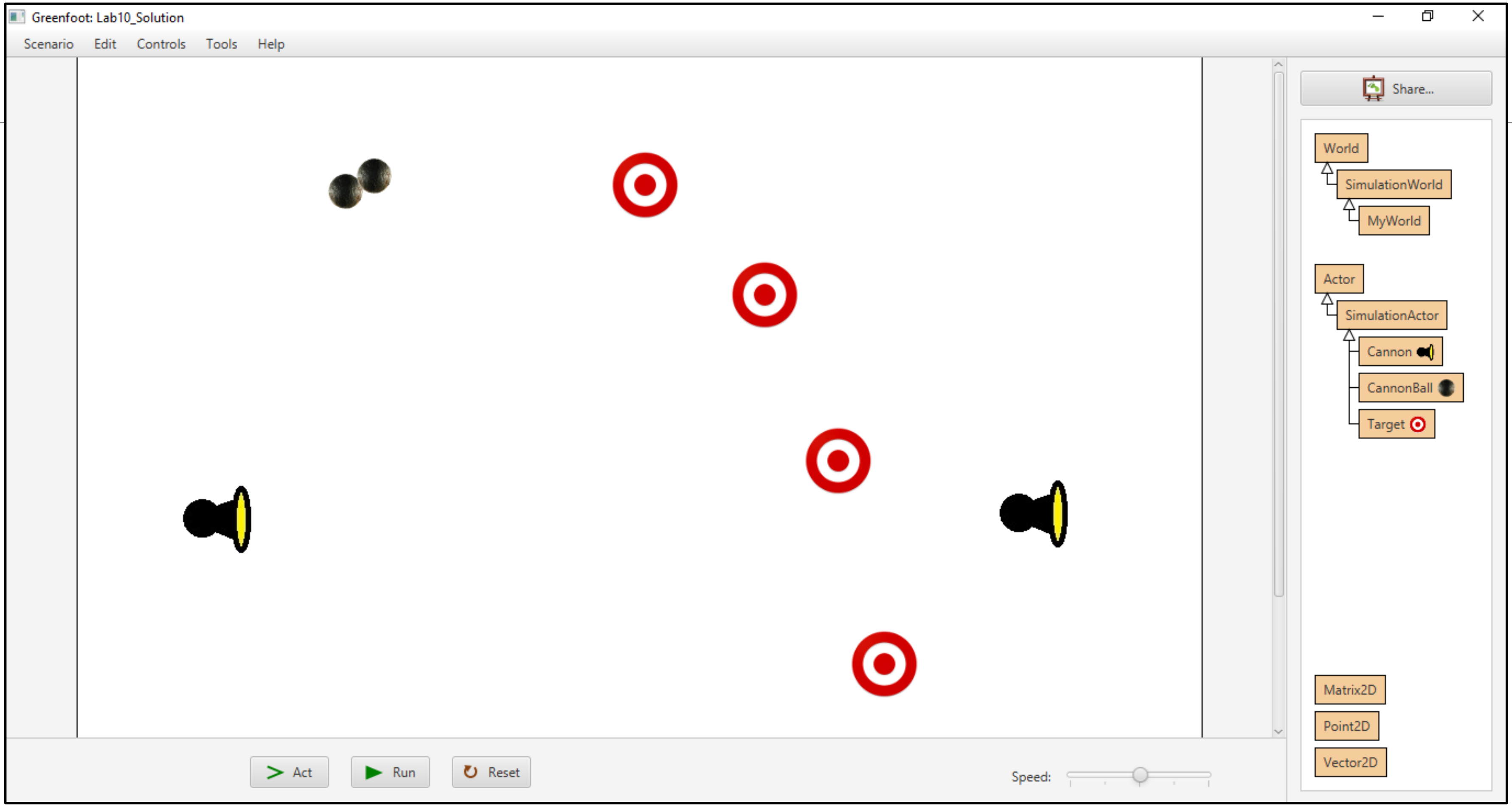

Greenfoot: Lab10_Solution
Scenario
Edit
Controls
Tools
Help
Share...
World
SimulationWorld
MyWorld
Actor
SimulationActor
Cannon
CannonBall
Target
Matrix2D
Point2D
Vector2D
Act
Run
Reset
Speed:

Figure 10

# Step 9: Commit your changes and push to github (2)

Try to remember the following commands

- git add *
- git status /*check that files are there*/
- git commit -m "Moving Camera in MyWorld"

(if you need to enter your name and email, just use the setup commands and commit again)

And then push your commit to Github

- git push

  /* Push the files to your repository, if you don't do this step, your files will not be saved online */

Double-check Github.com for your commit