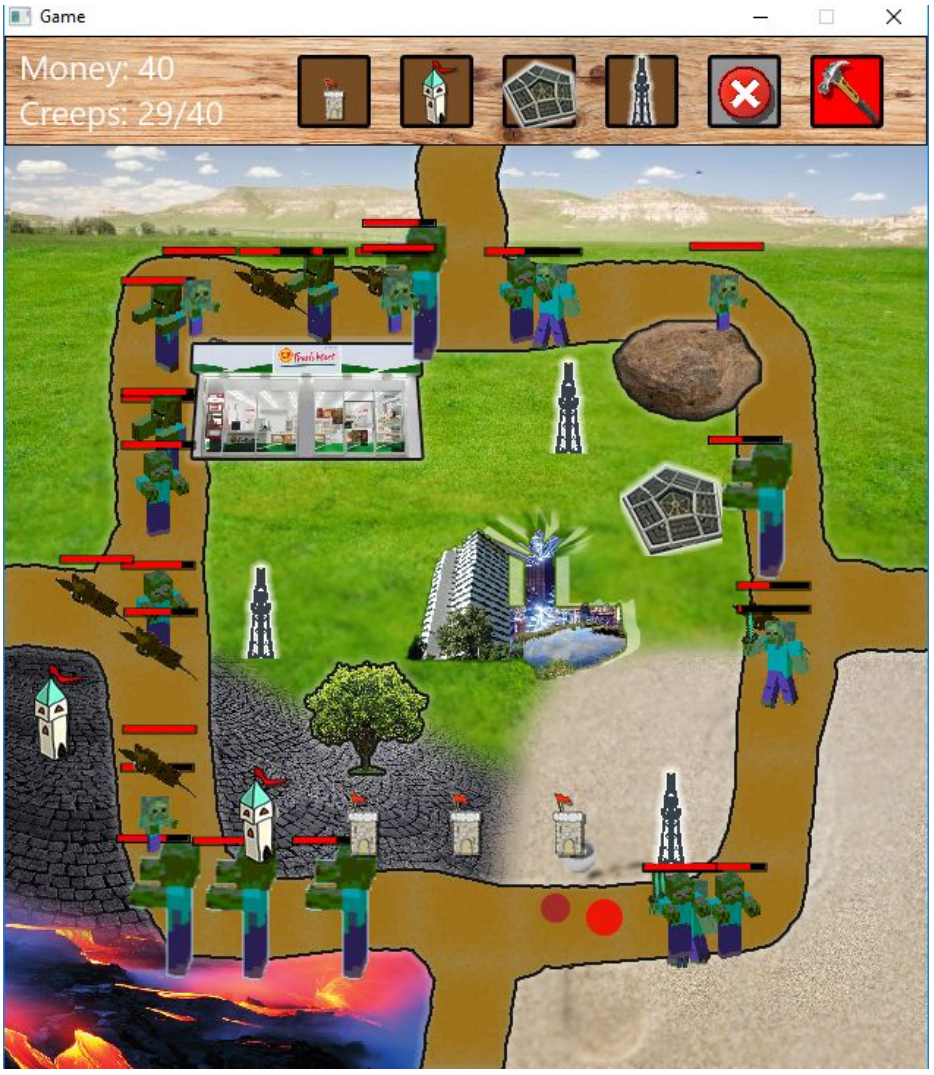
# Small Square Tower Defense Game

## Instruction

Tower Defense game is a game that the player has to kill the incoming creeps by placing the tower and the tower will attack a creep. In this game, creeps are moving in circle so the player have to keep the creep number to not exceed the maximum value or else the player will lose.



# User Manual

There is a shopping tab for buying towers on the top of the screen. To view a tower information such as cost , range , damage and speed, hover your mouse over a tower icon. To buy and place a tower, you must have enough money and click on a tower icon to select a tower and place it on a panel that doesn't have a tower. The range of the selecting tower will be shown when hovering the mouse over a panel while selecting a tower.


# 3. Implementation Detail

## 3.1 Package main

### 3.1.1 Class Main extends Application

#### 3.1.1.1 Method

| | |
|---|---|
| + void start(Stage primaryStage) | The main entry point for the JavaFX applications.<br>- Initialize movetarget. Initialize GameLogic, FieldDrawer, creepDrawer, BulletDrawer and TowerDrawer then add it to a pane.<br>- Add pane to center of BorderPane.<br>- Initialize menubar and add it to top of BorderPane.<br>- Set scene to a scene that has BorderPane as Root |
| + void main(String[] args) | An entry point of the application. |

## 3.2 Package shopping

### 3.2.1 Class MouseValue

#### 3.2.1.1 Field

| | |
|---|---|
| + int valueNow | A value that will change when holding something or not. Default is EMPTY. |
| + int EMPTY | The mouse isn't holding anything. |
| + int DESTROY | The mouse is holding destroy tool. |
| + int NORMALTOWER | The mouse is holding normal tower. |
| + int TALLTOWER | The mouse is holding tall tower. |
| + int FASTTOWER | The mouse is holding fast tower. |
| + int GODTOWER | The mouse is holding god tower. |

### 3.2.2 Class Menubar extends Pane

#### 3.2.2.1 Field

| | |
|---|---|
| + int money | The money that player has. |
| - Canvas display | A canvas that will draw money number and |

| | |
|---|---|
| | creep count |

#### 3.2.2.2 Constructor

| | |
|---|---|
| + Menubar() | Set PrefWidth to 630 and set PrefHeight to 75. Create five Rectangle and ToolTip for tower icon and set it to listen. Add background, display and Rectangles to this object. |

#### 3.2.2.3 Method

| | |
|---|---|
| - void updateDisplay() | Update display. Draw money, creeps count and tower icon when money not enough. |
| + void reduceMoney(int cost) | Reduce money by cost. |
| + boolean checkMoneyLeft(int cost) | Called when build a tower. If money less than cost, set Mousevalue.ValueNow to EMPTY and return true , else return false. |
| + void increaseMoney(int bounty) | Increase money by bounty. |
| - int creepsCount() | Return sum number of creep Count. |

## 3.3 Package holder

### 3.3.1 Class Holder

#### 3.3.1.1 Field

| | |
|---|---|
| - Holder INSTANCE | The only object of this class. |
| - List<Creeps> creepHolder | This contain every creep currently in game. |
| - List<Tower> towerHolder | This contain every tower currently in game. |
| - List<Bullet> bulletHolder | This contain every bullet currently in game. |
| + List<Image> creepsImage | This contain all of creeps image. |
| + List<Image> towersImage | This contain all of towers image. |
| + Image bulletImage | Bullet image. |
| + Image bg | Background image. |
| + Image end | Image that will show when game lose. |
| + AudioClip clickedSound | Sound that will play when click a tower icon or a panel to build. |

| | |
|---|---|
| + AudioClip shootSound | Sound that will play when a tower shoot. |

#### 3.3.1.2 Constructor

| | |
|---|---|
| + Holder() | Initialize all field. |

#### 3.3.1.3 Method

| | |
|---|---|
| + void loadResource() | Load all image and sound. This is called in static block. |
| + Holder getInstance() | Return instance. |
| + void addTower(Tower tower) | Add a tower to its holder. |
| + void addCreep(Creeps Creep) | Add a creep to its holder. |
| + void addBullet(Bullet bullet) | Add a bullet to its holder. |
| + void update() | Check each creep and bullet if it's destroyed, remove from its holder. |
| + getter of creepHolder, bulletHolder, towerHolder | Return the respective Holder. |

## 3.4 Package drawer

### 3.4.1 Class FieldDrawer extends Canvas

#### 3.4.1.1 Field

| | |
|---|---|
| + int NONETOWER | The state of a panel when it is not occupied by any tower. |
| + int HAVETOWER | The state of a panel when it is occupied by tower. |
| + int ROAD | The state of a panel that it is a way for creep walking. |
| + int XSIZE | The number of rows of panels is 9. |
| + int YSIZE | The number of column of panels is 9. |
| + int PANELSIZE | The size of a panel. |
| + int CANVASSIZE | The canvas is square so it's the width and height of canvas. |
| + int[][] map | 2D array represent the game field. |

#### 3.4.1.2 Constructor

| | |
|---|---|
| + FieldDrawer() | Initialize by calling superclass (canvas) constructor and draw background image. |

#### 3.4.1.3 Method

| | |
|---|---|
| + int getAt(int row, int column) | Get the state value of panel at row and column. If row or column is invalid, return -1. |
| + int xToColumn(double x) | Return the column by x position. |
| + int xToRow(double y) | Return the row by y position. |
| + void changeAt(int row, int column, int newValue) | Change the state value of panel at row and column to newValue. |

### 3.4.2 Class TowerDrawer extends Canvas

#### 3.4.2.1 Constructor

| | |
|---|---|
| + TowerDrawer() | Call superclass constructor and add listener. |

#### 3.4.2.2 Method

| | |
|---|---|
| + void drawEnd() | fill canvas with black color and draw game end image. |
| + void drawWin() | fill canvas with black color and draw game win image. |
| + void addListener() | Set on mouse clicked for building tower.<br>Set on mouse moved for showing tower range.<br>Set on mouse exited for clear the screen.<br>Redraw tower after every action. |

### 3.4.3 Class CreepDrawer extends Canvas

#### 3.4.3.1 Constructor

| | |
|---|---|
| + CreepDrawer() | Call superclass constructor. |

#### 3.4.3.2 Method

| | |
|---|---|
| + void drawCreeps() | Draw all creeps. Clear canvas before drawing. |
| + void start() | Start adding creeps. |
| + void addCreepDrawing(int k) | Add creeps in HowSummon by k creeps. |

### 3.4.4 Class BulletDrawer extends Canvas

#### 3.4.4.1 Constructor

| | |
|---|---|
| + CreepDrawer() | Call superclass constructor. |

#### 3.4.4.2 Method

| | |
|---|---|
| + void drawBullets() | Draw all Bullets. Clear canvas before drawing. |

## 3.5 Package gamerule

### 3.5.1 Class HowSummon

#### 3.5.1.1 Field

| | |
|---|---|
| - Holder INSTANCE | The only object of this class. |
| + int[] sleep | The pause between each wave. |
| + int[] amount1 | Amount of creeps to release in each wave. |
| + List<Creeps> summonlist | List of creeps to summon. |
| - double westX | Configure West Position. |
| - double westY | Configure West Position. |
| - MoveTarget westTarget | Configure West Target. |
| - double southX | Configure South Position. |
| - double southY | Configure South Position. |
| - MoveTarget southTarget | Configure South Target. |
| - double eastX | Configure East Position. |
| - double eastY | Configure East Position. |
| - MoveTarget eastTarget | Configure East Target. |
| - double northX | Configure North Position. |
| - double northY | Configure North Position. |
| - MoveTarget northTarget | Configure North Target. |

#### 3.5.1.2 Constructor

| | |
|---|---|
| + HowSummon() | Initialize summonlist |

#### 3.5.1.3 Method

| | |
|---|---|
| + void load1() | Add creeps to summonlist. |

| | |
|---|---|
| - Creeps getCreep(double x, double y, MoveTarget target) | Return a new creep at position x,y and set it movetarget to target. |
| - RookieC getRookieCreep(double x, double y, MoveTarget target) | Return a new Rookie creep at position x,y and set it movetarget to target. |
| - StrongC getStrongCreep(double x, double y, MoveTarget target) | Return a new Strong creep at position x,y and set it movetarget to target. |
| - JiantC getJiantCreep(double x, double y, MoveTarget target) | Return a new Jiant creep at position x,y and set it movetarget to target. |
| - FighterC getFighterCreep(double x, double y, MoveTarget target) | Return a new Fighter creep at position x,y and set it movetarget to target. |
| - FlyAbleC getFlyAbleCreep(double x, double y, MoveTarget target) | Return a new FlyAble creep at position x,y and set it movetarget to target. |
| + HowSummon getInstance() | Return instance. |
| + List<Creeps> getSummonlist() | Return summonlist. |

## 3.6 Package logic

### 3.6.1 Class GameLogic

#### 3.6.1.1 Field

| | |
|---|---|
| + List<Creeps> creepsContainer | Another container from holder. This is for CreepDrawer to look and draw creeps. |
| + int SLEEPTIME | Sleep time for each update loop and tower cooldown. |
| + int MAXCREEP | Maximum number of creeps. If number of creeps more than this, the player lose. |
| + boolean end | Flag indicate when the game end. |
| + boolean win | Flag indicate when the game win. |

#### 3.6.1.2 Constructor

| | |
|---|---|
| + GameLogic() | - Do nothing. |

#### 3.6.1.3 Method

| | |
|---|---|
| + void start(FieldDrawer fieldDrawer,CreepDrawer creepDrawer,BulletDrawer bulletDrawer,TowerDrawer towerDrawer) | Initialize end = false.<br>call updateLogic. |
| - void updateLogic(FieldDrawer fieldDrawer,CreepDrawer creepDrawer,BulletDrawer bulletDrawer,TowerDrawer towerDrawer) | Create a Thread that do<br>- start creepDrawer at start<br>- Loop make each tower shoot, drawers draw creep and bullet, check every creep if it is destroyed make it give money and remove from container, update creeps tower and bullet. |

## 3.7 Package entity

### 3.7.1 Interface Entity

#### 3.7.1.1 Method

| | |
|---|---|
| + boolean collideWith(AliveEntity other) | - Check if this collide with another AliveEntity.If distance between two object is more than sum of two radius, they're collided. |
| + boolean isDestroyed() | - Return True if this object will be destroyed. |
| + void move() | - Move this object. |
| + void update(); | - Update this object. |

### 3.7.2 Abstract Class AliveEntity implements Entity

#### 3.7.2.1 Field

| | |
|---|---|
| + double x | The x position. |
| + double y | The y position. |
| + double speed | The speed of this object. |
| # int radius | Radius of this object that will collide with other. If distance between object is more than sum of two radius. |

| | |
|---|---|
| # boolean isDestroyed | True if this object will be destroyed. |

#### 3.7.2.2 Method

| | |
|---|---|
| + boolean collideWith(AliveEntity other) | Check if this collide with another AliveEntity.If distance between two object is more than sum of two radius, they're collided. |
| + boolean isDestroyed() | Return True if this object will be destroyed. |
| + abstract void move() | - Move this object. |
| + abstract void update() | - Update this object. |

## 3.8 Package Bullet

### 3.8.1 Class Bullet extends AliveEntity

#### 3.8.1.1 Field

| | |
|---|---|
| + Creep target | The creep target of this bullet |
| - Tower tower | The tower that shoot this bullet |
| - Image img | Image of bullet. |
| + boolean boom | Status of Pre-destroyed. |
| - boolean miss | Status of miss target. |

#### 3.8.1.2 Constructor

| | |
|---|---|
| + Bullet(double x, double y, Tower tower) | Initialize all field. |

#### 3.8.1.3 Method

| | |
|---|---|
| + void update() | Update bullet status.<br>- called findTarget()<br>- move() |
| + Creeps findTarget() | Find nearest creep (From this bullet) |
| + void move() | Move x and y toward target. |
| - double distanceSize() | Calculate the distance between this bullet and the target. |
| + void draw(GraphicsContext gc) | Draw image of this bullet at x,y |

## 3.9 Package creeps

### 3.9.1 Class MoveTarget extends Point2D

#### 3.1.1.1 Field

| | |
|---|---|
| + MoveTarget UPLEFT | The upper left target of map for creep moving. |
| + MoveTarget UPRIGHT | The upper right target of map for creep moving. |
| + MoveTarget DOWNLEFT | The down left target of map for creep moving. |
| + MoveTarget DOWNRIGHT | The down right target of map for creep moving. |
| + MoveTarget LEFT | The left target of map for creep moving. |
| + MoveTarget DOWN | The down target of map for creep moving. |
| + MoveTarget RIGHT | The right target of map for creep moving. |
| + MoveTarget UP | The up target of map for creep moving. |
| + MoveTarget NextTarget | The next target to move to after this object target. |

#### 3.9.1.2 Constructor

| | |
|---|---|
| + Bullet(double x, double y) | Initialize by calling superclass. (This doesn't initialize next target so it has to be manually set.) |
| + Bullet(double x, double y, MoveTarget next) | Initialize by calling superclass and set the next target.. |

#### 3.9.1.3 Method

| | |
|---|---|
| + void initial() | Initialize all static field. |
| + void setNextTarget | Setter of NextTarget. |

### 3.9.2 Class Creeps extends AliveEntity

#### 3.9.2.1 Field

| | |
|---|---|
| # int maxHp | Maximum and start hit point. |
| # int hp | The current hp. |
| # int bounty | The money that will be rewarded when this |

| | |
|---|---|
| | creep die. |
| # MoveTarget target | Point target to move to of this creep. |
| + boolean boom | |
| + Image img | Image of this creep. |

#### 3.9.2.2 Constructor

| | |
|---|---|
| + Bullet(double x, double y, Tower tower) | Initialize all field. |

#### 3.9.2.3 Method

| | |
|---|---|
| + void update() | Update status of creep.<br>- If creep hp <= 0, change *isDestroyed* to true<br>- else call move() |
| + void move() | Move x and y toward target. If distance <= speed, change target to next target. |
| + void tookDamage(int damage) | Reduce hp by damage |
| + void draw(GraphicsContext gc) | Draw image of this bullet at x,y |
| + void boom(GraphicsContext gc) | Status of Pre-destroyed. |
| + void draw(GraphicsContext gc) | Draw image of this bullet at x,y |

### 3.9.3 Class FighterC extends Creeps

#### 3.9.3.1 Constructor

| | |
|---|---|
| + FighterC(double x, double y , MoveTarget target) | Initialize all field. |

### 3.9.4 Class FlyAbleC extends Creeps

#### 3.9.4.1 Constructor

| | |
|---|---|
| + FlyAbleC(double x, double y , MoveTarget target) | Initialize all field. |

### 3.9.5 Class JiantC extends Creeps

#### 3.9.5.1 Constructor

| | |
|---|---|
| + JiantC(double x, double y , MoveTarget target) | Initialize all field. |

### 3.9.6 Class RookieC extends Creeps

#### 3.9.6.1 Constructor

| | |
|---|---|
| + RookieC(double x, double y , MoveTarget target) | Initialize all field. |

### 3.9.7 Class StrongC extends Creeps

#### 3.9.7.1 Constructor

| | |
|---|---|
| + StrongC(double x, double y , MoveTarget target) | Initialize all field. |

## 3.10 Package tower

### 3.10.1 Class Tower

#### 3.10.1.1 Field

| | |
|---|---|
| + double x, y | Position in X , Y axis. ( It is center of a panel) |
| + int attack | This attack point. |
| + int cooldown | Max cooldown |
| + int cooldowncount | Current cooldown |
| + boolean ready | Status of ready to shoot a bullet |
| + Image img | Tower’s image |
| + int cost | Tower’s cost |
| + int range | Tower’s shooting range |
| *+ int COST* | This cost |
| *+ int RANGE* | This range |

#### 3.10.1.2 Constructor

| | |
|---|---|
| + Tower(int row, int column) | Initialize all field. |

#### 3.10.1.3 Method

| | |
|---|---|
| + void update() | Update status of tower.<br>- If creep dead, change *isDestroyed* to true |
| + void shootBulletIfReady() | Add a bullet to draw and shoot if ready. |
| + void move() | Move x and y toward target. |
| - double distanceTo(Creeps creep) | Calculate the distance between this tower and the creep. |
| + void draw(GraphicsContext gc) | Draw image of this tower at x,y |

### 3.10.2 Class FastT extends Tower

#### 3.10.2.1 Constructor

| | |
|---|---|
| + FastT(int row, int column) | Initialize all field. |

#### 3.10.1.1 Field

| | |
|---|---|
| *+ int COST* | This cost |
| *+ int RANGE* | This range |

### 3.10.3 Class GodT extends Tower

#### 3.10.3.1 Constructor

| | |
|---|---|
| + GodT(int row, int column) | Initialize all field. |

#### 3.10.3.1 Field

| | |
|---|---|
| *+ int COST* | This cost |
| *+ int RANGE* | This range |

### 3.10.4 Class TallT extends Tower

#### 3.10.4.1 Constructor

| | |
|---|---|
| + TallT(int row, int column) | Initialize all field. |

#### 3.10.4.1 Field

| | |
|---|---|
| *+ int COST* | This cost |

| | |
|---|---|
| *+ int RANGE* | This range |

### 3.10.5 Class BigT extends Tower

#### 3.10.5.1 Constructor

| | |
|---|---|
| + BigT(int row, int column) | Initialize all field. |

#### 3.10.5.1 Field

| | |
|---|---|
| *+ int COST* | This cost |
| *+ int RANGE* | This range |

## 3.11 Package impossibruException

### 3.11.5 Class ImpossibruException extends Exception

#### 3.11.5.1 Constructor

| | |
|---|---|
| + ImpossibruException() | This exception is to be thrown where the code shouldn't have reached. |