

EECS3311 Software Design (Fall 2020)

Q&A - Project

Thursday, November 19

How Enemies Act

References

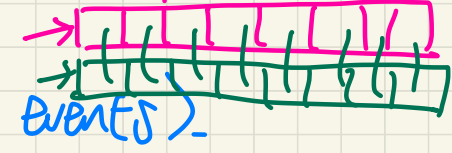
Section 7: Enemy Action in messages.txt

Section 6.13.5 Phase 5: Enemies Act in instructions PDF

RNG

↳ deterministic

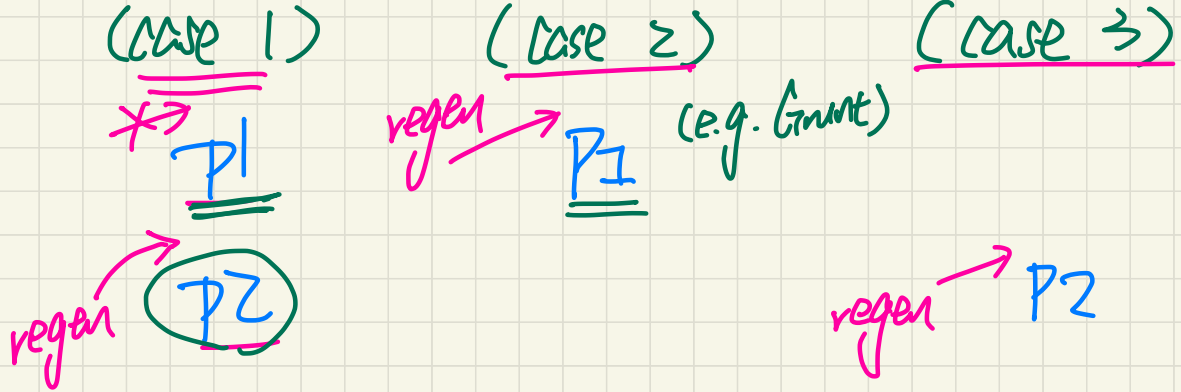
RNG



(P1) Phase 1: Preemptive Actions (triggered by events)

(P2) Phase 2: normal Actions

regen.



1 . A
2 B

move . triggers p.e.
of B.

- EXEC B's preemptive
actions.

- Assuming that B's p.a.
↳ does not end the
turn.

A's action

B's action.

Acceptance Test at011

Part 1 of 8

state: not started, normal, ok
Welcome to Space Defender Version 2.

-> play(5, 17, 2, 2, 2, 2, 2)

state: weapon setup, normal, ok

1: Standard (A single projectile is fired in front)

Health: 10, Energy: 10, Regen: 0/1, Armour: 0, Vision: 1, Move: 1, Move Cost: 1,
Projectile Damage: 70, Projectile Cost: 5 (energy)

2: Spread (Three projectiles are fired in front, two going diagonal)

Health: 0, Energy: 60, Regen: 0/2, Armour: 1, Vision: 0, Move: 0, Move Cost: 2,
Projectile Damage: 50, Projectile Cost: 10 (energy)

3: Snipe (Fast and high damage projectile, but only travels via teleporting)

Health: 0, Energy: 100, Regen: 0/5, Armour: 0, Vision: 10, Move: 3, Move Cost: 0,
Projectile Damage: 1000, Projectile Cost: 20 (energy)

4: Rocket (Two projectiles appear behind to the sides of the Starfighter and accelerates)

Health: 10, Energy: 0, Regen: 10/0, Armour: 2, Vision: 2, Move: 0, Move Cost: 3,
Projectile Damage: 100, Projectile Cost: 10 (health)

5: Splitter (A single mine projectile is placed in front of the Starfighter)

Health: 0, Energy: 100, Regen: 0/10, Armour: 0, Vision: 0, Move: 0, Move Cost: 5,
Projectile Damage: 150, Projectile Cost: 70 (energy)

Weapon Selected: Standard

-> toggle_debug_mode

state: weapon setup, debug, ok

In debug mode.

choice (1, 100)

[2, 101]

[2, 100]

[
)

Phase 7

Enemy spawning

↳ i → row
j → [1, 100]

non-empty {1}

[2, 100]

If an enemy is spawned, it must be a Grunt.

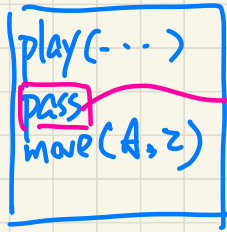
1%

[1, 2] [2, 2] [2, 2] [2, 2] [2, 2] [2, 101]

G F L I P

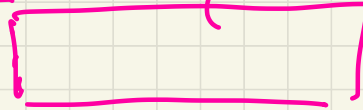
date
spawn

See p.8 of instructions.



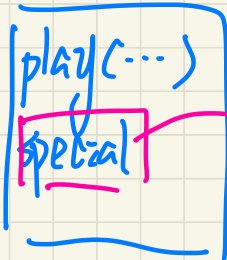
ETF_PASS

pass
do



trigger a turn in the model cluster.

end



ETF_SPECIAL

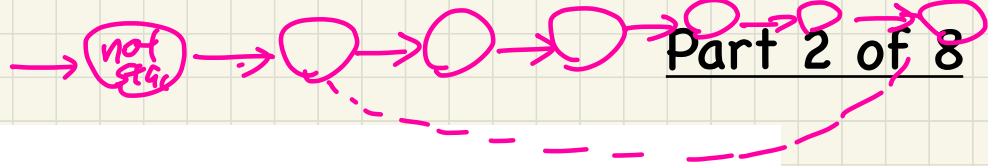
special
do



trigger preemptive action of grant.

end

Acceptance Test at011



→ setup_next(5)

state:in game(0.0), debug, ok

Starfighter:

[0,S]→health:70/70 energy:70/70 Regen:1/3, Armour:1, Vision:13, Move:10, Move Cost:3, location:[C,1]
Projectile Pattern:Standard, Projectile Damage:70, Projectile Cost:5 (energy)
Power:Recall (50 energy): Teleport back to spawn.
score:0

Enemy:

Projectile:

Friendly Projectile Action:

Enemy Projectile Action:

Starfighter Action:

Enemy Action:

Natural Enemy Spawn:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

current health.

total health max

Reference: See values of attributes in messages.txt

state:weapon setup, normal, ok

1:Standard (A single projectile is fired in front)

Health:10, Energy:10, Regen:0/1, Armour:0, Vision:1, Move:1, Move Cost:1,
Projectile Damage:70, Projectile Cost:5 (energy)

2:Spread (Three projectiles are fired in front, two going diagonal)

Health:0, Energy:60, Regen:0/2, Armour:1, Vision:0, Move:0, Move Cost:2,
Projectile Damage:50, Projectile Cost:10 (energy)

3:Snipe (Fast and high damage projectile, but only travels via teleporting)

Health:0, Energy:100, Regen:0/5, Armour:0, Vision:10, Move:3, Move Cost:0,
Projectile Damage:1000, Projectile Cost:20 (energy)

4:Rocket (Two projectiles appear behind to the sides of the Starfighter and accelerates)

Health:10, Energy:0, Regen:10/0, Armour:2, Vision:2, Move:0, Move Cost:3,
Projectile Damage:100, Projectile Cost:10 (health)

5:Splitter (A single mine projectile is placed in front of the Starfighter)

Health:0, Energy:100, Regen:0/10, Armour:0, Vision:0, Move:0, Move Cost:5,
Projectile Damage:150, Projectile Cost:70 (energy)

Weapon Selected:Standard

state:armour setup, normal, ok

1:None

Health:50, Energy:0, Regen:1/0, Armour:0, Vision:0, Move:1, Move Cost:0

2:Light

Health:75, Energy:0, Regen:2/0, Armour:3, Vision:0, Move:0, Move Cost:1

3:Medium

Health:100, Energy:0, Regen:3/0, Armour:5, Vision:0, Move:0, Move Cost:3

4:Heavy

Health:200, Energy:0, Regen:4/0, Armour:10, Vision:0, Move:-1, Move Cost:5

Armour Selected:None

state:engine setup, normal, ok

1:Standard

Health:10, Energy:60, Regen:0/2, Armour:1, Vision:12, Move:8, Move Cost:2

2:Light

Health:0, Energy:30, Regen:0/1, Armour:0, Vision:15, Move:10, Move Cost:1

3:Armoured

Health:50, Energy:100, Regen:0/3, Armour:3, Vision:6, Move:4, Move Cost:5

Engine Selected:Standard

state:power setup, normal, ok

1:Recall (50 energy): Teleport back to spawn.

2:Repair (50 energy): Gain 50 health, can go over max health. Health regen will not be in effect if over cap.

3:Overcharge (up to 50 health): Gain 2*health spent energy, can go over max energy. Energy regen will not be in effect if over cap.

4:Deploy Drones (100 energy): Clear all projectiles.

5:Orbital Strike (100 energy): Deal 100 damage to all enemies, affected by armour.

Power Selected:Recall (50 energy): Teleport back to spawn.

Acceptance Test at011

Part 3 of 8

```

state:in game(0.0), debug, ok
Starfighter:
[0,S]->health:70/70, energy:70/70, Regen:1/3, Armour:1, Vision:13, Move:10, Move Cost:3, location:[C,1]
Projectile Pattern:Standard, Projectile Damage:70, Projectile Cost:5 (energy)
Power:Recall (50 energy): teleport back to spawn.
score:0
Enemy:
Projectile:
Friendly Projectile Action:
Enemy Projectile Action:
Starfighter Action:
Enemy Action:
Natural Enemy Spawn:
  1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
A - - - - - - - - - - - - - - - - - - - - - -
B - - - - - - - - - - - - - - - - - - - - - -
C 5 - - - - - - - - - - - - - - - - - - - - - -
D - - - - - - - - - - - - - - - - - - - - - -
E - - - - - - - - - - - - - - - - - - - - - -
    
```

no effect.

no effect.

$$70 - (3 * 5) = 64$$

$$64 + 3 = 67$$

Enemy Spawn

Phase 7 of 1st Turn

- 1st num: [1, 5] → 1
- 2nd num: [1, 100] → 1
- See p.17 of instructions.
- 1st use of RNG: (1,1) gen. Grunt

loc: [A,17]

Testing: 1. tune thresholds
2. property of RNG

$$70 - (3 * 5) = 64$$

Regen happens before every act of Starfighter.

```

state:in game(1.0), debug, ok
Starfighter:
[0,S]->health:70/70, energy:64/70, Regen:1/3, Armour:1, Vision:13, Move:10, Move Cost:3, location:[A,1]
Projectile Pattern:Standard, Projectile Damage:70, Projectile Cost:5 (energy)
Power:Recall (50 energy): Teleport back to spawn.
score:0
Enemy:
[1,G]->health:100/100, Regen:1, Armour:1, Vision:5, seen_by_Starfighter:F, can_see_Starfighter:F, location:[A,17]
Projectile:
Friendly Projectile Action:
Enemy Projectile Action:
Starfighter Action:
The Starfighter(id:0) moves: [C,1] -> [A,1]
Enemy Action:
Natural Enemy Spawn:
  A Grunt(id:1) spawns at location [A,17].
  1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
A 5 - - - - - - - - - - - - - - - - - - - - - -
B - - - - - - - - - - - - - - - - - - - - - -
C - - - - - - - - - - - - - - - - - - - - - -
D - - - - - - - - - - - - - - - - - - - - - -
E - - - - - - - - - - - - - - - - - - - - - -
    
```

[A,17]

Acceptance Test at011

Part 4 of 8

```

state:in game(1.0), debug, ok
Starfighter:
[0,S]->health:70/70, energy:64/70, Regen:1/3, Armour:1, Vision:13, Move:10, Move Cost:3, location:[A,1]
Projectile Pattern:Standard, Projectile Damage:70, Projectile Cos:5 (energy)
Power:Recall (50 energy): Teleport back to spawn.
score:0
Enemy:
[1,G]->health:100/100, Regen:1, Armour:1, Vision:5, seen_by_Starfighter:F, can_see_Starfighter:F, location:[A,17]
Projectile:
Friendly Projectile Action:
Enemy Projectile Action:
Starfighter Action:
The Starfighter(id:0) moves: [C,1] -> [A,1]
Enemy Action:
Natural Enemy Spawn:
A Grunt(id:1) spawns at location [A,17].
  1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
A S - - - - - - - - - - - - - - - - - - G
B - - - - - - - - - - - - - - - - - - -
C - - - - - - - - - - - - - - - - - - -
D - - - - - - - - - - - - - - - - - - -
E - - - - - - - - - - - - - - - - - - -
    
```

no effect for regen.

- Energy regen done before fire
 - fire according to weapon
 - Grunt not preempted by fire
 - Regen then act
- Energy spawning (no energy tho turn).

$$64 + \frac{3}{3} = 67$$

$$67 - 5 = 62$$

->fire

```

state:in game(2.0), debug, ok
Starfighter:
[0,S]->health:70/70, energy:62/70, Regen:1/3, Armour:1, Vision:13, Move:10, Move Cost:3, location:[A,1]
Projectile Pattern:Standard, Projectile Damage:70, Projectile Cost:5 (energy)
Power:Recall (50 energy): Teleport back to spawn.
score:0
Enemy:
[1,G]->health:100/100, Regen:1, Armour:1, Vision:5, seen_by_Starfighter:F, can_see_Starfighter:F, location:[A,17]
Projectile:
[-1,*]->damage:70, move:5, location:[A,2]
[-2,<]->damage:15, move:4, location:[A,14]
Friendly Projectile Action:
Enemy Projectile Action:
Starfighter Action:
The Starfighter(id:0) fires at location [A,1].
A friendly projectile(id:-1) spawns at location [A,2].
Enemy Action:
A Grunt(id:1) moves: [A,17] -> [A,15]
A enemy projectile(id:-2) spawns at location [A,14].
Natural Enemy Spawn:
  1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
A S * - - - - - - - - - - - - - - - - - - < G
B - - - - - - - - - - - - - - - - - - -
C - - - - - - - - - - - - - - - - - - -
D - - - - - - - - - - - - - - - - - - -
E - - - - - - - - - - - - - - - - - - -
    
```

regen →

phase 2 → pz

Acceptance Test at011

Part 6 of 8

```

state:in game(3.0), debug, ok
Starfighter:
[0,S]->health:70/70, energy:62/70, Regen:1/3, Armour:1, Vision:13, Move:10, Move Cost:3, location:[A,2]
Projectile Pattern:Standard, Projectile Damage:70, Projectile Cost:5 (energy)
Power:Recall (50 energy): Teleport back to spawn.
score:0
Enemy:
[1,G]->health:100/100, Regen:1, Armour:1, Vision:5, seen_by_Starfighter:T, can_see_Starfighter:F, location:[A,13]
Projectile:
[-1,*]->damage:70, move:5, location:[A,7]
[-2,<]->damage:15, move:4, location:[A,10]
[-3,<]->damage:15, move:4, location:[A,12]
Friendly Projectile Action:
A friendly projectile(id:-1) moves: [A,2] -> [A,7]
Enemy Projectile Action:
A enemy projectile(id:-2) moves: [A,14] -> [A,10]
Starfighter Action:
The Starfighter(id:0) moves: [A,1] -> [A,2]
Enemy Action:
A Grunt(id:1) moves: [A,15] -> [A,13]
A enemy projectile(id:-3) spawns at location [A,12].
Natural Enemy Spawn:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
A - S - - - - * - - - - G - - - -
B - - - - - - - - - - - - - - - - -
C - - - - - - - - - - - - - - - - -
D - - - - - - - - - - - - - - - - -
E - - - - - - - - - - - - - - - - -
    
```

- projectiles move
- Energy regen done before move
- move 1 space
- update enemy vision
- Grunt not preempted by move
- Regen then act
- update enemy vision

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A	S					*						G				
B																
C																
D																
E																

$$62 + 3 = 65$$

$$65 - (3 * 1) = 62$$

```

>move(A,3)
state:in game(4.0), debug, ok
Starfighter:
[0,S]->health:70/70, energy:62/70, Regen:1/3, Armour:1, Vision:13, Move:10, Move Cost:3, location:[A,3]
Projectile Pattern:Standard, Projectile Damage:70, Projectile Cost:5 (energy)
Power:Recall (50 energy): Teleport back to spawn.
score:0
Enemy:
[1,G]->health:61/100, Regen:1, Armour:1, Vision:5, seen_by_Starfighter:T, can_see_Starfighter:F, location:[A,11]
Projectile:
[-4,<]->damage:15, move:4, location:[A,10]
Friendly Projectile Action:
A friendly projectile(id:-1) moves: [A,7] -> [A,12]
The projectile collides with enemy projectile(id:-2) at location [A,10], negating damage.
The projectile collides with enemy projectile(id:-3) at location [A,12], negating damage.
Enemy Projectile Action:
Starfighter Action:
The Starfighter(id:0) moves: [A,2] -> [A,3]
Enemy Action:
A Grunt(id:1) moves: [A,13] -> [A,11]
The Grunt collides with friendly projectile(id:-1) at location [A,12], taking 39 damage
A enemy projectile(id:-4) spawns at location [A,10].
Natural Enemy Spawn:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
A - S - - - - - - - - - < G - - - - -
B - - - - - - - - - - - - - - - - -
C - - - - - - - - - - - - - - - - -
D - - - - - - - - - - - - - - - - -
E - - - - - - - - - - - - - - - - -
    
```

$$70 - 15 - 15 = 40$$

$$40 - 1 = 39$$

↓ Armour

regen

Acceptance Test at011

Part 7 of 8

```

state:in game(4.0), debug, ok
Starfighter:
[0,S]->health:70/70, energy:62/70, Regen:1/3, Armour:1, Vision:13, Move:10, Move Cost:3, location:[A,3]
Projectile Pattern:Standard, Projectile Damage:70, Projectile Cost:5 (energy)
Power:Recall (50 energy): Teleport back to spawn.
score:0
Enemy:
[1,G]->health:61/100, Regen:1, Armour:1, Vision:5, seen_by_Starfighter:T, can_see_Starfighter:F, location:[A,11]
Projectile:
[-4,<]->damage:15, move:4, location:[A,10]
Friendly Projectile Action:
A friendly projectile(id:-1) moves: [A,7] -> [A,12]
The projectile collides with enemy projectile(id:-2) at location [A,10], negating damage.
The projectile collides with enemy projectile(id:-3) at location [A,12], negating damage.
Enemy Projectile Action:
Starfighter Action:
The Starfighter(id:0) moves: [A,2] -> [A,3]
Enemy Action:
A Grunt(id:1) moves: [A,13] -> [A,11]
The Grunt collides with friendly projectile(id:-1) at location [A,12], taking 39 damage.
A enemy projectile(id:-4) spawns at location [A,10].
Natural Enemy Spawn:

```

- projectiles move
- Energy regen done before move
- move 2 spaces
- update enemy vision
- Grunt not preempted by move
- Regen then act
- update enemy vision

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A	-	S	-	-	-	-	-	-	G	<	G	-	-	-	-	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

$$\underline{62} + \underline{3} = \underline{65}$$

$$\underline{65} - (\underline{3} * \underline{2}) = \underline{59}$$

```

->move(A,1)
state:in game(5.0), debug, ok
Starfighter:
[0,S]->health:70/70, energy:59/70, Regen:1/3, Armour:1, Vision:13, Move:10, Move Cost:3, location:[A,1]
Projectile Pattern:Standard, Projectile Damage:70, Projectile Cost:5 (energy)
Power:Recall (50 energy): Teleport back to spawn.
score:0
Enemy:
[1,G]->health:62/100, Regen:1, Armour:1, Vision:5, seen_by_Starfighter:T, can_see_Starfighter:F, location:[A,9]
Projectile:
[-4,<]->damage:15, move:4, location:[A,6]
[-5,<]->damage:15, move:4, location:[A,8]
Friendly Projectile Action:
Enemy Projectile Action:
A enemy projectile(id:-4) moves: [A,10] -> [A,6]
Starfighter Action:
The Starfighter(id:0) moves: [A,3] -> [A,1]
Enemy Action:
A Grunt(id:1) moves: [A,11] -> [A,9]
A enemy projectile(id:-5) spawns at location [A,8].
Natural Enemy Spawn:

```

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A	S	-	-	-	<	<	G	-	-	-	-	-	-	-	-	-	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

regen

phase 2

Acceptance Test at011

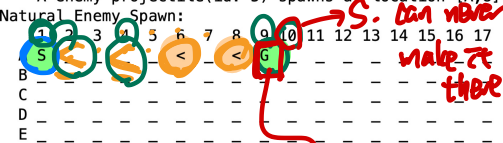
Part 8 of 8

```

state:in game(5.0), debug, ok
Starfighter:
 [0,S]->health 70, energy 59, Regen:1/3, Armour:1, Vision:13, Move:10, Move Cost:3, location:[A,1]
 Projectile Pattern:Standard, Projectile Damage:70, Projectile Cost:5 (energy)
 Power:Recall (50 energy): Teleport back to spawn.
 score:0
 Enemy:
 [1,G]->health 62, Regen:1, Armour:1, Vision:5, seen_by_Starfighter:T, can_see_Starfighter:F, location:[A,9]
 Projectile:
 [-4,->damage 15, move 4, location:[A,6]
 [-5,->damage 15, move 4, location:[A,8]
 Friendly Projectile Action:
 Enemy Projectile Action:
 A enemy projectile(id:-4) moves: [A,10] -> [A,6]
 Starfighter Action:
 The Starfighter(id:0) moves: [A,3] -> [A,1]
 Enemy Action:
 A Grunt(id:1) moves: [A,11] -> [A,9]
 A enemy projectile(id:-5) spawns at location [A,8].
 Natural Enemy Spawn:
 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
 S < < < < < < < < < < < < < < < <
 B
 C
 D
 E
  
```

→ Current health of enemy.

(A,1) → (A,10)
 15 destroyed spaces
 at (A,9)



$$59 + 3 = 62$$

$$62 - (3 * 8) = 38$$

4 X

If not destroyed:

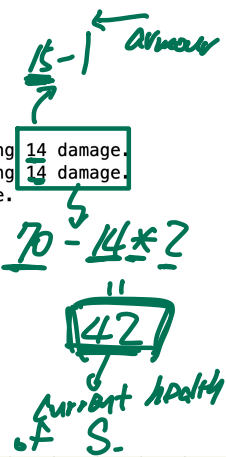
$$62 - (3 * 9) = 35$$

last collection destroying S.

```

-> move(A,10)
state:not started, debug, ok
Starfighter:
 [0,S]->health 0, energy 38, Regen:1/3, Armour:1, Vision:13, Move:10, Move Cost:3, location:[A,9]
 Projectile Pattern:Standard, Projectile Damage:70, Projectile Cost:5 (energy)
 Power:Recall (50 energy): Teleport back to spawn.
 score:2
 Enemy:
 Projectile:
 Friendly Projectile Action:
 Enemy Projectile Action:
 A enemy projectile(id:-4) moves: [A,6] -> [A,2]
 A enemy projectile(id:-5) moves: [A,8] -> [A,4]
 Starfighter Action:
 The Starfighter(id:0) moves: [A,1] -> [A,9]
 The Starfighter collides with enemy projectile(id:-4) at location [A,2], taking 14 damage.
 The Starfighter collides with enemy projectile(id:-5) at location [A,4], taking 14 damage.
 The Starfighter collides with Grunt(id:1) at location [A,9], trading 62 damage.
 The Grunt at location [A,9] has been destroyed.
 The Starfighter at location [A,9] has been destroyed.
 Enemy Action:
 Natural Enemy Spawn:
 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
 A - - - - - X - - - - -
 B - - - - - - - - - - -
 C - - - - - - - - - - -
 D - - - - - - - - - - -
 E - - - - - - - - - - -
 The game is over. Better luck next time!
  
```

→ silver orb (2 points) dropped by Grunt



- projectiles move
- Energy regen done before move
- move 9 spaces (colliding after 8 spaces)
- Starfighter destroyed