



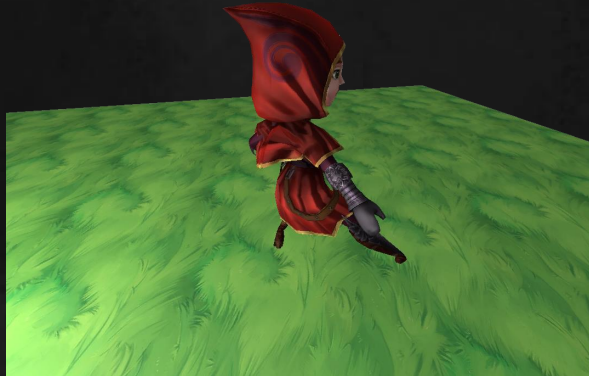


# ACHIEVEMENTS

Loading Models  
(with Textures and Normal-Maps)



Phong



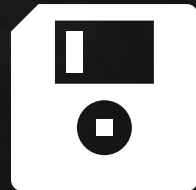
Overlay



User Input

```
Select Card from  
0: ScytheCard (Blue)  
0  
Your current Commandline:  
0: Empty  
1: Empty  
2: Empty  
3: Empty  
4: Empty  
5: BlazeCard  
Select Slot from: 0, 1, 2, 3, 4  
|
```

Loading and Saving

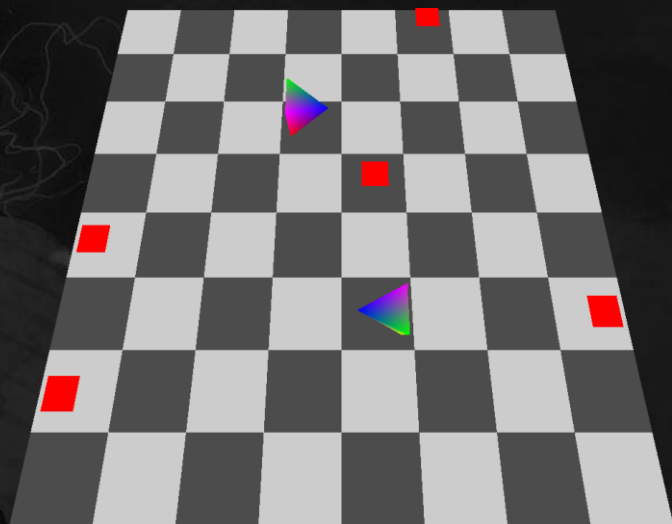


Dependency Injection



...

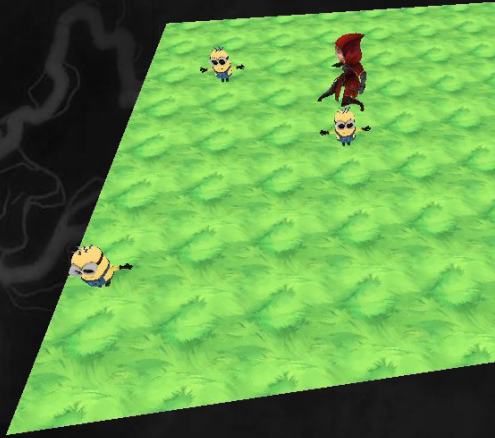
# THE VISUAL CHANGES



after Milestone 1



# THE VISUAL CHANGES



models and textures)



# THE VISUAL CHANGES



+ (new models and textures)

+ **OVERLAY GRAPHICS**



# THE VISUAL CHANGES



+ (new models and textures)

+ **OVERLAY GRAPHICS**

+ **PHONG-LIGHTING**



# THE VISUAL CHANGES



+ (new models and textures)

+ **OVERLAY GRAPHICS**

+ **PHONG-LIGHTING**

+ **OBJECT OUTLINE**



# OVERLAY GRAPHICS





# OVERLAY GRAPHICS



$$w_{max} = 1 \quad \in [0; 1]$$



# OVERLAY GRAPHICS



$$w_{max} = 0.5 \quad \in [0; 1]$$

$$h_{max} = 1 \quad \in [0; 1]$$



# OVERLAY GRAPHICS



$$w_{max} = 0.5 \quad \in [0; 1]$$

$$h_{max} = 0.5 \quad \in [0; 1]$$

$$t_x = 0 \quad \in [-1; 1]$$



# OVERLAY GRAPHICS



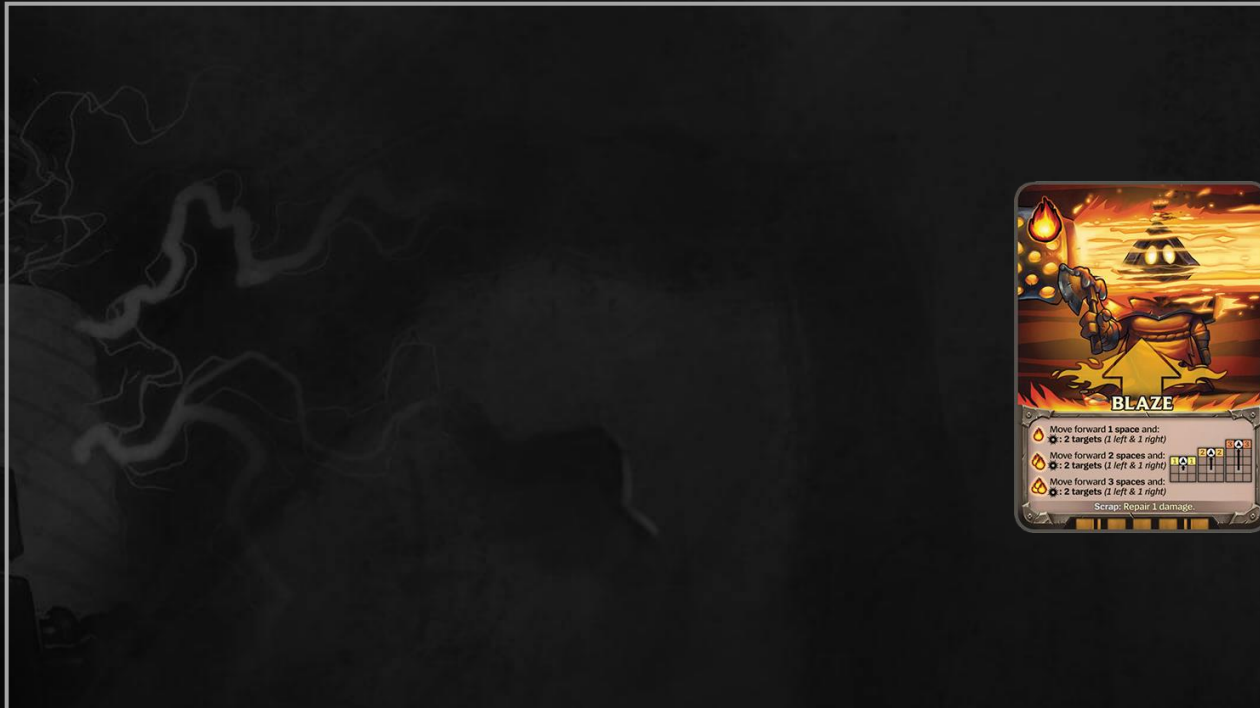
$$w_{max} = 0.5 \quad \in [0; 1]$$

$$h_{max} = 0.5 \quad \in [0; 1]$$

$$t_x = -1 \quad \in [-1; 1]$$



# OVERLAY GRAPHICS



$$w_{max} = 0.5 \quad \in [0; 1]$$

$$h_{max} = 0.5 \quad \in [0; 1]$$

$$t_x = 1 \quad \in [-1; 1]$$



# OVERLAY GRAPHICS



$$w_{max} = 0.5 \quad \in [0; 1]$$

$$h_{max} = 0.5 \quad \in [0; 1]$$

$$t_x = 0 \quad \in [-1; 1]$$

$$t_y = 0 \quad \in [-1; 1]$$



# OVERLAY GRAPHICS



$$w_{max} = 0.5 \quad \in [0; 1]$$

$$h_{max} = 0.5 \quad \in [0; 1]$$

$$t_x = 0 \quad \in [-1; 1]$$

$$t_y = -1 \quad \in [-1; 1]$$



# OVERLAY GRAPHICS



$$w_{max} = 0.5 \quad \in [0; 1]$$

$$h_{max} = 0.5 \quad \in [0; 1]$$

$$t_x = 0 \quad \in [-1; 1]$$

$$t_y = 1 \quad \in [-1; 1]$$



# OVERLAY GRAPHICS

([Desmos](#))



$$w_{max} = 0.5 \quad \in [0; 1]$$

$$h_{max} = 0.5 \quad \in [0; 1]$$

$$t_x = 0 \quad \in [-1; 1]$$

$$t_y = 0 \quad \in [-1; 1]$$



# OVERLAY GRAPHICS

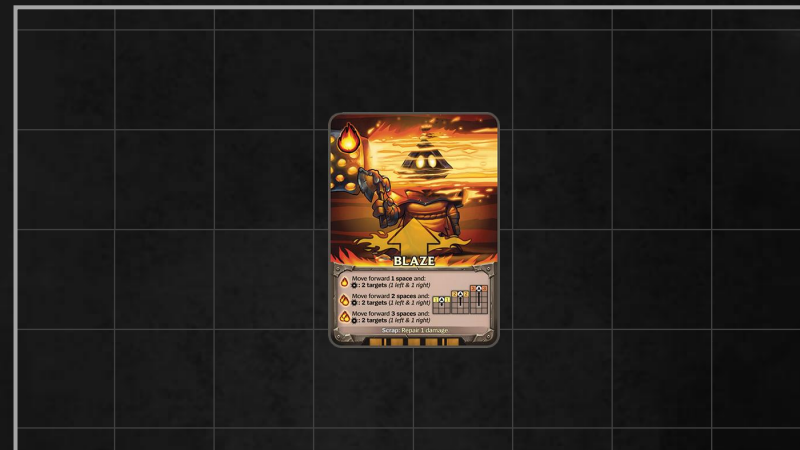
Screen coordinates



$$w = 0.4$$

$$h = 0.53$$

New Coordinate System



←  
:  $r_{hw}$

$$w_{max} = 0.5$$

$$t_x = 0$$

$$h_{max} = 0.5$$

$$t_y = 0$$

$r_{hw}$ : height-width ratio of the screen

# OVERLAY GRAPHICS

Screen coordinates



$$w = 0.4$$

$$h = 0.53 \text{ } 0.94$$

New Coordinate System



$$w_{max} = 0.5 \quad t_x = 0$$

$$h_{max} = 0.5 \quad t_y = 0$$

←  
:  $r_{hw}$

$r_{hw}$ : height-width ratio of the screen



# OVERLAY GRAPHICS



$$w_{max} = 0.15 \quad t_x = \dots$$

$$h_{max} = 0.3 \quad t_y = 0.9$$

$$w_{max} = 1 \quad t_x = 0$$

$$h_{max} = 0.3 \quad t_y = -1$$



# OVERLAY GRAPHICS



$$w_{max} = 0.121$$

$$h_{max} = 0.594$$

$$t_x = -0.146$$

$$t_y = 0.444$$

⇒ Scene Graph









# LIGHTING-MODEL



- Phong Lighting Model
- 1 source of light
- diffuse component decreases with distance



# LIGHTING-MODEL



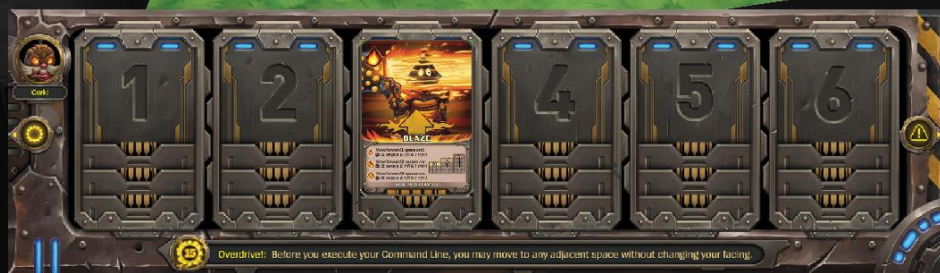
# LIGHTING-MODEL

(Normal Mapping)





# OBJECT OUTLINE





# OBJECT OUTLINE

([learnopengl.com](http://learnopengl.com))



Screen



Stencil Buffer





# OBJECT OUTLINE

([learnopengl.com](http://learnopengl.com))



Screen



Stencil Buffer



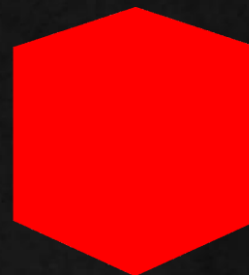


# OBJECT OUTLINE

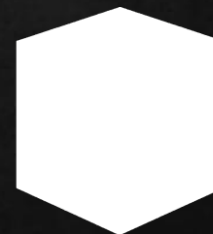
([learnopengl.com](http://learnopengl.com))



Screen



Stencil Buffer



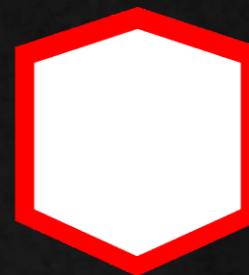


# OBJECT OUTLINE

([learnopengl.com](http://learnopengl.com))



Screen



Stencil Buffer





# OBJECT OUTLINE

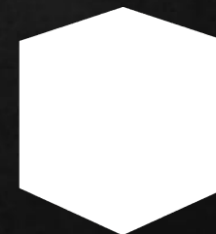
([learnopengl.com](http://learnopengl.com))



Screen



Stencil Buffer





# OBJECT OUTLINE

([learnopengl.com](http://learnopengl.com))



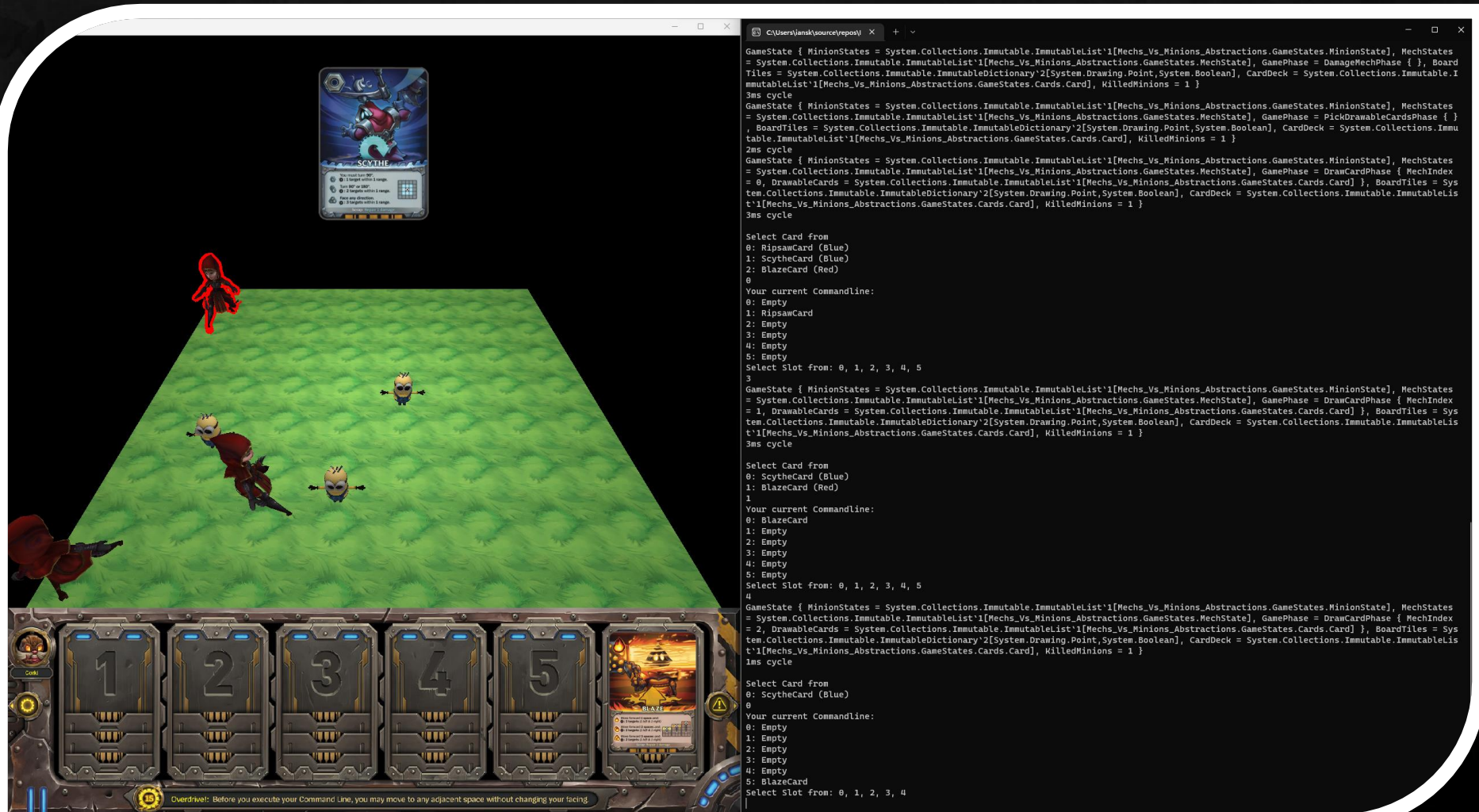
“Scaled” Outline



“Shifted” Outline

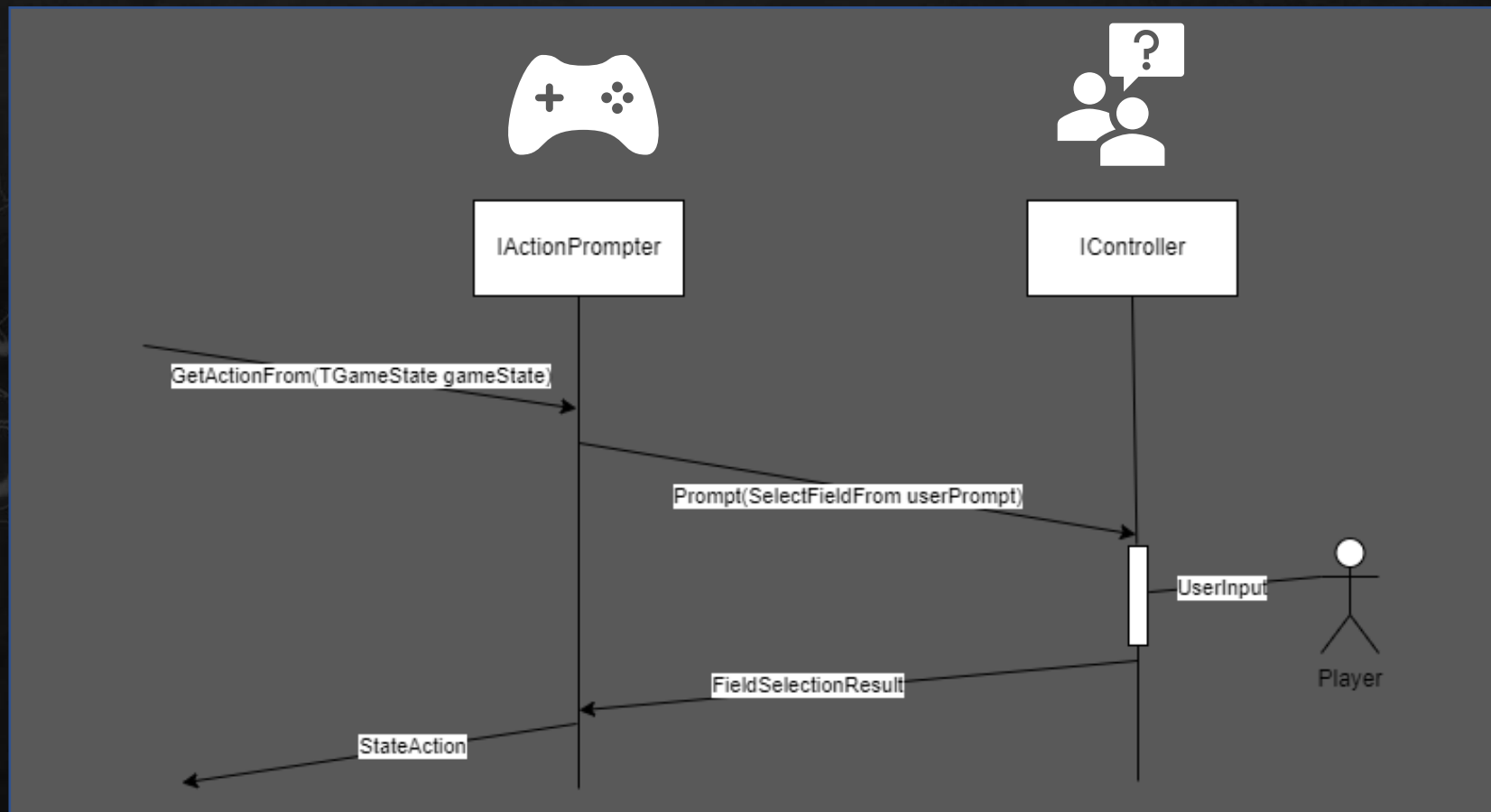


# USER INPUT





# USER-PROMPTS



# TESTS



## Test Explorer

Test run finished: 20 Tests (20 Passed, 0 Failed, 0 Skipped) run in 598 ms

| Test  | Duration | Traits | Error Message |
|---|----------|--------|---------------|
| Mechs-Vs-Minions-GameLogic-Tests (20)               | 336 ms   |        |               |
| Mechs_Vs_Minions_GameLogic_Tests.CardTests (9)      | 206 ms   |        |               |
| BlazeTests (3)                                      | 70 ms    |        |               |
| RipsawTests (3)                                     | 65 ms    |        |               |
| ScytheTests (3)                                     | 71 ms    |        |               |
| Mechs_Vs_Minions_GameLogic_Tests.MovementTests (11) | 130 ms   |        |               |
| MechMovementTests (6)                               | 68 ms    |        |               |
| MinionMovementTests (5)                             | 62 ms    |        |               |

## [Fact]

0 references | uekip, 25 days ago | 1 author, 1 change

```
public void Minion_MoveNorth1_MinionMoved()
```

```
{
```

```
    var minion = MinionState.CreateAt(new Point(x:0, y:0));
```

```
    var gameState = GameStateWith(minions: new[] { minion });
```

```
    var expectedMinionState = minion with { Position = new Point(x:0, y:1) };
```

```
    var newMinionState = Movement.MoveMinion(gameState, minion, Orientation.North);
```

```
    newMinionState.Should().BeEquivalentTo(expectedMinionState);
```

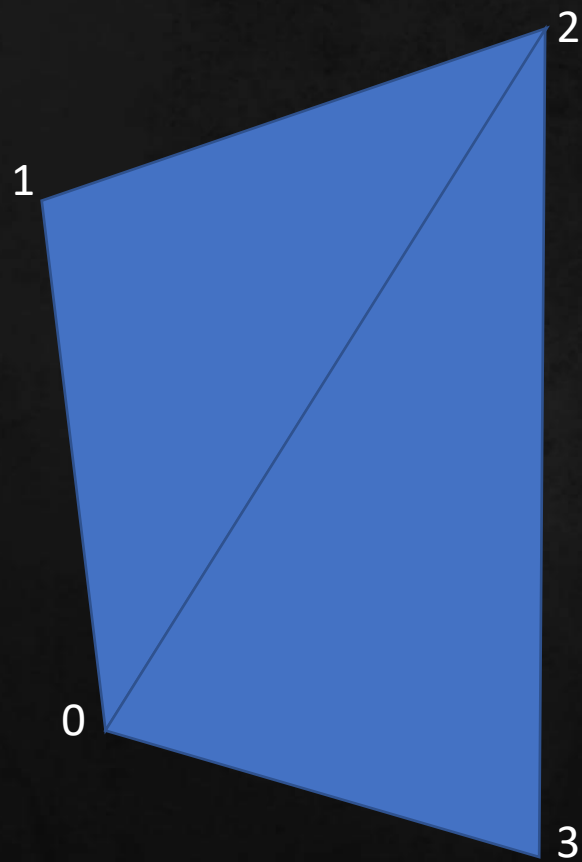
```
}
```



# ASSERTIONS



```
Debug.Assert(face.Count == 3);
```



Triangle 1: 0,1,2  
Triangle 2: 0,2,3