BEGINNING METAL

HANDS-ON CHALLENGES

Beginning Metal

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Challenge #11: Touch Handlers

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In this challenge, you're going to add touch ability to your scenes. By the end of the challenge you'll be able to rotate the mushroom along its x and y axes.

Touch events are detected by the view controller, so we'll set up the touch event handlers there.

In **ViewController.swift**, add these four touch methods to `ViewController`:

```
override func touchesBegan(_ touches: Set<UITouch>,
                           with event: UIEvent?) {
  renderer?.scene?.touchesBegan(view, touches:touches,
                                with: event)
}

override func touchesMoved(_ touches: Set<UITouch>,
                           with event: UIEvent?) {
  renderer?.scene?.touchesMoved(view, touches: touches,
                                with: event)
}

override func touchesEnded(_ touches: Set<UITouch>,
                           with event: UIEvent?) {
  renderer?.scene?.touchesEnded(view, touches: touches,
                                with: event)
}

override func touchesCancelled(_ touches: Set<UITouch>,
                               with event: UIEvent?) {
  renderer?.scene?.touchesCancelled(view, touches: touches,
                                    with: event)
}
```

That's one touch handler for every touch event. Your app should have a build error until we've added the scene methods.

In `Scene`, add the touch handlers so that each scene subclass can override them:

```
func touchesBegan(_ view: UIView, touches: Set<UITouch>,
                  with event: UIEvent?) {}

func touchesMoved(_ view: UIView, touches: Set<UITouch>,
                  with event: UIEvent?) {}

func touchesEnded(_ view: UIView, touches: Set<UITouch>,
                  with event: UIEvent?) {}

func touchesCancelled(_ view: UIView, touches: Set<UITouch>,
                      with event: UIEvent?) {}
```

Your app should now compile again.

In **LightingScene.swift**, override `touchesBegan(_:touches:with:)` and `touchesMoved(_:touches:with:)`:

```
override func touchesBegan(_ view: UIView, touches: Set<UITouch>,
                           with event: UIEvent?) {
}

override func touchesMoved(_ view: UIView, touches: Set<UITouch>,
                           with event: UIEvent?) {
}
```

Still in `LightingScene`, set up a property to hold the previous touch location:

```
var previousTouchLocation: CGPoint = .zero
```

Store the first touch location. Add this to `touchesBegan(_:touches:with:)`:

```
guard let touch = touches.first else { return }
previousTouchLocation = touch.location(in: view)
```

In `touchesMoved(_:touches:with:)`, calculate the difference between the current touch location and the previous touch location:

```
guard let touch = touches.first else { return }
let touchLocation = touch.location(in: view)

let delta = CGPoint(x: previousTouchLocation.x - touchLocation.x,
                    y: previousTouchLocation.y - touchLocation.y)
```

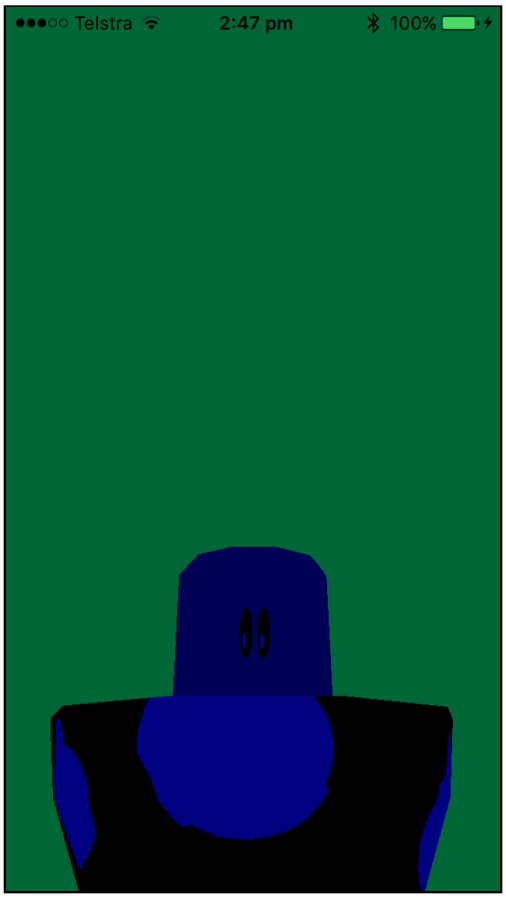
Still in `touchesMoved(_:touches:with:)`, rotate the mushroom by this difference, but stepping it down by a sensitivity factor:

```
let sensitivity: Float = 0.01
mushroom.rotation.x += Float(delta.y) * sensitivity
mushroom.rotation.y += Float(delta.x) * sensitivity
```

Then at the end of `touchesMoved(_:touches:with:)`, store the current touch location ready for the next move:

```
previousTouchLocation = touchLocation
```

Build and run, and you should be able to rotate the mushroom around its origin.



Now you've implemented touch, your future games will be so much more interesting :].