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CODEX

How to Generate Lightning in Swift [Recursively]

Generate realistic-looking lightning strikes in Swift

Artturi Jalli · Follow

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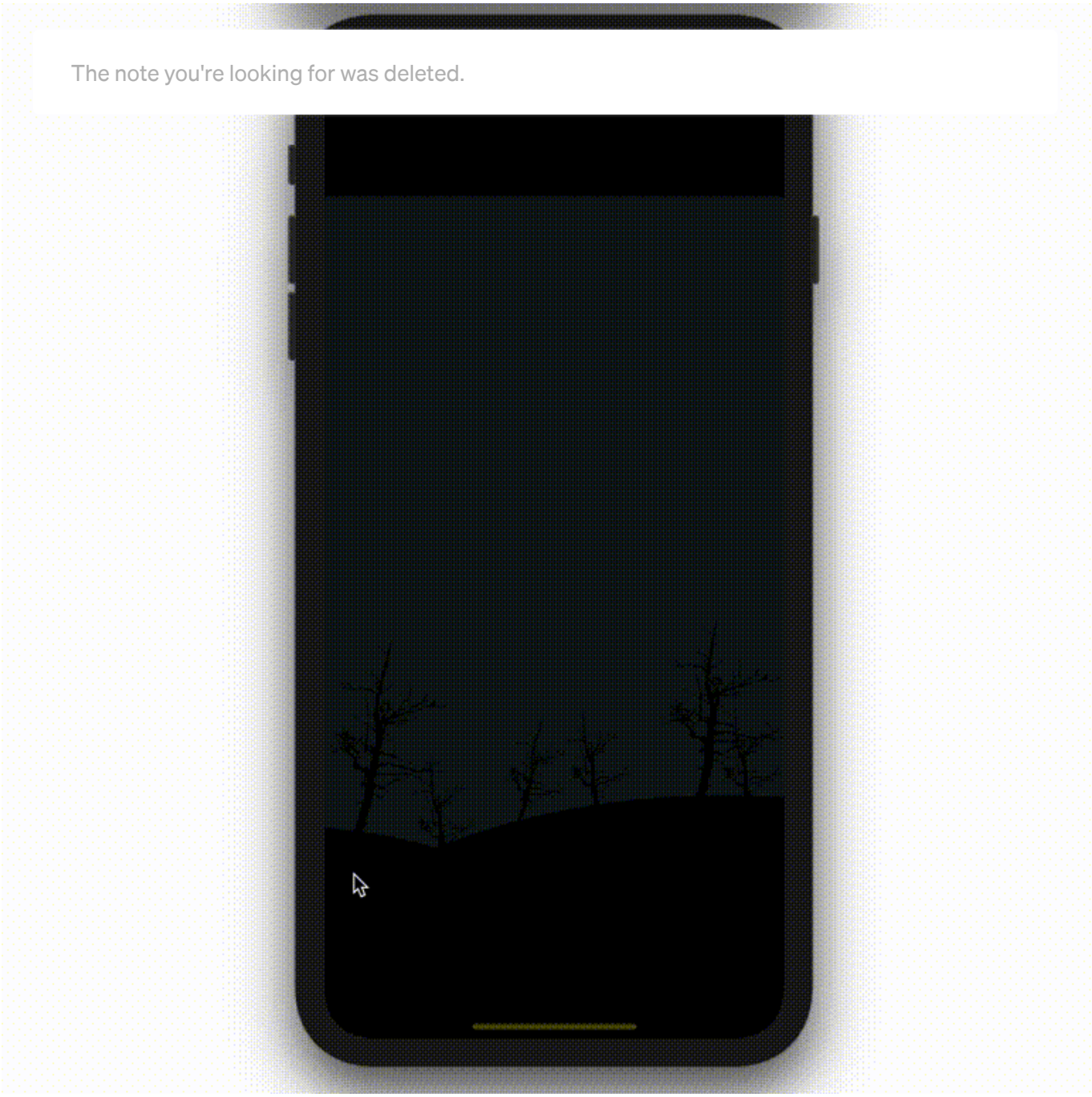

Learn how to generate realistic lightning in Swift.

Disclaimer: This post contains affiliate links.

The Setup

To get started, create a Game App in Xcode. Remove `Actions.sks` file and remove the hello label from `GameScene.sks`. Then erase excess code in

`GameScene.swift` file to make it look like this:

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```
import SpriteKit
import GameplayKit

class GameScene: SKScene {
    override func didMove(to view: SKView) {
        self.backgroundColor = .black
    }
}
```

Drawing a Single Line

A lightning strike consists of small paths or line segments that are connected to form the lightning strike.

First off, we want to be able to draw a line from point A to point B. The following code snippet will return a line:

```
func createLine(pointA: CGPoint, pointB: CGPoint) -> SKShapeNode {
    let pathToDraw = CGMutablePath()
    pathToDraw.move(to: pointA)
    pathToDraw.addLine(to: pointB)
    let line = SKShapeNode()
    line.path = pathToDraw
    line.glowWidth = 1
    line.strokeColor = .white
    return line
}
```

Note that this function returns a shape node. It does not automatically add the line segment to the screen. You can add a line to the scene by adding the following to the `didMove` function:

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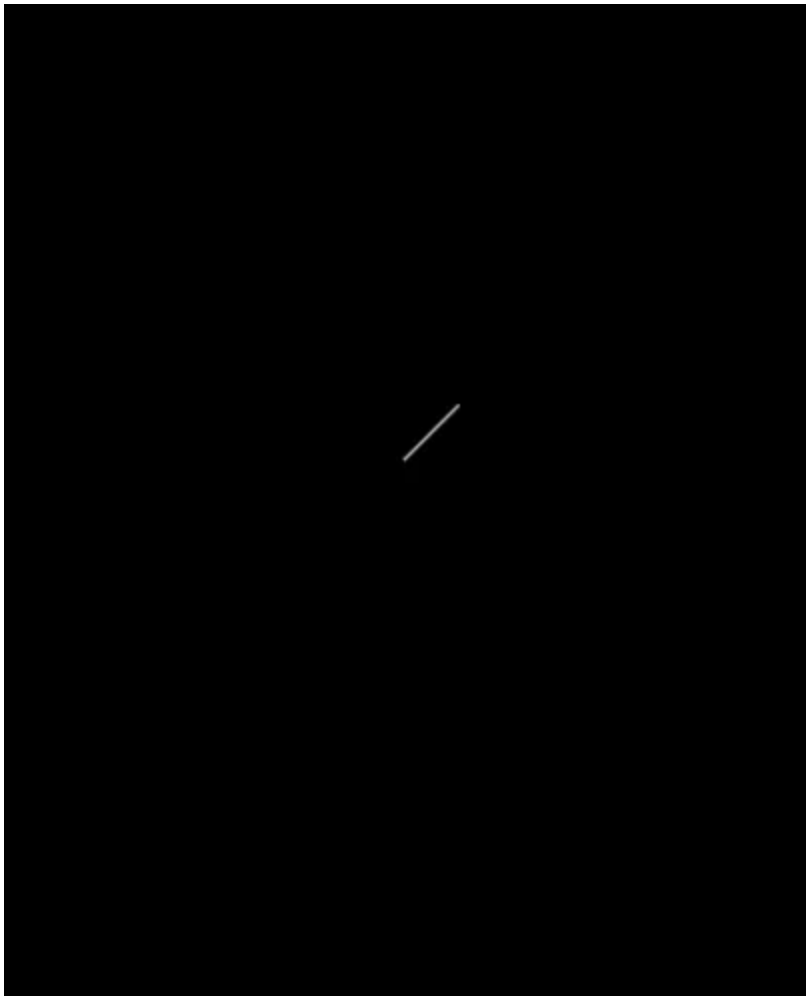
```
self.addChild(line)
```



A line from point (0, 0) to point (50, 50)

Feel free to tweak `x` and `y` to draw different kinds of lines.

Connecting the Lines

Next up, to create a lightning strike, we need to connect the lines. This can be done by generating the path for lightning by utilizing the above `createLine` method:

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```
    var startPoint = startingFrom
    var endPoint = startPoint
    let numberOfLines = 120

    var idx = 0
    while idx < numberOfLines {
        strikePath.append(createLine(pointA: startPoint, pointB:
endPoint))
        startPoint = endPoint
        let r = CGFloat(10)
        endPoint.y -= r

        idx += 1
    }
    return strikePath
}
```

In the above, we create an array of lines by looping in such a way that the previous line's endpoint is the starting point for the next one. This way the lightning strike is a continuous line.

To draw a set of lines let's create a function called `lightningStirke` that draws a lightning strike to the scene based on a path input to it:

```
func lightningStrike(throughPath: [SKShapeNode]) {
    for line in throughPath {
        self.addChild(line)
    }
}
```

Now, in `didMove` function add a lightning strike to the scene by first generating a path for the strike and then lighting up the path by calling the `lightningStrike`:

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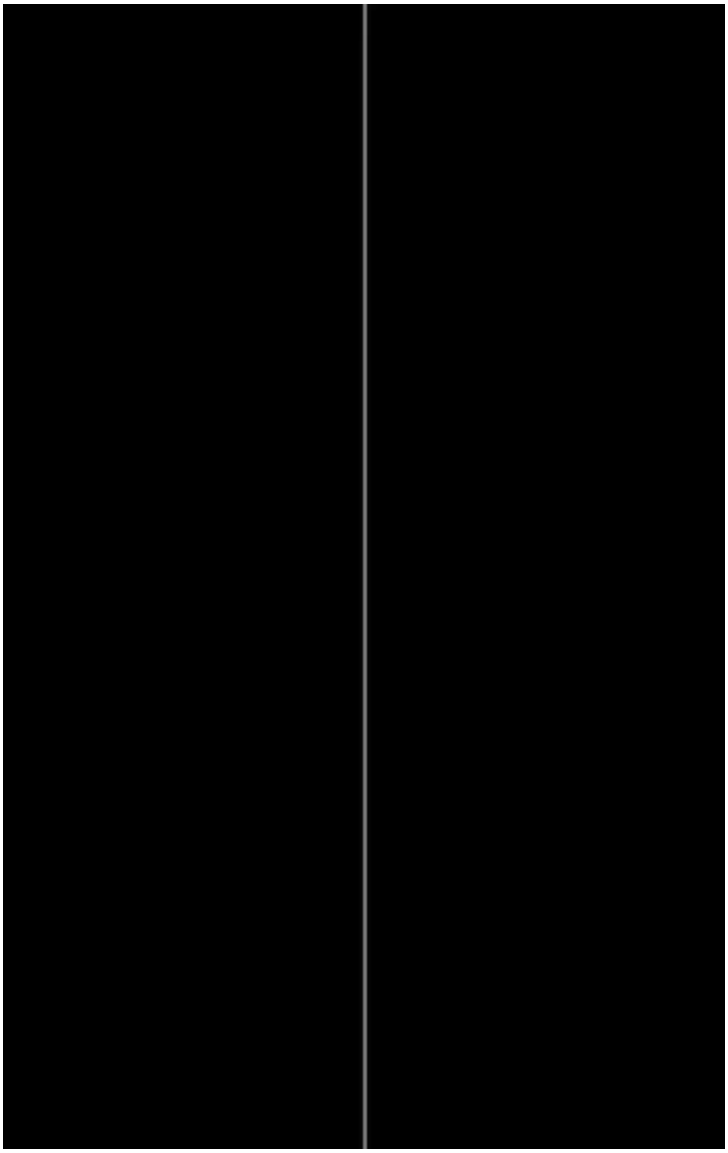
```
lightningStrike(throughPath: path)
```

We now see that the lightning strike is a long line from the top to the bottom.



We need to add some randomness to the lines constructing the strike to make it look more realistic. This can be done by randomizing the x position `endPoint` for each line. Update `generateLightningPath` function by adding

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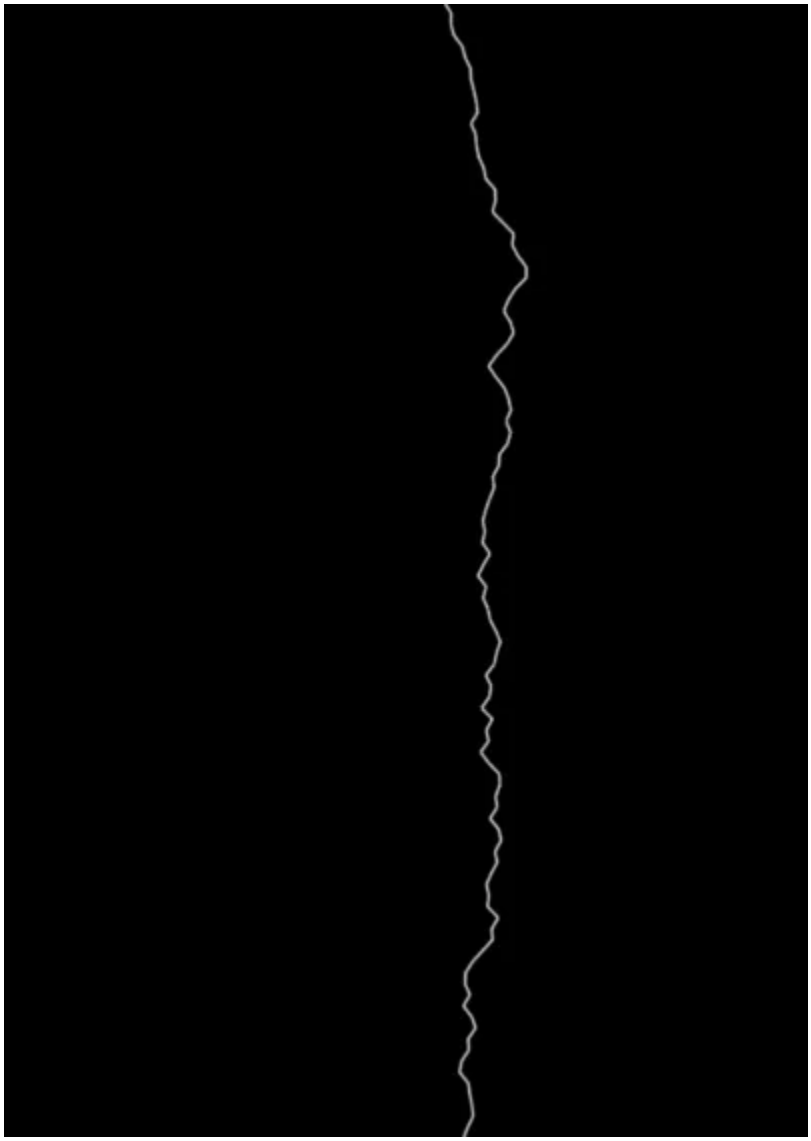
after `endPoint.y -= r`.

Result:



Fading Out the Strike

With the current implementation, the lightning strike stays in the scene forever. But we want it to disappear in a split second. To do this, run a

`fadeAlpha` action on the lightning strike:

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```
func lightningStrike(throughPath: [SKShapeNode]) {
    let path = genrateLightningPath(startingFrom: CGPoint(x:
frame.midX, y: frame.size.height / 2))

    for line in throughPath {
        self.addChild(line)
        line.run(SKAction.fadeAlpha(to: 0, duration: 1))
    }
}
```

Now the lightning strike fades away 1 second after appearing.

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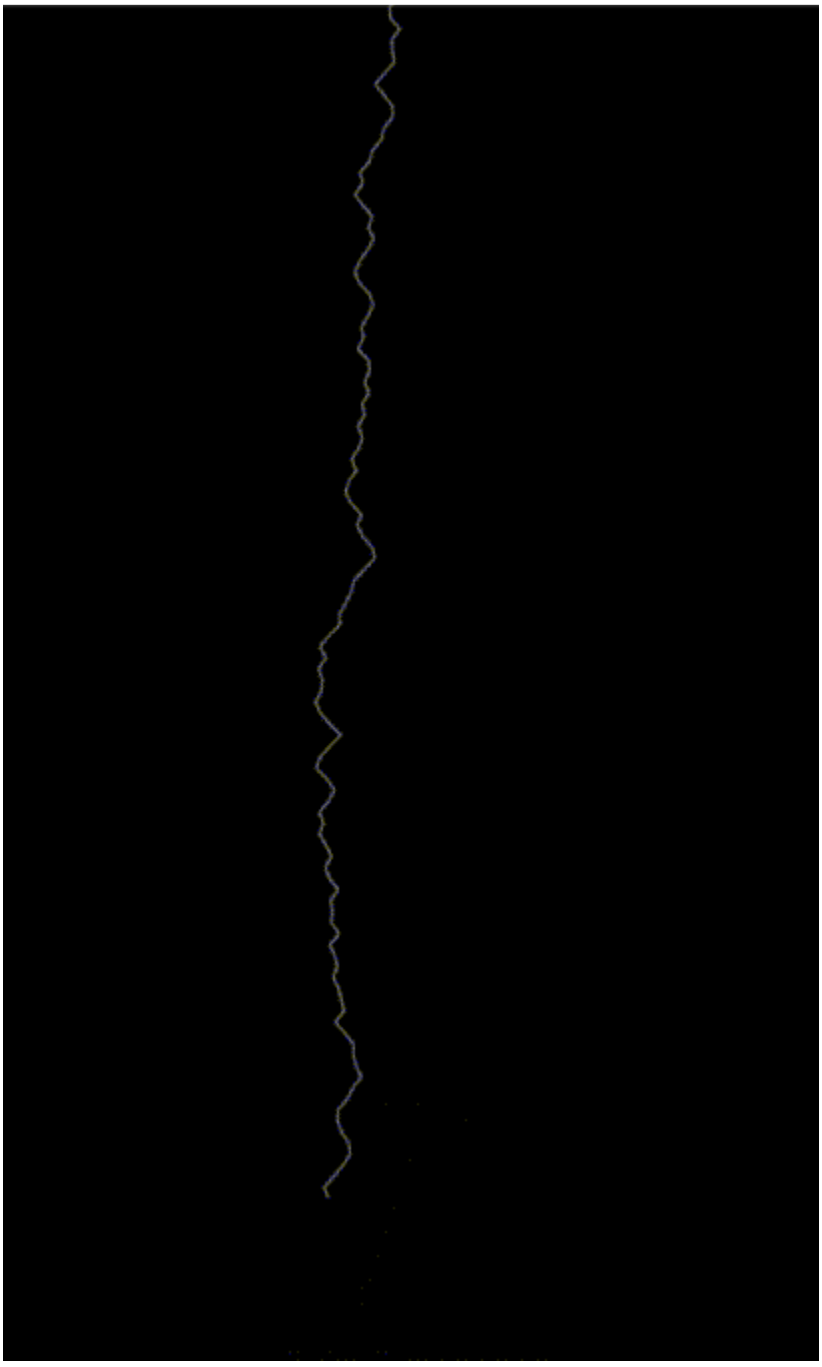

Let’s make it possible to trigger lightning strikes by touching the screen. We move the functionality from `didMove` to `touchesBegan` as follows:

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

```
    let path = genrateLightningPath(startingFrom: CGPoint(x:
```

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```
}
```

Flickering

We don't want the lightning strike to disappear, but we want it to flicker in the screen for a second before vanishing.

We create an action sequence for all of the lightning strike's lines. It repeatedly fades the lines in and out. Let's create the *action sequence* for the lightning strike's lines, by extending the `lightningStrike` function:

```
func lightningStrike(throughPath: [SKShapeNode], maxFlickeringTimes:
Int) {

    let fadeTime = TimeInterval(CGFloat.random(in: 0.005 ... 0.03))
    let waitAction = SKAction.wait(forDuration: 0.05)
    let reduceAlphaAction = SKAction.fadeAlpha(to: 0.0, duration:
fadeTime)
    let increaseAlphaAction = SKAction.fadeAlpha(to: 1.0, duration:
fadeTime)
    let flickerSeq = [waitAction, reduceAlphaAction,
increaseAlphaAction]

    var seq: [SKAction] = []
    let numberOfFlashes = Int.random(in: 1 ... maxFlickeringTimes)

    for _ in 1 ... numberOfFlashes {
        seq.append(contentsOf: flickerSeq)
    }

    for line in throughPath {
        seq.append(SKAction.fadeAlpha(to: 0, duration: 0.25))
        seq.append(SKAction.removeFromParent())
        line.run(SKAction.sequence(seq))
        self.addChild(line)
    }
}
```

Note the last `for` loop completes the flickering action sequence by fading ou

Note that we also added a new parameter `maxFlickeringTimes` to the function. This determines how many times the flickering sequence is run. Also, remember to modify the `lightningStrike` function call inside the `touchesBegan` function to pass in the new parameter by giving it some nice value, such as 5.

Result:

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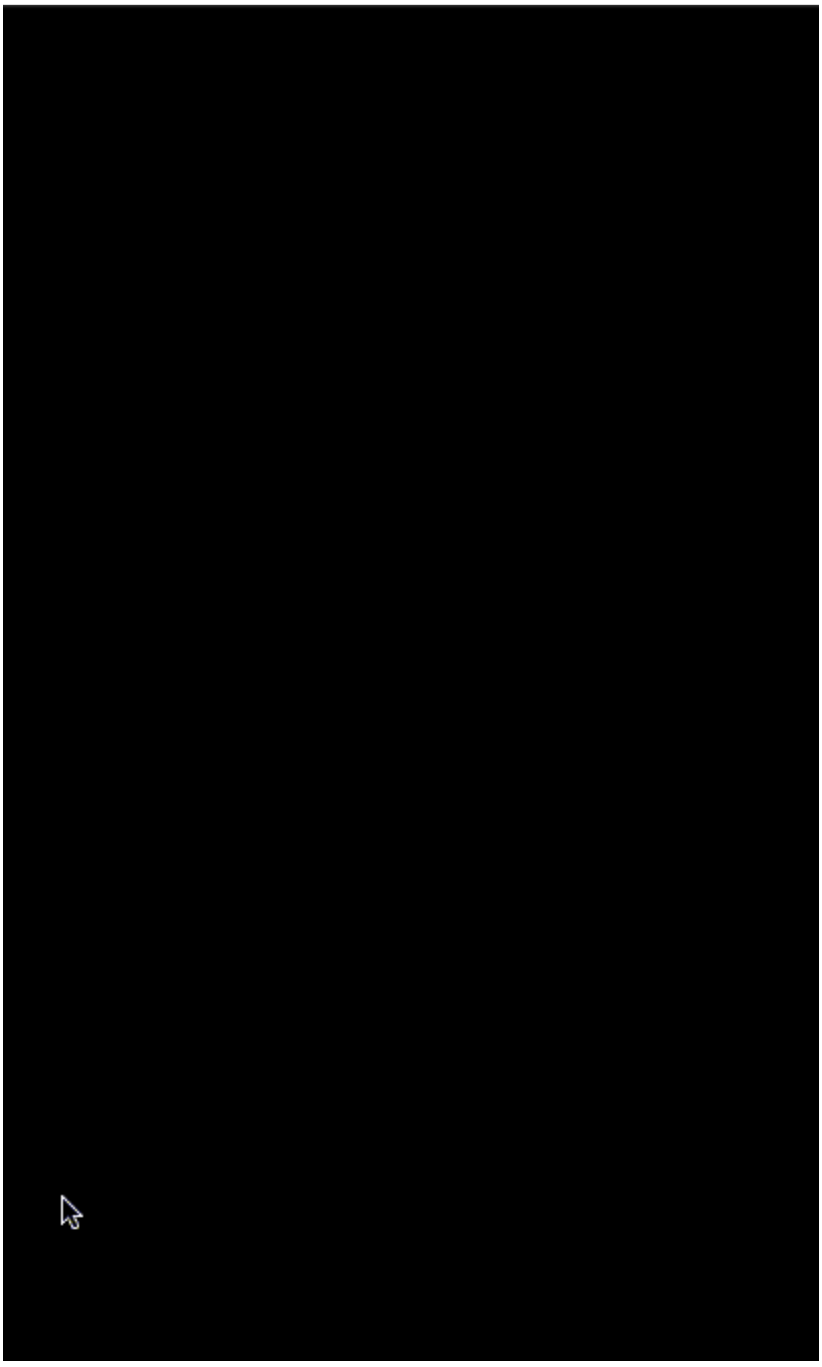

Flickering the Background

Flashes of lightning light up the sky. In this case, we can achieve it by rapidly changing the color of the background. This is done with action sequences:

1. We light up the background

2 Wait for a split second

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3

4. Repeat 1–3 multiple times to achieve the flickering effect

```
func flashTheScreen(nTimes: Int) {
    let lightUpScreenAction = SKAction.run { self.backgroundColor =
UIColor.gray }
    let waitAction = SKAction.wait(forDuration: 0.05)
    let dimScreenAction = SKAction.run { self.backgroundColor =
.black}

    var flashActionSeq: [SKAction] = []
    for _ in 1 ... nTimes + 1 {
        flashActionSeq.append(contentsOf: [lightUpScreenAction,
waitAction, dimScreenAction, waitAction])
    }
    self.run(SKAction.sequence(flashActionSeq))
}
```

Now call this function at the end of `lightningStrike` function to flicker the screen as the lightning strike occurs:

```
flashTheScreen(nTimes: numberOfFlashes)
```

Result:

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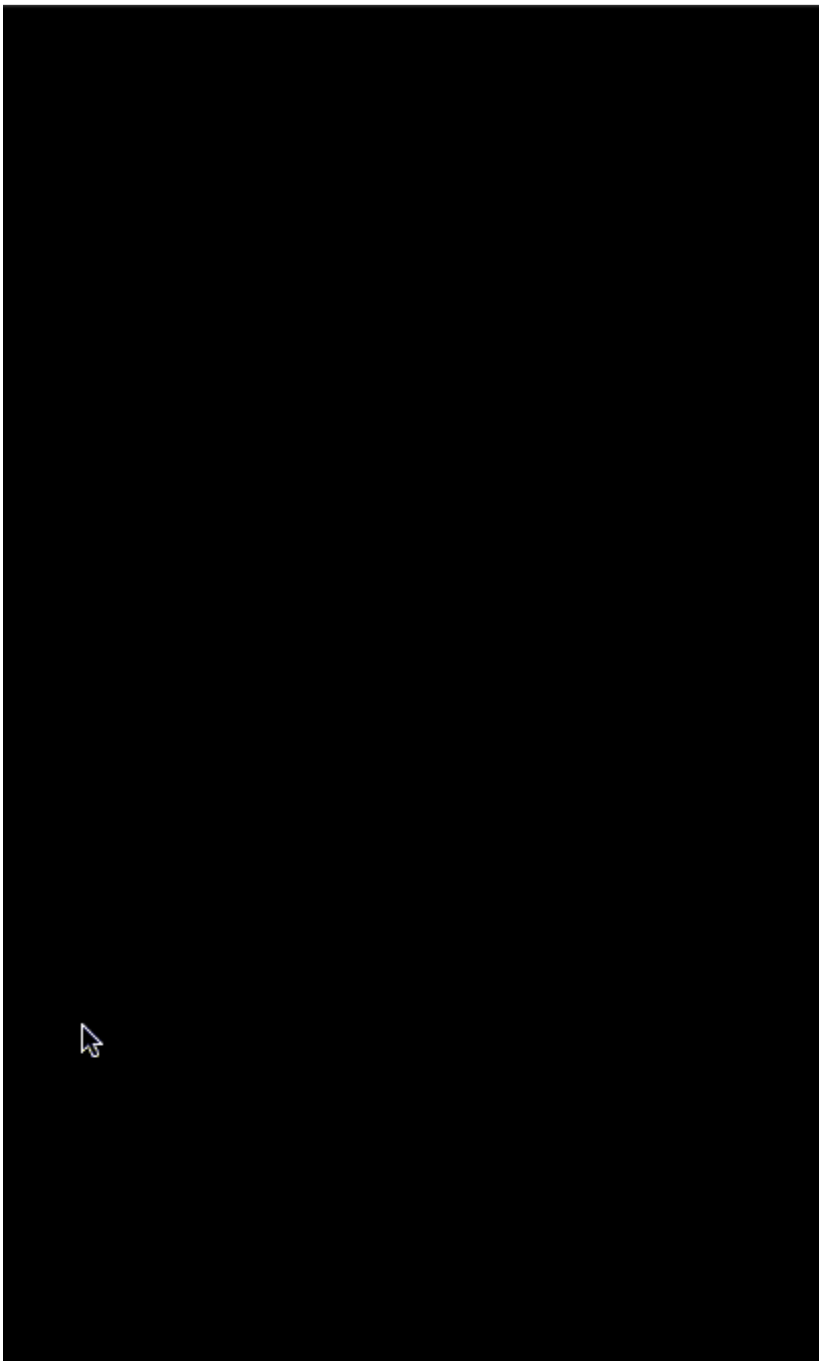
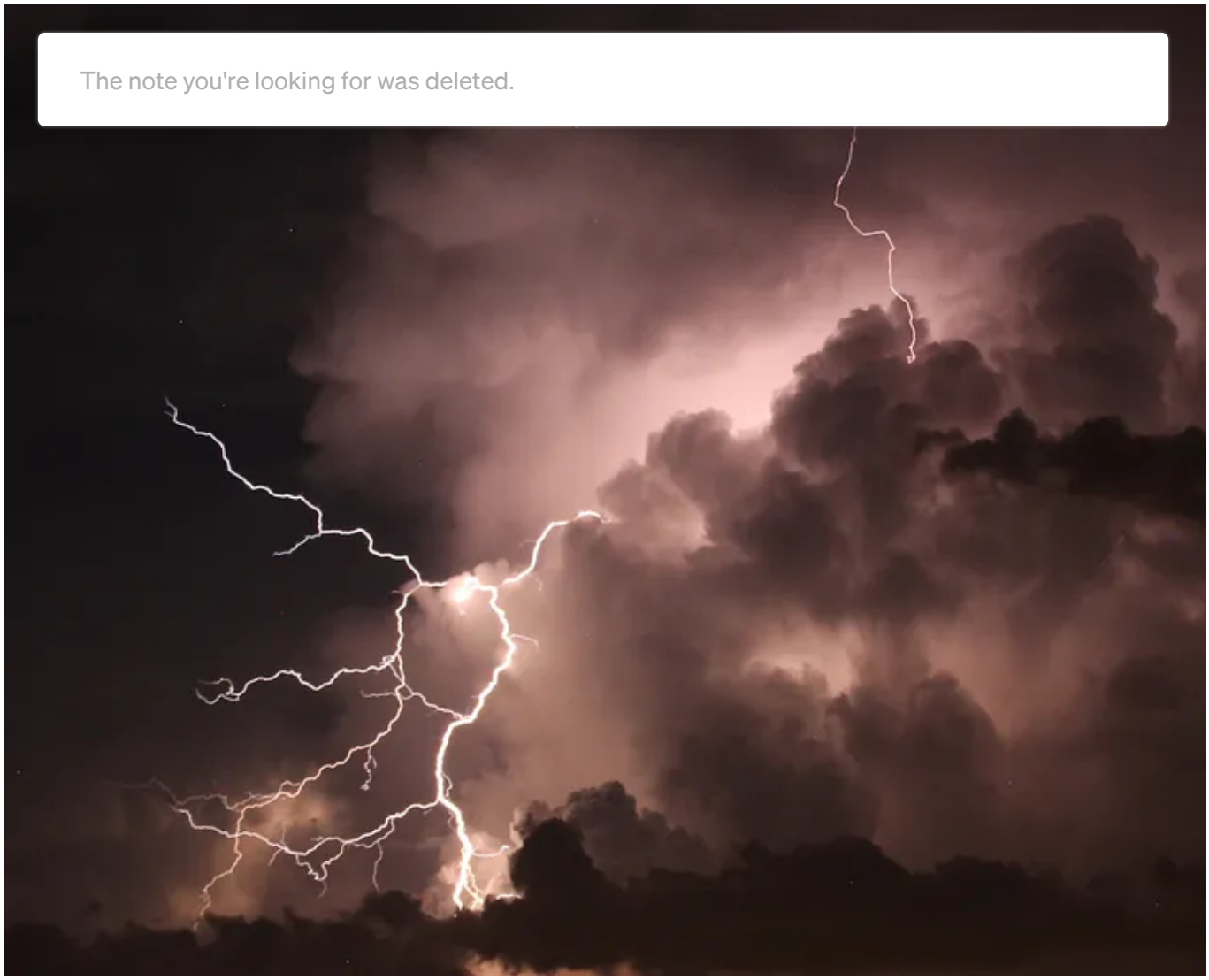


Branching the Lightning Strike

The lightning strike is not always a single strike but it branches out too:



Controlling the Striking Angle

To make the lightning strike branch out, we need to be able to control the direction of the lightning strike.

To do this, add an `angle` parameter to `generateLightningPath` function:

```
func genrateLightningPath(startingFrom: CGPoint, angle: CGFloat) ->
[SKShapeNode] {

    ...

}
```

Let's modify the implementation of `generateLightningPath` by changing the wa The note you're looking for was deleted. es in `generateLightningPath`:

```
endPoint.y -= r
endPoint.x += CGFloat.random(in: -r ... r)
```

with


```
endPoint.y -= r * cos(angle) + CGFloat.random(in: -r ... r)
endPoint.x += r * sin(angle) + CGFloat.random(in: -r ... r)
```

Here we used trigonometry to determine the next position based on the `angle`.

Now the lightning strikes in the direction of the `angle` passed into the `generateLightningPath` function.

Recursion for Branching

For branching, we need to know if we are working with the main lightning path or if we are in a lightning strike's branch. For this, we extend the implementation of `generateLightningPath` by adding an `isBranch` boolean to the parameters of the function.

```
func genrateLightningPath(startingFrom: CGPoint, angle: CGFloat,
isBranch: Bool) -> [SKShapeNode] {

    ...
```

```
}
```

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Let's then make `numberOfLines` smaller in case we are working with a branch:

```
func genrateLightningPath(startingFrom: CGPoint, angle: CGFloat,
isBranch: Bool) -> [SKShapeNode] {
    let numberOfLines = isBranch ? 50 : 120
    ...
}
```

As we generate the lightning path in `generateLightningPath` by adding lines together we want that with a small chance the path creates a branch:

Right after the lines in `generateLightningPath`

```
endPoint.y -= r * cos(angle) + CGFloat.random(in: -10 ... 10)
endPoint.x += r * sin(angle) + CGFloat.random(in: -10 ... 10)
```

Add this piece of code:

```
if Int.random(in: 0 ... 100) == 1 {
    let branchingStartPoint = endPoint

    let branchingAngle = CGFloat.random(in: -CGFloat.pi / 4 ...
CGFloat.pi / 4) // the angle to make the branching look natural

    strikePath.append(contentsOf: genrateLightningPath(startingFrom:
branchingStartPoint, angle: branchingAngle, isBranch: true))
}
```

This part generates a branch from the lightning strike with a probability of

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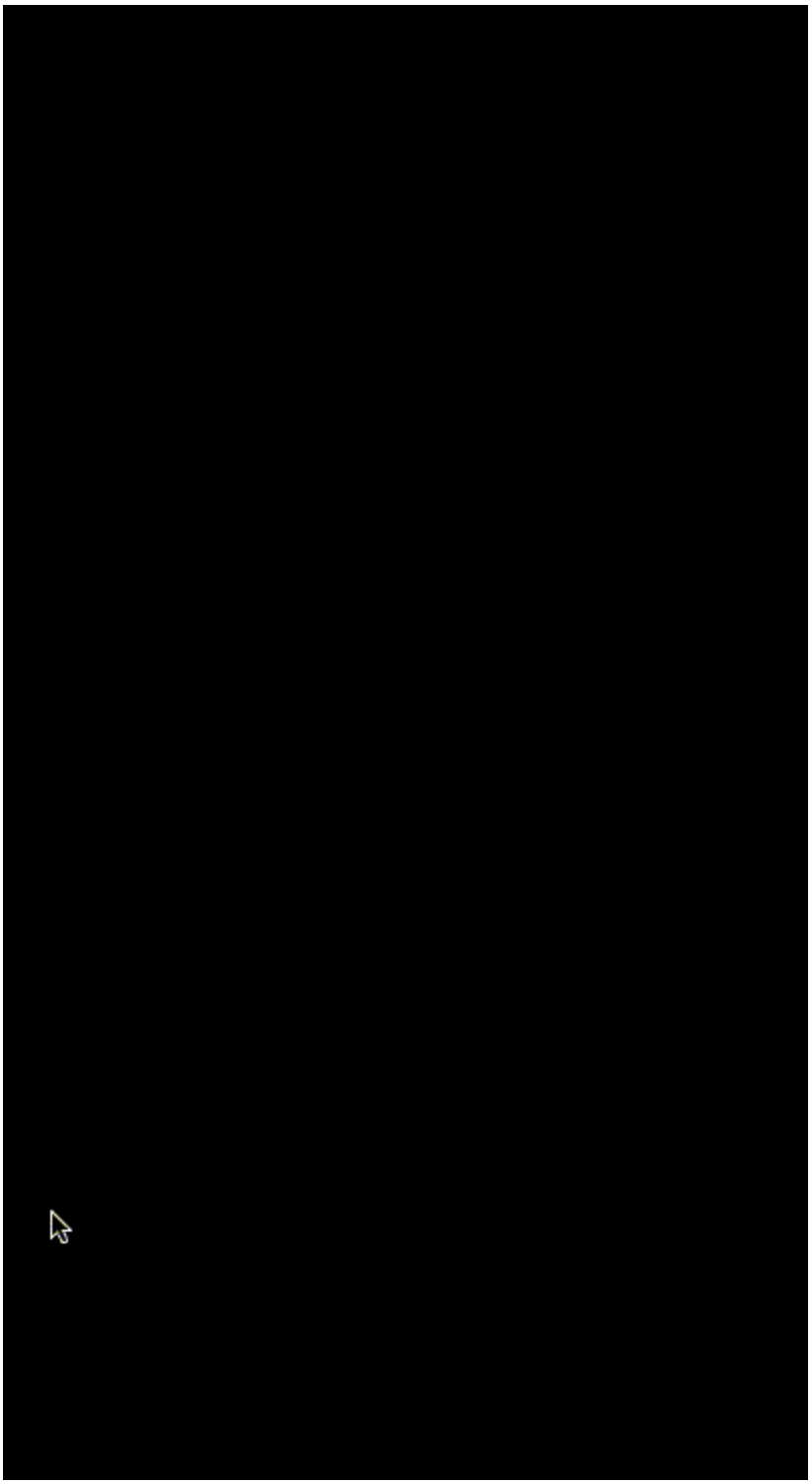
Now run the app and enjoy the effect.



Feel free to copy the full implementation from my Github Repo. It includes a so The note you're looking for was deleted.

Conclusion

Thanks for reading. Happy coding!

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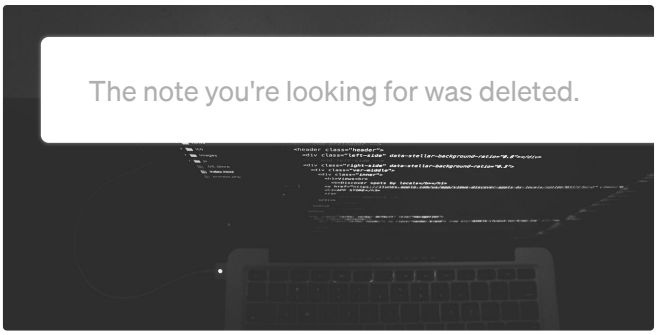

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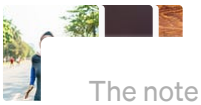

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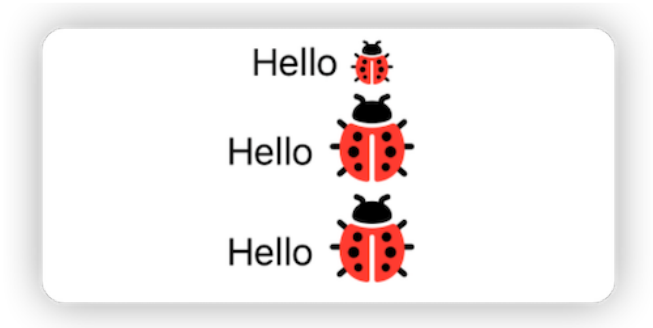

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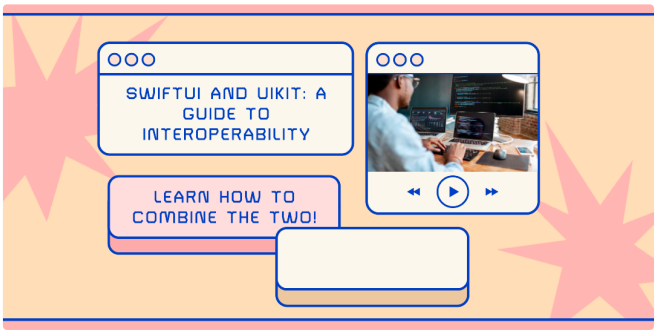

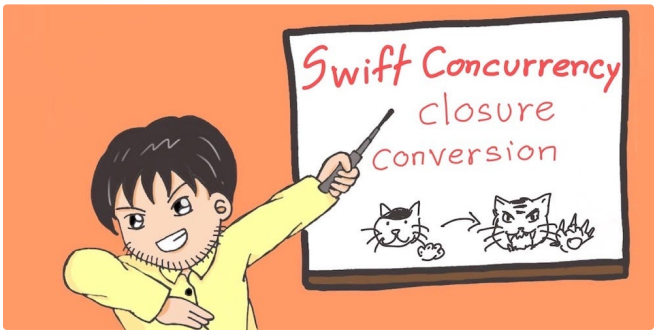

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