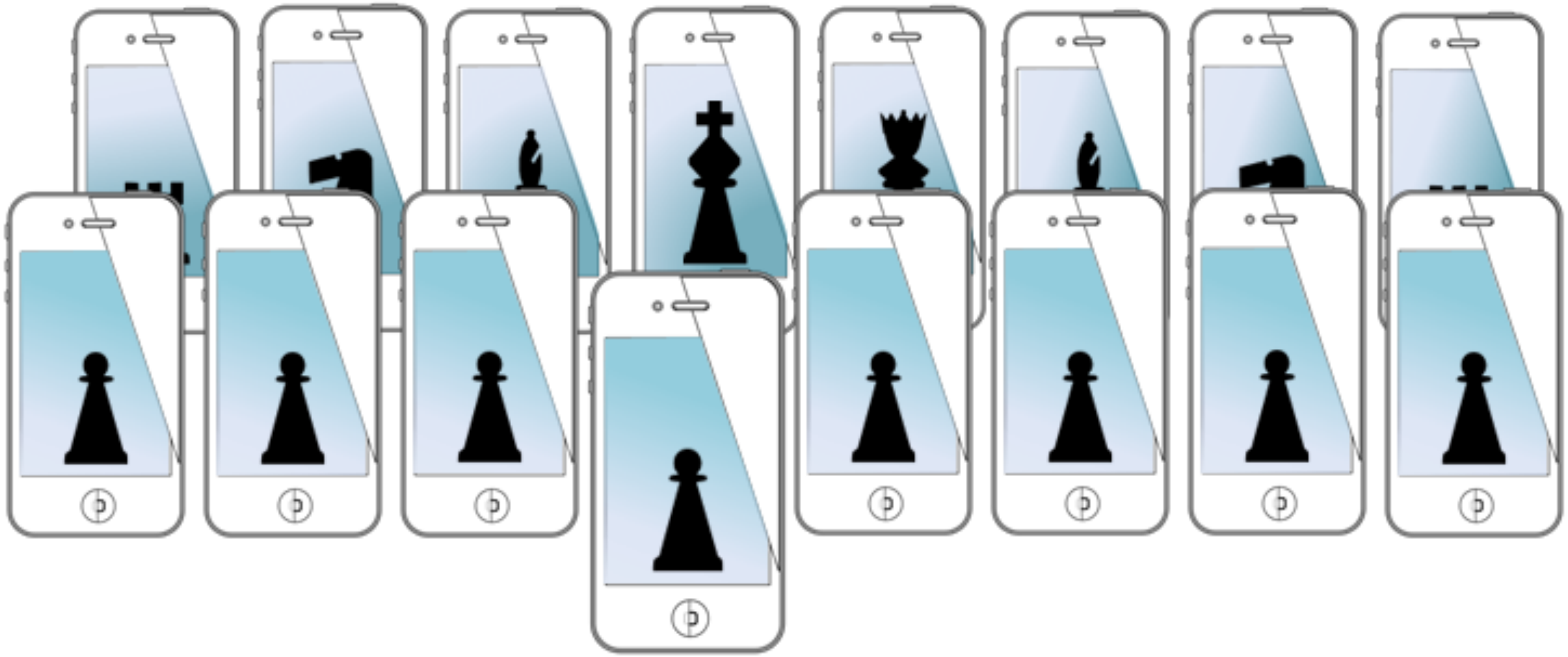
MOBILE SENSING LEARNING



CS5323 & 7323

Mobile Sensing and Learning

SceneKit and 3D Games

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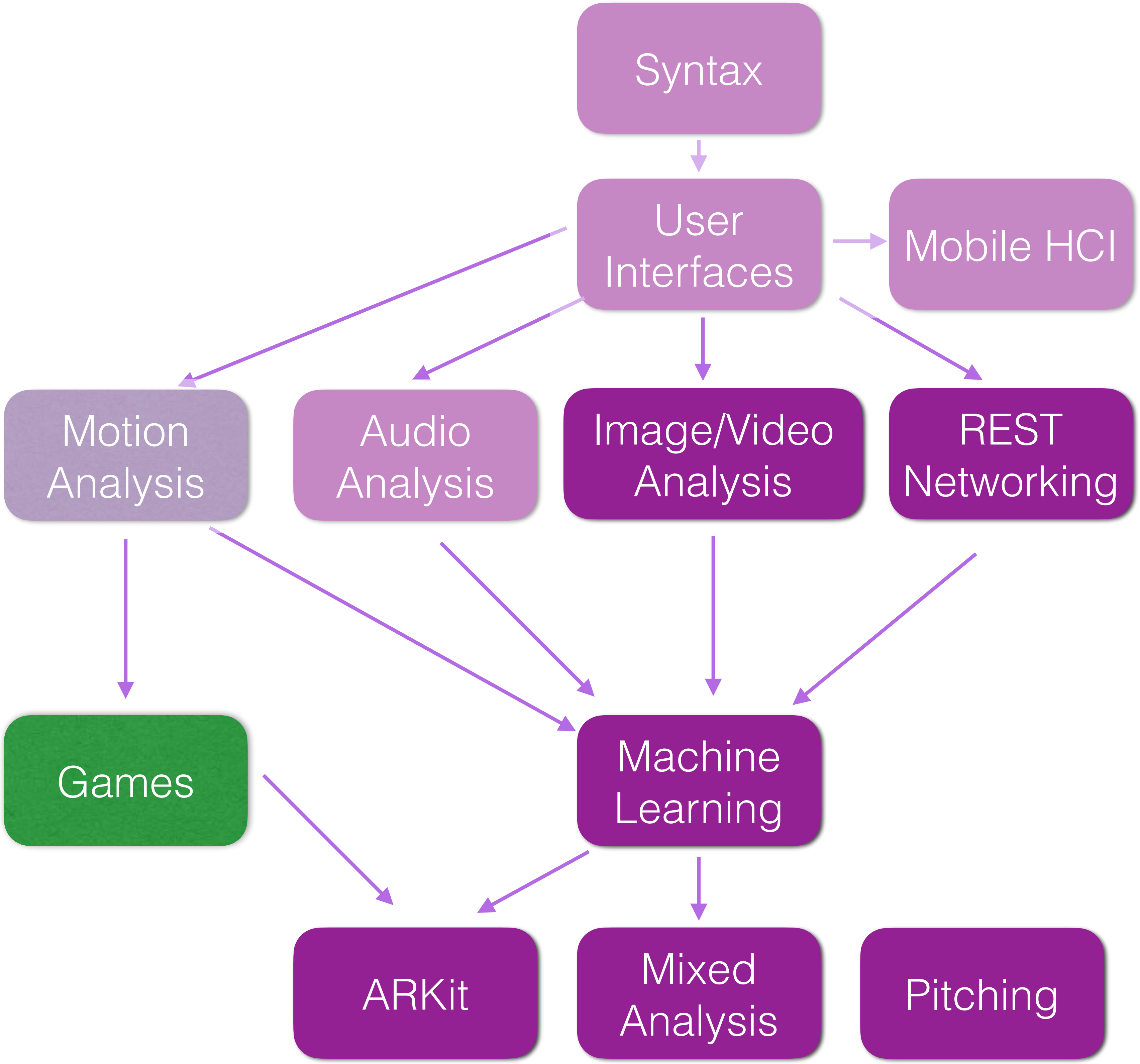
logistics and agenda

- Logistics:
  - grading update
  - A2 due soon
- agenda:
  - SpriteKit Review
  - SceneKit

class overview



Syntax

User Interfaces

Mobile HCI

Motion Analysis

Audio Analysis

Image/Video Analysis

REST Networking

Games

Machine Learning

ARKit

Mixed Analysis

Pitching

SceneKit: 3D scenes

- SceneKit allows you to create a 3D world and add physics, nodes, lighting, etc.
  - very powerful
- basic workflow:
  - setup world
  - add nodes

work flow in 3D scenes

SCNScene

rootNode

→

SCNNode

Name
Camera
Light
Geometry

childNodes[]

→

SCNGeometry

Name
Materials[]
Text
Shape (plane, box, sphere, cylinder…)

→

SCNMaterial

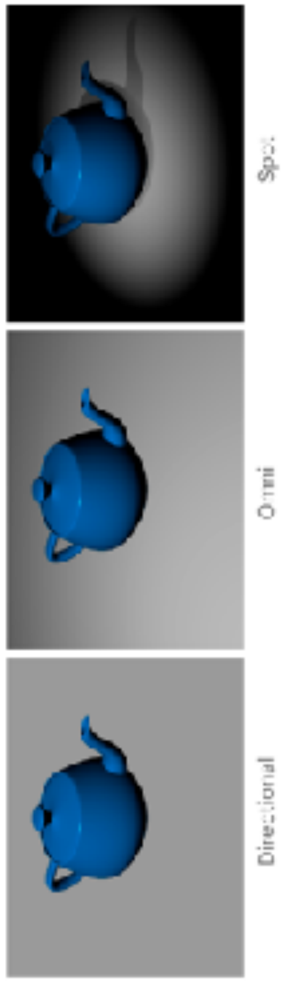
Name
Diffuse
Ambient
Specular
Reflective
…

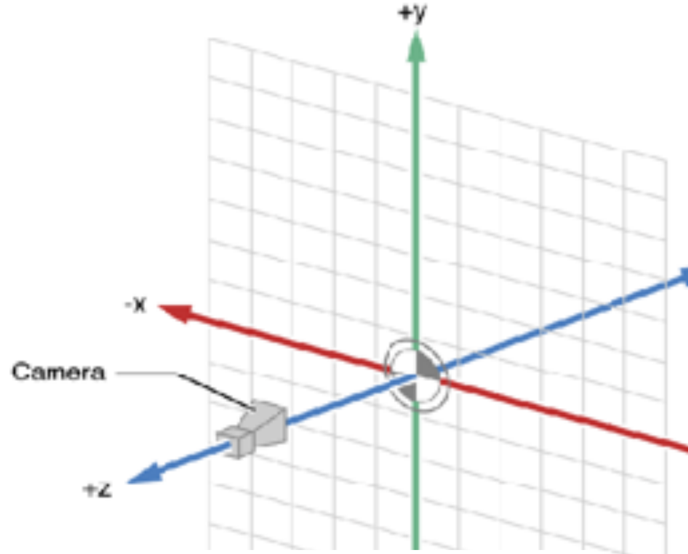
SCNLight

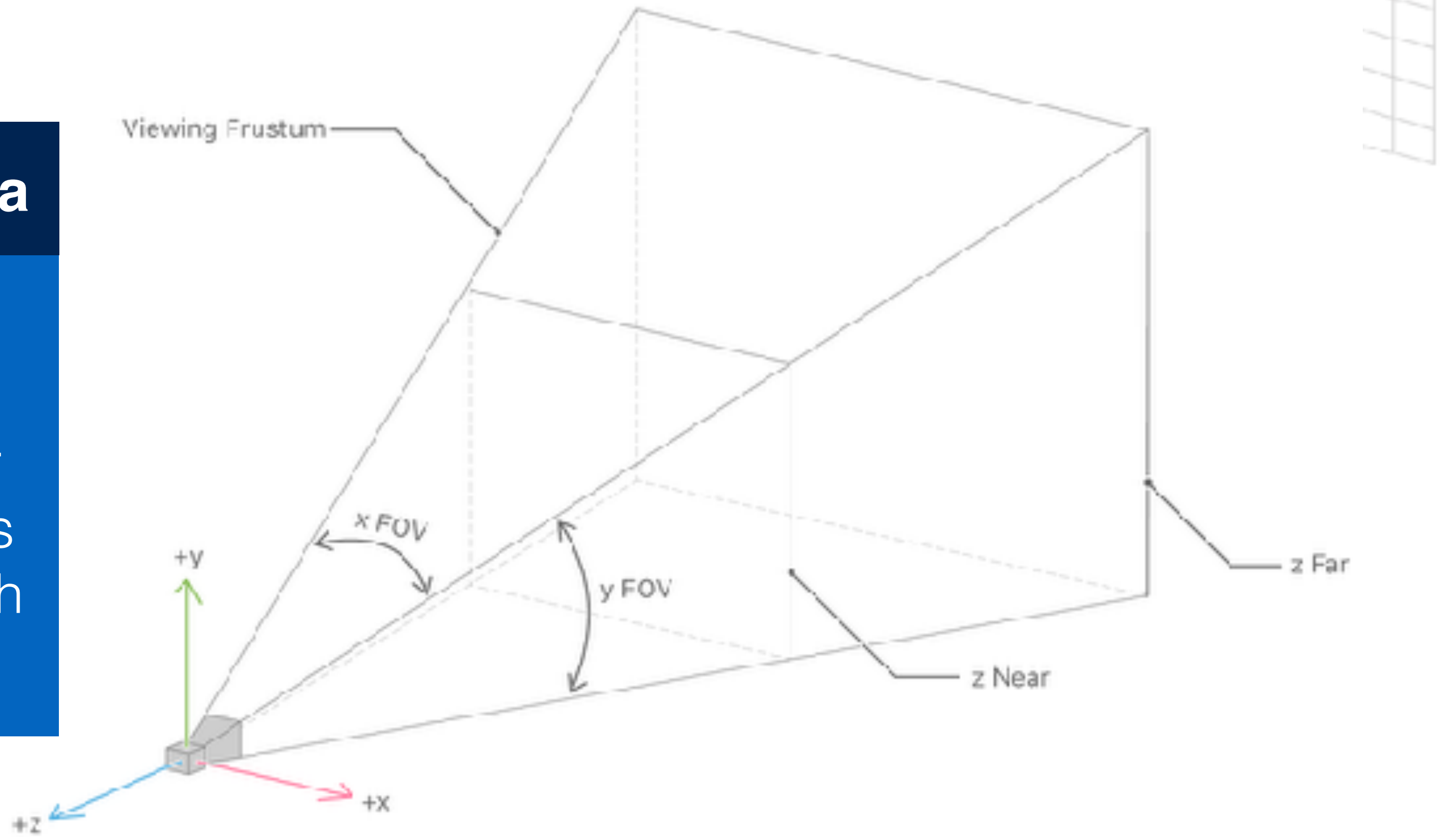
Type (ambient, omni, spot, directional)
Color
Temperature
Intensity
…

SCNCamera

Location
FoV
zNear / zFar
Euler Angles
Focal Length
…

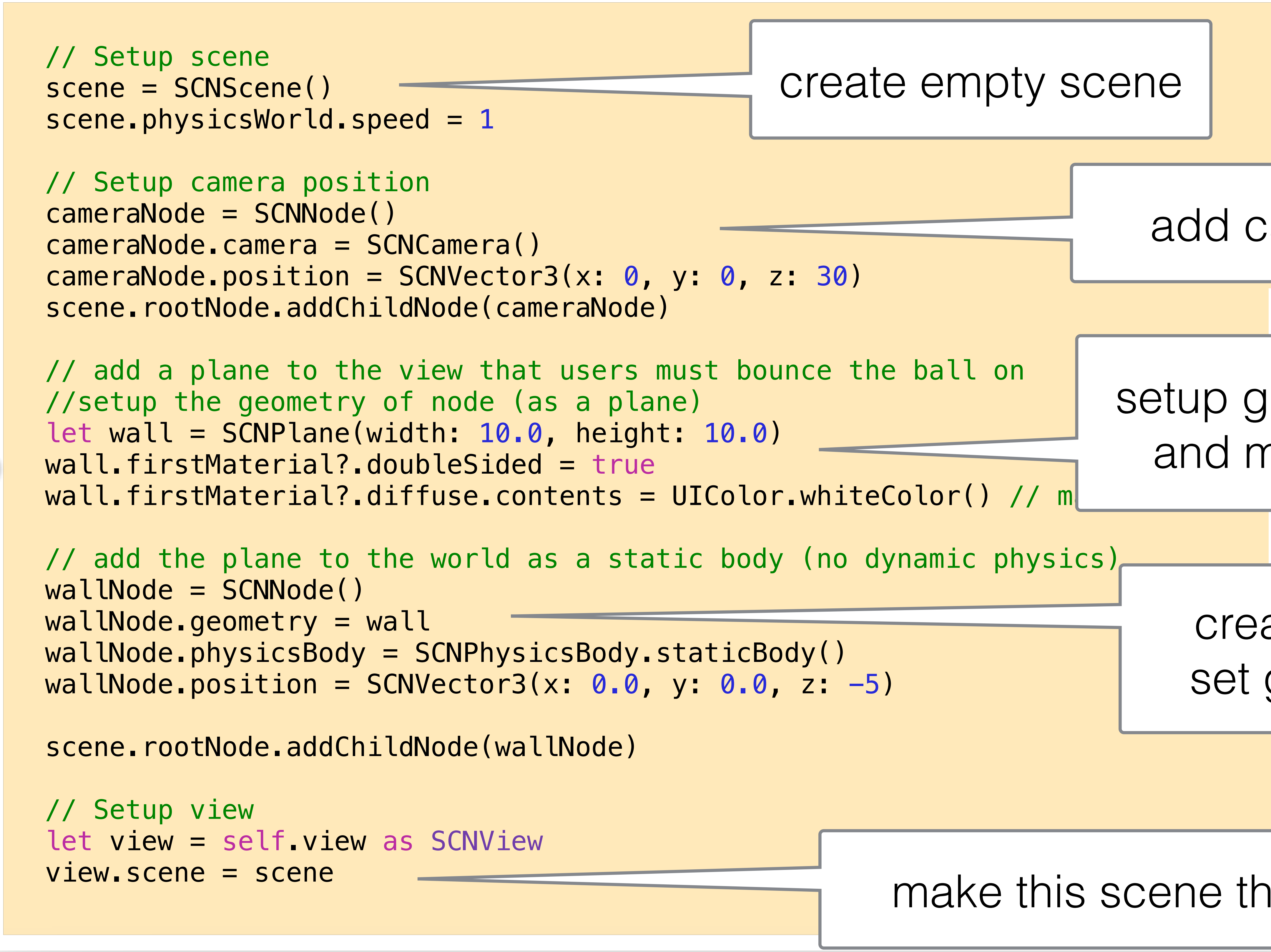






SCNNode is the base for nearly everything in simulation env.

example: setting up a world



```
// Setup scene
scene = SCNScene()
scene.physicsWorld.speed = 1

// Setup camera position
cameraNode = SCNNode()
cameraNode.camera = SCNCamera()
cameraNode.position = SCNVector3(x: 0, y: 0, z: 30)
scene.rootNode.addChildNode(cameraNode)

// add a plane to the view that users must bounce the ball on
//setup the geometry of node (as a plane)
let wall = SCNPlane(width: 10.0, height: 10.0)
wall.firstMaterial?.doubleSided = true
wall.firstMaterial?.diffuse.contents = UIColor.whiteColor() // m

// add the plane to the world as a static body (no dynamic physics)
wallNode = SCNNode()
wallNode.geometry = wall
wallNode.physicsBody = SCNPhysicsBody.staticBody()
wallNode.position = SCNVector3(x: 0.0, y: 0.0, z: -5)

scene.rootNode.addChildNode(wallNode)

// Setup view
let view = self.view as SCNView
view.scene = scene
```

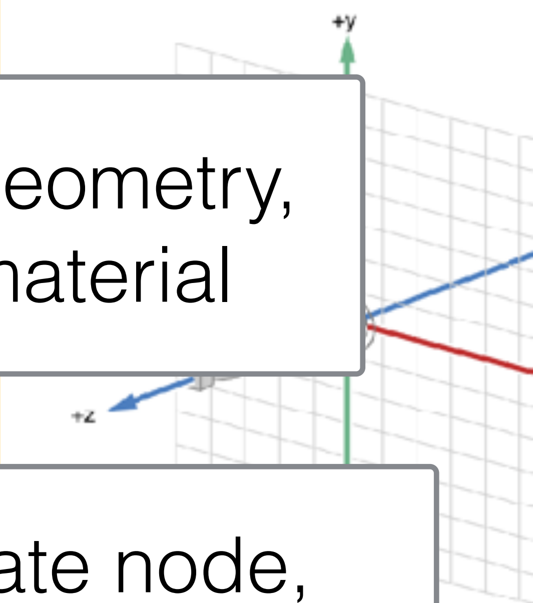
create empty scene

add camera

setup geometry, and material

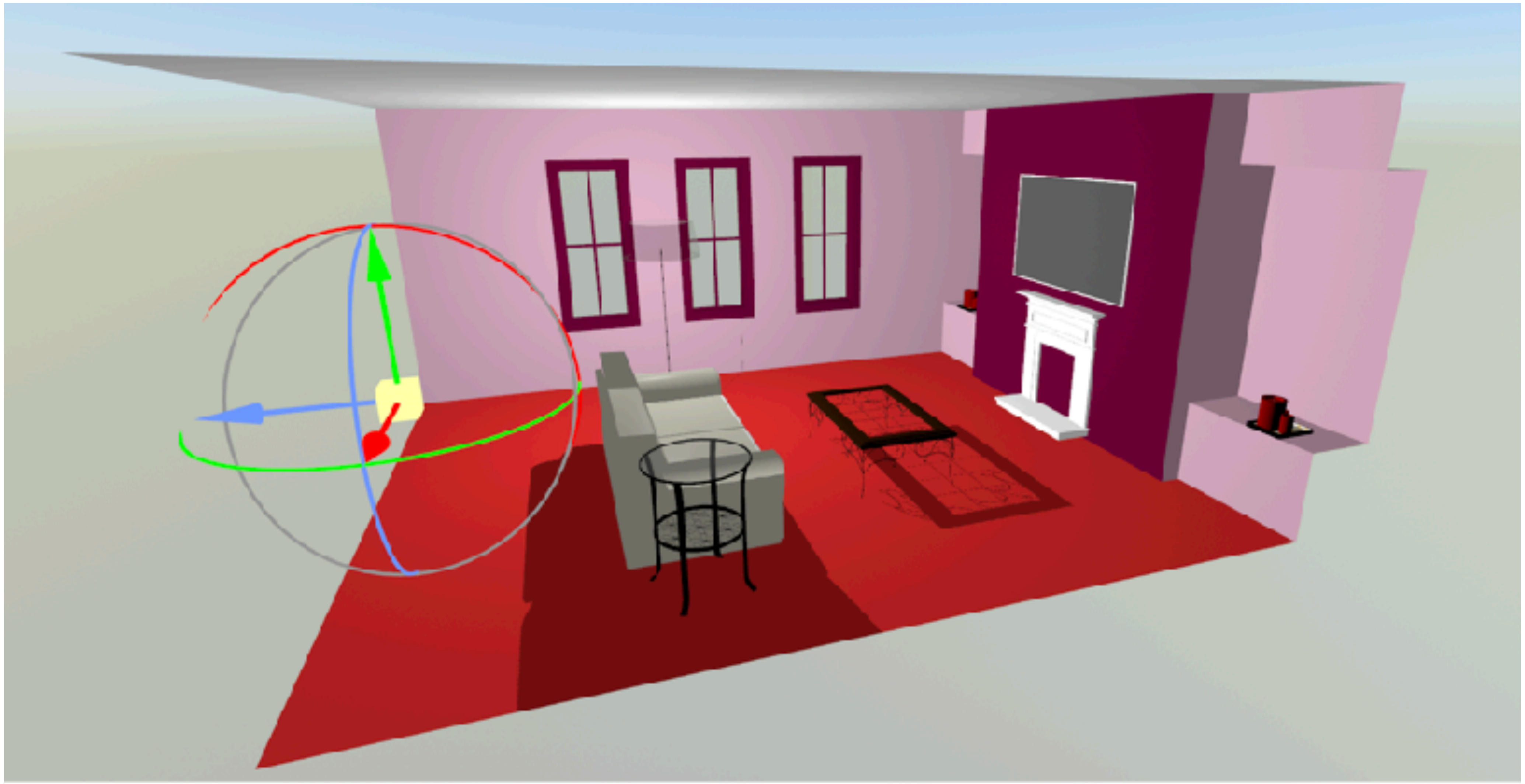
create node, set geometry

make this scene the world

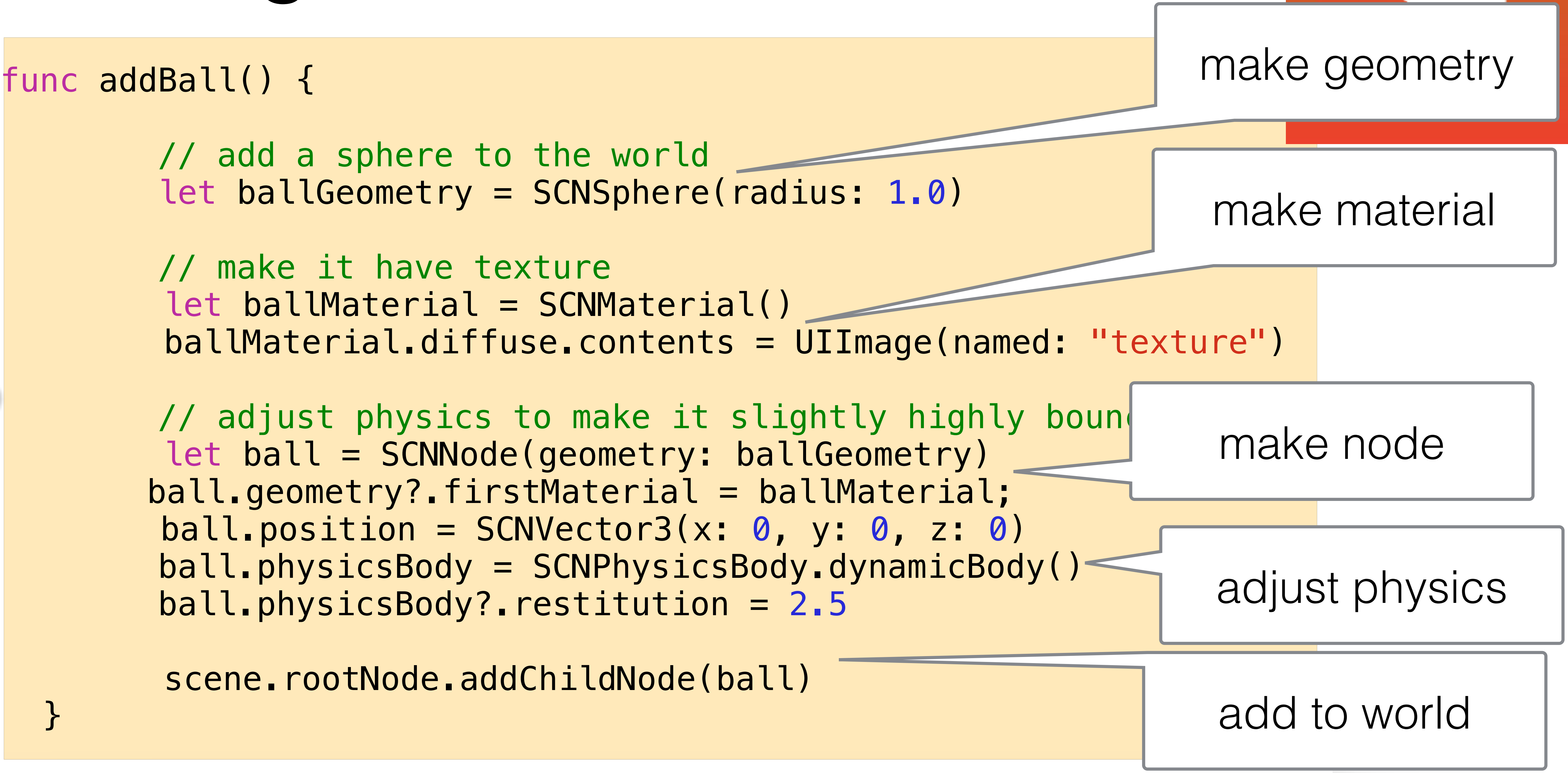


making a scene

- many software allow export to .scn files (blender, sketchup, maya, etc.)
- many other exports can be imported by Xcode (like .dae file)
- once imported, Xcode allows manipulation of nodes



adding custom node to world



```
func addBall() {

        // add a sphere to the world
        let ballGeometry = SCNSphere(radius: 1.0)

        // make it have texture
         let ballMaterial = SCNMaterial()
         ballMaterial.diffuse.contents = UIImage(named: "texture")

        // adjust physics to make it slightly highly boun
         let ball = SCNNode(geometry: ballGeometry)
        ball.geometry?.firstMaterial = ballMaterial;
         ball.position = SCNVector3(x: 0, y: 0, z: 0)
        ball.physicsBody = SCNPhysicsBody.dynamicBody()
        ball.physicsBody?.restitution = 2.5

         scene.rootNode.addChildNode(ball)
  }
```

make geometry

make material

make node

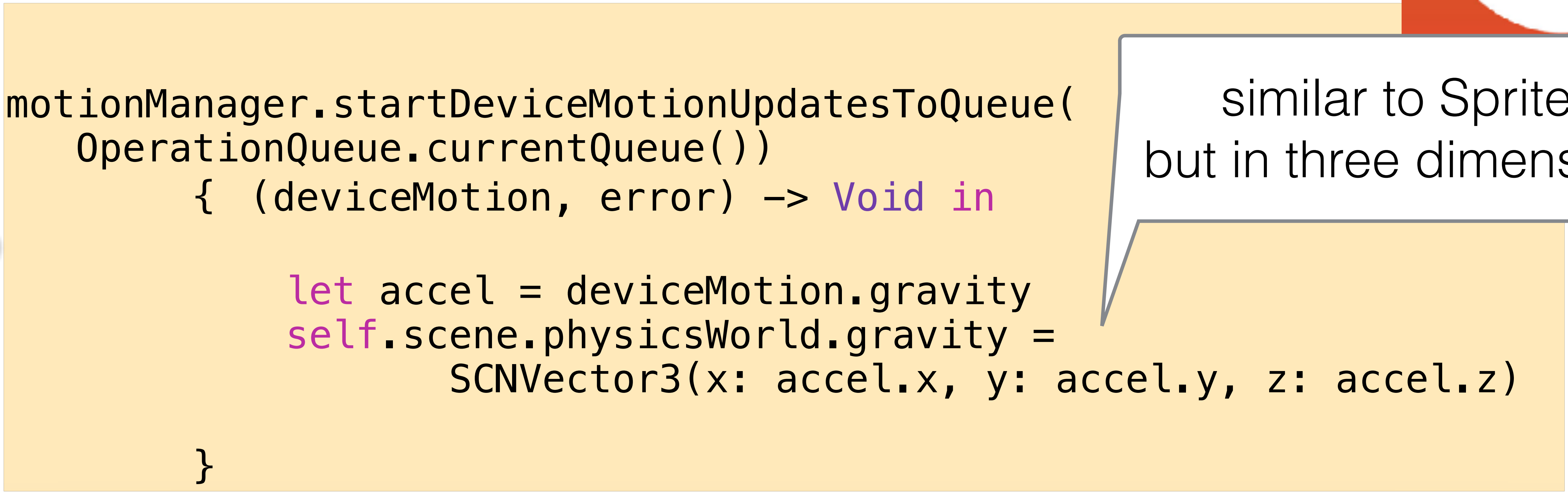
adjust physics

add to world

Physics Body Types

Static bodies are unaffected by forces and collisions and cannot move.
Dynamic bodies are affected by forces and collisions with other body types.
Kinematic bodies are not affected by forces/collisions, by moving them directly you can cause collisions on dynamic bodies.

world physics, motion

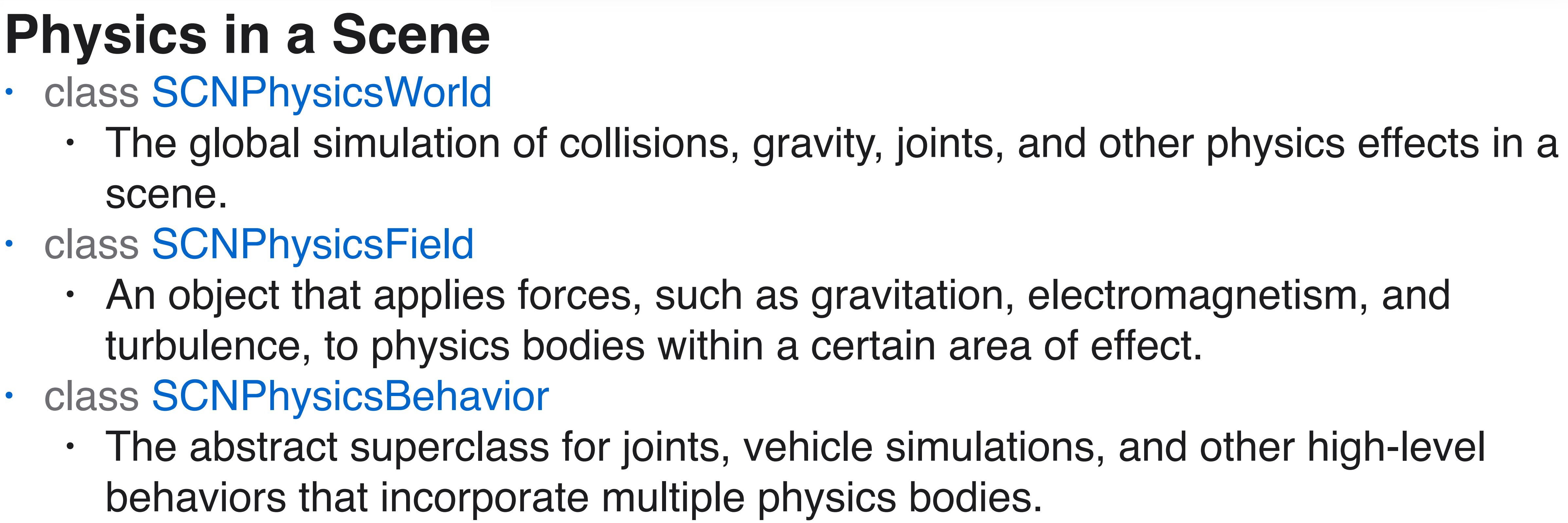


```
motionManager.startDeviceMotionUpdatesToQueue(
   OperationQueue.currentQueue())
        {  (deviceMotion, error) -> Void in

            let accel = deviceMotion.gravity
            self.scene.physicsWorld.gravity =
                   SCNVector3(x: accel.x, y: accel.y, z: accel.z)

        }
```

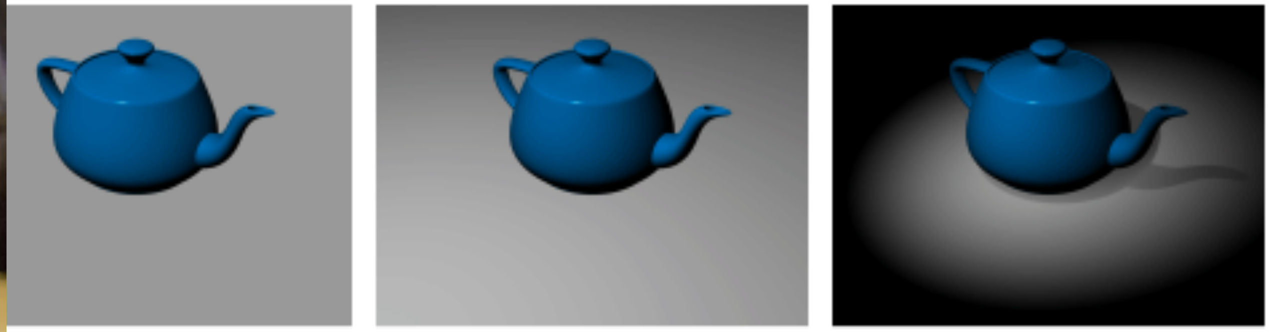
similar to SpriteKit
but in three dimensions!!



Physics in a Scene

- class SCNPhysicsWorld
  - The global simulation of collisions, gravity, joints, and other physics effects in a scene.
- class SCNPhysicsField
  - An object that applies forces, such as gravitation, electromagnetism, and turbulence, to physics bodies within a certain area of effect.
- class SCNPhysicsBehavior
  - The abstract superclass for joints, vehicle simulations, and other high-level behaviors that incorporate multiple physics bodies.

When we move to **Augmented Reality**, SceneKit is the engine for adding **Virtual Elements** to the Actual World!

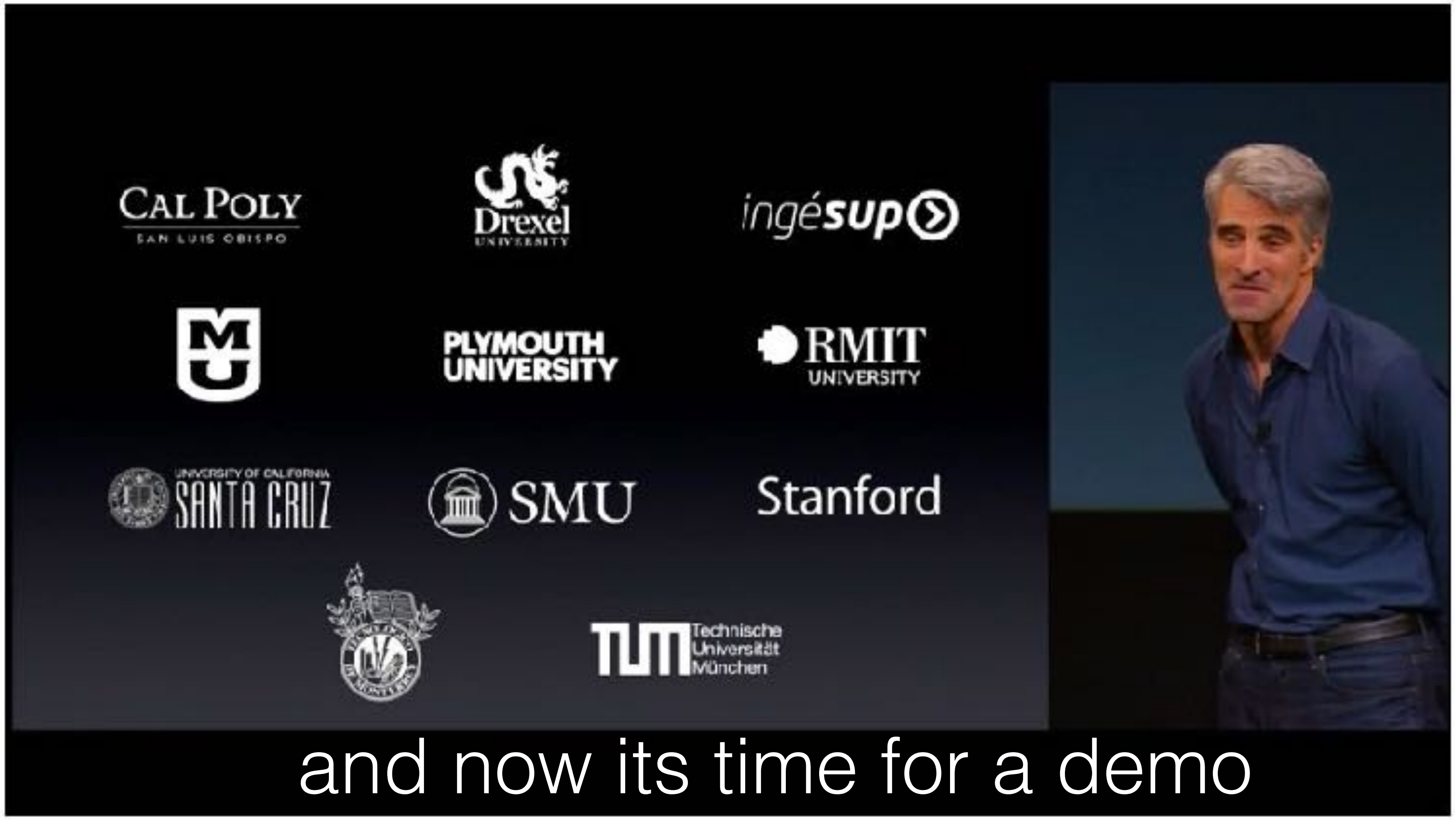

Directional

Omni

Spot

device motion demo 3

- SceneKit VR
  - intro to 3D
- hockey
  - formative demo



and now its time for a demo

the end of motion…

- before moving on…
- assignment posted

for next time…

- Image processing!

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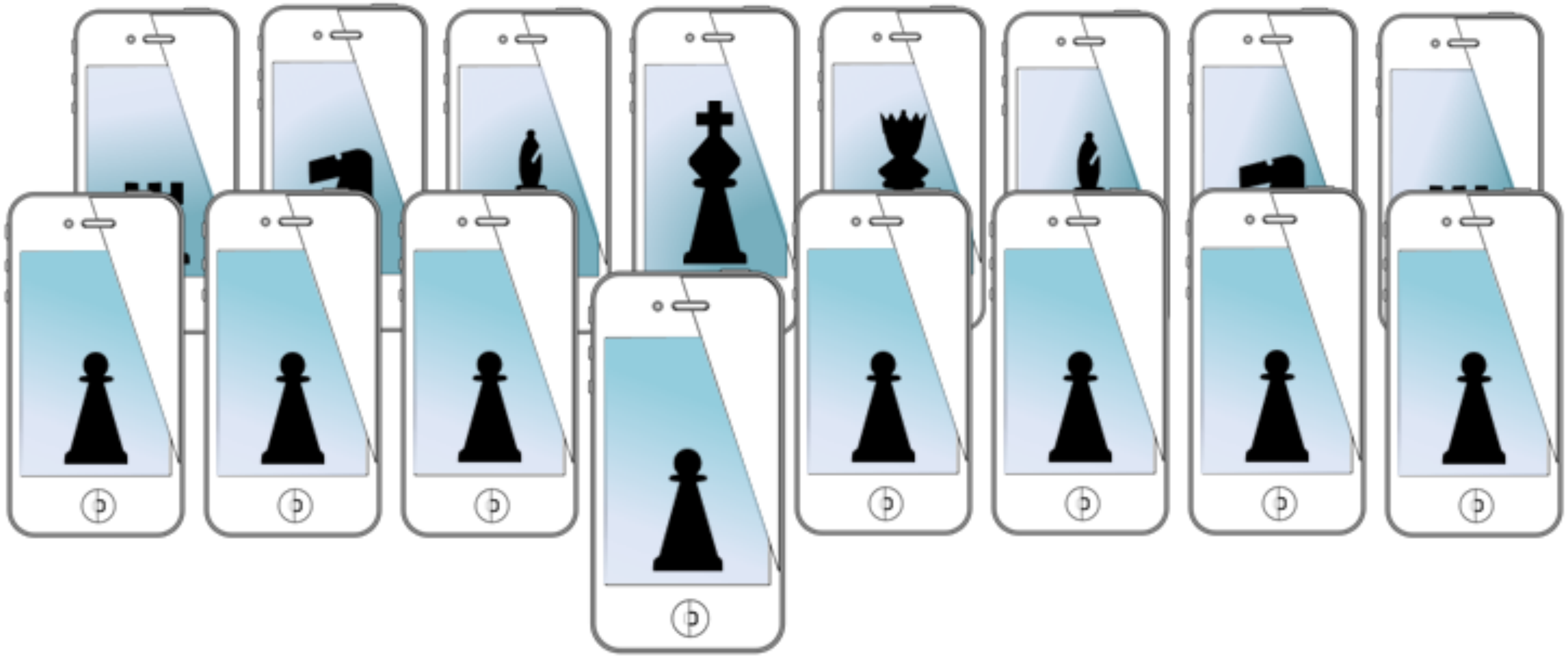

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activity, pedometers, and motion sensing

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