Introduction to ARKit

Xidong Wang
Al Wold

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Agenda

- Intro to ARKit concepts
- Demo code walkthrough
- Live demo

Augmented Reality and ARKit

- Augmented reality allows developer to insert simulated objects into a real world environment
- ARKit is an API provided by Apple in iOS 11+ to simplify development of augmented reality apps
- ARKit integrates with existing APIs: SceneKit, SpriteKit, Metal and Unity

Video source: https://developer.apple.com/videos/play/wwdc2017/602/

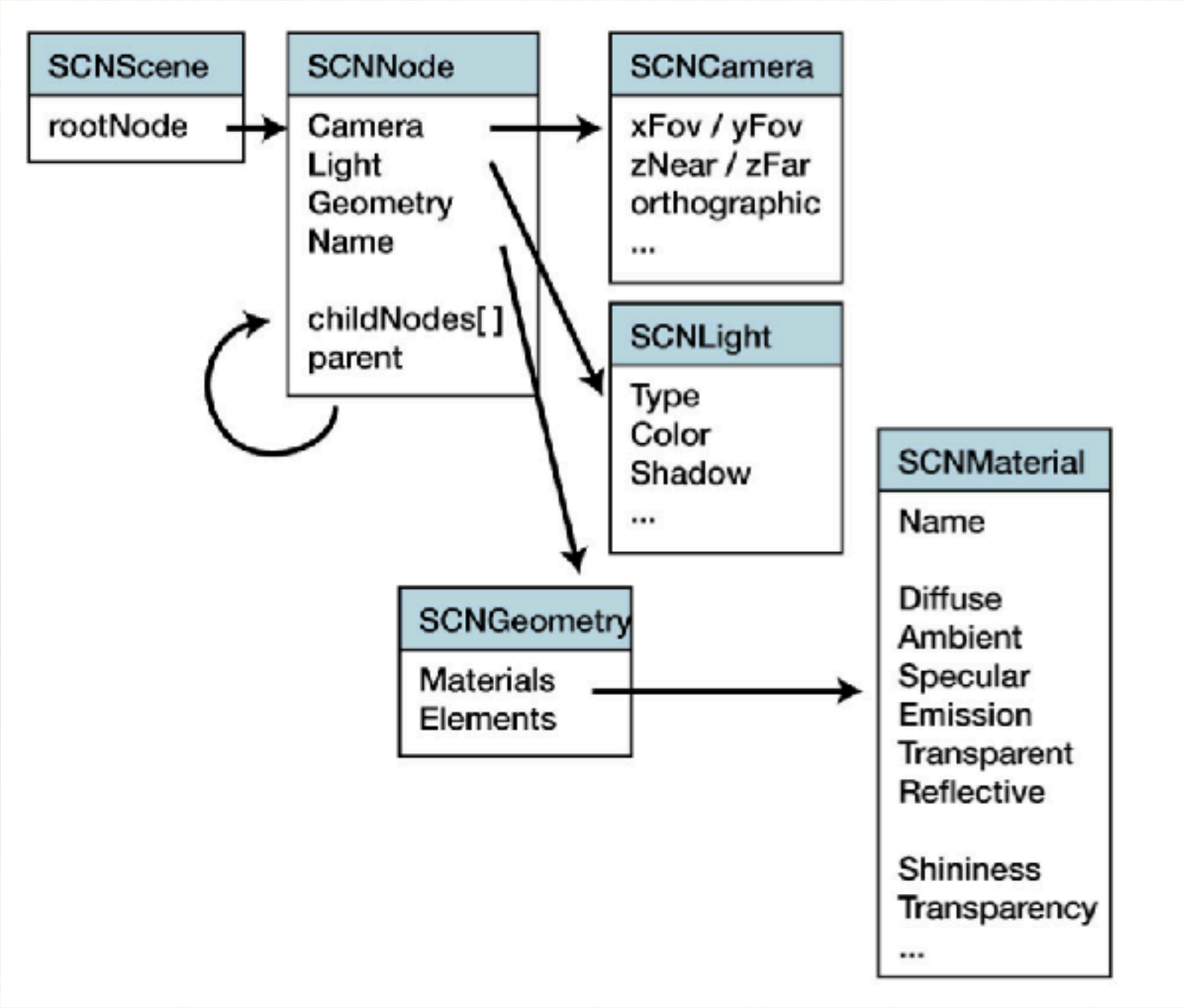
ARKit features

- Objects placed into the simulated environment stay in sync with the camera as user moves device
- Plane detection
- Lighting estimation
- Hit testing

SceneKit

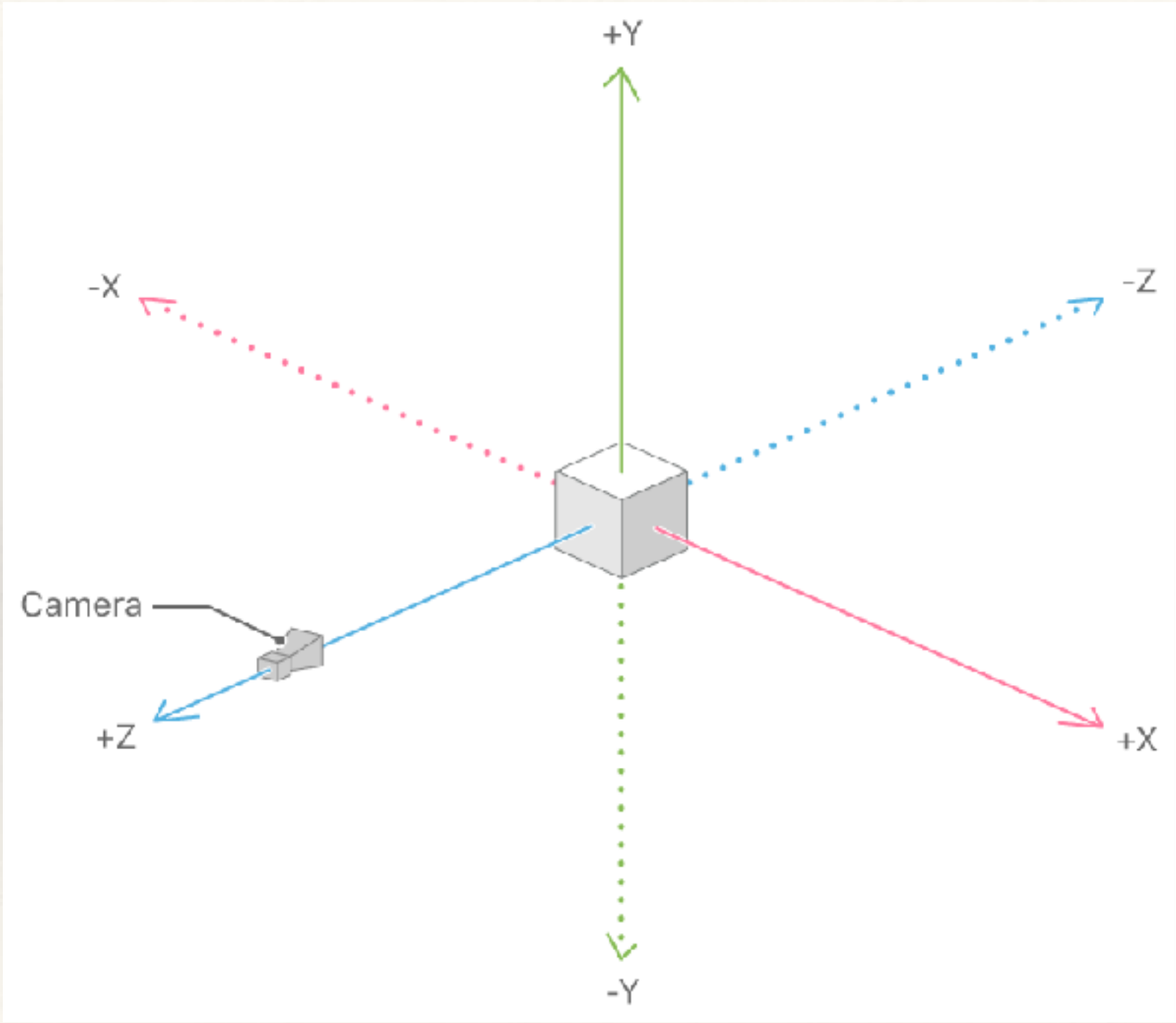
- Apple's graph-based 3D API
- 3D scene is built as a graph, which is conceptually intuitive
- Easy physics support is built in
- Images are produced by light coming from a simulated source, reflecting off objects, and being picked up by camera
- When integrating with ARKit, the camera image is just a background and does not affect rendering

SceneKit structure



Source: https://www.raywenderlich.com/83748/beginning-scene-kit-tutorial

SceneKit Coordinate Space



Source: https://developer.apple.com/documentation/scenekit/organizing_a_scene_with_nodes

Demo

- Allow the user to tap on the floor in the room to drop a ball from above
  - Detect planes (e.g. floor, tables) and create physics objects for the ball to hit
  - When user taps, determine location on plane, and drop a ball 2 meters above
  - Ball will interact with table/floor/other balls to create realistic physics interactions

Plane Detection

- As ARKit gets information about the environment, it notifies you when it thinks it sees a horizontal flat surface
- ARKit adds `SCNNode`, to which you can add other things
- 3 callbacks on `ARSCNViewDelegate`
  - `renderer(_:didAdd:for:)`
  - `renderer(_:didUpdate:for:)`
  - `renderer(_:didRemove:for:)`
- As you move around, information gets better and planes get updated and merged

Walkthrough and Demo

Gotchas

- When adding a plane, ARKit adds a node with the position of the detected plane - you must add your objects to that node
- ARKit/SceneKit callbacks do not run on main thread, so UIKit updates must dispatch to main thread
- When updating geometry on a node, physics bodies do not automatically update to match

Resources + Questions

- Official documentation for ARKit, SceneKit, especially the reference for each class (e.g. `SCNNode`)
- Series of articles by Mark Dawson: https://blog.markdaws.net/arkit-by-example-part1-7830677ef84d
- raywenderlich.com tutorials:
  - https://www.raywenderlich.com/128668/scene-kit-tutorial-with-swift-part-1 (plus parts 2 and 3)
  - https://www.raywenderlich.com/83748/beginning-scene-kit-tutorial
- WWDC video: https://developer.apple.com/videos/play/wwdc2017/602/

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