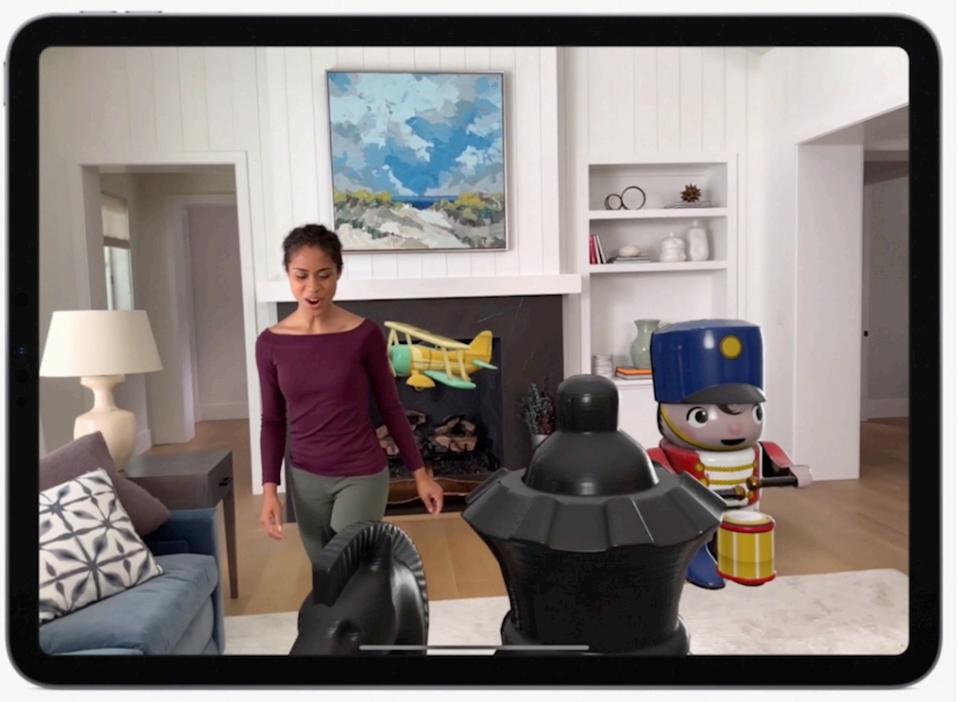


Bringing People into AR

Huynh Bao Trung Nguyen, Andreas Stiller, Luke Gavin

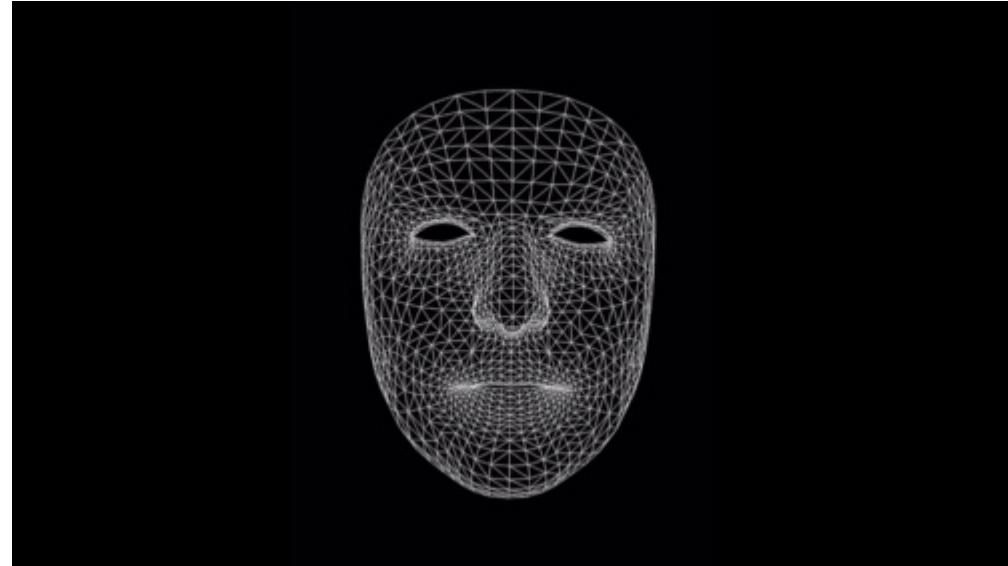
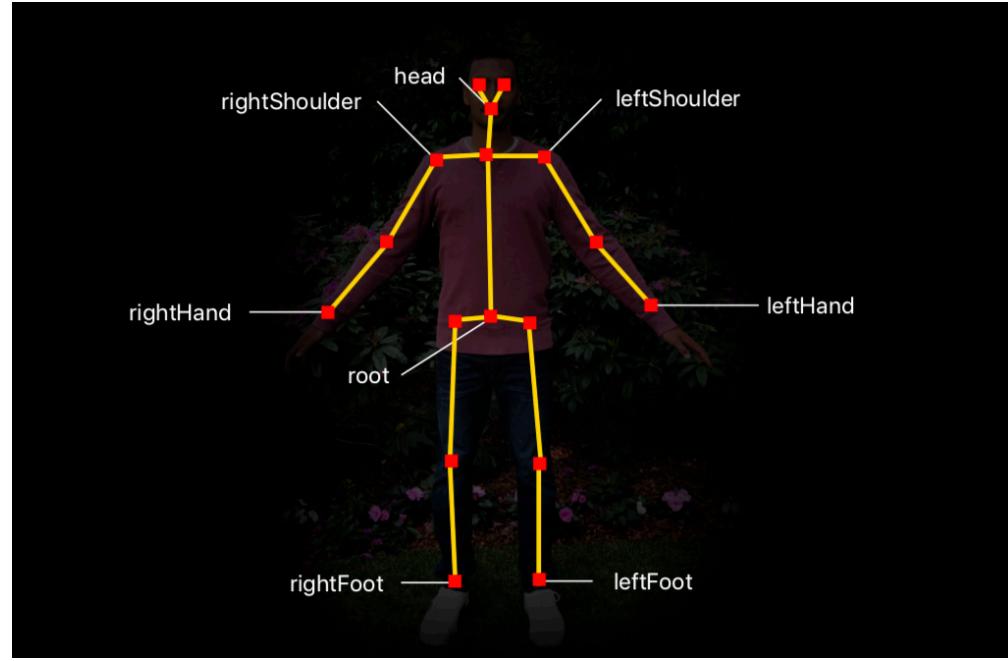




ARKit

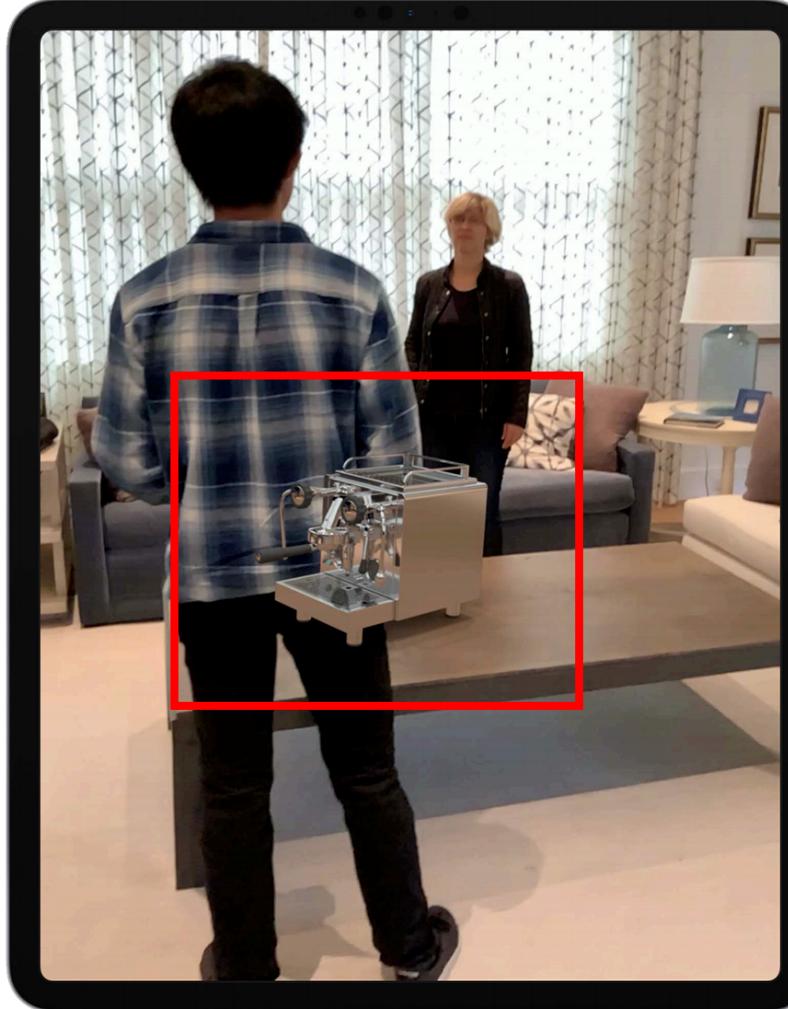


2

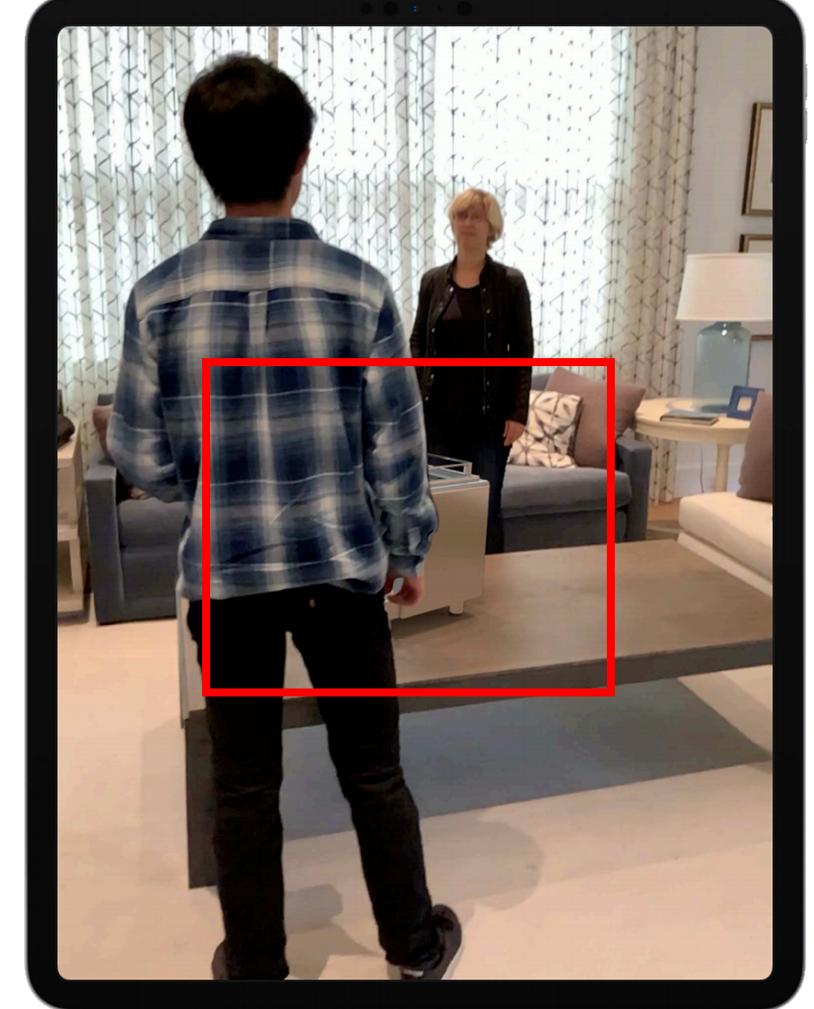


People Occlusion

- Depth-ordering problem



Without People Occlusion



With People Occlusion



∞

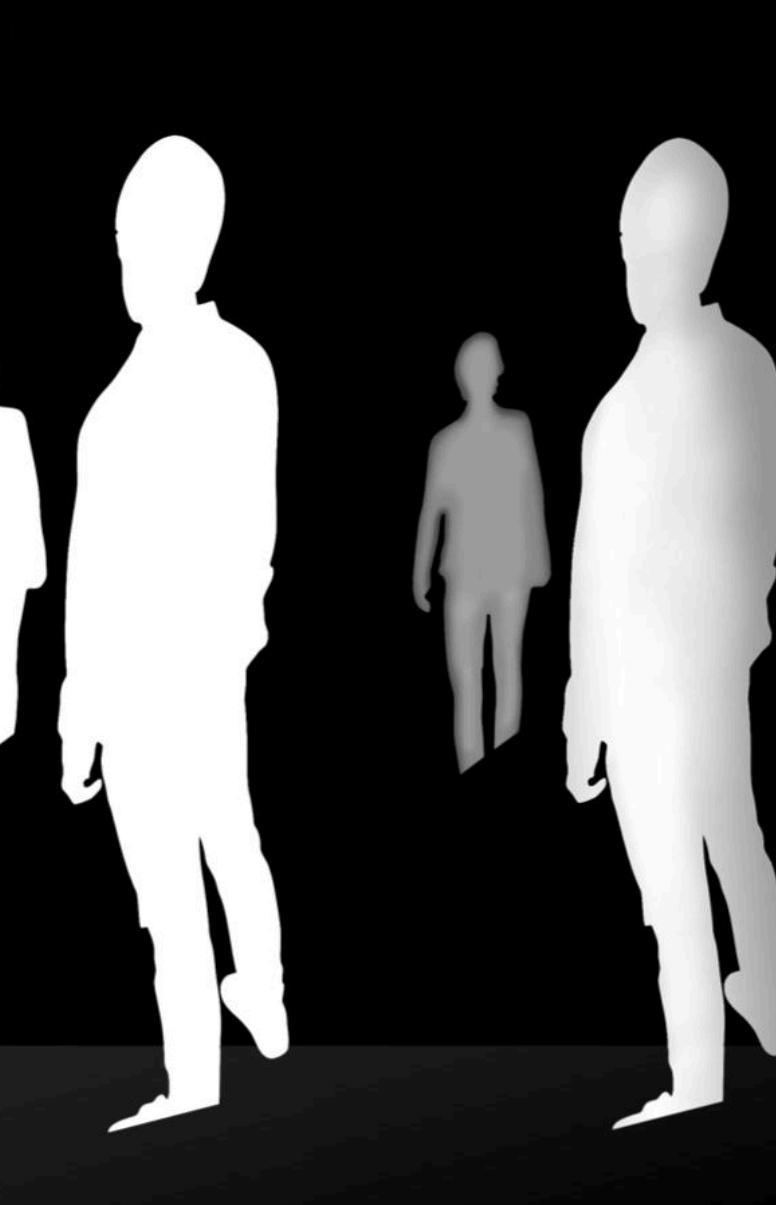
4 m

3 m

2 m



Segmentation



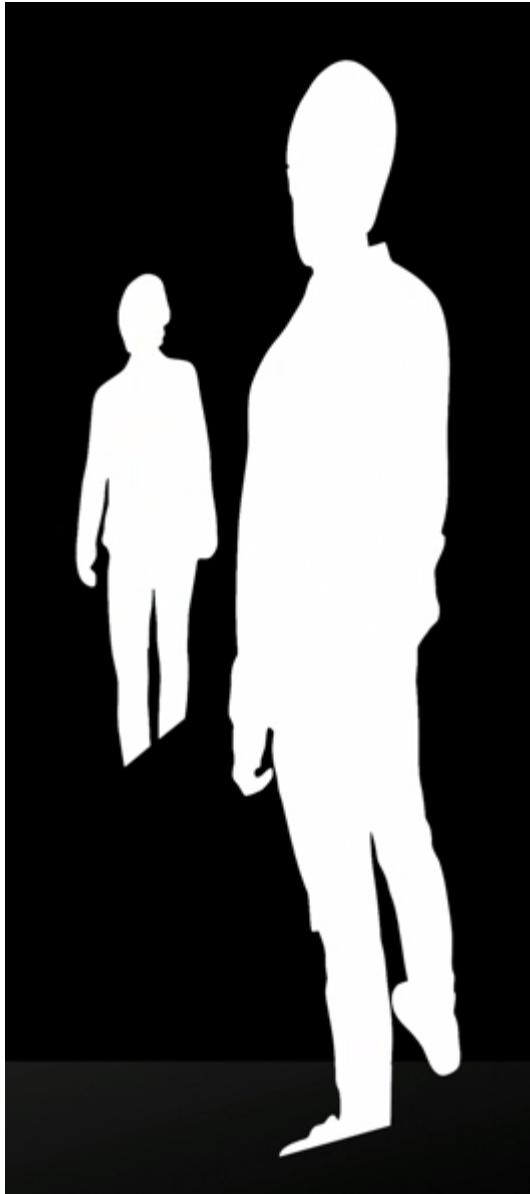
Depth



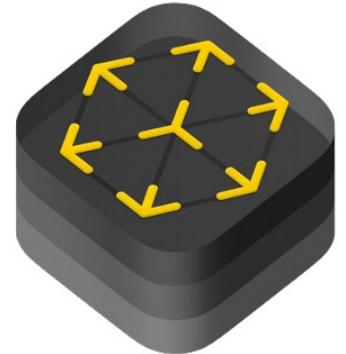
People



Matting Process



People Occlusion in ARKit



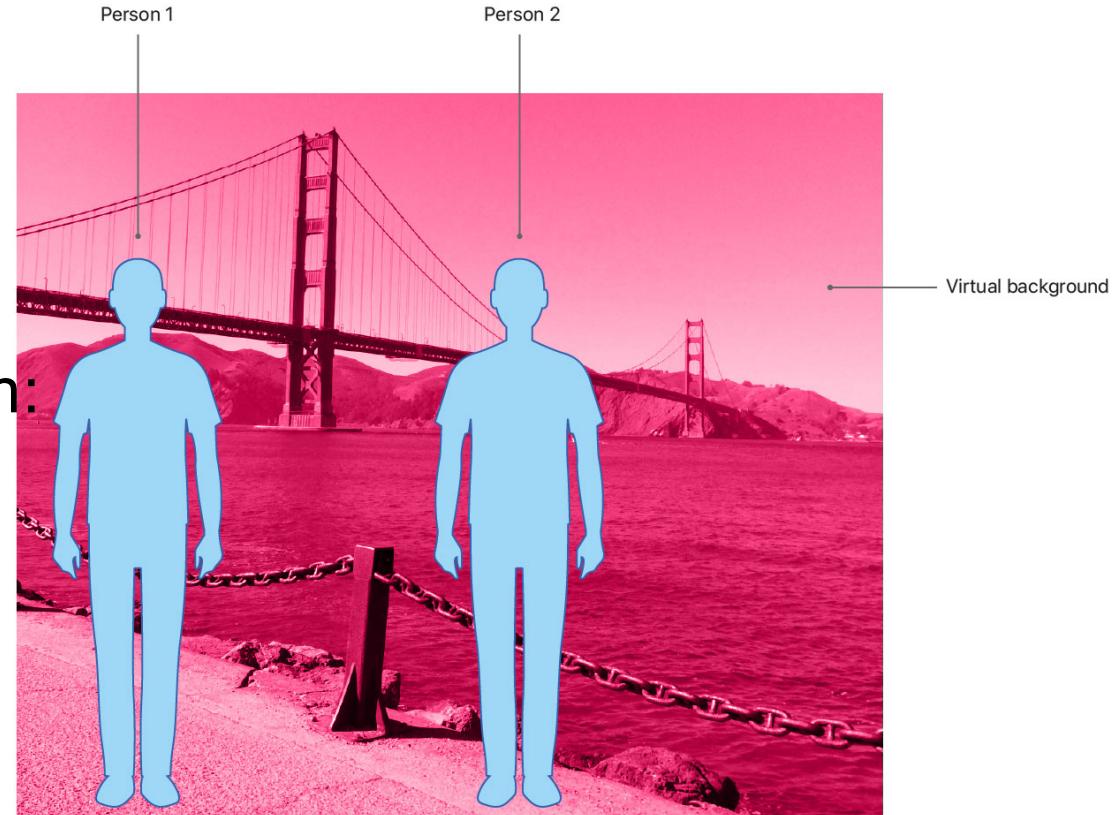
- Verify Device Support for People Occlusion

```
guard  
    ARWorldTrackingConfiguration.supportsFrameSemantics(  
        .personSegmentationWithDepth)  
else {  
    fatalError("People occlusion is not supported on this device.")  
}
```

- Enable People Occlusion

```
config.frameSemantics.insert(.personSegmentationWithDepth)  
arView.session.run(config)
```

- Always occlude persons:
`personSegmentation`
- Occlude persons depending on depth:
`personSegmentationWithDepth`



Disable People Occlusion

```
config.frameSemantics.remove(.personSegmentationWithDepth)  
arView.session.run(config)
```

SceneKit



Metal

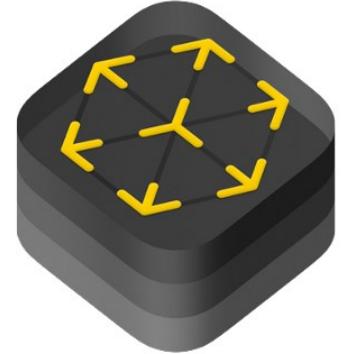


Body Tracking





Motion Capture in RealityKit



- Verify Device Support for Body Tracking

```
guard ARBodyTrackingConfiguration.isSupported else {
    fatalError("This feature is only supported on devices with an
    A12 chip")
}

let configuration = ARBodyTrackingConfiguration()
arView.session.run(configuration)
```

Load Rigged Mesh and Tracked Person

```
// Asynchronously load the 3D character.  
Entity.loadBodyTrackedAsync(named:  
    "character/robot")  
    .sink(receiveCompletion: {  
        // Error Handling  
    },  
    receiveValue: {  
        (receiveValue: Entity) in  
        if let receiveValue = receiveValue as?  
            BodyTrackedEntity {  
                // Scale the character to human size  
                receiveValue.scale = [1.0, 1.0, 1.0]  
                self.character = receiveValue  
            }  
    })
```

- Get location where you want to put your character

```
let characterAnchor = AnchorEntity()  
arView.scene.addAnchor(characterAnchor)  
characterAnchor.position = arBodyPosition + characterOffset
```

- Add the character to that location

```
characterAnchor.addChild(character)
```

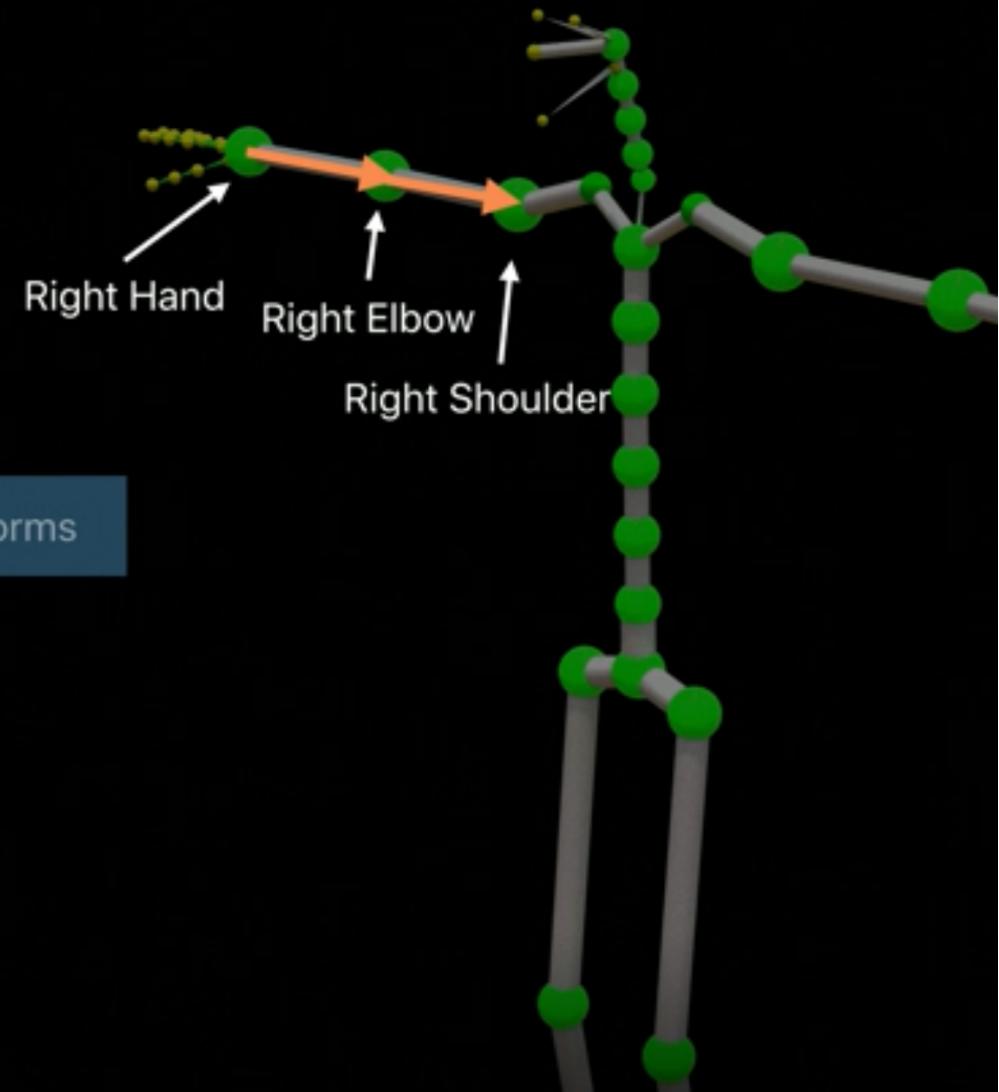
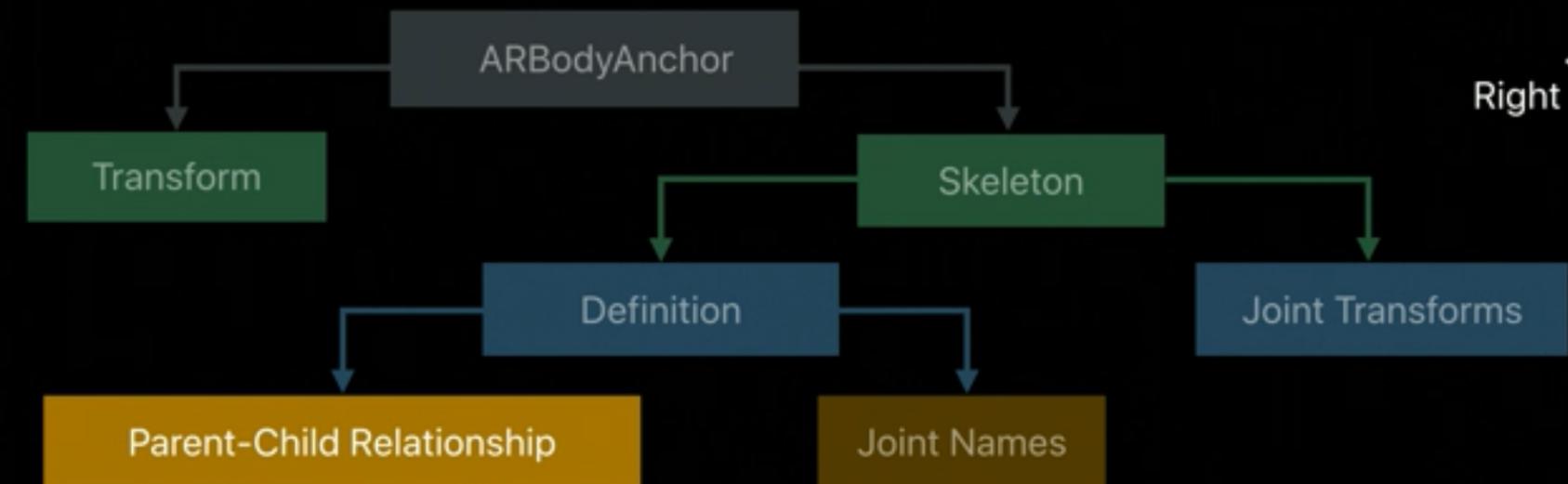
- ARSessionDelegate to get ARBodyAnchor

```
func session(_ session: ARSession, didUpdate anchors: [ARAnchor]) {  
    for anchor in anchors {  
        guard let bodyAnchor = anchor as? ARBodyAnchor else { continue }  
    }  
}
```



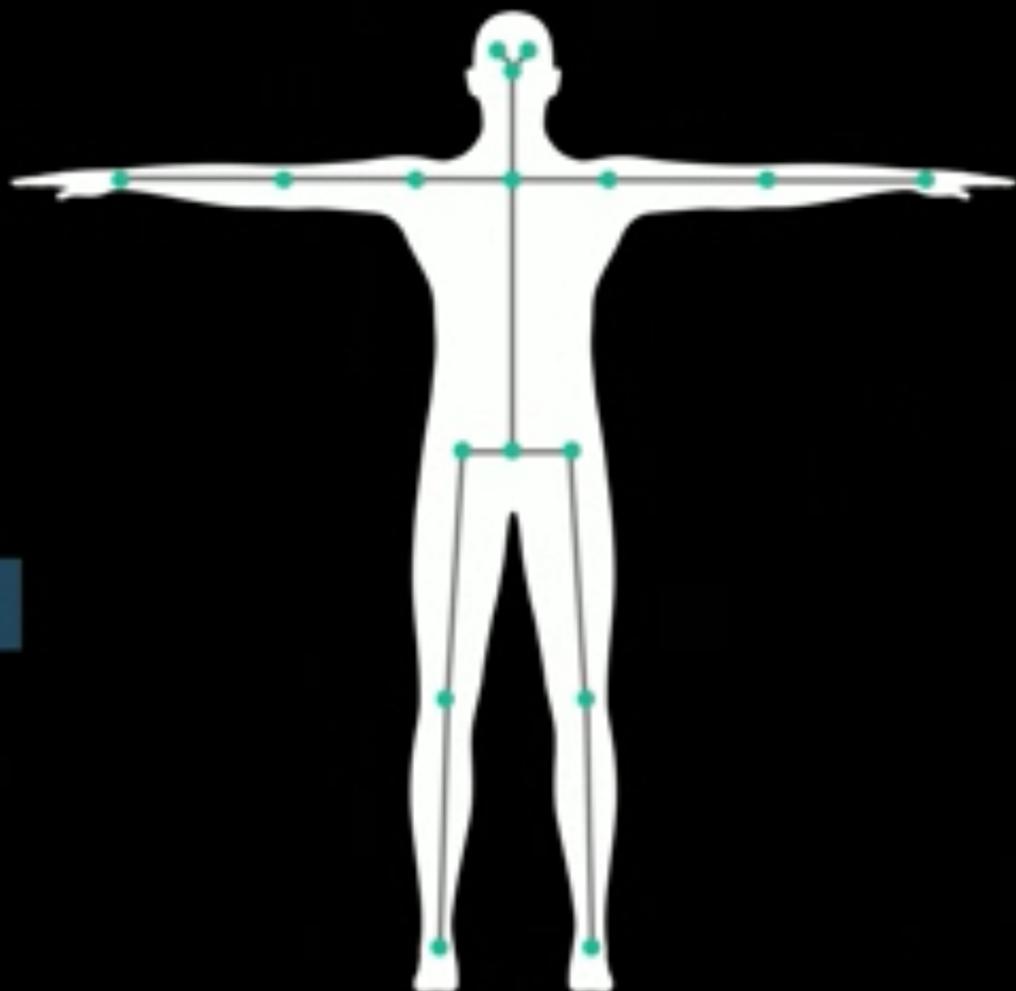
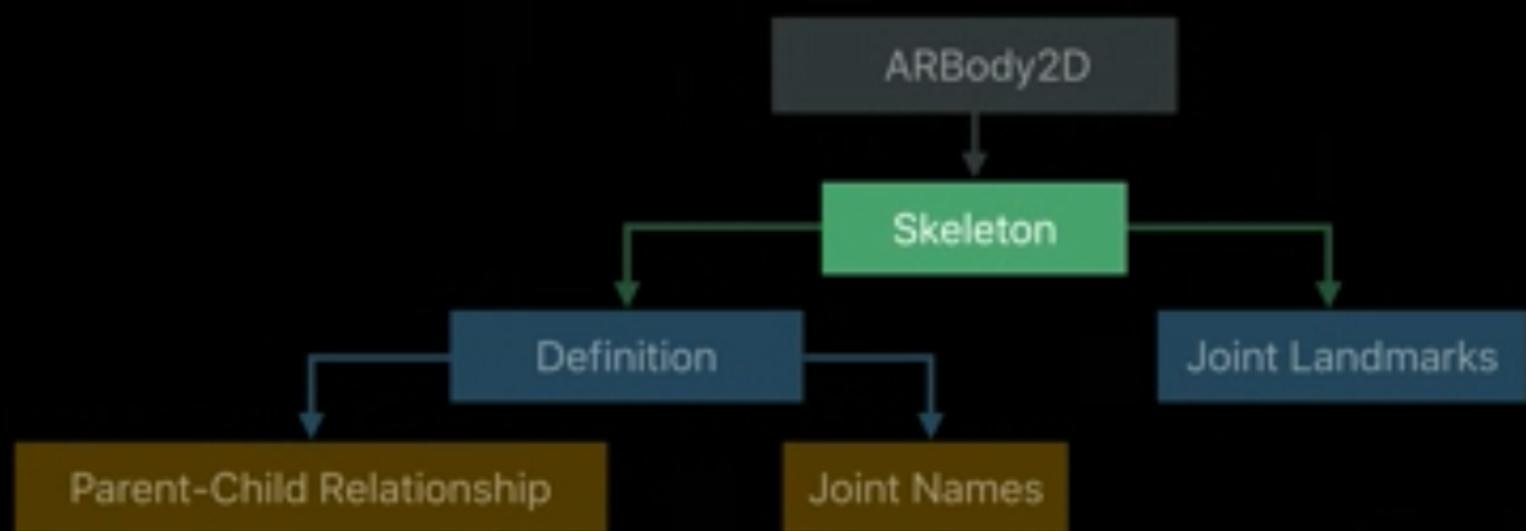
- BodyTrackedEntity





Extracting Data from 3D Skeleton

```
// Access to the Position of Root Node
let hipWorldPosition = bodyAnchor.transform
// Accessing the Skeleton Geometry
let skeleton = bodyAnchor.skeleton
// Accessing List of Transforms of all Joints Relative to Root
let jointTransforms = skeleton.jointModelTransforms
// Iterating over ALL Joints
for (i, jointTransform) in jointTransforms.enumerated() {
    // Extract Parent Index from Definition
    let parentIndex = skeleton.definition.parentIndices[i]
    // Check if it's not the Root
    guard parentIndex != -1 else { continue }
    // Find Position of Parent Joint
    let parentJointTransform = jointTransforms[parentIndex]
```



Extracting Data from 2D Skeleton

```
func session(_ session: ARSession, didUpdate frame: ARFrame) {  
    // Accessing ARBody2D Object from ARFrame  
    let person = frame.detectedBody!  
    // Use Skeleton Property to Access the Skeleton  
    let skeleton2D = person.skeleton  
    // Access Definition Object Containing Structure  
    let definition = skeleton2D.definition  
    // List of Joint Landmarks  
    let jointLandmarks = skeleton2D.jointLandmarks  
    // Iterate over ALL the Landmarks  
    for (i, joint) in jointLandmarks.enumerated() {  
        // Find Index of Parent  
        let parentIndex = definition.parentIndices[i]  
        // Check if it's not the Root  
        guard parentIndex != -1 else { continue }  
        // Find Position of Parent Index  
        let parentJoint = jointLandmarks[parentIndex]  
    }  
}
```

Demo

Thank you for your attention

Any Questions?