Chessro

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CS291A - Mixed and Augmented Reality
Spring 2020
@UCSB CS Department

Outline

Dev Team

Chen:

- Constructed project structure
- Implemented the backend
- Connected frontend with backend
- Developed game logics
- Applied coaching overlay

Jingxuan:

- Implemented frontend by using Reality Composer
- Built chess piece interactions
- Developed the multi-device communication


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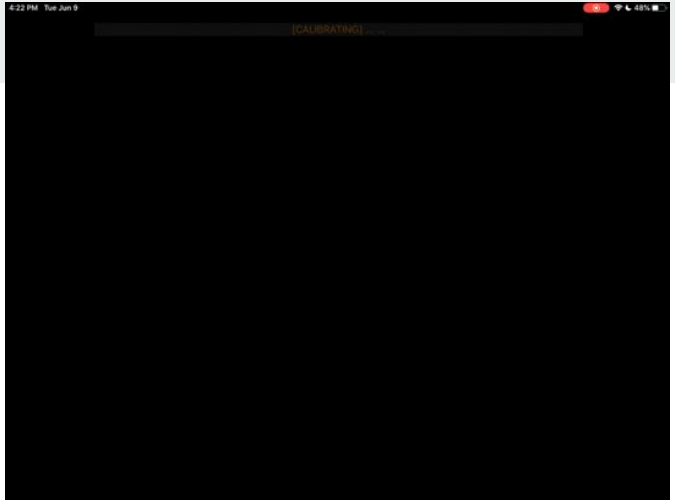
FINISH UP THE GAME

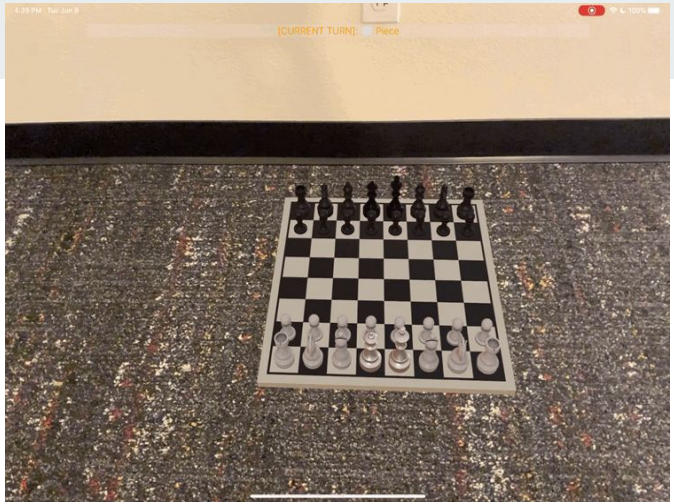
Chessro Features 1

- Coach Users to calibrate
- Map world coordinate to Chessboard grids
- Tapping AR Entities
  - Animation
  - Draw Movable Grids
  - Realtime Ray Casting
  - Sounds
- Pan Gesture, Dragging
  - Animation - resume position
  - Realtime Ray Casting to detect piece drop point



Chessro Features 2

- Basic People Occlusion
- Share AR Scene across devices
    - Real-time AR Entities Data Transfer
    - Can allow up to 5 devices to join host and view the game



Tech Stack

Application Core:

- Frontend
- Backend

Deployed Platform

Application Core

Swift OOP & Protocol

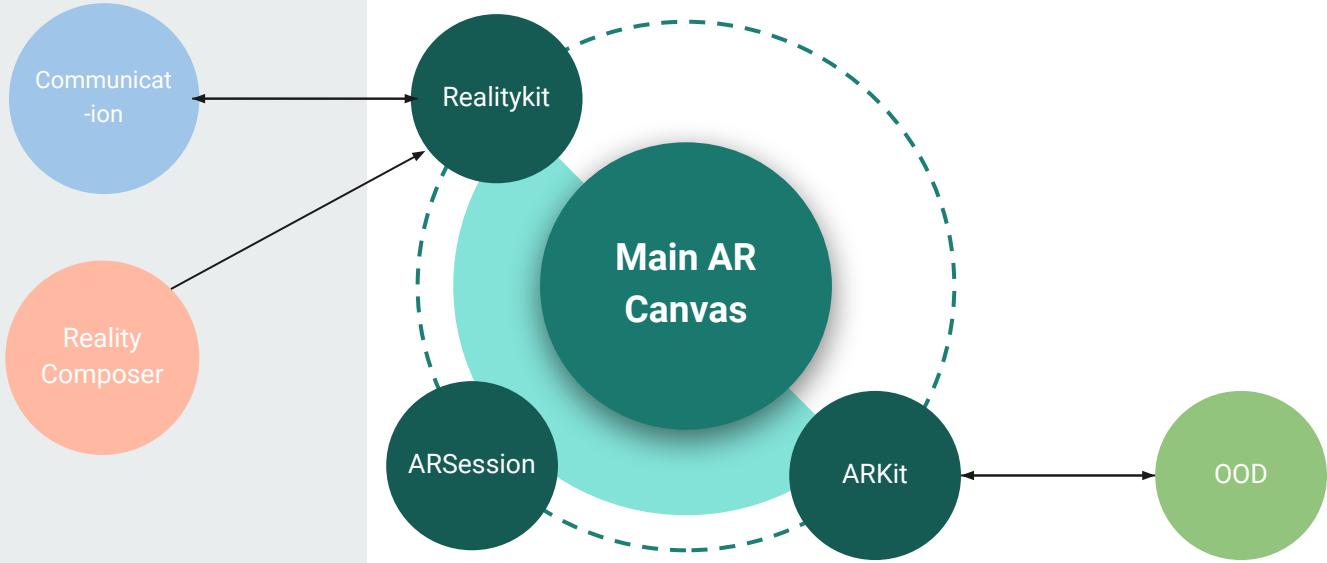
Reality Composer

Realitykit

UIkit

Realitykit Network Synchronization

Frontend & Backend



Deployed Platforms

iPadOS: 13.3.0 +
iOS: 13.4.0 +

Single Lense Devices:

- iPad Pro (10.5-inch)
- iPhone 5

Double Lense Devices:

- iPhone Xs
- iPhone X

LIDAR Scanner Devices:

- iPad Pro (11-inch)

Challenges

Physical Engine (Bugs?)

Incomplete Occlusion

Devices Communication

- Incomplete API Doc
- Unknown Crash

Physic Engine

1. Unable to perform Pan gesture/dragging
2. Keep messing up other pieces during movement
3. Set our own gravity plane

Incomplete Occlusion

1. Single Lense: No occlusion offered
2. Double Lense: Extremely inaccurate (Unable to detect depth in real time)
3. Double Lense with LIDAR: Better performance, but still unable to fully detect hands when moving further

Device Communication

- Incomplete API Doc
  - ~~MultipeerConnectivity - MCSession~~
  - ~~CollaborationData - ARSession~~
  - MultipeerConnectivityService - Realitykit
- Unknown Crash (Old Device)

- AR Entity Ownership Issue
  - Host Device vs. Peer Devices
  - Gestures Registration On Shared Entities
- Unstable Connection
  - Data amount
  - Animation

Overview & Insight

- General idea regarding how AR works on iOS Devices, as well as its development cycle
- Powerful AR = More computation needed = More power consumption
- LIDAR Scanner/Depth Detector plays a core role to initialize instant AR experience
- Require Real-time Lighting Adjustment & Environment Mapping to make AR Entities realistic

Future Work

- Implement handtracking in AR chess to allow users move pieces by some hands gestures
- Enable the peer devices to interact with the chess
- Apply UIKit to allow players to customize the chess game such as changing models of the chess pieces or chess board.

Q&A