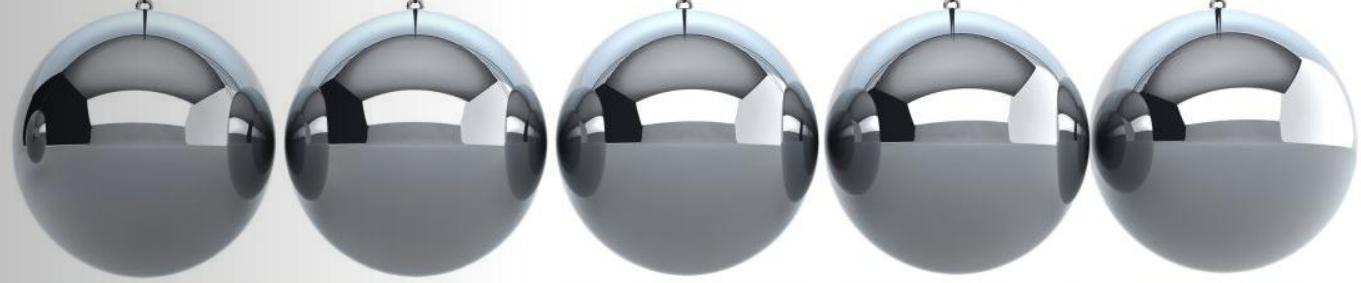
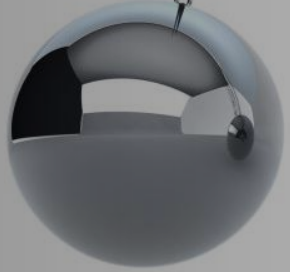


AR STEM Learning Demo: Newton's Cradle



JOHN GUST

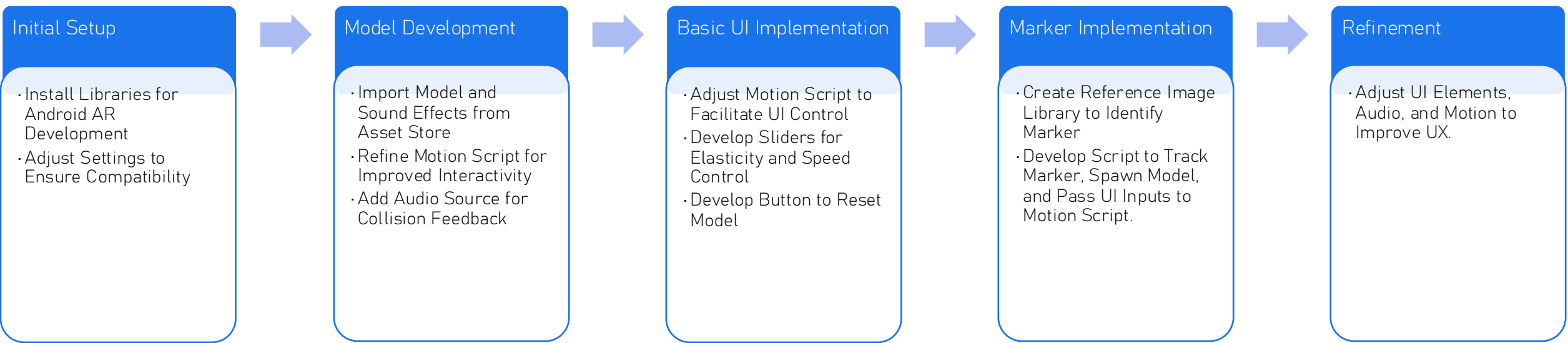
Objectives

- Develop an Android-based mobile app to visualize a Newton's cradle in an AR environment.
- Implement sliders and/or buttons to adjust variables like velocity and collision elasticity.
- Reflect variable adjustments in real time.

Tools Used

- Unity 6.3 LTS (6000.3.5f2)
- AR Foundation (ARCore)
- Newton's cradle with basic script imported from Unity Asset Store (<https://assetstore.unity.com/packages/3d/props/newton-cradle-hq-110036>)
- Scripting Assistance from Gemini and Grok AI.

Design Process



Key Features

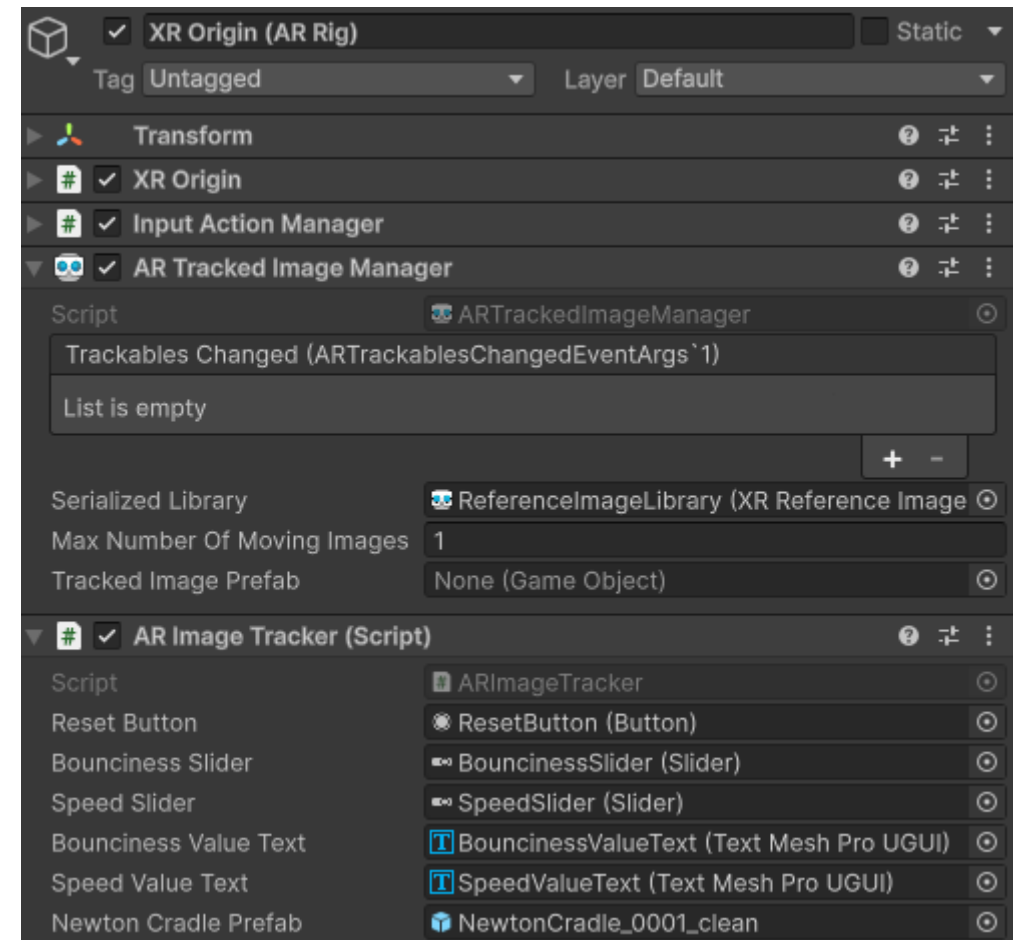
- Touch-Drag-Release Interaction for Each Ball
- Marker Tracking for Cradle Positioning
- Parameter Control via Sliders
- Real-Time Reaction to Interactions and Parameter Changes
- Reset Button to Stop Motion
- Dynamic Audio Feedback for Improved Immersion

App Structure

- XR Origin (AR Rig)
 - Camera Offset
 - Main Camera
 - Screen Space Ray Interactor
- AR Session
- Directional Light
- Canvas
 - Bounciness Slider
 - Speed Slider
 - Reset Button
- Event System
- Model: NewtonCradle_0001_clean
 - Cradle
 - BallPivot0
 - Ball0
 - BallPivot1
 - Ball1
 - BallPivot2
 - Ball2
 - BallPivot3
 - Ball3
 - BallPivot4
 - Ball4

Notable Components: XR Origin (AR Rig)

- AR Tracked Image Manager
 - Identifies Marker from Reference Image Library
- AR Image Tracker (Script)
 - Tracks Marker in 3D
 - Spawns Model at Marker
 - Moves Model to Stay on Marker
 - Passes UI Inputs to Spawned Model



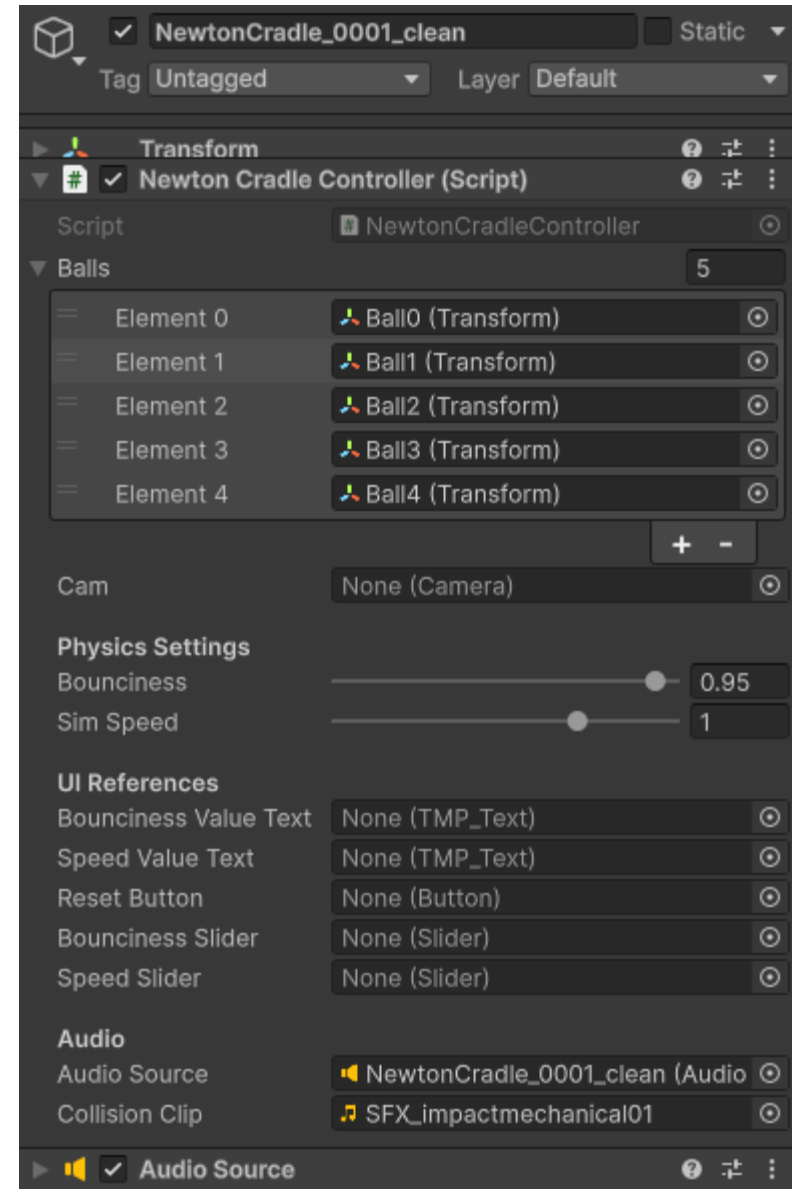
Notable Components: Main Camera

- Physics Raycaster
 - Used for Touch/Click Inputs

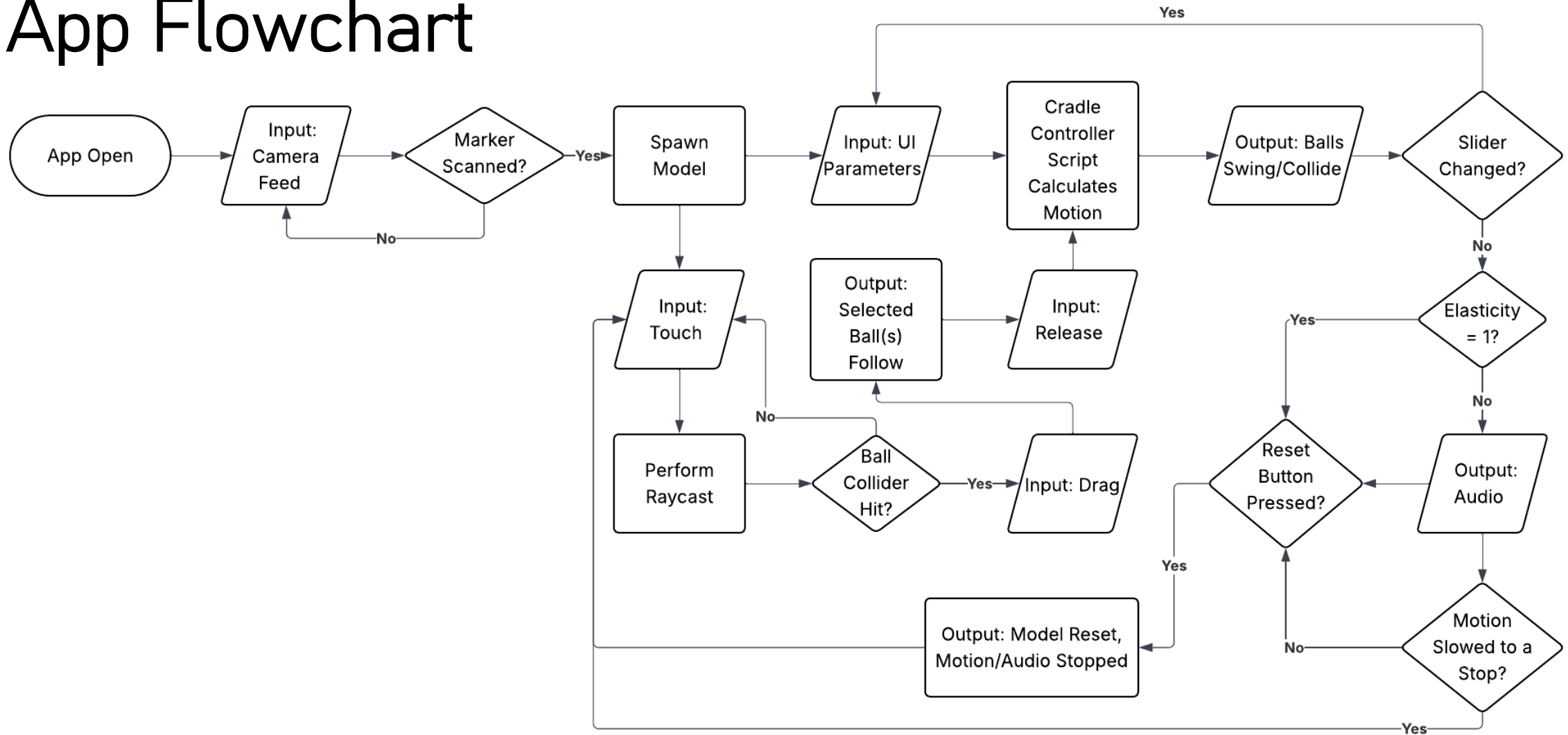


Notable Components: Model

- Model
 - Audio Source
 - Newton Cradle Controller (Script)
 - Initializes Positioning of Model Components upon Spawn
 - Receives UI Parameters from AR Image Tracker Script
 - Receives Raycasting Inputs
 - Controls Motion of Model Component and Audio Feedback
- Balls 0-4
 - Added Sphere Colliders for Raycasting



App Flowchart



Demo Video

https://www.linkedin.com/posts/john-gust-86b94280_hello-all-i-know-it-has-been-some-time-ugcPost-7447084083580522496-cDdl?utm_source=social_share_send&utm_medium=android_app&rcm=ACoAABE5gIMBvocFmmUUFAEkMldirSQbWkg136l&utm_campaign=copy_link