

# PHYSICALLY-BASED SIMULATION RIGID AND SOFT BODIES IN INTERACTIVE SYSTEMS AND GAMES PROJECT MILESTONE PRESENTATION

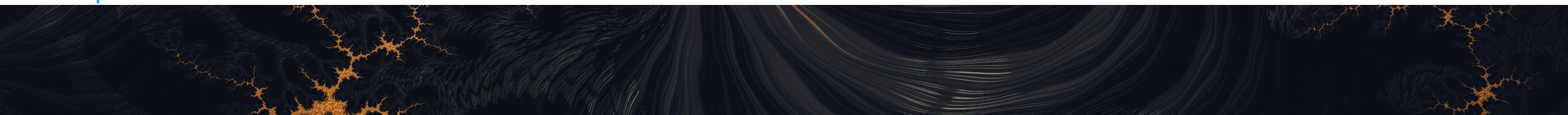
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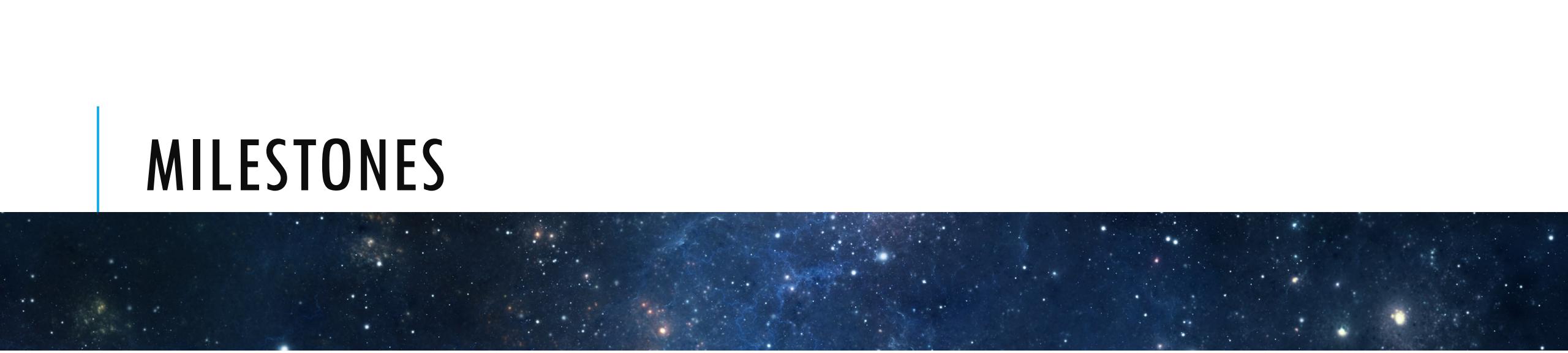
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# SIMULATION SCENARIO



- Motivation: Game with Physically-based Interactive System
- Interactive System consists of Soft-Bodies & Rigid-Bodies
- Implementation of Forces applied on Soft-Bodies & Rigid-Bodies

# MILESTONES



1. Set up Basic Scene
2. Rigid-Body Implementation
3. Collision Handling for Rigid-Body
  - OBB vs OBB
  - OBB vs Sphere
  - Sphere vs Sphere

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1. Soft-Body Implementation
2. Collision Handling for Soft-Body
3. Interactivity (Drag&Drop, Spawn, Move, etc.)

# SIMULATION METHODS

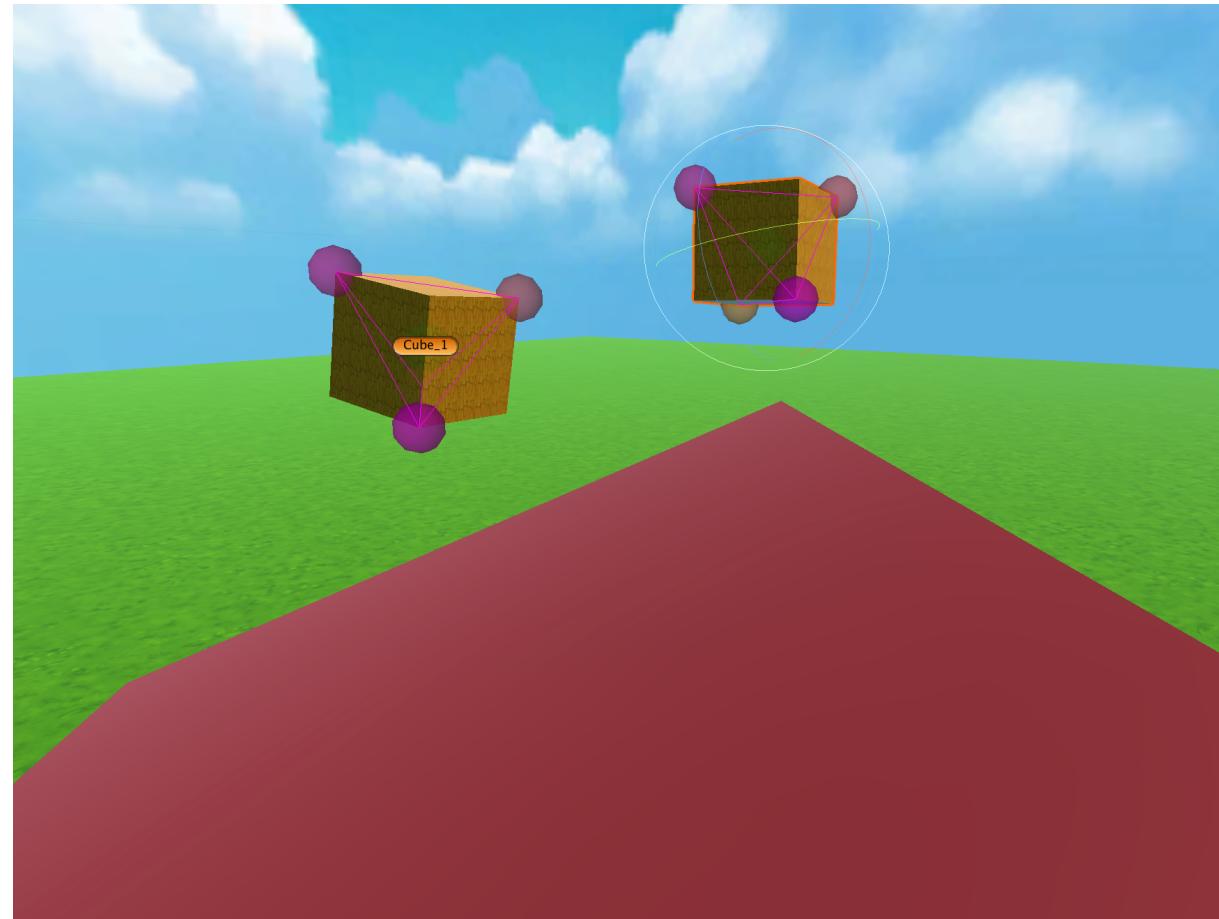
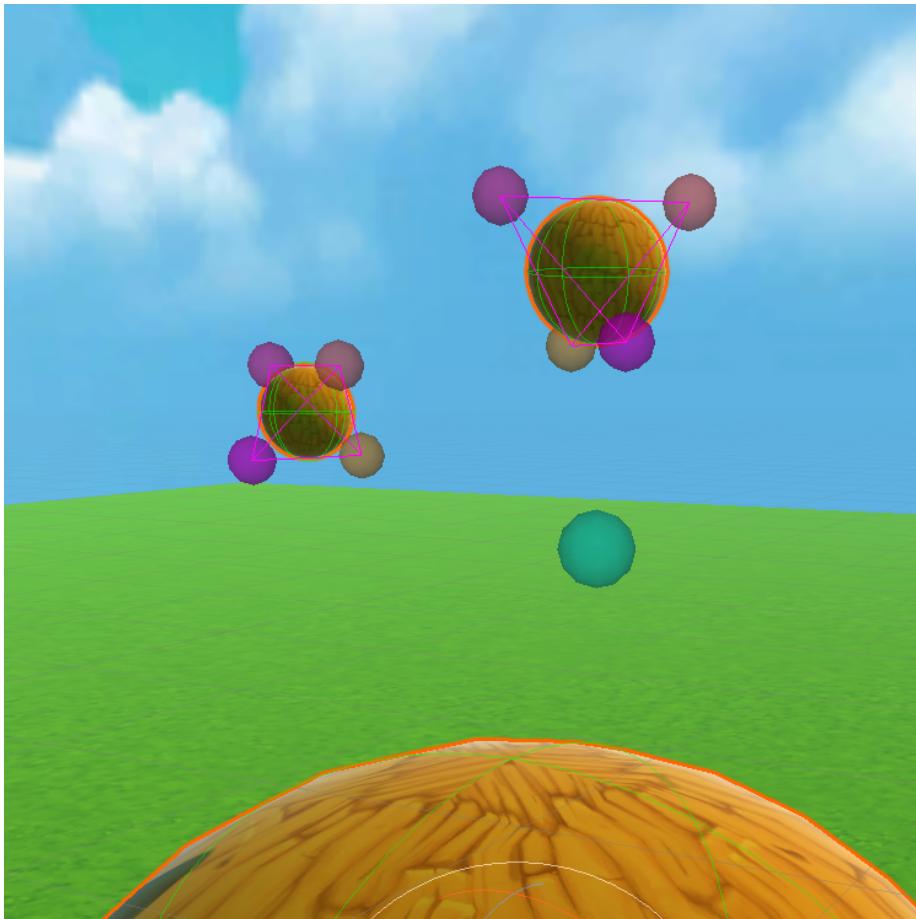


Verlet Integration [[Advanced Character Physics T.J.](#) ]

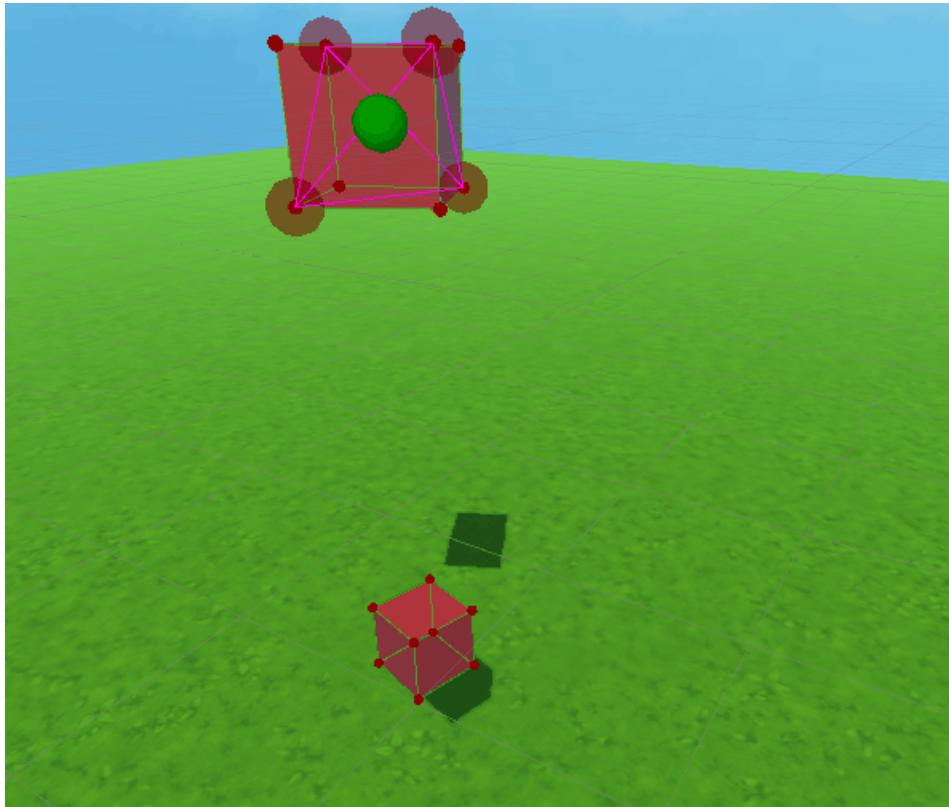
- Position-Based Dynamics
- Representation of Rigid Bodies by individual particles and distance constraints
- Iterative constraint solving
- Collision resolution by projection

# RIGID BODIES

Tetrahedron of particles embedded in Sphere/Cube



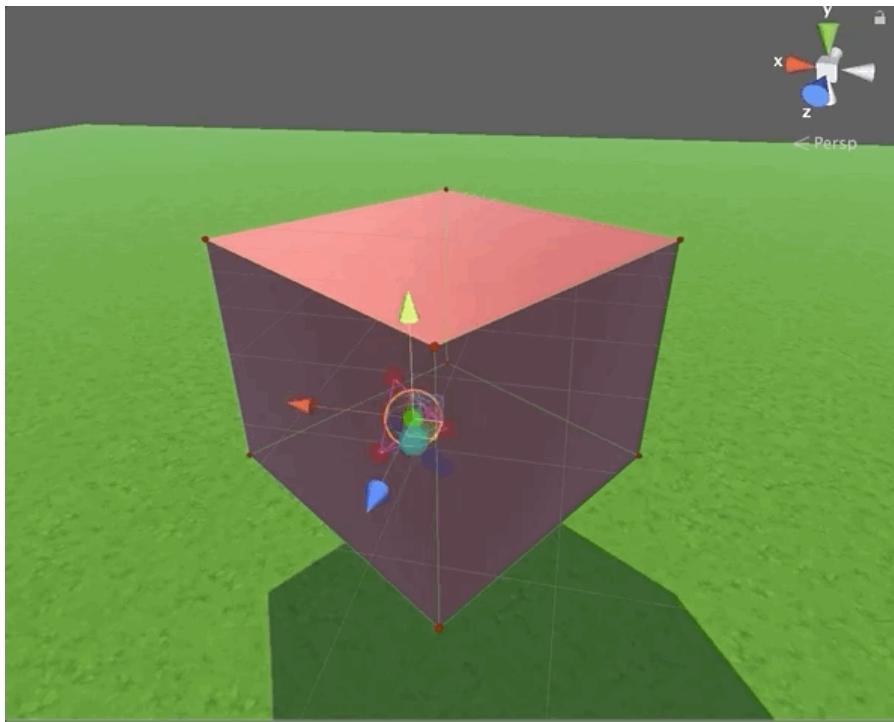
# RIGID BODIES – COLLISIONS...



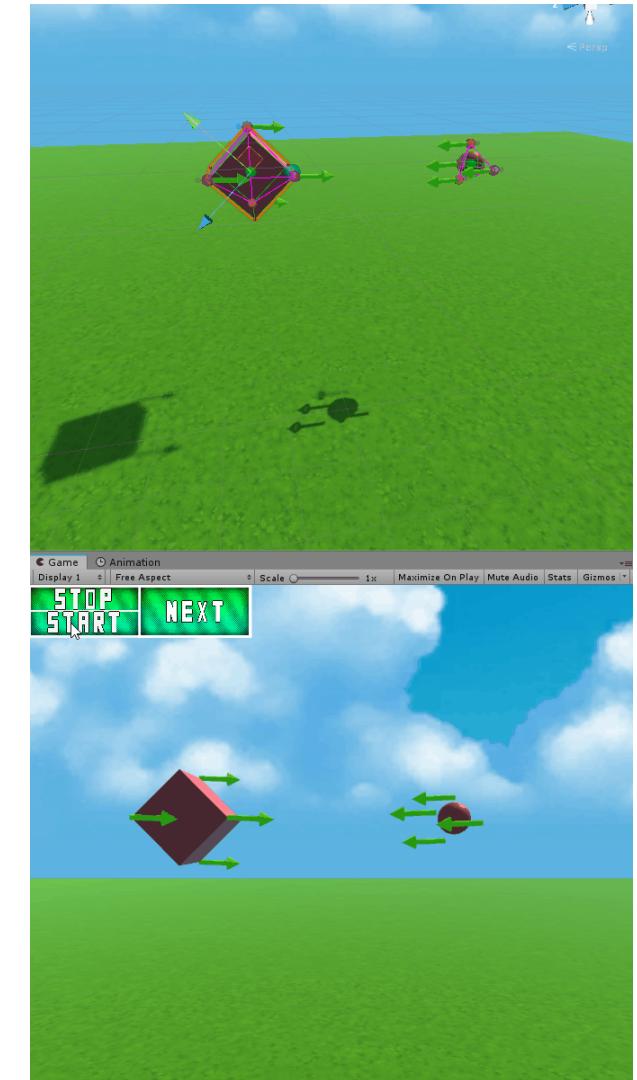
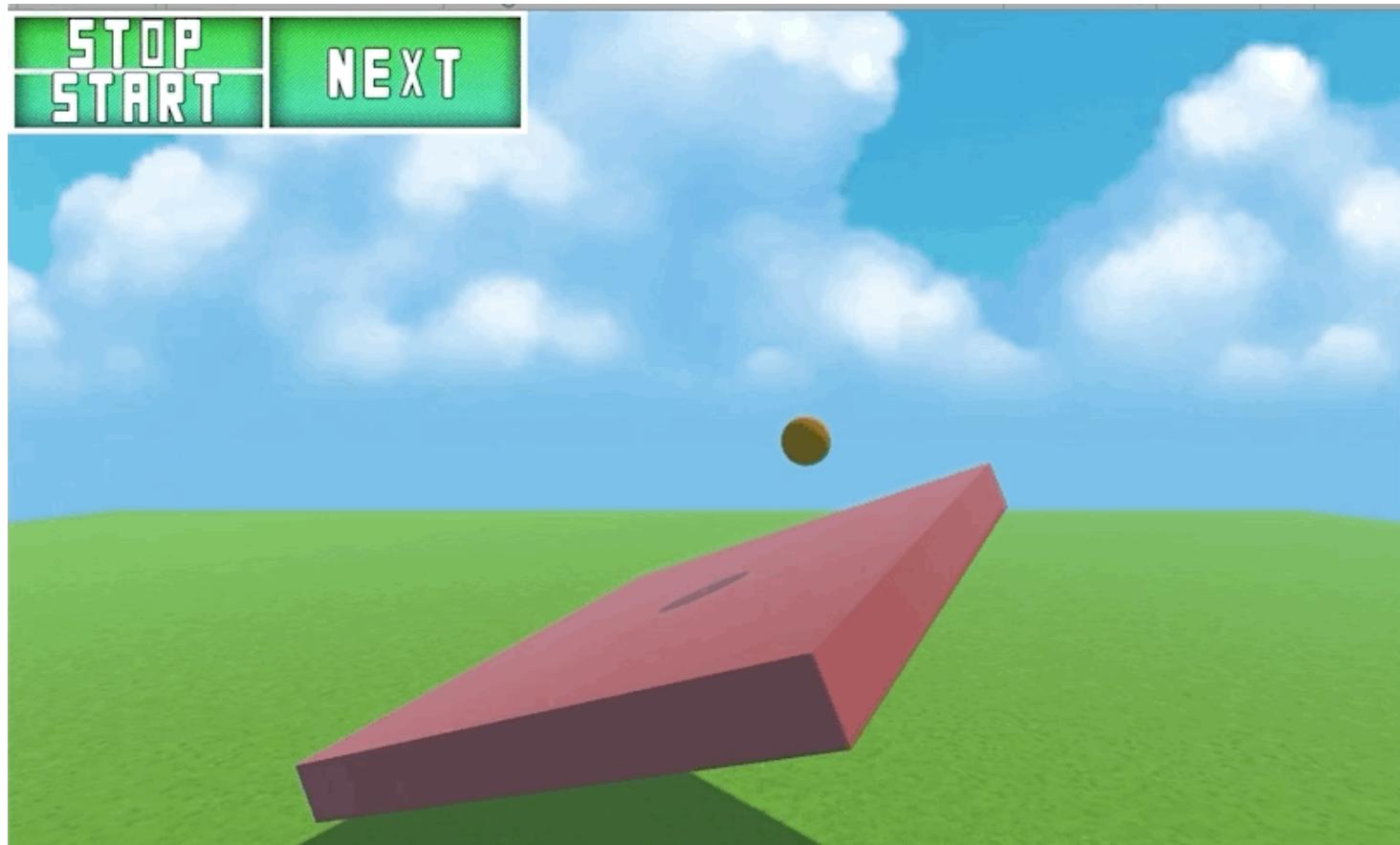
## Separating Axis Theorem

- Find separating plane (see image)
- Project particles out of collision state
- Resolve constraints to preserve rigidity

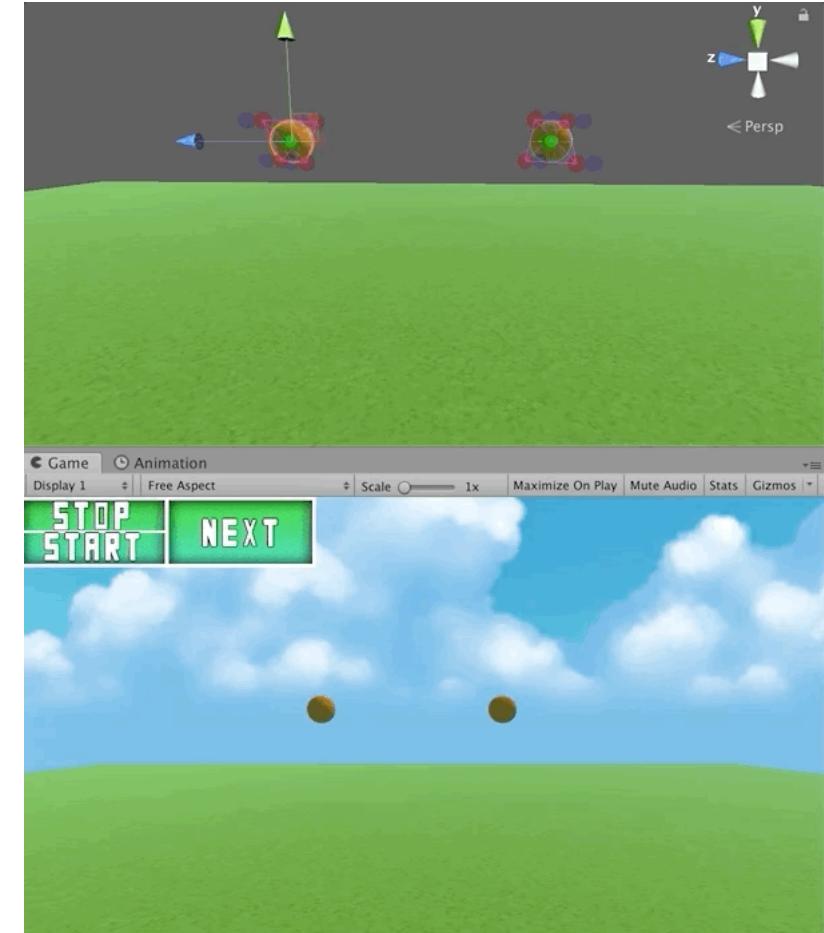
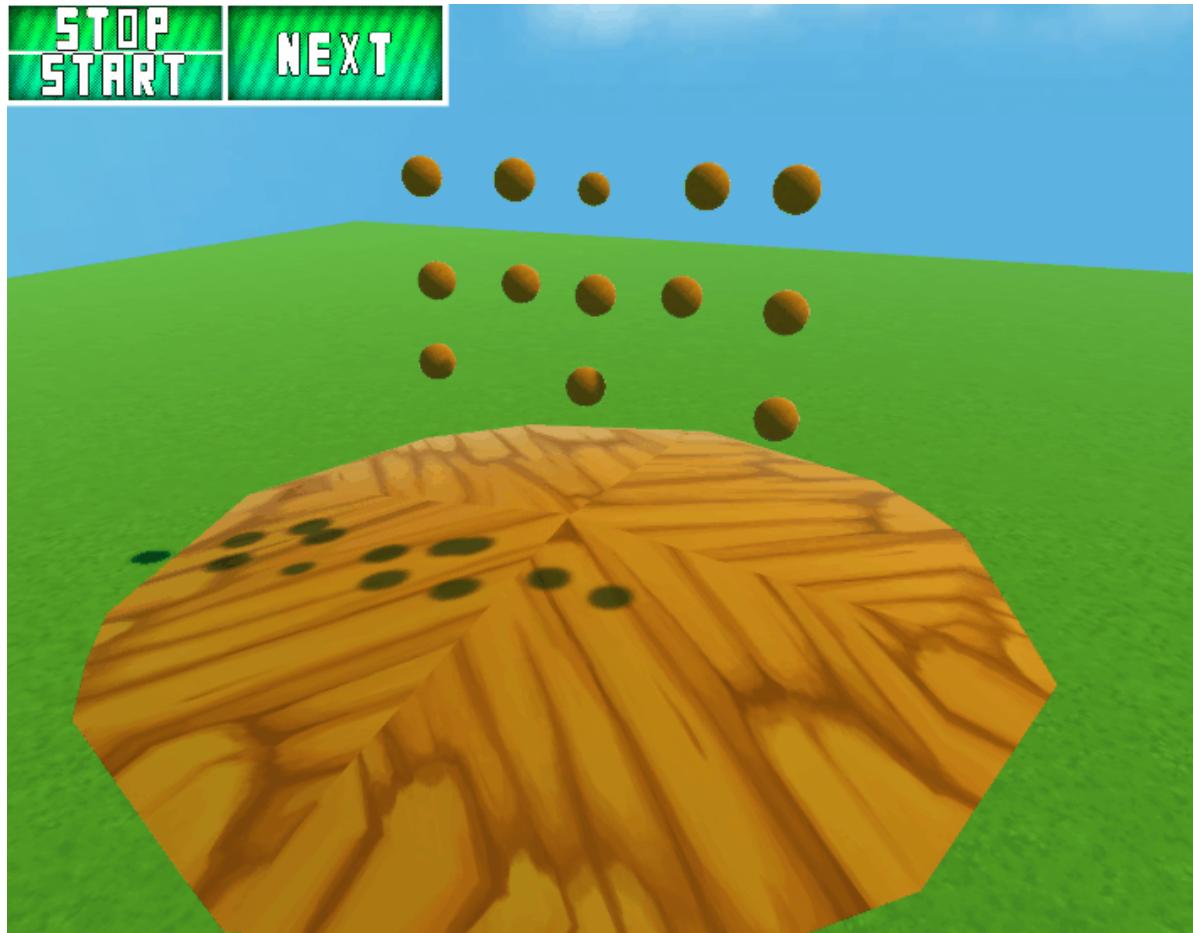
# RIGID BODIES – COLLISIONS... ☹



# RIGID BODIES – COLLISIONS... ☺



# RIGID BODIES – COLLISIONS...



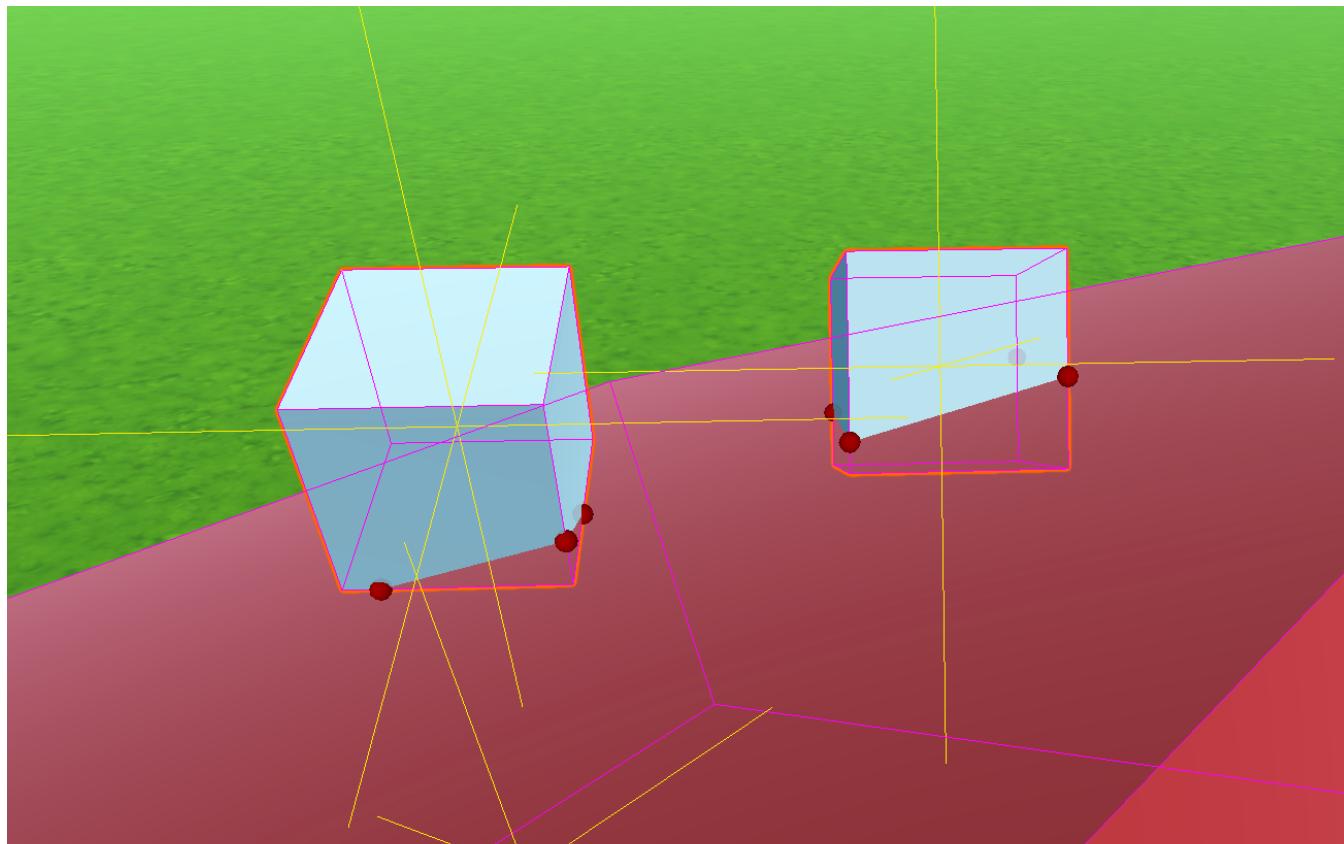
# WORK IN PROGRESS



Particle Structures based on mesh

- For deformable objects
- Collision resolution is more involved

# WORK IN PROGRESS



## Contact points

- OBB vs. OBB  
collision improvement

# WORK IN PROGRESS



## Interactivity

- Simple shoot on click

# TODO



- Spacial structure (e.g. octree)
- Rigid Body – multiple OBBs
- Friction
- Soft Body
- Gamification of interactivity