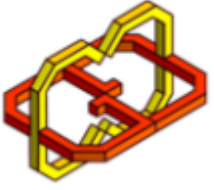




Real world physics

VR project

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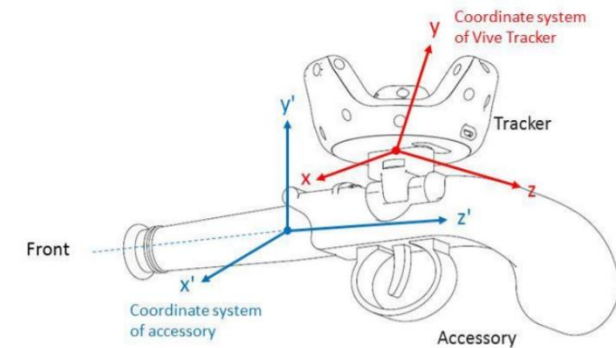
Overview

- The project goal is to simulate real world, throwing objects physics, with only hand movements.
- The throw velocity is reflected by the hand movements speed.
- Each object has its own mass.
- When the wind is activated, the object will move in the wind direction.



System & Technologies

- We developed the project using Unity 2018.4.5f1 environment, scripted with C# in Visual Studio 2019.
- Equipment required:
 - HTC VIVE headset
 - HTC VIVE Trackers





HTC VIVE Trackers

- 270-degree tracking FOV.
- Very accurate.
- Can be placed in various locations.
- Actions are defined by movements – No trigger.
- We use HTC VIVE Trackers in our project to get the user coordinates in the virtual space, and its being used for various calculations.

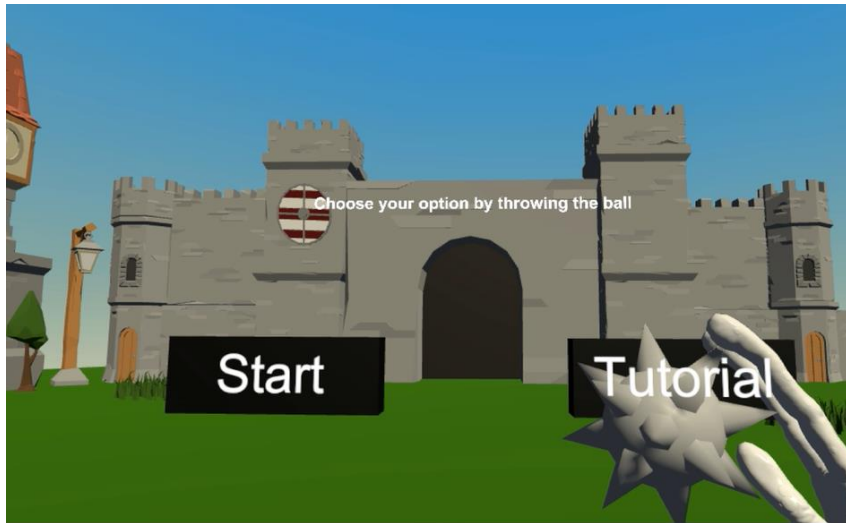
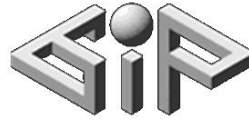
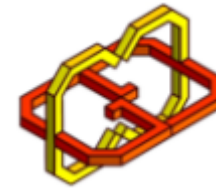




Throwing features



- An object can be thrown by simulating throwing hand movement.
- The velocity is determined by the hand movement speed.
- The ball moves in the intended direction.
- Object release from hand without buttons.
- Realistic ballistic ball movement.



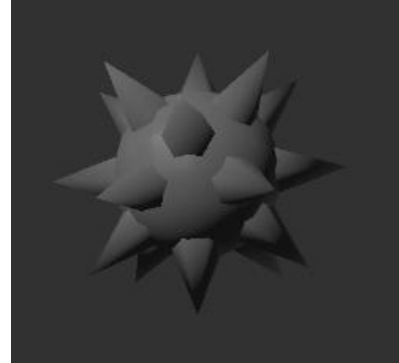
Environment Features

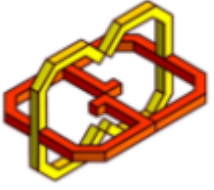
- Tutorial with multiple learning stages.
- Wind cause deviation of the throw direction.
- Objects move towards the player.



Assets & Models

- Different ball models
- Different moveable objects
- SteamVR
- 3D Cartoon Village



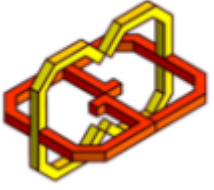


Challenges & Conclusions

- How to define a throw without a trigger?
 - Direction
 - Initial velocity
 - Release velocity
- An efficient and precise throwing algorithm.
 - Average vector?
 - Least squares? (numerical method)
 - Normal distribution – Gauss bell

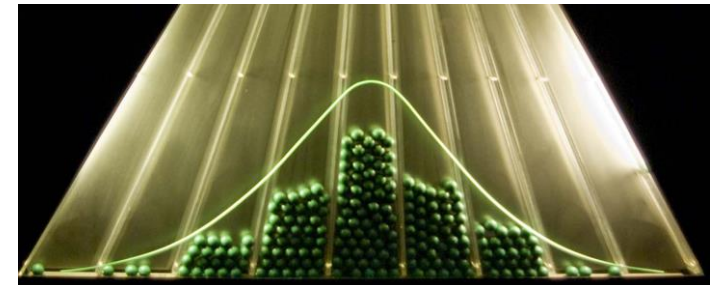
Not accurate!

Not enough coords – not optimal



Throwing algorithm

- There are numerous inaccurate coordinates in the beginning and at the end of a throw.
- Mostly the throwing direction is based around the median coordinates.
- The solution: Normal distribution-based algorithm.
 - The median coordinates is more significant to determine the direction.
 - Very accurate due to the number of coordinates in one throw.
 - Fast calculations – little latency.



Thanks!

