

Hypothesis:

1. How does the regulation of the Buoyant Force influence the movement of an object or body that has a volume, density and mass and one that has little to no force of gravity?
2. How do people engage or how can they engage with application of the Archimedes Principle as well as with Unity's built in physics in a way that challenges unity's physics through the concept of weightlessness =??
3. What influence does the objects mass, density and volume have on the gravity scale if the body exists within the premises of Unity built in physics and how can players play around with the application of the Buoyant Force to suspend the ball in air to achieve the challenge of getting the ball past certain checkpoints placed at relative distances?

What is buoyant force?

 Google Classroom

Why the heck do things float?

What does buoyant force mean?

Have you ever dropped your swimming goggles in the deepest part of the pool and tried to swim down to get them? It can be frustrating because the water tries to push you back up to the surface as you're swimming downward. The name of this upward force exerted on objects submerged in fluids is the **buoyant force**.

Interrogation and Exploration

With this artefact, I'm looking to find out the extent to which the application of the buoyancy force can defy the standard of Unity's physics system. How hard can you apply force and how do you regulate it to influence your own experience in the game as well as the outcome of the game on a bigger realm? I am also looking to find out how players cope with the pressure of the instantiation of the balls of different sizes and mass at different intervals and how that influences the outcome of the players experience overall.

Reflection

The following are the findings i have obtained from testing the game repeatedly with the objective of seeing the results of my hypotheses questions:

Through research as well as testing vigorously , the configuration of Unity's Physics systems has been made to enhance the force of gravity that acts on game objects who use it as opposed to any other property that forms part of the rigid body component . Depending on the value that you use to adjusting the mass of an object in unity through the mass property of the rigid body component m the game object's mass will or will not contribute to the resistance of any force applied to it. The higher the mass of a game object, the more resistant it is to acceleration and thus it becomes greatly affected by gravity. The opposite is also plausible and true. The gravity component of Unity's rigid bodies works independently of other properties like mass and this is why most of my circle or balls which were instantiated at different times would be greatly affected by gravity even though force was applied to them

The Application of Archimedes Principle that breeds the concept of the Buoyant Force played a huge role in becoming a primary mechanic in this game. The way in which this force works in direct contrast to Unity's force of gravity helped bring forth an interesting interaction and gameplay into the game. This force, which works on the idea that for an object or body to float and thus maintain its suspension in the air, the object exerts a force on the surface it occupies and the surface in turn will exert an equal upthrust force on the object to cause it to float . By virtue of the latter, this ultimately cancels out the force of gravity and thus the body floats. In the game, the way in which players engaged with the manipulation of this force became very pivotal to the way in which they understand the dynamic between force and weight as well with gravity. For some balls , a large quantity of force had to be applied on some balls while the same force also had to be regulated at smaller quantity to get balls to get past checkpoints. The complexity that the addition of this force brought to the both in terms of gameplay and the larger scope of the game premise underscored the boundaries to which Unity's physics system can be pushed to achieve a specific objective.

On a broader scale, by exploring the intention behind this artefact, I have found that the application of force onto a body also speaks to the larger idea of not only how Unity's physics influences the behavior of a game object but actively being the person behind regulation of the Buoyant force, the player gets to use his agency to influence the trajectory of how the game will pan out.

Apart from the application of the Buoyant force to the game object, i have also found out that the extent to which this force will influence the behavior of the game objects it acts on is also influenced by factors like the objects density, the fluid density and volume of the object.

Looking deeper into the creation of this game and taking into consideration the feedback from other play testers, I have come to find out the role that color and size plays in visually communicating things and in the context of this game ; weight, fluid density, volume and gravity scale differences. The build of Unity's physics system as well as the Buoyancy Force is in a way that it functions like a "back end" program, where players cannot necessarily see or physically pinpoint the force application or gravity influence however they can feel it. By using different colors and sizes of different balls, players were able to

intertwine their visual and emotive senses to indulge in an even more engaging play experience.

The instantiation of different sized and scaled balls at different intervals ranging from small to short intervals was also interesting way to introduce pressure and complexity. Something I picked up from playtesting with my peers is the intensity that applying the force induced in their play experience. Some players seemed to "literally fight" with the space bar key as they were applying force and that contributed to the engagement that the dynamic between force and weight can cause in nuanced forms of engagement like games.

Playtest Report/Feedback

Below is some of the feedback and ideas that i obtained from other play testers:

Initially, I had not considered or thought as far as how the use of color and size can benefit the premises of the game especially as far as how mass(size) can influence the movement of a game object in space. One of the play testers said he could feel that the balls are of different densities , volume and gravity scale however , the fact that they were all uniform (the same color and most were in size as well), may or may have not contributed a shortcoming in the players engagement within the game.

After the play test, I went to implement this idea of incorporating color and variety in sizes of the ball to help player visually distinguish the effect of the weight, fluid density , volume and gravity scale in the various balls that get instantiated at different intervals. This greatly improved the level of engagement that players had in response to the visual communication of elements that inform the intent and expression of that intent.

Another form of feedback worth noting is on the educational aspect that the game explored by virtue of what was being tested and was used to test the hypothesis of the game. One player said that they had an idea of what Buoyancy was but had never been exposed to the intricacies of how the force application actually works on a body to cause it to float. By playing the game , it helped them understand the concept better and by virtue of that also begin to appreciate the composition that went into showing the application of buoyancy force on objects which in turn ended up also providing an interesting perspective on it.

References:

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