Course Title: Introduction to Virtual Reality

Assignment 5: Final Report

Course Code: ENSF 545

Lab Number: B01

Instructor Name: Yaoping Hu

Student Names: Gibran Akmal & Aashik Ilangovan

Team Names: RedPill

Submission Date: December 6th, 2022

Introduction:
The subject area and problem of the project lie in the entertainment and video game space. Specifically, our area of project would be to create a basketball mini-game where users will shoot virtual ball objects, aimed to go through a virtual hoop.

Description (Objectives and Scope):
Our objective is to provide a simple understanding, yet a semi-difficult game that users can partake in. We want to create this basketball mini-game project that is widely accessible to all users, regardless of their influence on video games/virtual reality. The scope of the application is limited to just a simple experiment on basic haptic feedback and its impact on a user's experience.

Description (Tasks & Target Users):
The task the user will have to accomplish is to throw the virtual basketballs into a mini hoop within that scene. We will provide the user with 5 different balls to throw (5 chances) and additionally, we will create the incentive to score at least 3 out of the 5 balls to win. The target users of our project are more correlated with individuals who enjoy the light and easy-to-play video games with little to no experience in VR as an introduction to the field and its many aspects. Our target users are teens and young adults who are passionate about gaming and virtual reality.

Details of Developed Techniques:

We started off development using the assets from one of the projects in the 545+602-LabCode folder called *testPuzzleHaptics*. However, we only utilized a few of the assets and source code from that project, those being the *floor plane* object, *Haptic Surface (Script), Block Puzzle Controller (Script)* and the *HapticDeviceWithGrabber* object used for building the haptic wand the user can use for interaction. However, we modified the *Haptic Surface (Script) and the BlockPuzzleController (Script)* to add additional functionality for our app. Throughout the project we found a basketball hoop asset online that we were able to utilize and the rest of the objects and scripts added were original and our own. The detailed procedure has been given below:

1. After the template of our application was ready, we generated a sphere object to represent our basketball. In order to allow this sphere to act like an actual ball we had to apply various physics components to it such as a sphere collider, rigidbody (with gravity), etc. as shown in Appendix G. The unique pattern on the balls seen in appendix E come from a shader we applied to change the ball's color. Furthermore to simulate the actual bounciness a basketball has, we created a custom 'Bouncy' material with the specific settings shown in appendix F. These settings are tuned to make sure the ball does not

bounce too much or too little but mimics an actual basketball as accurately as possible. Finally, the Haptic Surface (Script) was attached to the sphere to allow it to be felt by the haptic device and allow interaction with the grabber. Once we finished building this basketball object, we duplicated it to create 5 balls all spaced evenly on our plane (court)

2. In order to stop the balls from coming back or staying on the court, we extended the plane by adding another section, separating the court into a sloped area and a flat area as shown in appendix H . The balls start at the flat area and after the user has shot them, they fall down on the slope and roll out of the scene. This was achieved by adding a slight rotation to the long plane to give it a slope and attach it to the section that is straight. Lastly a shader of a stock image of wood material was attached to the planes to give the aesthetic look of a hardwood floor seen in most basketball gyms.
3. In order to stop the basketballs from rolling down the slope if accidentally touched by the user or to stop shot balls from ricocheting back to the flat area we installed some barriers in and around the shooting area. We did this by simply arranging some more planes in sectioned format and attaching a box collider component to it so objects cannot pass through. As observed in appendix I, these planes were given a red translucent material to display for the mesh render allowing us to still be able to see the court through these barriers
4. For the actual hoop we agreed it would be more efficient if we imported a finished basketball hoop asset instead of building it from scratch ourselves. So we imported a very good model we found on a website called 3DWarehouse. Its own custom mesh renderer was attached which was helpful. We placed this hoop at the edge of our court and resized it as we saw fit, experimenting with the scaling of the hoop, and the distance of the camera from the scene to find the most natural view for the user to be able to comfortably play.
5. In order to avoid users' attempts at cheating, we reduced the gray box surrounding the haptic grabber to be just at the edge of the shooting area and not be close to the hoop as shown in appendix J. The edge of this gray box is the maximum area the grabber can move within so this being further away from the hoop means users are forced to actually shoot the ball from the set distance rather than picking it up and dropping it right on top of the net. Also in order to indicate a made shot, we placed a very thin plane below the hoop so that any falling ball going through the hoop has to make contact with it as shown in appendix K. We attached a mesh collider with a trigger so that objects could pass through it because a box or sphere collider's trigger field was too wide. We then unchecked the mesh render in order to make this plane invisible. In addition, we also wrote a custom script called *Splash (Script)* to detect when the ball touches this plane using an OnTriggerEnter() event and if so, then it changes the color of this ball to green, giving a visual indicator of a made shot to the user as we found this functionality common in most basketball arcade games. The specifics of this script can be found in appendix L.

We wanted to take the haptic grabbing functionality a little bit further by adding some color identifying functionality. So we modified the *'HapticGrabber.cs' script* attached to the *Grabber* object. Firstly, we instantiated a global variable called 'basketball' that represented a basketball that had already been grabbed and let go (thrown). Later on in the Update() function, we can check whether something is being grabbed, and if so, that object can be assigned our 'basketball' game object and stored from which we can then change its color to red through the <Renderer> component as seen in appendix M. This functionality will change the color of the ball to red whenever the user clicks the button on the haptic device to pick it up. This will aesthetically signal what ball the user picked up or is throwing.

Finally, we were able to repurpose the *BlockPuzzleController* to the Block Sphere Controller as seen in appendix N. We increased the number of elements to 5 and reassigned them to our spheres (basketballs) so that when the user presses the 'Space' key, all balls are reset to the starting position. However, even after the reset the balls will keep their colors from the previous round, (red if they missed, and green if they made it) allowing a user to keep track of their score from the previous round and have a target to beat for the current round.

Hypothesis and Procedure:

Our hypothesis for this project will be that a user's success rate (how many hoops they can make in 5 attempts) is unaffected by the force feedback they receive.

The procedure for collecting data to prove or disprove this hypothesis would be to record the number of hoops a user makes with the first version of the application (one with force feedback) and record the number of hoops a user makes with the second version of the application (without feedback). Additionally, we will allow users 3 attempts at each version and take the average of the three accuracy percentages of makes to get a more thorough read on the correlations between haptic feedback and no haptic feedback. The Analysis and Discussion section will include comparisons of all the different users' accuracy for both versions and seeing the average difference in accuracy between the two versions.

Observations and Analysis & Discussion :

Table 1: Number of shots a user makes in both versions for each attempt

User	Shots Made in first attempt (with haptic feedback) - version 1	Shots Made in second attempt (with haptic feedback) - version 1	Shots Made in third attempt (with haptic feedback) - version 1	Shots Made in first attempt (with no haptic feedback) - version 2	Shots Made in second attempt (with no haptic feedback) - version 2	Shots Made in third attempt (with no haptic feedback) - version 2

User 1:	0	1	2	0	0	1
User 2:	0	1	4	0	0	0
User 3:	1	2	3	1	2	2
User 4:	0	2	2	1	2	0
User 5:	0	1	3	0	1	0
User 6:	1	0	2	0	2	2

Now we can analyze these numbers further by totalling the amount the users made with each version. Additionally we will also add a column and calculate the accuracy of makes versus shots attempted using this equation. $number\ of\ makes\ /\ 15$. As each participant in total attempted each version 3 times while each version gave you 5 individual attempts. Meaning 3 x 5 = 15 attempts per version. Let's look at the updated table.

Table 2: Displays the accuracy (percentage of shots made versus attempted) and the total number of shots made per version.

User	Number of Makes for total version 1 (with haptic feedback)	Percentage of shots made versus attempted (%)	Number of Makes total for version 2 (without haptic feedback)	Percentage of shots made versus attempted (%)
User 1	3	20	1	6
User 2	5	33.3	0	0
User 3	6	40	5	33.3
User 4	4	26.7	3	20
User 5	4	26.7	1	6
User 6	3	20	4	26.7

Looking at the data now, we can see with the exception of user 6, every other user performed considerably worse in the second version (without haptic feedback) than they did in the first version (with haptic feedback). In fact when we average out all the users' percentages for the first version (with haptic feedback we get an average percentage of shots made that is 27.8%. This is done with the below equation of adding the total percentages of each user and dividing by the number of users (6) in version 1.

$((20\% + 33.3\% + 40\% + 26.7\% + 26.7\% + 20\%) / 6) = 27.8\%$

We can now do the same with version 2 (without haptic feedback).
((*6% + 0% + 33.3% + 20% + 6% + 26.7%*) / 6) = 15.3%

This shows us that the average percentage of shots made between all users in version 2 (without haptic feedback) is 15.3% which is 12.5% worse than the average percentage for version 1. In fact, despite participants doing the first version first and having 15 shots to understand the motion of the game (as the application is unchanged, just the haptic feedback a user experiences), participants on average performed an astonishing ~1.81 times worse without haptic feedback. This analysis and data therefore disproves our original hypothesis stating that haptic feedback will not have an affect on a participants ability to make a shot when in fact after our study, participants performed 1.8x worse on average when removing haptic feedback.

Additionally after our study we allowed participants to fill out a google forms survey through a QR Code found in Appendix A. The results of that survey in summary by google forms is posted in Appendix B. But we will further discuss it. When asked about the enjoyability for version 1 of the application (with haptic feedback), 66% of users rated it a 5/5 and the rest voted it a 4/5. When asked about the enjoyability for version 2 of the application (without haptic feedback), 50% of users rated it a 2/5, 2 users voted it a 3 /5 while one user voted it a 5/5. When asked about the difficulty for version 1 of the application (with haptic feedback), 50% of users rated it a 3/5, 2 people voted it a 2/7 and one user voted it a 1 /7. When asked about the enjoyability for version 2 of the application (without haptic feedback), 2 users voted it a 2/7 , one user voted it 1 / 7, 2 more users voted it a 5/7 and one user voted it a 1/7. When asked about how natural the application felt for version 1 (with haptic feedback), 66% of users rated it a 5/5, one user rated it a 4/5 and another voted it a 3 / 5. When asked about how natural the application felt for version 2 (without haptic feedback), 66% of users rated it a 5/5, one user rated it a 4/5 and another voted it a 3 / 5. Lastly users were allowed to have an open ended response which is shown below.

Table 3: Displays users open ended suggestions on our application

User	Suggestion:
User 1	Shots from different ranges
User 2	Change the camera angle a bit
User 3	Nothing its great
User 4	No movement on the second version
User 5	More angle to throw from

User 6	Bigger hoop

With the results of the questionnaire we can conclude that on average users enjoyability of the game was relatively positive with haptic feedback compared to without haptic feedback. Users rated the application without haptic feedback as more difficult in comparison to the application with haptic feedback. Lastly, users further rated on average that the application with haptic feedback where they are able to feel the weight and resistance of the ball felt more natural to use as compared to the application without haptic feedback. We can further infer that a user's enjoyability of the application is directly linked to the natural feel that an application delivers, allowing a user to perform better as proven by our results.

Comments on Engineering Life Cycle:

We are both software engineers and implemented the Software Development Life Cycle very thoroughly throughout our development of this project. We developed our software in iterations using mainly the Agile model of the Software Development Life Cycle. However we borrowed a little from the Waterfall model as well because we firstly performed a planning and requirement analysis where we carefully studied the course project description given to us and tried to decide what are the main functionalities we should try to aim for in our first iteration of building this software. Another major thing we decided during this Req Analysis phase was what tools would be best suited to meet these requirements, which is when we decided on developing with Unity instead of OpenGL as we felt our skill sets were higher in that area. We did the design and development phases in small weekly time frames where we would split up the work and reconvene during the labs to discuss our progress and help each other with any errors but mainly to test our progress so far. This cycle of planning ,analysis, designing, building, and testing would repeat for each iteration as each build was incremental in terms of features and the only testing we could get done was in the lab since we did not have the haptic device available outside of the lab which is why the weekly time frames worked perfectly for us. We saw many advantages such as being able to accommodate changing requirements very easily such as feedback from our TA's as well as having documentation be easily employed between versions of our application ,etc. In general these development life cycle models worked well for us.

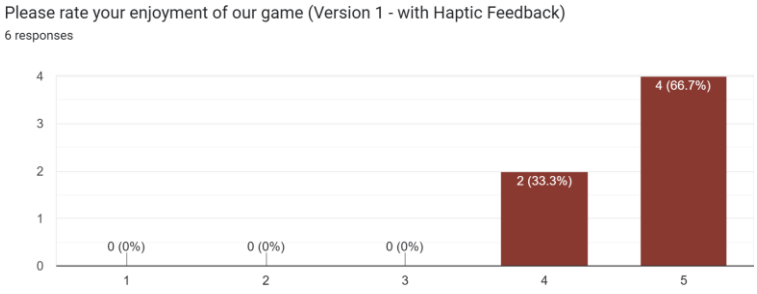
References:

- 3d Model asset of basketball hoop: https://3dwarehouse.sketchup.com/model/849803283cf10ab619420b7669e7265/TZU107-Basketball-Goal?hl=en
- Wooden parquet texture: https://stock.adobe.com/search/images?k=hardwood+floor+pattern&asset_id=163321474

Appendices:

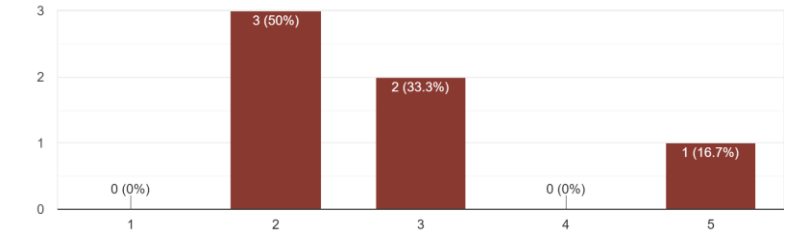
Appendix A: QR Code used for users to fill in a questionnaire

Appendix B: Google Forms Survey Results of Each Questions



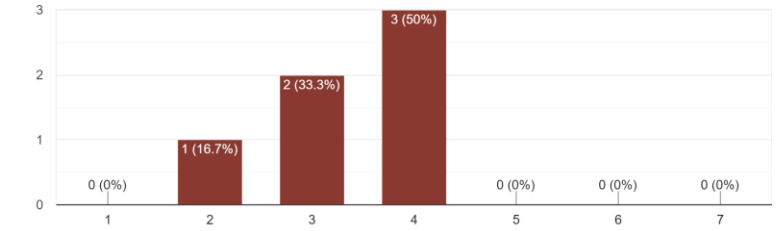
Please rate your enjoyment of our game (Version 2 - WITHOUT Haptic Feedback)

6 responses



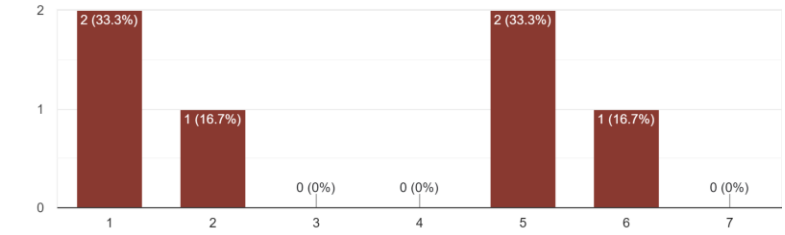
What would you rate the difficulty of our game? (Version 1 - with Haptic Feedback)

6 responses



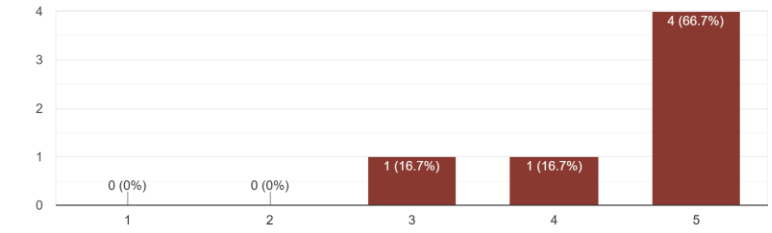
What would you rate the difficulty of our game? (Version 2 - WITHOUT Haptic Feedback)

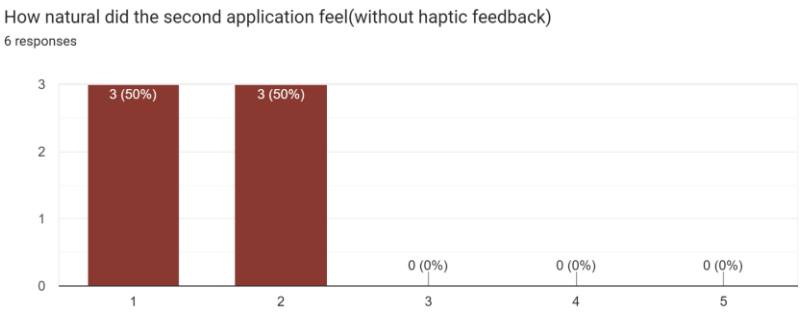
6 responses



How natural did the first application feel (with haptic feedback)

6 responses





How can we improve our game?

6 responses

Shots from different ranges

Change the camera angle a bit

Nothing its great

No movement on the second version

More angle to throw from

Bigger hoop

Appendix C: UPDATED CONSENT FORM

Consent Form:

Researchers:

Aashik Ilangovan, Engineering, Software: aashik.ilangovan@ucalgary.ca: 587-891-9667

Gibran Akmal, Engineering, Software: gibran.akmal@ucalgary.ca*: 403-383-9736*

Supervisor:

Professor Yaoping Hu, Engineering, huy@ucalgary.ca

VR Basketball Mini Hoops

The University of Calgary Conjoint Faculties Research Ethics Board has approved this research study.

Participation is entirely voluntary and confidential.

Purpose of the Study

The purpose of this study is to conduct research on how haptic feedback affects a user. More specifically in relation to the project, the study aims to understand the physical discrepancies user experiences when using a haptic feedback device, and while experiencing different levels of haptic feedback

What Will I Be Asked To Do?

You will be tasked with playing a basketball mini hoop game. The user will be given 5 basketballs to throw into the hoop. The user will use two different versions of the basketball mini-game where the game will feel slightly different. You will be using each application 3 times. Additionally, we will ask a few simple questions about your experience including your enjoyment of using the application, your rating of the difficulty of the different applications etc. The total time for completing both versions of the application should take about 5 - 10 minutes per participant.

If allowed we would like to videotape participants to see their reactions to the force feedback and how they choose to counteract the changes in the two versions.

Your participation in this study is entirely voluntary and you refuse to participate in parts or all of the study, refuse to answer any or all questions and may withdraw from the study at any given time without penalty.

What Type of Personal Information Will Be Collected?

There are several options for you to consider if you decide to take part in this research. You can choose all, some, or none of them. Please review each of these options and choose Yes or No:

I grant permission to be video-taped: Yes: ___ No: ___

I grant permission to have my company's name used: Yes: ___ No: ___

I wish to remain anonymous: Yes: ___ No: ___

I wish to remain anonymous, but you may refer to me by a pseudonym: Yes: ___ No: ___

The pseudonym I choose for myself is: _____

You may quote me and use my name: Yes: ___ No: ___

The video tapings will only be shown to the researchers conducting the study and any supervisors that may request its access.

You can revise the list of choices as necessary to accommodate the circumstances of your research.

Are there Risks or Benefits if I Participate?

There are no foreseeable risks or benefits if you choose to partake in the study.

What Happens to the Information I Provide?

The information you provide will be used in conducting our analysis of the data collected. Ultimately names and any other personal information given will be confidential to the researchers and supervisors and will be left out when providing statistics and analysis on the data that we collect while you participate in the study. Pseudonyms will only be used while discussing a participant's trial and will be left out in the final analysis.

Participants are free to withdraw until 2 Weeks after the data collection, if they decide to withdraw from the study the data will be erased from the study as well as any additional information provided.

No one except the researcher and her supervisor will be allowed to see or hear any of the answers to the questionnaire or the interview tape. There are no names on the questionnaire. Only group information will be summarized for any presentation or publication of results. The questionnaires are kept privately online and cabinet only accessible by the researchers and their supervisor. The anonymous data will be stored for 1 year on a computer disk, which will be permanently erased.

Signatures

Your signature on this form indicates that 1) you understand to your satisfaction the information provided to you about your participation in this research project, and 2) you agree to participate in the research project.

In no way does this waive your legal rights nor release the investigators, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from this research project at any time. You should feel free to ask for clarification or new information throughout your participation.

Participant’s Name: (please print) _____

Participant's Signature: _____ Date: _____

If consenting to participate anonymously(please print "Yes"):_____ Date:_____

Researcher's Name: (please print) _____

Researcher's Signature: _____ Date: _____

Questions/Concerns

If you have any further questions or want clarification regarding this research and/or your participation, please contact:

Researcher(s):

Aashik Ilangovan, Department of Engineering, Software: aashik.ilangovan@ucalgary.ca, 587-891-9667

Gibran Akmal, Department of Engineering, Software: gibran.akmal@ucalgary.ca, 403-383-9736

If you have any concerns about the way you've been treated as a participant, please contact the Research Ethics Analyst, Research Services Office, University of Calgary at 403.220.6289 or 403.220.8640; email cfreb@ucalgary.ca. A copy of this consent form has been given to you to keep for your records and reference. The investigator has kept a copy of the consent form.

Appendix D: SIGNATURES OF NON ANONYMOUS PARTICIPANTS

Signatures

Your signature on this form indicates that 1) you understand to your satisfaction the information provided to you about your participation in this research project, and 2) you agree to participate in the research project.

In no way does this waive your legal rights nor release the investigators, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from this research project at any time. You should feel free to ask for clarification or new information throughout your participation.

Participant's Name: (please print) Quinn Ledingham

Participant's Signature: _____ Date: 2022-12-2

If consenting to participate anonymously(please print "Yes"):_____
Date:_____

Researcher's Name: (please print)
Gibran Akmal, Aashik Ilangovan

Researcher's Signature: _____ Date: Dec 2, 2022

Signatures

Your signature on this form indicates that 1) you understand to your satisfaction the information provided to you about your participation in this research project, and 2) you agree to participate in the research project.

In no way does this waive your legal rights nor release the investigators, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from this research project at any time. You should feel free to ask for clarification or new information throughout your participation.

Participant's Name: (please print) Jens Varughese

Participant's Signature: _____ Date: _____

If consenting to participate anonymously(please print "Yes"):_____
Date: 2022-12-02

Researcher's Name: (please print)
Gibran Akmal, Aashik Ilangovan

Researcher's Signature: _____ Date: Dec 2, 2022

Signatures

Your signature on this form indicates that 1) you understand to your satisfaction the information provided to you about your participation in this research project, and 2) you agree to participate in the research project.

In no way does this waive your legal rights nor release the investigators, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from this research project at any time. You should feel free to ask for clarification or new information throughout your participation.

Participant's Name: (please print) Cobe Reinhold

Participant's Signature: CR. Date: Dec 1, 2022

If consenting to participate anonymously(please print "Yes"):_____
Date:_____

Researcher's Name: (please print)
Gibran Akmal, Aashik Ilangovan

Researcher's Signature: _____ Date: Dec 2, 2022

Signatures

Your signature on this form indicates that 1) you understand to your satisfaction the information provided to you about your participation in this research project, and 2) you agree to participate in the research project.

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Participant's Name: (please print) Hunter Coles

Participant's Signature: _____ Date: Dec 2, 2022

If consenting to participate anonymously(please print "Yes"):_____
Date:_____

Researcher's Name: (please print) Gibran Akmal, Aashik Ilangovan

Researcher's Signature: _____ Date: Dec 2, 2022

Signatures

Your signature on this form indicates that 1) you understand to your satisfaction the information provided to you about your participation in this research project, and 2) you agree to participate in the research project.

In no way does this waive your legal rights nor release the investigators, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from this research project at any time. You should feel free to ask for clarification or new information throughout your participation.

Participant's Name: (please print) Jackson Carnegie

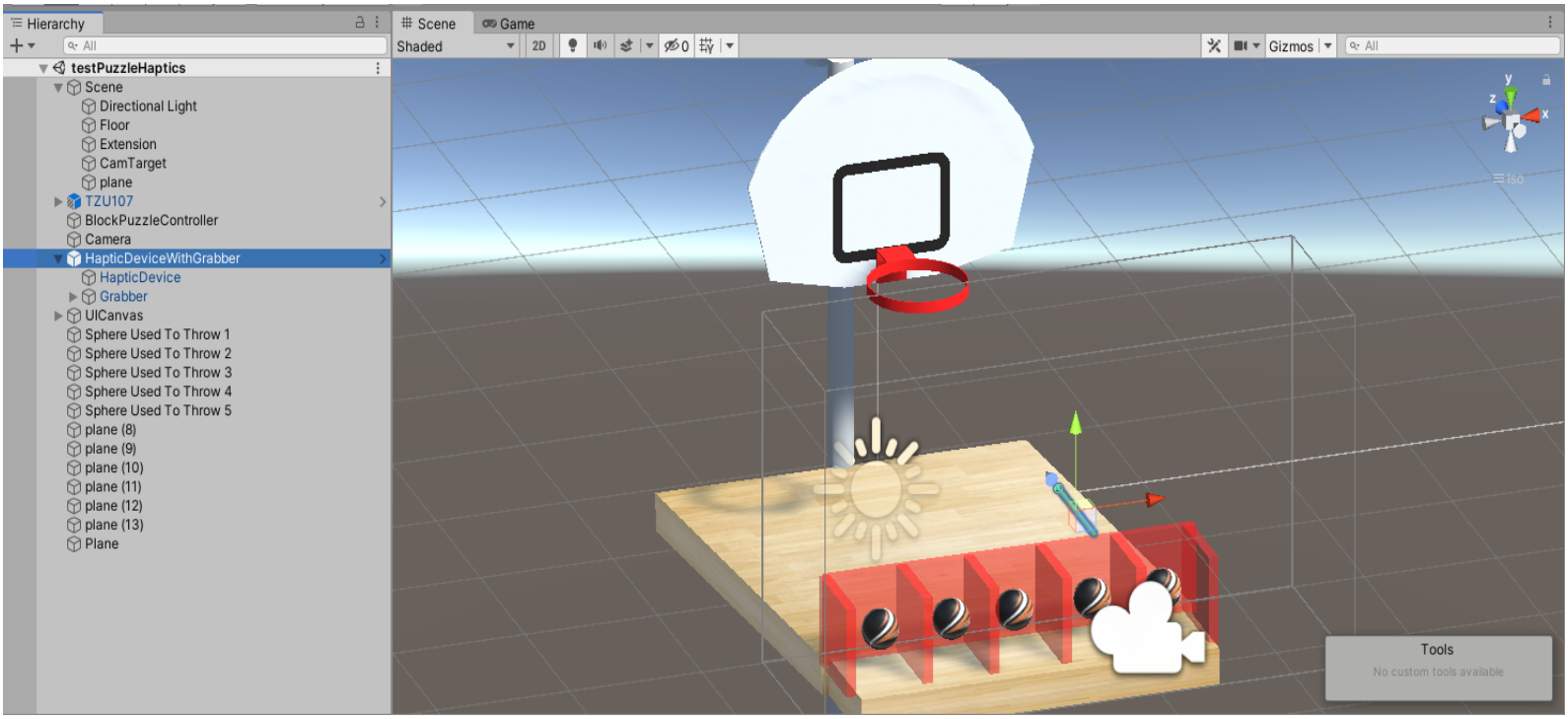
Participant's Signature: Jackson Carnegie Date: Dec 2, 2022

If consenting to participate anonymously(please print "Yes"):_____
Date:_____

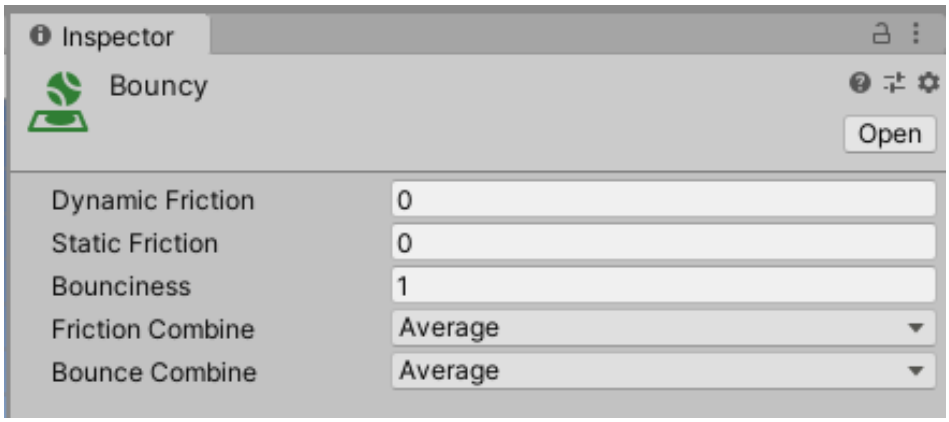
Researcher's Name: (please print) Gibran Akmal, Aashik Ilangovan

Researcher's Signature: _____ Date: Dec 2, 2022

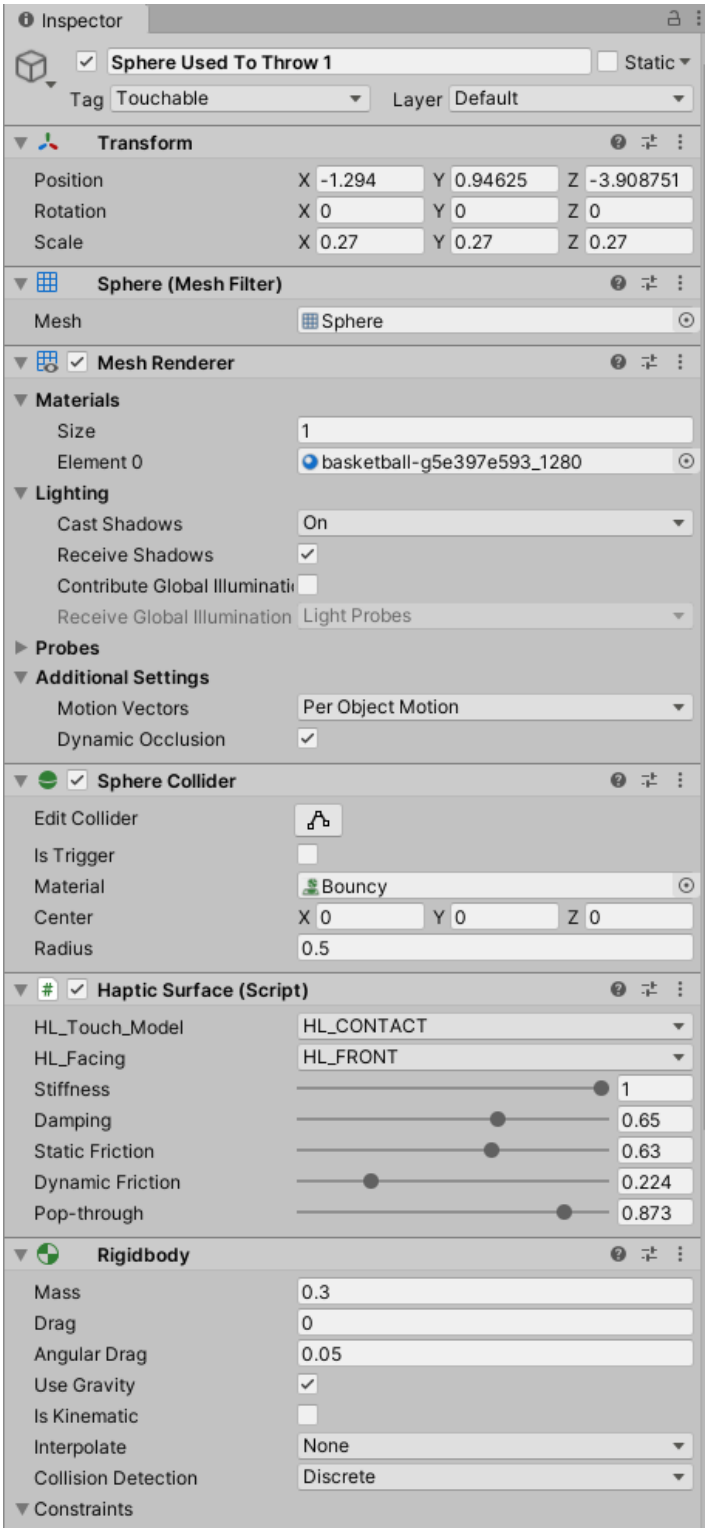
Appendix E: OBJECTS IN THE SCENE



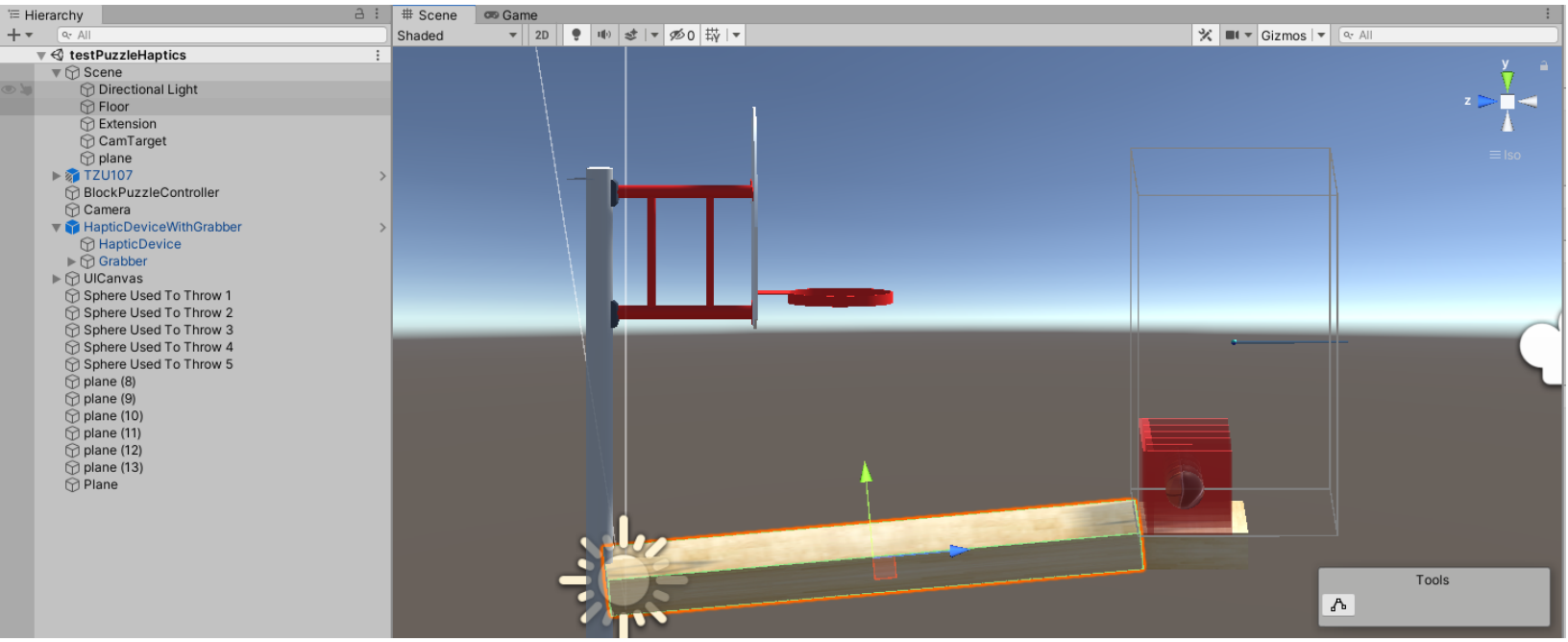
Appendix F: CUSTOM 'BOUNCY' MATERIAL



Appendix G: COMPONENTS ON A BALL SPHERE OBJECT



Appendix H: EXTENDED PLANE OBJECT & ITS COMPONENTS



Inspector

Floor — Static

Tag: Touchable — Layer: Default

Transform

	X	Y	Z
Position	-3.1	5.1	-23.1
Rotation	-5	-180	0
Scale	37.33333	3.373544	50

Cube (Mesh Filter)

Mesh: Cube

Box Collider

Edit Collider

Is Trigger: ☐

Material: None (Physic Material)

	X	Y	Z
Center	0	0	0
Size	1	1	1

Mesh Renderer

Materials

Size: 1

Element 0: istockphoto-577965322-170667a

Lighting

Cast Shadows: On

Receive Shadows: ☑

Contribute Global Illuminati: ☐

Receive Global Illumination: Light Probes

Probes

Additional Settings

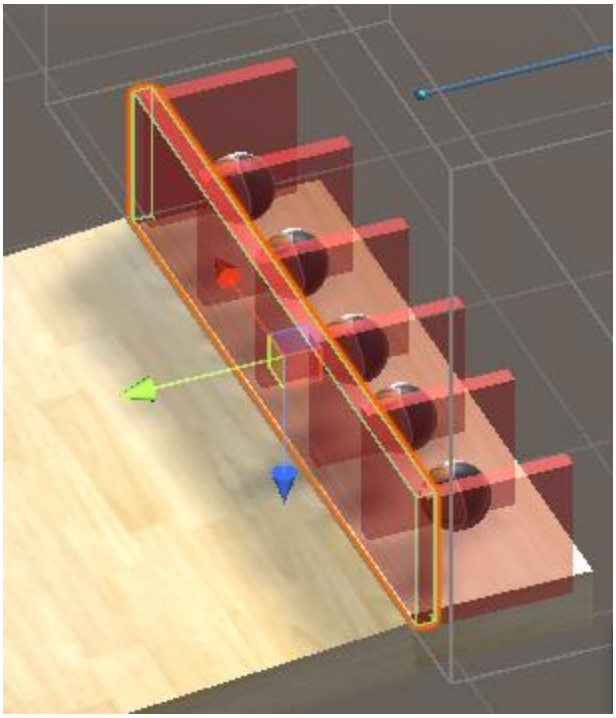
Motion Vectors: Per Object Motion

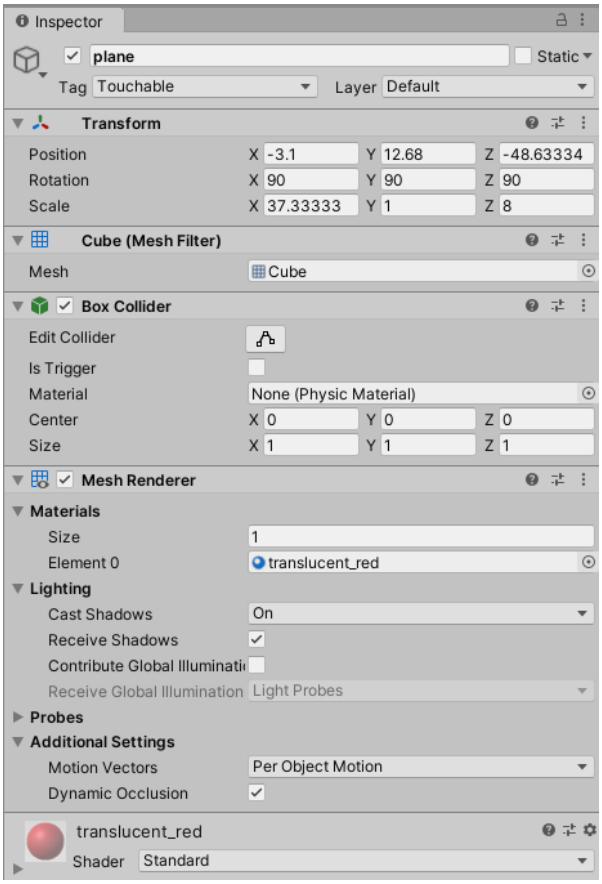
Dynamic Occlusion: ☑

istockphoto-577965322-170667a

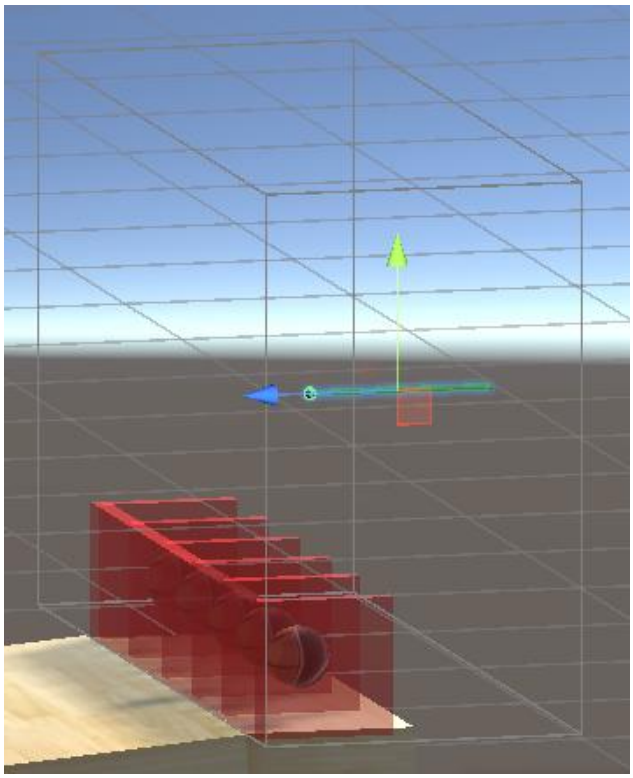
Shader: Standard

Appendix I: BARRIER PLANES & ITS COMPONENTS

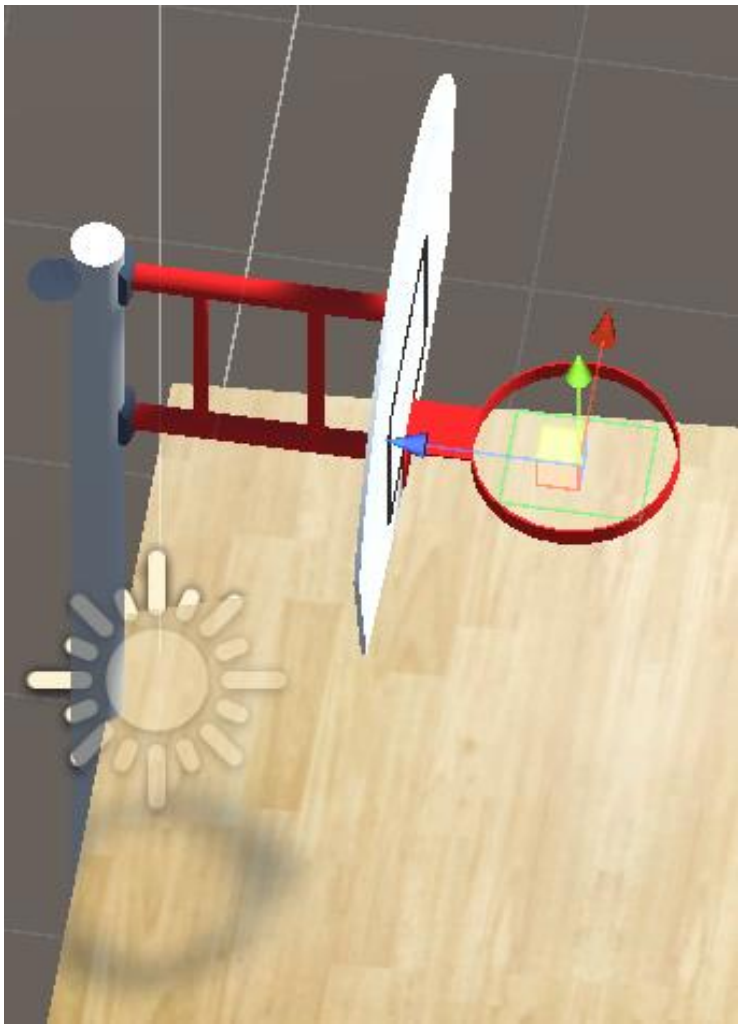




Appendix J: GRABBER AREA OF OPERATION



Appendix K: SPLASH PLANE & COMPONENTS



Inspector

Plane — Static

Tag: Untagged — Layer: Default

Transform

Position	X -0.2	Y 2.136	Z -1.514
Rotation	X 0	Y 0	Z 0
Scale	X 0.04	Y 1e-17	Z 0.05

Plane (Mesh Filter)

Mesh: Plane

Mesh Renderer

Materials

- Size: 1
- Element 0: Default-Material

Lighting

- Cast Shadows: On
- Receive Shadows: ✓
- Contribute Global Illuminati: ☐
- Receive Global Illumination: Light Probes

Probes

Additional Settings

- Motion Vectors: Per Object Motion
- Dynamic Occlusion: ✓

Mesh Collider

- Convex: ✓
- Is Trigger: ✓
- Cooking Options: Mixed...
- Material: None (Physic Material)
- Mesh: Plane

Spash (Script)

Script: Spash

Default-Material

Shader: Standard

Appendix L: Splash.cs SCRIPT

Spash.cs

Assembly-CSharp | Spash | Start()

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
//This is a custom script we built for scoring functionality - Gibran Akmal
//This script changes the color of any game object that enters the trigger volume under our basketball hoop, indicating a made shot (Splash)
Unity Script (1 asset reference) | 0 references
public class Spash : MonoBehaviour
{
    // Start is called before the first frame update
    //nothing to do in the start or update functions
    Unity Message | 0 references
    void Start()
    {

    }

    // Update is called once per frame
    Unity Message | 0 references
    void Update()
    {

    }

    //Upon collision with another GameObject, this will change color of that game object to Green
    Unity Message | 0 references
    private void OnTriggerEnter(Collider other)
    {
        //get the renderer component and change the material color.
        other.gameObject.GetComponent<Renderer>().material.color = new Color(0, 1, 0, 1);

        Debug.Log("MADE SHOT!");

    }
}
```

Since the ‘trigger’ option was enabled for the collider, this means we can set up an OnTriggerEnter() method meaning as soon as our plane is touched by the collider of some other object, that function will execute. The function gets the object that the collider belongs to, and changes its color to green. Also prints to the debug console that a shot has been made.

Appendix M: HapticGrabber.cs SCRIPT MODIFICATION

```
//if something is currently being grabbed by the grabber
if (grabbing)
{

    basketBall = grabbing; //assign that gameObject to the basketball variable to store for later use

    //Get the Renderer component of the sphere (basketball) and assign it a new color of RED as soon as the ball is grabbed
    basketBall.GetComponent<Renderer>().material.color = new Color(1, 0, 0, 0);

    Debug.Log("CURRENTLY GRABBING SOMETHING");

}
//otherwise if nothing is being grabbed and there is no object assigned to the variable basketball
else if (!grabbing && basketBall != null)
{
    //output to the log that nothing is being grabbed
    Debug.Log("CURRENTLY NOT GRABBING ANYTHING");

    //optionally can also change the color of the balls back to normal
    //however we don't want this since we want our users to be able to visually track their misses and buckets from the previous attempt
    //basketBall.GetComponent<Renderer>().material.color = new Color(1, 1, 0, 1);
}
```

Appendix N: BALL RESET