# Abstract

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# Introduction

At a minimum the project aims to discover and implement the destruction of a virtual environment. In particular, individual objects made up of different materials such as: Wood, Glass and Stone will be created with unique variations of destruction.

A tool will be devised allowing dynamic destruction via the unity pipeline, quickly creating destructible objects. Done efficiently, memory would be saved allowing the tool to be used in active environments such as in video games.

# Background Research

## **Research Aims/Questions:**

* How does basic destruction operate?
* How shattering works in software like blender?
* The Structures of different materials?
* Can destruction be computationally efficient?

## **Research methods**

Qualitive research: the task requires exploration of a (personally) unknown field, tutorials will be used and discoveries analysed.

Software’s (like blender) will be studied for how shattering is done, as this is needed for the unity pipeline.

Quantitative research: for accuracy of physical destruction, understanding of basic physics and the makeup of objects in a digital space.

# Outcomes

A tutorial by (DanielFilms, 2017) allowed insight towards destroying objects in a conventional manor. The technique involving the replacement of an object with a “shattered” variant.

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Figure 1

A cube in blender

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Figure 4 And some basic code from (Brackeys, 2017)

Figure 3 Using the cell fracture addon mentioned in (DanielFilms, 2017).

Figure 2 After applying multiple subdivisions

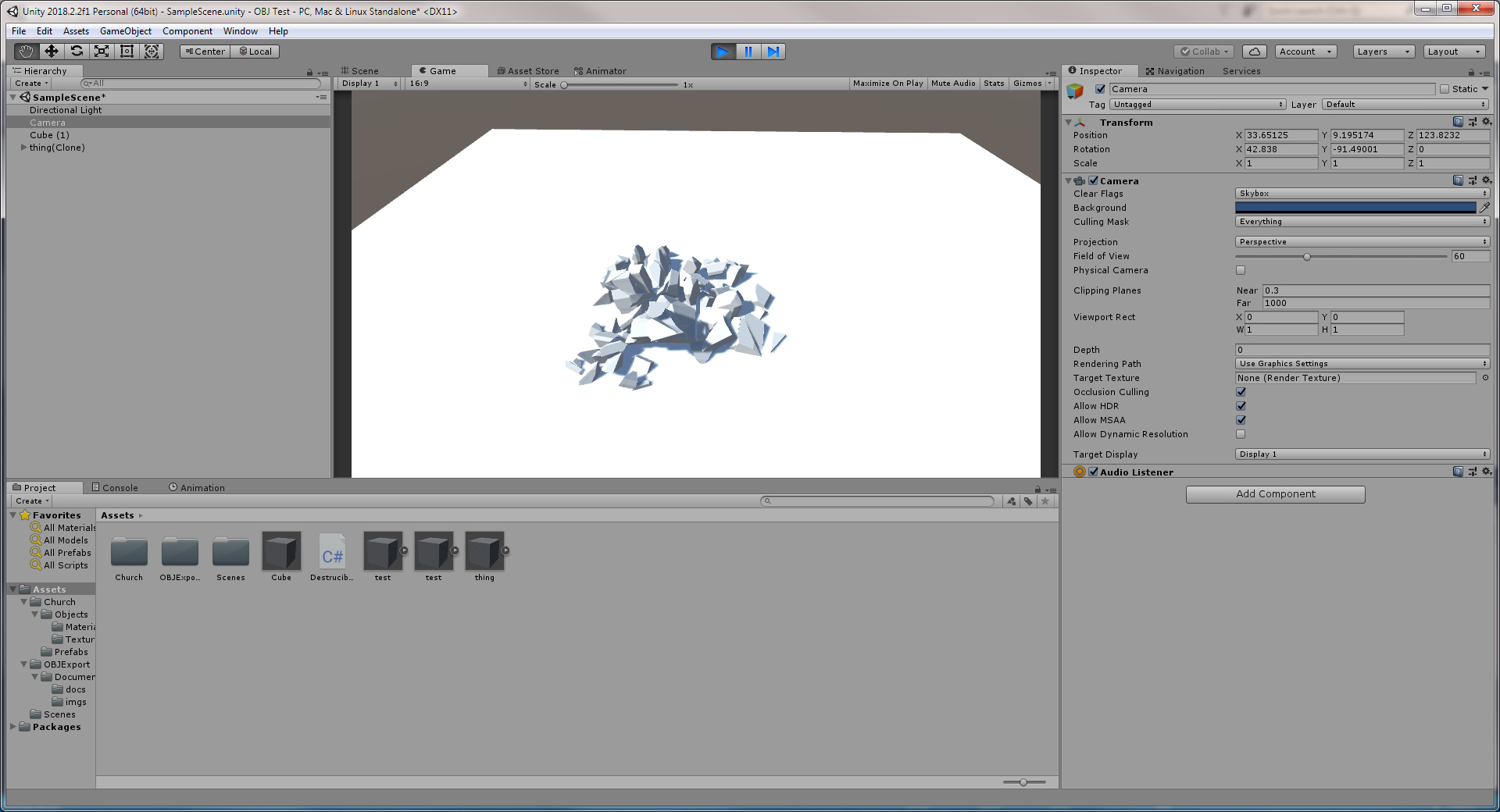


Figure 5 A simple cube shattering from gravity after being clicked on.

Afterwards a premade tool allowing objects to be cut was discovered.

This being essential, as objects that shatter are required to break into pieces, this is covered in a simple manor with mesh alteration in the cut.

(BLINDED-AM-ME, 2018)’s MeshCut and MeshMaker class were downloaded and implemented using an array of game objects that stored the output.

using System.Collections;

using System.Collections.Generic;

using UnityEngine;

public class CutInHalf : MonoBehaviour

{

void OnMouseDown()

{

GameObject[] pieces = MeshCut.Cut(gameObject, transform.position, transform.right, GetComponent<Renderer>().material);

for (int i = 0; i < pieces.Length; i++)

{

if (!pieces[i].GetComponent<BoxCollider>())

pieces[i].AddComponent<BoxCollider>();

if (!pieces[i].GetComponent<Rigidbody>())

pieces[i].AddComponent<Rigidbody>();

}

All the code below the cut adds a collider and rigidbody if there isn’t one, giving the objects physics and preventing falling through the floor via gravity.

}

}

Figure 2 This cube upon the click of the mouse

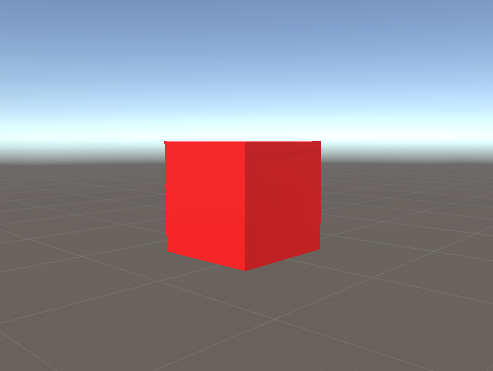


Figure 3 Is cut in two

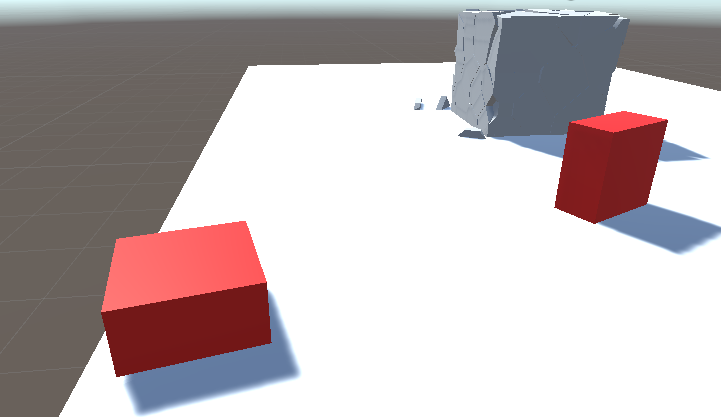
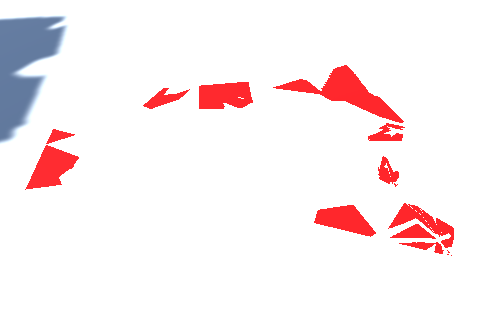


Figure 4 Although multiple clicks results in only shaving triangles of the object.



However, with the code provided in the classes used, gives insight into the mesh logic and can be extracted.

# Evaluation

Evaluate your outcomes and your approach, suggest further improvements or directions.

# References

# Bibliography

BLINDED-AM-ME. (2018, April 15). *Unity Assets*. Retrieved November 18, 2018, from Github: https://github.com/BLINDED-AM-ME/UnityAssets

Brackeys. (2017, February). *SHATTER / DESTRUCTION in Unity (Tutorial)*. Retrieved October 29, 2018, from Youtube: https://www.youtube.com/watch?v=EgNV0PWVaS8

DanielFilms. (2017, April). *How to make objects shatter in blender*. Retrieved October 29, 2018, from Youtube: https://www.youtube.com/watch?v=SlJEInN\_Els