

## [ PHOTOGAMMETRY ]

What are beneficial use-cases for photogrammetry in a 3D game?

# Photogrammetry

Presentation by

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As specialization topic in the Game Creation and Producing Course at the Saxion University of Applied Science

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Dienstag, 23. August 2016

# Introduction

the reason behind this research

**I choose this topic for my research, because I found it always delightful to be able to scan in real world object for the use in a virtual environment.**

Since I knew photogrammetry and the workflow behind it, its something, that I wanted to try out a bit more in depth on my own. As Photogrammetry seems to be used more and more in the industry recently, the topic is more relevant than ever.

The paper is examining the general boundaries and benefits of photogrammetry and looks at its usability in a few different use cases, to be able to draw a conclusion, for which type of project it's a suitable addition to the regular modeling and texturing workflow.



# Research Questions

Theoretical Background

*What are beneficial use-cases for photogrammetry in a 3D game?*

How useful is photogrammetry for scanning objects that are used in a 3D game?

What kind of objects are suitable for photogrammetry?

What challenges are there when applying photogrammetry?

# Scope

The boundaries of the research



## Requirements

What hardware & software is required?



## Complexity

How complex is the scanning process? What limitations does it have?



## Output

What are the results?





## First Tests



# Mossy Stone V1

first scans

I have read already quite a lot about photogrammetry in the past, so that I had already a rough idea about it, before I started shooting.

However, I though it makes sense to gain some personal experience with the process itself, before I start an in depth research.

So I picked up a mossy stone from our garden, placed it on piece of newspaper on our garden table and started capturing.







# First thoughts

Limitation of the camera



I started capturing the images with an old compact camera, that was already collection dust in on of my drawers for years.

Although the end results turned out be quite good. I was a bit annoyed by the limited control, which I had with this camera.



# First Improvements





# Turntables

Let it move

## Why move the camera and not the object?

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One thing, which I noticed during my first test captures, was the quite time and space consuming step of replacing the camera with its tripod after every shot.

Because it was quite rainy, while I was trying to shot a few more objects on our garden table, I started to look into a less space consuming solution: turntables!



# Turntable V1

Simple, but effective





# Studio Setup V1

Improved capture setup

After I made some test sequences with the turntable, I thought it was time to further improve the rest of my equipment, to be able to gather some more comparable data for my further research.



## DSLR - Camera

Increased capture resolution to 18 Megapixel,  
Allowed more control over the image capture.



## Light Diffuser

Better control over the shadows and highlights on the capture objects.  
Reproducible, due to the fully artificial light source.



## Studio Background

Helps to avoid unintentional global illumination.  
Facilitates the masking of objects.





Further Improvements



# Automated Turntable

Be lazy



## Motorized Turntable

I added an Arduino with an stepper motor and Bluetooth module to the turntable, so that I am able to automatically move the capture object.



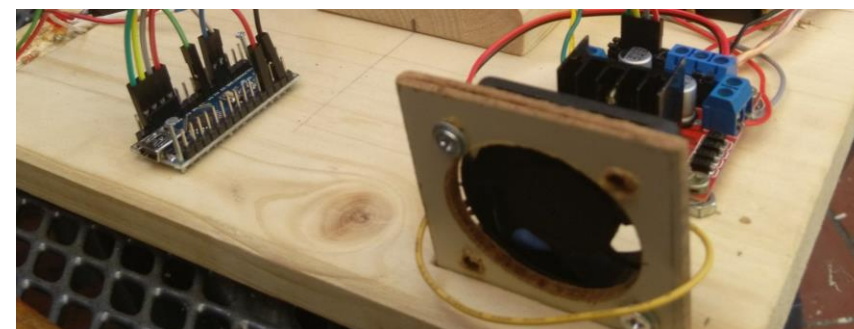
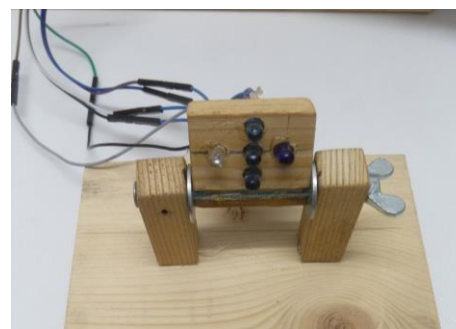
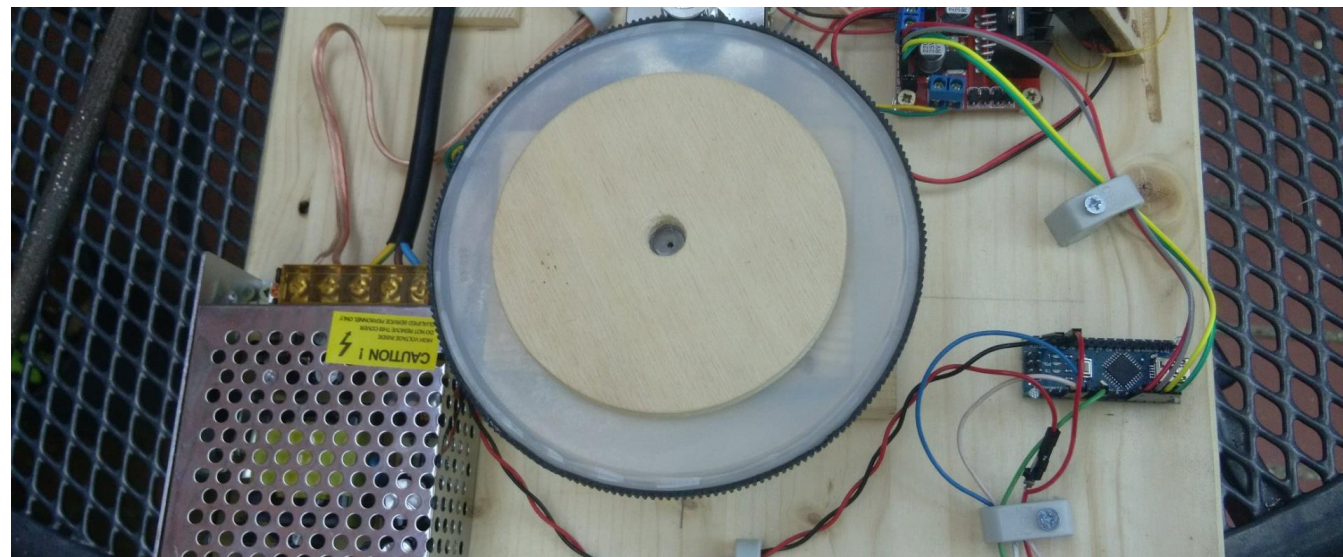
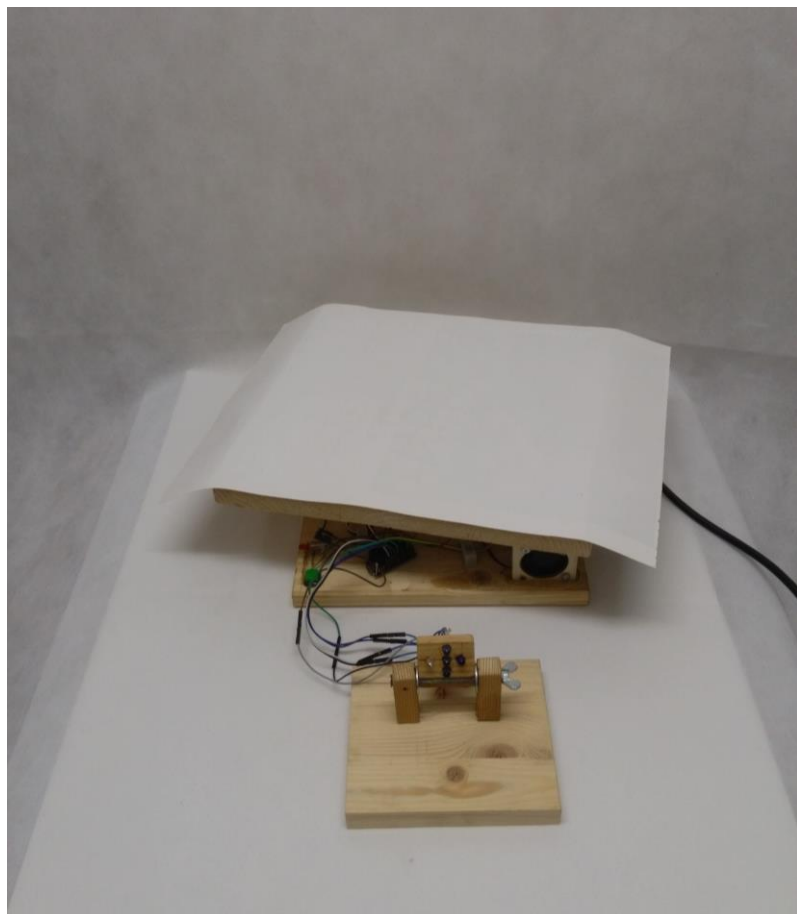
## Automated Camera

The Arduino is armed with a IR-LED array, to remotely trigger the DSLR

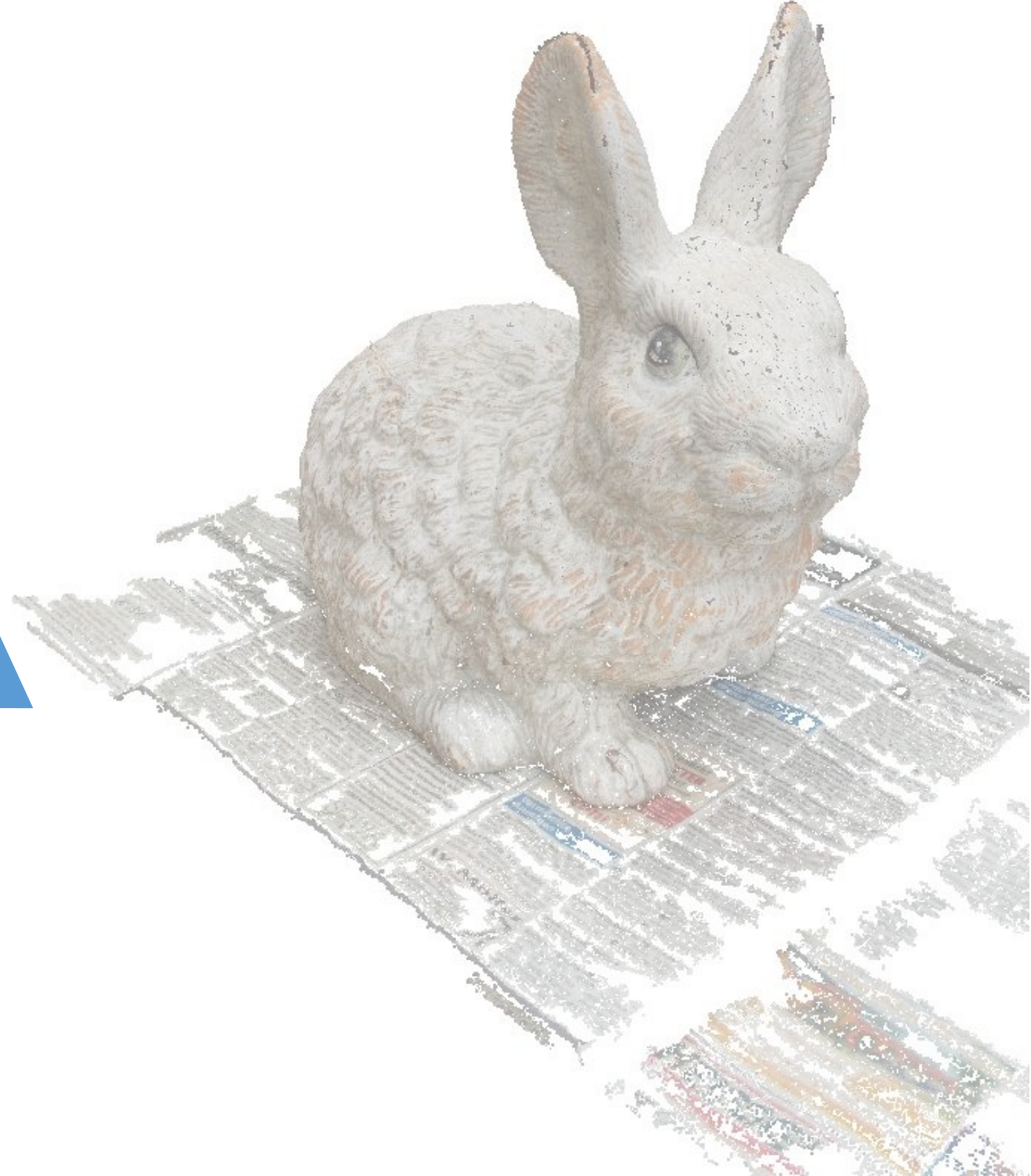


# Automated Turntable

Increased productivity



# Research Scans



# Research Scans

How are the objects influencing the capturing process?

To gather some own experience what difficulties may arise while capturing objects.

I selected a couple of test objects as representation of different object & material types, based on my previous research.



Wooden Log



Owl Decoration



Milk Can



Mossy Stone



Woodwaste



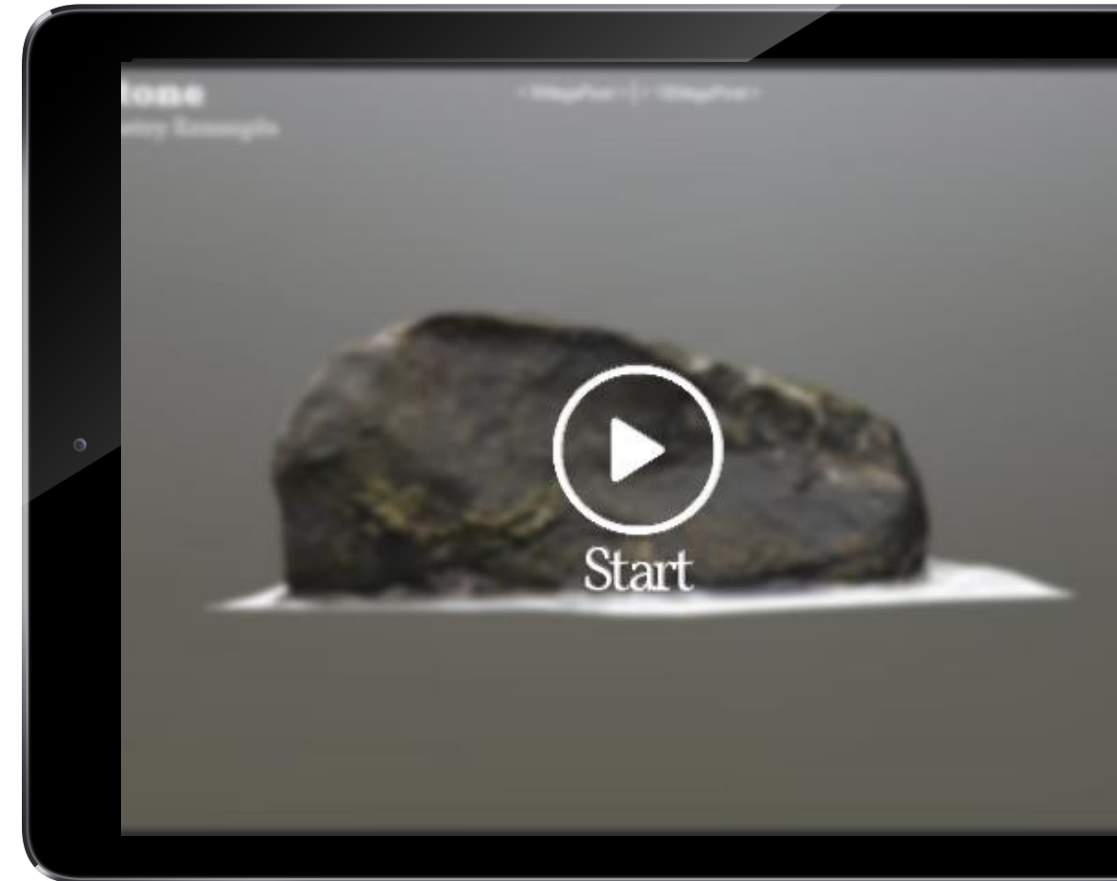
# Scan Results

Interactive model viewer

**Each of the scanned objects is pointing at a different advantage, or disadvantage of photogrammetry**

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This was meant as confirmation of the previous research and also to give a more in depth answer to the given main question. In addition, they offer some interesting content to visualize the more theoretical parts of the investigated technique.

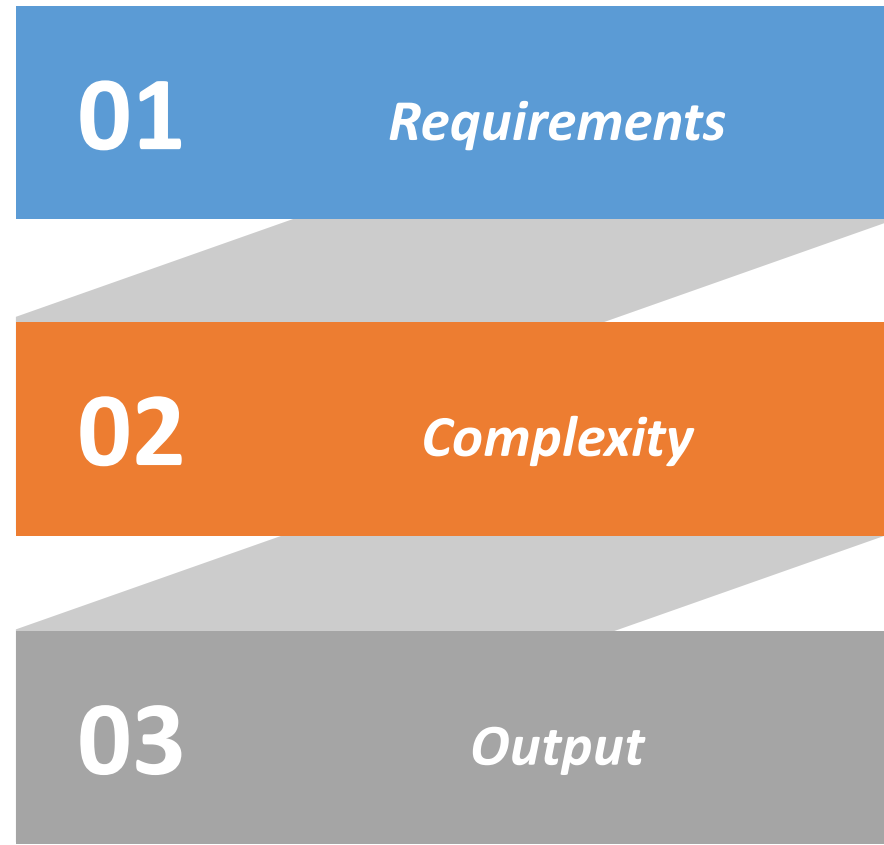


# Results

## The Outcome

The research scans have shown, that the use of photogrammetry can be a relatively quick and easy way, to produce assets with a great amount of detail, if the scanned object offers ideal surface definitions.

However, it also shows that it cannot fully replace the manual creation of assets from scratch, due to the increased effort that the creation of certain object types requires.



End results





# Conclusion

Of the research

## Photogrammetry,

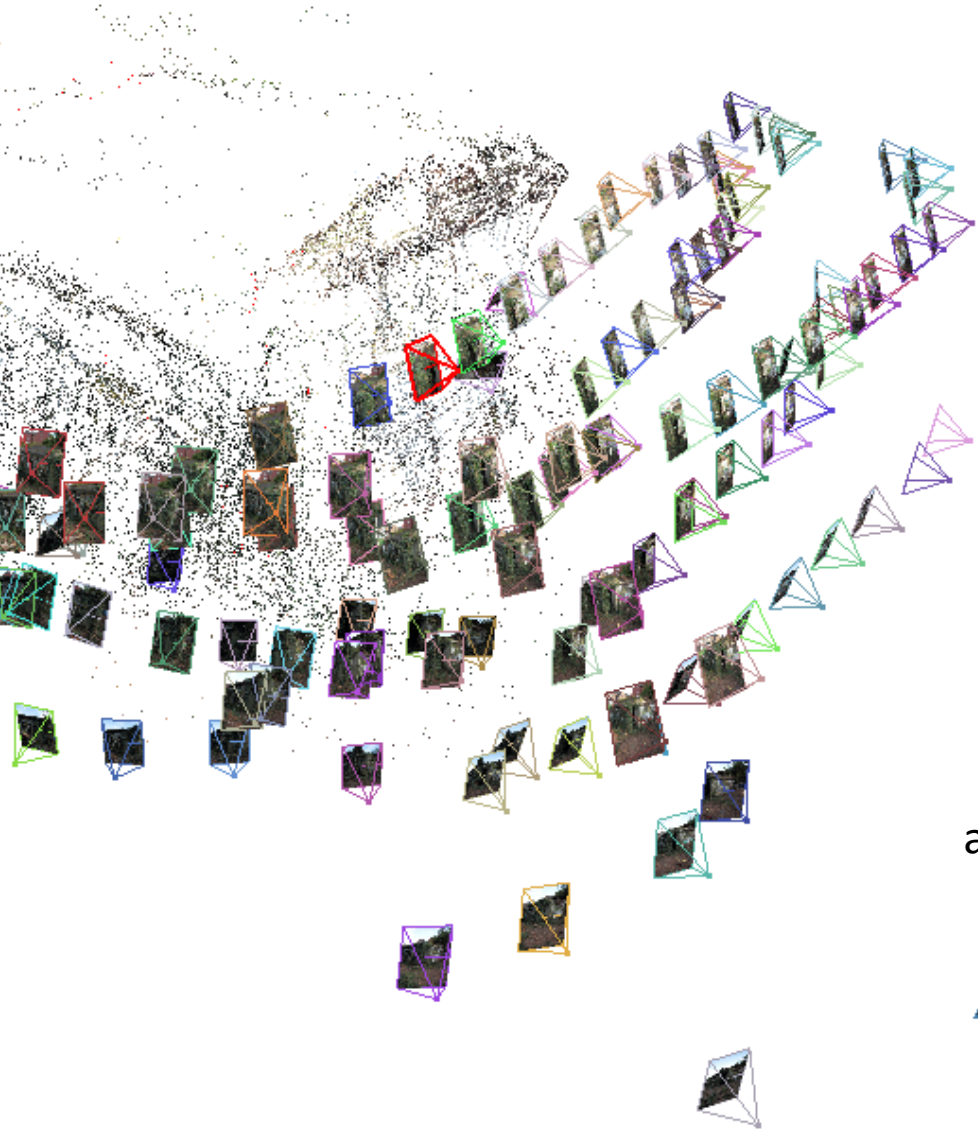
offers a valid addition to a regular modeling workflow for projects, which:



Require objects with a lot of surface details  
and/or wear & tear, or weathering effects with  
a realistic appearance



Don't contain a lot of  
objects with reflective,  
or transparent parts



# Recommendations

For starting with photogrammetry



If somebody is interested in looking into photogrammetry, there are a few things I would recommend to consider:

- 1 Start with something, that you have access to, an old camera, or your mobile phone, to figure out if it fits to you, before spending much time or money on it.
- 2 First scan some small and easy moveable objects, which are ideal for photogrammetry, to get a feel for it. Else you might be frustrated quickly.
- 3 Afterwards gradually increase the difficulty of your scans and amount of your equipment, if you like.



# Recommendations

For using photogrammetry in a project

Photogrammetry can be a useful addition to projects which include objects with mostly opaque and rough surfaces. As its strength is the scan of old and worn down objects, with a lot of wear & tear and history on their surface. The more surface details an object has, the easier the scanning gets.

However, when objects don't have a lot of surface definition, or problematic material types, like reflective, or transparent parts, the capturing and processing gets way more time intensive.



# Thank you

Questions?

