# Experiment and results

## What is the object you are going to test?

I am going to test the ambient occlusion that I programmed myself in Vulkan, the code can be found at:

<https://github.com/DaanDemaecker/DDM3-Lite-Engine>

The 3 AO techniques are:

* SSAO, Screen Space Ambient Occlusion
* HBAO, Horizon Based Ambient Occlusion
* GTAO, Ground Truth Ambient Occlusion

## What tests are you going to conduct?

I am going to perform 2 types of tests:

* Benchmarking to test the framerate and memory usage
* A questionnaire to see which type of ambient occlusion looks the best according to a group of people

## What are the concrete measurements you are going to do:

For the benchmarking: duration of Ambient occlusion generation in milliseconds, CPU usage, and VRAM usage.

The benchmarking will be done in a controlled environment with the same 3D models, the same sample count, and the same screen size.

The screen size and sample count, however, will be adjusted over the 3 types of AO at the same time to widen the range of measurements and get a clearer result.

For the questionnaire, what percentage of people have a certain preference for which ambient occlusion?

The questionnaire will show 4 images, 1 without AO, and then 3 with each a different type of AO. All with the same 3D Model and camera angle.

The 3D model will be switched out and the textures will be to once again widen the range of measurements.

## Who are the test subjects you are going to test with:

The test subjects for the questionnaire can be of any type of person, it is a matter of opinion. Expertise, age, gender, and other factors are all irrelevant to the questions presented.

## What are the results you expect, and what is the nature of the data you are going to accumulate:

* Expected results:  
  In terms of looks
  + “GTAO will look better than HBAO and SSAO”
  + “HBAO will look better than SSAO but worse than HBAO”
  + “SSAO will look worse than both GTAO and HBAO”
* - In terms of performance
  + “GTAO will perform better than HBAO and SSAO”
  + “HBAO will perform better than SSAO but worse than HBAO”
  + “SSAO will perform worse than both GTAO and HBAO”
* - In terms of memory usage
  + “GTAO and HBAO will have the same RAM usage and will both be better than SSAO”
  + “All 3 methods will have the same VRAM usage”

Nature of data:

* For performance and memory usage: qualitative data:
  + Performance: ms/time to generate ao
  + CPU usage: mb of usage
  + VRAM usage: mb of usage
* In terms of looks, qualitative data:
  + Percentage preference for each AO method based on questionnaire responses

## What type of analysis are you going to do:

Performance Data:

* Discard the 5 highest and 5 lowest measurements to eliminate outliers.
* Calculate average frame times, CPU usage, and VRAM over the 3 types of AO and compare.

Questionnaire data:

* Count total votes per AO method.
* Calculate percentages per AO method.
* Compare percentages.

## What parts of the case study/experiment will answer which of the hypotheses:

The hypotheses in terms of looks will be answered by the questionnaire.  
The hypotheses in terms of performance will be answered by the framerate benchmarking.  
The hypotheses in terms of memory usage will be answered by the memory usage benchmarking.