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Graduation Work Title

Supervisor: Vandenberghe Pieter-Jan

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Graduation Work 2023-2024

Digital Arts and Entertainment

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Contents

[Abstract & Key words 2](#_Toc153482830)

[Preface 3](#_Toc153482831)

[List of Figures 4](#_Toc153482832)

[Introduction 5](#_Toc153482833)

[Literature Study / Theoretical Framework 6](#_Toc153482834)

[Research 7](#_Toc153482835)

[1. Topic 1 7](#_Toc153482836)

[1.1. Subtopic 1 7](#_Toc153482837)

[1.1.1. Subtopic 7](#_Toc153482838)

[2. Topic 2 8](#_Toc153482839)

[1.2. Subtopic 1 8](#_Toc153482840)

[1.2.1. Subtopic 8](#_Toc153482841)

[case study 10](#_Toc153482842)

[1. introduction 10](#_Toc153482843)

[2. Modelling 10](#_Toc153482844)

[2.1. Blockout 11](#_Toc153482845)

[2.2. Zbrush 12](#_Toc153482846)

[3. Texturing 12](#_Toc153482847)

[4. Shading 12](#_Toc153482848)

[5. Lighting 13](#_Toc153482849)

[Discussion 14](#_Toc153482850)

[Conclusion 15](#_Toc153482851)

[Future work 16](#_Toc153482852)

[Critical Reflection 17](#_Toc153482853)

[References 18](#_Toc153482854)

[Acknowledgements 19](#_Toc153482855)

[Appendices 20](#_Toc153482856)

# Abstract & Key words

**An abstract explains the outline of the paper concisely (the methods, results, etc.). Maximum length of 250 words, preferably both in English and Dutch.**

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# Preface

***A preface is a statement of the author's reasons for undertaking the work and may include personal comments that are not directly relevant to other sections of the thesis or dissertation.* No word count limit.**

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# List of Figures

**The list of figures lists the figures in the order in which they appear throughout the thesis. They may be numbered sequentially, or be subdivided following the chapters in which they appear.**

Figure 1: A picture showing something

Figure 2: A graph showing another thing

Figure 3.1: A tabel showing yet another thing, that appears in chapter 3.

# Introduction

**In the introduction, you write the background of your topic and discuss the observation that spurred you on to do this research project. Explain the purpose of the paper and present your research question(s) and the hypothesis at the end of this section. This section is typically a couple of pages long.**

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# Literature Study / Theoretical Framework

**In the literature review, you present the secondary research you have conducted. You detail the background of your topics and write about the concepts that are relevant to the study. Assume that not every reader has the same skillset or -level as you do! This section typically requires a substantial amount of references and can be a lengthy section that requires a considerable amount of pages.**

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# Research

**In the research section, you detail the elements of your experiment(s), the tests, objects you will test upon and subjects you will test with, the data gathering, data cleaning or feature extraction, measurements, … and you present the results obtained in an objective manner for each of the tests you conducted.**

## Research Question:

What performance impact does switching from a state machine to Goal Oriented Action Planning have on a simulation game, and what’s the effect on the agent?

Feedback : Check de effect op de agent in de plaats performance van wat?? Welk effect op de agent?

## Hypothesises:

**H0**: After comparing the data graphs from both state machines and Goal Oriented Action Planning there is no real difference in performance. Both take the same amount of time or less than 5% difference running the scripts per frame.

**H1**: The Data graph of the Goal Oriented action planning take a longer time running the scripts for the frames, the Goal Oriented Action Planning takes more than 5% longer compared to the state machines. 1 zin

**H3**: The time it takes for both agents to complete their tasks is the same or there is a small difference of a second.

**H4**: The Agents of the state machine are faster compared to the agents of the Goal Oriented Action Planning approach.

!!!!Meet eenheid erbij zetten.!!!!!

## Methodology:

### Measuring Performance:

I will be measuring the performance of the state machine level and the Goal Oriented Action Planning level with the Unity Profiler. The target of the profiler is 60 fps and the data will be taken from builds and not tested in the editor. In the Profiler I will track how much time is spent on running the scripts. Once I have the data off both levels I will load the data in the Profile Analyzer where I get a better view of the captured frames. I will compare the first graph with the second graph.

### To check the difference in behaviours:

* Play the level multiple times and take the time of each agent to react and take the average of it and compare it to the other behaviours average time.

Methodologie uitschrijven. Veel groter

## Experiment:

The goal of the experiment is to compare **Goal Oriented Action Planning** against **State Machines** and answer the hypothesises.

### Experiment Set-Up:

I will create two visually identical levels in Unity. The only difference between the levels will be the AI behaviour logic. In the first level agents will use **Goal Oriented Action Planning**. In The second level agents will use **State machines**. The implementation of the Goal Oriented Action Planning is done using the guide by Penny The Byll (<https://learn.unity.com/project/goal-driven-behaviour?uv=2021.3&courseId=5dd851beedbc2a1bf7b72be>). For the **State Machines** in the second level I will be recreating the agents behaviours of the **Goal Oriented Action Planning** making sure the behave in exactly the same way.

#### Agent Behaviors

**Patient:**

* Go to Hospital.
* Register at the front desk.
* Go to the waiting room.
* Once a nurse is free go to the treatment room.
* Go home.

**Nurse:**

* Wait for patient
* Get patient from the waiting room
* Treat patient.
* Repeat.

### Testing the level for performance:

I will create a **build** for each one of the levels one for **Goal** **Oriented Action Planning** and one for **State Machines**.

#### Data Collection:

I will run each level for a **duration** of **5 minutes** while the **Unity Profiler** is collecting data. Once I have the data from a level I will only look at the **script execution time**, while the **target frame rate(FPS)** is set to **60 FPS**. After completing the test I will extract the **Unity Profiler** data and import it in the **Unity Profiler Analyzer** for a more detailed analysis. I will run the level with the **Unity Profiler** for **five times in total** and compare their data against themselves and take the **average of the five runs**.

#### Data Comparison:

After taking the average of the five runs for both **AI decision making systems** I will compare them against each other.

These are the variables I will Compare against each other:

* Average execution time per frame for scripts.
* How many time the target fps of 60 was missed.

These are the averages of **five runs** of **Goal Oriented Actions Planning** compared to the averages of five runs of **State Machines**. I will also a graph of every run.

### Answer:

After I have compared the **five runs** of both behaviour decision making systems, I can **answer Hypothesis 0 and 1**.

The experiment is a simulation. There are two visually identical levels where the only difference is the agents his AI. One level will have the **Goal Oriented Action Planning** behaviour, while the other will have the **state machines** as his behaviour. To make the agents Goal Oriented Action Planning behaviour I will use this guide from Penny De Byll <https://learn.unity.com/project/goal-driven-behaviour?uv=2021.3&courseId=5dd851beedbc2a1bf7b72be>.

After having a complete working level of the **Goal Oriented Action Planning** approach, I will recreate the same agents behaviours but with **State Machines.** Both AI work differently but the agents will still have the same behaviours.

**Testing:**

I make a build of each level and use the unity profiler to get the data from the build. I let each level play for 5 minutes. After the 5 minutes I extract the data and import that into the unity profiler analyser.

I will use the guide that makes the simulation game In Goal Oriented Action Planning from unity learn and try to make a version that does the exact same but with a state machine instead of Goal Oriented Action Planning. There will be a level with only Goal Oriented Action planning and a level with only State machines. I will build both levels and let them run for 5 minutes with the profiler and get the data. Once I have the data from both levels I will compare the data graphs with only scripts selected with the unity Profile Analyzer(you can get it from the package manager).

## Topic 1

### Subtopic 1

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### Subtopic

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## Topic 2

### Subtopic 1

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# case study

**Alternatively, as opposed to research, you might have opted for a case study. Whichever you choose, you detail the elements of your experiment(s), the tests, objects you will test upon and subjects you will test with, the data gathering, data cleaning or feature extraction, measurements, … and you present the results obtained in an objective manner for each of the tests you conducted.**

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## introduction

**In the introduction, you write the background of your topic, explain the purpose of the paper more broadly, and explain the hypothesis, and the research question(s).**

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## Modelling

### Blockout

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Figure 1 : MAKING OF THE HOBBIT: THE DESOLATION OF SMAUG – LAKETOWN (WETA DIGITAL, 2014)

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### Zbrush

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## Texturing

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## Shading

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## Lighting

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# Discussion

**In this section, you offer an interpretation of the results you obtained and try to relate them to the theoretical framework you presented. This is typically not a very long section, but obviously one of the most important ones.**

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# Conclusion

**In this section, you ascertain the demonstrable outcomes of your study and outline the merits of the project for the academic field and the discourse community. This is typically not a very long section, but obviously also one of the more important ones.**

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# Future work

**This section is sometimes standalone, sometimes incorporated in the conclusion. It looks at the shortcomings of the study, alternative strategies, and what could be the next course of action in the research field. This is typically not a very long section.**

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# Critical Reflection

**This section is typically associated with a bachelor paper, not other forms of serious writing. It allows the student to reflect on the learning outcomes, both academically and in terms of personal growth.**

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# References

**In this section, you list all the references you made in alphabetical order; consequently adhere to the referencing style you have chosen.**

Casey Raes (2014), Processing (second edition).

Saccade. (n.d.). In Wikpedia. Retrieved November 6 2016 from <https://en.wikipedia.org/wiki/Saccade>

Sarah Northway (2016) A year in VR Northway [Powerpoint slides] from <https://www.gdcvault.com/play/1024631/A-Year-in-VR-A>

# Acknowledgements

**In this section, you can thank people who contributed to your work in a meaningful way.**

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# Appendices

**In many cases, there are items that were developed for a research paper that can’t go into the actual paper in full. Things suc as code, art pieces, output of statistical analysis, questionnaires, … In this section, you can present these elements; use the first page to list and number the items, then paste them sequentially. If some items are too large, you can store them online, and link to them. Common practice is to keep those links active at least one year after the publication of the thesis.**

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