**UG Project Plan**

**CSC-30014**

### Project Overview and Description

**Student Name: Charlotte Smith**

**Student Username: w6h45**

**Student Number: 16007988**

**Degree Title: Computer Science**

**Supervisor Name: Dr Adam Stanton**

**Project Title: Physically Based Renderer Implemented With A Low Level Graphics API**

**Please provide a brief Project Description:**

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| A physically based renderer is an application capable of rendering a virtual 3D scene that models the behaviour of light and materials as close to reality as possible. |

**What are the aims and objectives of the Project?**

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| The goal is to produce an application that can take a 3D scene file (a collection of meshes, textures, lights, etc) and produce a rendered 3D scene with realistic lighting behaviours.  A major part of the system will include ray tracing, utilising the bidirectional reflectance distribution function to model opaque lighting behaviours, therefore realtime rendering is not currently planned, as it has very high hardware requirements. |

**Please provide a brief overview of the key literature related to the Project:**

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| --- |
| **Physically Based Rendering From Theory To Implementation, Matt Pharr, Wenzel Jakob, and Greg Humphreys (2004)**  This book provides a comprehensive look at the mathmatical theory behind physically based rendering as well as it’s mathmatical implementation, complete with source code examples, the third edition of the book is approx. 1200 pages long, and provides more than enough information to provide a complete understanding of the topic.  Available free online at [https://www.pbr-book.org](https://www.pbr-book.org/) |

### Project Processes and Methods

**Please provide a brief overview of the Methodology to be used in the Project (inc. an overview of best practice within the Methodology):**

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| --- |
| Because the project output is primarily visual, comprehensive unit testing becomes difficult, therefore the project will be created iteratively, starting with a simple polygon rendering, then continuously refining and adding features.  Output will be compared to an existing implementation, specifically the same scene rendered in Blender. |

**Will any special Data Collection Methods will be employed (e.g card sorts, questionnaires, simulations, …)?**

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| --- |
| No |

**Briefly describe how you will ensure your project is in line with BCS Project Guidelines (BSc Computer Science Single Honours Students only)?**

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| The inherent complexity of the project ensures that enough time will be spent on the project, as well as ample material will be available for documentation.  Moreover photorealistic rendering is an ever-evolving field that is very relevant to the field of computer science. |

### Time and Resource Planning

**Will Standard Departmental Hardware be used?** YES

**If NO please outline the Hardware/Materials to be used:**

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| --- |
|  |

**Will Software which is already available in department be used? NO**

**If NO please outline the Software to be used including how any necessary licences will be obtained:**

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| All software used will be open source  Blender (GPL): Comparison Implementation  RenderDoc (MIT): Graphics Debugging Tool |

**Will the project require any Programming?** YES

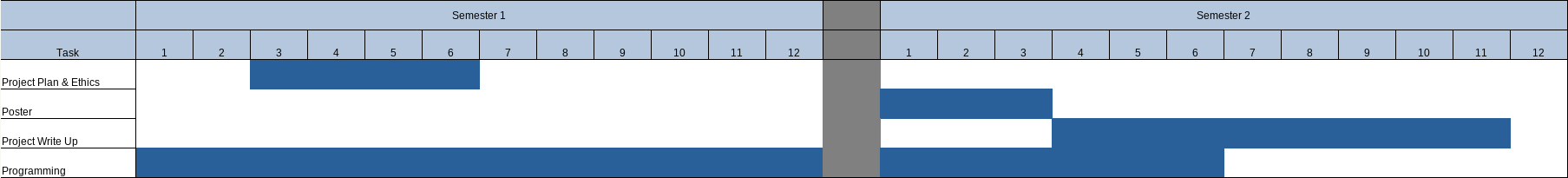
**If YES please list the (potential) Programming Languages to be used (including any IDEs and Libraries you may make use of):**

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| --- |
| Languages:  Rust  GLSL (GL Shader Language)  IDE/Dev Tools:  Neovim  gdb  Libraries:  Vulkan: Graphics  SDL2: Windowing |

**Table of Risks (*if non Standard Hardware and/or Software to be used please also include backup options/ contingency plans here)*:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Risk-id**  **Description** | **Probability/Likelihood of occurring** | **Best practice prevention measures** | **Remedy** |
| **Loss of data** | **Unlikely** | **Data backups** | **All elements of the project will be regularly saved to github** |
| **Blender** |  |  | **Autodesk Maya** |
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**Gantt Chart (must include milestones and deliverables):**

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### References

**Please include a list of References used in this Plan (using Harvard reference style):**

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| --- |
| **Matt Pharr, Wenzel Jakob, and Greg Humphreys, Physically Based Rendering From Theory To Implementation (2004)**  **Marmoset. 2021. *Basic Theory of Physically-Based Rendering*. [online] Available at: <https://marmoset.co/posts/basic-theory-of-physically-based-rendering/> [Accessed 3 November 2021].** |

**Submission Date: 02-11-2021**

**PLEASE NOTE THAT SHOULD YOUR PROJECT UNDERGO ANY MAJOR CHANGES FOLLOWING THE SUBMISSION OF THIS PLAN YOU ARE EXPECTED TO SUBMIT AN UPDATED PLAN WHICH ACCURATELY REFLECTS YOUR PROJECT.**