# Fractal Explorer

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| **Student** | Louis Durston-Wyatt | | |
| **Teacher(s)** | Steve Wentworth | | |
| **Version** | 1.0 | **Date issued** |  |

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| Background |
| The problem my project will solve is the gap in truly interactive, high-quality fractal visualisers. It will be a useful educational tool for teaching students about fractals in the complex plane in a visual, interactive way.  My program’s aim is to generate and display a fractal in the complex plane (such as the Mandelbrot Set and Newton’s Fractals, generated using iterative methods) that the user can traverse by panning and zooming. The fractal will regenerate at increasing levels of precision as it is zoomed into, creating the illusion of infinite detail. The user can then “record” a route through the fractal and press “generate”; a high-resolution video following this route through the fractal will be generated using compute shaders, where the GPU can iterate many complex inputs in parallel.  This lends itself to computational methods because generating the sets that represent these fractals requires repeated iteration of functions (such as the Mandelbrot equation, zn+1 = zn2 + c) which would be impossible without computationally performing the calculations to arbitrary detail. Also, displaying these sets on the complex plane cannot be done without a computer as millions of points need to be plotted.  Benefits for this project:   * Helps educate people about a high-level mathematics topic in an interactive way * Parallel processing on the GPU allows for a much quicker generation time than competitors |

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| Research |
| **Target Market**   * People interested in fractal mathematics who want to use the software recreationally * Teachers/professors who want to use the software as a tool to teach students * Students who want to use the software to further their understanding of fractal mathematics   **Alternatives**  Do research on competitor products which offer the same or similar features to what you are offering. For those competitors, look at the features they are offering, list these features here with some discussion as to whether you will include this feature or not (if you are including a researched feature then add it to your background section above success criteria below, if you are not including a researched feature make it clear in your out of scope section. |

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| Success Criteria |
| How will you measure success? High level success criteria at this stage, you will go into more indepth success criteria during each sprint of development? |

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| Out of scope |
| List any features that you do not plan to including in your development project, examples could be **having Visa payments on a website**, then justify your reasons why you will not be including the feature. |

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| Stakeholders / Responsibilities |
| **Stakeholders**   * Samuel So   + Demographic: A-Level Student at ULMaS, interested in fractal mathematics but would like to further understand the topic using Fractal Explorer. Motives are educational/recreational. * Elysia Barker   + Demographic: …   **Responsibilities**  My stakeholders will be asked to provide ideas for the requirements of the product based on their roles within academia; these different roles (student, teacher/professor, recreational) are representative of the target demographics of my project, allowing the development of the program to be adjusted to the needs of the average consumer.  These ideas for improvements can be given by the stakeholder at the end of each development cycle, of which there will be 3 to 5 before the product is completed. Each cycle will take approximately 1 month to be completed, with the final product being mostly developed by December 2022. This guidance could simply be in the form of an e-mail, in which the stakeholder lays out a few key points on how well the prototype of the product meets their needs as a consumer.  Stakeholders will also take part in user acceptance testing at checkpoints in the program’s development, most likely after each developmental cycle. This will only involve testing a prototype of the product and completing a form, in which they can provide feedback at a level of detail that seems suitable to the stakeholder. |

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| Ability |
| * Discuss your capabilities in Computer Science that suggests you are able to offer this computing solution. * Discuss the Computer Science techniques that will be deployed to solve this problem. * Discuss the development lifecycle that will be deployed on the project. * Discuss the programming languages that may be necessary in providing a solution to this problem. * Programming style e.g. procedural, embedded, Object Orientated. * Discuss what resources maybe necessary (hardware, software, devices, pay particular attention to hardware and software that you will need, that may currently not be installed on the school computers/laptops etc). |

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| Risks | | | |
| **ID** | **Risk** | **Action to address** | **Owner** |
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| Sprint Zero Requirements | |
| **Requirement No** | **Description** |
| 1 | High level requirements for entire project (including visual and user experience designs) |
| 2 | Detailed requirements for Sprint One |

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| Sign off | | |
| **Student** | Louis Durston-Wyatt | Image.jpeg |
| **Stakeholder** | Elysia Barker |  |
| **Stakeholder** | Samuel So |  |
| **Teacher(s)** | Steve Wentworth |  |