


Individual Project (CS3IP16)

**Department of Computer Science
University of Reading**

Project Initiation Document

PID Sign-Off

Student No.	24008064
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Degree programme (BSc CS/BSc IT)	BSc Computer Science
Supervisor Name	Prof. Atta Badii
Supervisor Signature	
Date	29 September 2017

SECTION 1 – General Information

Project Identification

1.1	Project ID (as in handbook)
	370
1.2	Project Title
	Zombie Infestation Simulation
1.3	Briefly describe the main purpose of the project in no more than 25 words
	Creation of a simulation software that helps model how a realistic (or custom) zombie infestation would spread across the world

Student Identification

1.4	Student Name(s), Course, Email address(s)
	e.g. Anne Other, BSc CS, a.other@student.reading.ac.uk
	Czar Ian Echavez, BSc Computer Science, c.i.echavez@student.reading.ac.uk

Supervisor Identification

1.5	Primary Supervisor Name, Email address
	e.g. Prof Anne Other, a.other@reading.ac.uk
	Prof. Atta Badii Atta.badii@reading.ac.uk
1.6	Secondary Supervisor Name, Email address
	Only fill in this section if a secondary supervisor has been assigned to your project
	Tom Thorne t.thorne@reading.ac.uk

Company Partner (only complete if there is a company involved)

1.7	Company Name
1.8	Company Address
1.9	Name, email and phone number of Company Supervisor or Primary Contact

SECTION 2 – Project Description

2.1	<p>Summarise the background research for the project in about 400 words. You must include references in this section but don't count them in the word count.</p>
	<p>Research will be split into 2 categories; the first involves research that is outside of the realms of Computer Science, such as Human Geography, Epidemiology and Pathology. The second involves the development of software, which includes UIs, pre-existing software linked to the project and the optimisations that could be applied to the software.</p> <p>Research will include how normal (non-zombie) infections spread; this will generally be considering the mathematics involved with the theories relating to epidemics and pandemics [1][2] as well as the different pathogens which can act as the cause of zombification, especially the terrifying cordyceps fungi which already cause insects to behave in a zombielike manner [3].</p> <p>Another background research needed is the population geography of humans around the world. This is so as to arrive at an appropriate contagion models of how the infection would spread, since people are used as infection vectors (and hosts) to propagate the zombie infection. This part would need to look through population censuses around the world.</p> <p>As mentioned before, there are already existing examples of the relevant software such as [4] which has a user-friendly UI, however the algorithm used for the spread of zombies is very simplified and uses the Gillespie algorithm which is more commonly used with chemical reactions (usually where the initial amount must end with the same amount i.e. zombies to people amount). Another simulation that is linked to the project is the GLEAM Simulator [5]; the simulator allows 2D and 3D visualisation as well as a builder for simulation scenarios.</p> <p>(Not for zombie simulation but the idea in this project [6] can be transferred into this project)</p> <p>The final but most important research that must be done is how to develop the simulation, which includes selection of the best integration of the language, the libraries and IDE to use. I have experience using SDL as a 2D rendering library which will help with the development of the simulation visualisation. However, I would also like to see if it is possible to visualise the simulation in 3D.</p> <p>References:</p> <p>[1] http://post.queensu.ca/~ja9/My_Homepage_Files/Download/Epidemic%20Theory%20and%20Group%20Violence.pdf</p> <p>[2] https://dspace.library.uu.nl/bitstream/handle/1874/8591/heesterbeek_96_concept_epidemic.pdf?sequence=3</p> <p>[3] http://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0036352&type=printable</p> <p>[4] https://mattbierbaum.github.io/zombies-usa/</p> <p>[5] http://www.gleamviz.org/simulator/</p> <p>[6] https://github.com/Hopson97/Empire</p>
2.2	<p>Summarise the project objectives and outputs in about 400 words.</p> <p>These objectives and outputs should appear as tasks, milestones and deliverables in your project plan. In general, an objective is something you can do and an output is something you produce – one leads to the other.</p>

Tasks to complete:

Background Research:

- Research how real-life diseases spread around the world, particularly pandemic level diseases
- Research into epidemic theory; including r_0 , incubation periods of diseases, and various kinds of transmission vectors
- Research of pathogens
- Find data about population numbers across multiple countries
- Look at pre-existing software and find some ideas which can be implemented in the project

The research will be used in analysis to help with the designing of how the product will look like as well as how the prototype will function.

Analysis and design:

- Parse through research to find information relevant to the project.
- Turn the equations into pseudocode functions i.e. make some pseudocode
- Create flow charts to show the processes to be performed by the program
- Create UML diagrams to plan the functions and classes which will be used in the project

The analysis and design makes the development of the software much easier since the time spent creating the program is not wasted on going back and forth between the files trying to see what has been already done. The analysis of the previous research will enable the systematic selection of the resources and the acquisition of relevant information. Pre-converting the equations to pseudocode makes it easier to create the final program code. Creating both the flowcharts and the UML is the design outline which will be used during development as the layout of how the classes and their functions should be.

Develop prototype:

- Create the prototype based on the designs
- optimisations

Testing evaluation/validation:

- Test the prototype:
 - o User inputs
 - o File inputs
 - o Saving/loading data
 - o Graphics rendering
 - o Performance testing, possibly on different machines
 - o Usability evaluation involving trailing by target user types

Assessments:

- Report documentation
- Poster

2.3

Initial project specification - list key features and functions of your finished project.

Remember that a specification should not usually propose the solution. For example, your project may require open source datasets so add that to the specification but don't state how that data-link will be achieved – that comes later.

	<p>The project will deliver and document a Zombie Infestation Simulation solution whereby:</p> <p>UI:</p> <ul style="list-style-type: none"> - Allows user to manipulate the simulation - Visualises the simulation in either 2D or 3D - Allows the user to choose whether to display the simulation while running <p>Accuracy:</p> <ul style="list-style-type: none"> - The simulation is reasonably accurate. (can be tested by comparing simulations to real life events) - The software follows the algorithms and the relevant calculations as well as gives correct outputs to the user inputs. <p>Inputs:</p> <ul style="list-style-type: none"> - Simulation can save scenarios as well as load previous scenarios - Simulation can be changed while running i.e. the user can change infection statistics while the simulation is running so that the simulation can be manipulated live
2.4	<p>Describe the social, legal and ethical issues that apply to your project. Does your project require ethical approval?</p>
2.5	<p>Identify and lists the items you expect to need to purchase for your project. Specify the cost (include VAT and shipping if known) of each item as well as the supplier. e.g. item 1 name, supplier, cost</p> <ul style="list-style-type: none"> - Possible printing and binding costs (~£5-£10)
2.6	<p>State whether you need access to specific resources within the department or the University e.g. special devices and workshop</p>

SECTION 3 – Project Plan

3.1	Project Plan Split your project work into sections/categories/phases and add tasks for each of these sections. It is likely that the high-level objectives you identified in section 2.2 become sections here. The outputs from section 2.2 should appear in the Outputs column here. Remember to include tasks for your project presentation, project demos, producing your poster, and writing up your report.		
Task No.	Task description	Effort (weeks)	Outputs
1			
1.1	Background Research	3	...
1.2	...		
	All research done at the same time (this is to ensure that the information found can be easily cross checked across different sources)	3	All the information needed for how the program should calculate the spread of the zombies to make a realistic simulation
2	Analysis and design	4	
2.1	...		...
2.2	...		...
	Parse research data	0.5	Relevant research data to be used for analysis and design
	Creation of pseudocode	0.5	Pseudocode usable for the development later
	Creation of flowcharts for the various parts of the program	1.5	Flowcharts that show all the processes involved in the running of the program
	Creation of the UML	1.5	UML which will show the layout of the entire program, including the classes and function which will be involved
3	Develop prototype	10	
3.1	...	...	...
3.2	...	...	...
	Creation of the entire prototype	8	A fully functioning prototype which can be used to demonstrate the project
	Project demonstration	n/a	
	Optimisations on the programs and code clean-up	2	A cleaned-up version of the prototype which should make the prototype run smoother
4	Testing, evaluation/validation	1.5	
4.1	unit testing		...
4.2	...	...	...
	Test user and file (loading and saving) inputs	0.5	Less buggy user and file inputs
	Graphics tests	0.5	Less buggy graphics
	Performance tests	0.5	Allows for the developer to see the minimum specifications to run the program
5	Assessments	3.5	
5.1	produce poster	0.5	Poster
5.2	write-up project report	2	Project Report
	Final demonstration and presentation	1	
TOTAL	Sum of total effort in weeks	22	

SECTION 4 - Time Plan for the proposed Project work

For each task identified in 3.1, please *shade* the weeks when you'll be working on that task. You should also mark target milestones, outputs and key decision points. To shade a cell in MS Word, move the mouse to the top left of cell until the cursor becomes an arrow pointing up, left click to select the cell and then right click and select 'borders and shading'. Under the shading tab pick an appropriate grey colour and click ok.

Project stage	START DATE: .././.... <enter the project start date here>												
	Project Weeks												
	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26
1 Background Research													
All research to be done in 3 weeks													
2 Analysis/Design													
Parse research data													
Creation of pseudocode													
Creation of flowcharts													
Creation of UMLs													
3 Develop prototype.													
Creating the entire prototype													
Project demonstration													
Program optimisations and code clean-up													
4 Testing, evaluation/validation													
Test user and file (loading and saving) inputs													
Graphics tests													
Performance tests													
5 Assessments													
Project poster													

Report write up														
Project demonstration and presentation														

RISK ASSESSMENT FORM

Assessment Reference No.		Area or activity assessed:	
Assessment date			
Persons who may be affected by the activity (i.e. are at risk)			

SECTION 1: Identify Hazards - Consider the activity or work area and identify if any of the hazards listed below are significant (tick the boxes that apply).

1.	Fall of person (from work at height)		6.	Lighting levels		11.	Use of portable tools / equipment		16.	Vehicles / driving at work		21.	Hazardous fumes, chemicals, dust		26.	Occupational stress	✓
2.	Fall of objects		7.	Heating & ventilation		12.	Fixed machinery or lifting equipment		17.	Outdoor work / extreme weather		22.	Hazardous biological agent		27.	Violence to staff / verbal assault	
3.	Slips, Trips & Housekeeping		8.	Layout , storage, space, obstructions		13.	Pressure vessels		18.	Fieldtrips / field work		23.	Confined space / asphyxiation risk		28.	Work with animals	
4.	Manual handling operations		9.	Welfare facilities		14.	Noise or Vibration		19.	Radiation sources		24.	Condition of Buildings & glazing		29.	Lone working / work out of hours	
5.	Display screen equipment	✓	10.	Electrical Equipment	✓	15.	Fire hazards & flammable material		20.	Work with lasers		25.	Food preparation		30.	Other(s) - specify	

SECTION 2: Risk Controls - For each hazard identified in Section 1, complete Section 2.

Hazard No.	Hazard Description	Existing controls to reduce risk	Risk Level (tick one)			Further action needed to reduce risks <i>(provide timescales and initials of person responsible)</i>
			High	Med	Low	
5	Long uses of display equipment can cause eyesores and nausea	5 – 15 minutes breaks between 1 hour of use of the computer			✓	
10	Excessive electrical usage can cause fire or equipment damage	Using surge protected sockets as well as ensuring all plugs have the correct fuse type for each plug			✓	
26	Too much stress can cause psychological trauma	n/a		✓		
Name of Assessor(s)			SIGNED			
Review date						

Health and Safety Risk Assessments – continuation sheet

Assessment Reference No	
Continuation sheet number:	

SECTION 2 continued: Risk Controls

Hazard No.	Hazard Description	Existing controls to reduce risk	Risk Level (tick one)			Further action needed to reduce risks <i>(provide timescales and initials of person responsible for action)</i>
			High	Med	Low	
Name of Assessor(s)			SIGNED			
Review date						