***Complex Game Systems*** *Mara Dusevic*

***Purpose of the system***

The system aims to allow users to generate two-dimensional dungeon crawler maps within Unity that can be customised. Applying the library allows for easy implementation of a procedurally generated map and requires very little input from the user. It features custom inspectors and editors that can be used to edit aspects of the generation as well as scripts that contain all the necessary mathematical algorithms. The user will have the ability to apply custom asset packs to the system, create editable rooms within a tile map which can be navigable and edited by the generation.

***Third-party libraries required***

The following are the libraries that are required to build the system:

* Basic Unity libraries included
* Unity Editor Library – used to create UI elements in Unity’s editor to change variables

***Mathematical operations to be used***

To randomise the dungeon simple random operations will be used to position the various sections. Additionally, operations to check for overlapping of those sections, basic vector math for calculating distances between objects and quaternions to deal with rotation.

***Advanced algorithms to be implemented***

To place the corridors connecting rooms, they are first generated through a depth-first search algorithm. It firstly checks one single piece on the grid where the surrounding pieces are checked to determine whether they are in use or not. If the piece hasn’t been visited, this piece then travels across the grid in a random direction. This process is then repeated until there is a dead end. At a dead end the algorithm backtracks to the previous piece and chooses a new random direction. If not, the piece will continue to backtrack. When all pieces have been checked we return to the initial starting point so the algorithm will find a new start position to create new corridors.

***How it will be made modular***

The system will be made available to users via the Unity Asset Store as a package they can download and implement into their project. The package will contain all the scripts needed, a demo scene and a README to inform the user on how to use the system.

***Integrating the system with a new or existing application***

It can be added into any new or old application via the package manager within Unity and the Unity Asset Store. When implemented the user will be told via a README file where to apply the scripts and how to customise the generation with their own assets or scripts.