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by 201305463 Student Number

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TIME SUBMITTED	14-OCT-2015 03:55PM	WORD COUNT	1710
SUBMISSION ID	47210429	CHARACTER COUNT	9081

Networked Multiplayer Tower Defence (Grey, 2015)

Initial Report

Submitted for the BSc in
Computer Science with Games Development

October 2015

by

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Word Count: 1427

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1 Introduction

This project covers a networked multiplayer tower defence game. A tower defence game is where a player will use placeable towers to defend their lives from encroaching enemies. In this case it will include a second player who controls the enemies, both earning resources depending on their success as the game progresses. There are a number of example games out there but very few include a multiplayer aspect into the gameplay as tower defence games are usually single player. The main technologies that will be explored in this project are AI pathfinding and reducing latency across the network, these are both very important as pathfinding is essential for enemy movement and reducing latency is equally important for a multiplayer game.
This document will be used to outline the title and background surrounding the project as well as show the objectives of the project, task/time plans and that any risks associated have been found.

2 Background

The tower defence genre of games has been around for a long time with many iterations of varying success. From the prototypical Rampart released in 1990 to the map mods for games such as StarCraft in the 2000's and simple flash games played on the internet (Wikipedia, 2015) all have certain mechanics in common which are a given for tower defence games, such as using placeable towers to defend a number of lives from progressively harder waves of enemies who follow a set path towards the goal, however a vast majority are purely single player games and it is the multiplayer aspect of the project that will differentiate it from the rest but this itself also brings forth problems including latency between machines.

Flash versions of tower now dominate the genre in terms of numbers and an extremely well received flash tower defence game is the Bloons Tower Defence series of games with the first itteration released in 2007. In this the towers are different kinds of monkey who shoot different projectiles with different effects and the enemies are balloons which as the number of rounds beaten increase Bloons with more layers and travel at a faster speed will begin to be spawned. The bloons always follow the distinct pathway and players are unable to place towers on the path.

(Ninja Kiwi, 2007)
Bloons TD

(Ninja Kiwi, 2009)
Bloons TD 3

(Ninja Kiwi, 2011)
Bloons TD 5 iOS

In the earliest versions Bloons TD was quite a basic game with only 5 different towers each with 2 upgrades such as Dart Tower, Bomb Tower or Super Monkey. In terms of bloons there were initially 6 different type with the only 2 having special abilities. As the newer versions were released more types of towers and bloons had been added, by Bloons TD 3 the tower count had increased to 8 adding towers such as a Boomerang tower and a Monkey Beacon support tower which boosts other towers around it as well as adding road items such as Road Spikes which pop a layer of bloons that run over them and exploding Pineapples which do the same in an area. By Bloons TD 5 the Bloons series was one of the most well know and popular browser based tower defence game eventually making it to ios and doing the same, at this point there are 18 towers each with 2 different upgrade paths, 2 road items and 14 different bloon types such as camo bloons which can only be seen by towers which can see through camo and regrowth bloons which will grow back layers if unpopped for a certain time.

The most recent additions to the series are Bloons TD Battles which add a multiplayer aspect and Bloons Monkey City which adds a city building aspect, two different aspects which are not usually included in tower defence games.

(Ninja Kiwi, 2012)

In Bloons TD Battles 2 players play the same map at the same time and have to hold out against the bloons longer than the other player to win. Players can use the money they earn to either upgrade and strengthen their defences or to add bloons to the current wave of bloons on their opponents side making it harder to survive. This mechanic of adding bloons to the opponents wave is the only truly multiplayer aspect that affects the other player, other than that there is no interaction between the players only that when one loses all their lives the other wins.

The Bloons series has been so successful because throughout the iterations the games were constantly updated as well as the refining the basic Tower Defence mechanics as well as adding some that have become staples like support towers and road items. It also has simple and colourful artwork that grabs the attention of whoever is playing and exceptional level design with each map providing a different challenge. From this is can be seen that for a tower defence to succeed it must first have the basic mechanics in place and refined as well as have an art scheme that grabs attention and also level design that keeps the game fun and challenging without becoming boring.

Though much fewer in number there has been a few standalone versions of tower defence games for pc and console. One such example is know as Defense Grid: The Awakening.

(Hidden Path Entertainment, 2008)

Defense Grid was originally released in 2008 for pc and was rereleased a year later on Xbox Live Arcade. This was one of the first proper 3d tower defence games that would be considered as somewhat of a commercial success. With a number of towers each with a distinct look as to tell them apart and with a different firing type and strength as well as a number of different enemies getting progressively harder much like any tower defence game. There is also a number of different levels as you progress each with a different path and tower placement layouts some with a lot of places to put towers some with very little, this changes the dynamic of each level by limiting the amount of towers you can use. Defence Grid is similar to most tower defence however what sets it apart from others is the enemy differences and special abilities for example some have shields that will protect them for a short period and others will fly straight towards the goal. This difference in enemies and level design is what makes this game so good and adds an extra depth of strategy and difficulty.

Both these games show that for a tower defence game to succeed it must, first have a number of distinct and different towers each with its own strengths and weaknesses, second it must have a range of different enemies again each with their own strengths and weaknesses. Finally it should also have a range of different levels that introduce different problems and strategies to each game. These points are what will need to be included in the game to make is a success that people would want to play repeatedly.

3 Aim and Objectives

The aim of the project is to create a networked multiplayer tower defence game and explore the technologies associated.

The above will be met and measured by the objectives below:

1. Working gameplay and interactive user interface.
2. A network/connection for multiplayer gameplay
3. Scripting/AI pathfinding.

Objective 1 – Working gameplay and interactive user interface

This is the base of the game and most important as without meeting this objective there will be no game to be shown. To succeed this aim the players must be able to place towers and enemies at will by interacting with the Ui and game scene. Clicking a tower or enemy the player should see the Ui change and information shown.

Objective 2 – A network/connection for multiplayer gameplay

For two players to play on separate machines a network connection between the machines is needed. To succeed this aim the players should be able to play together without lag between the 2 machines, this will mean reducing the latency within the network so players see the other player's actions when they happen.

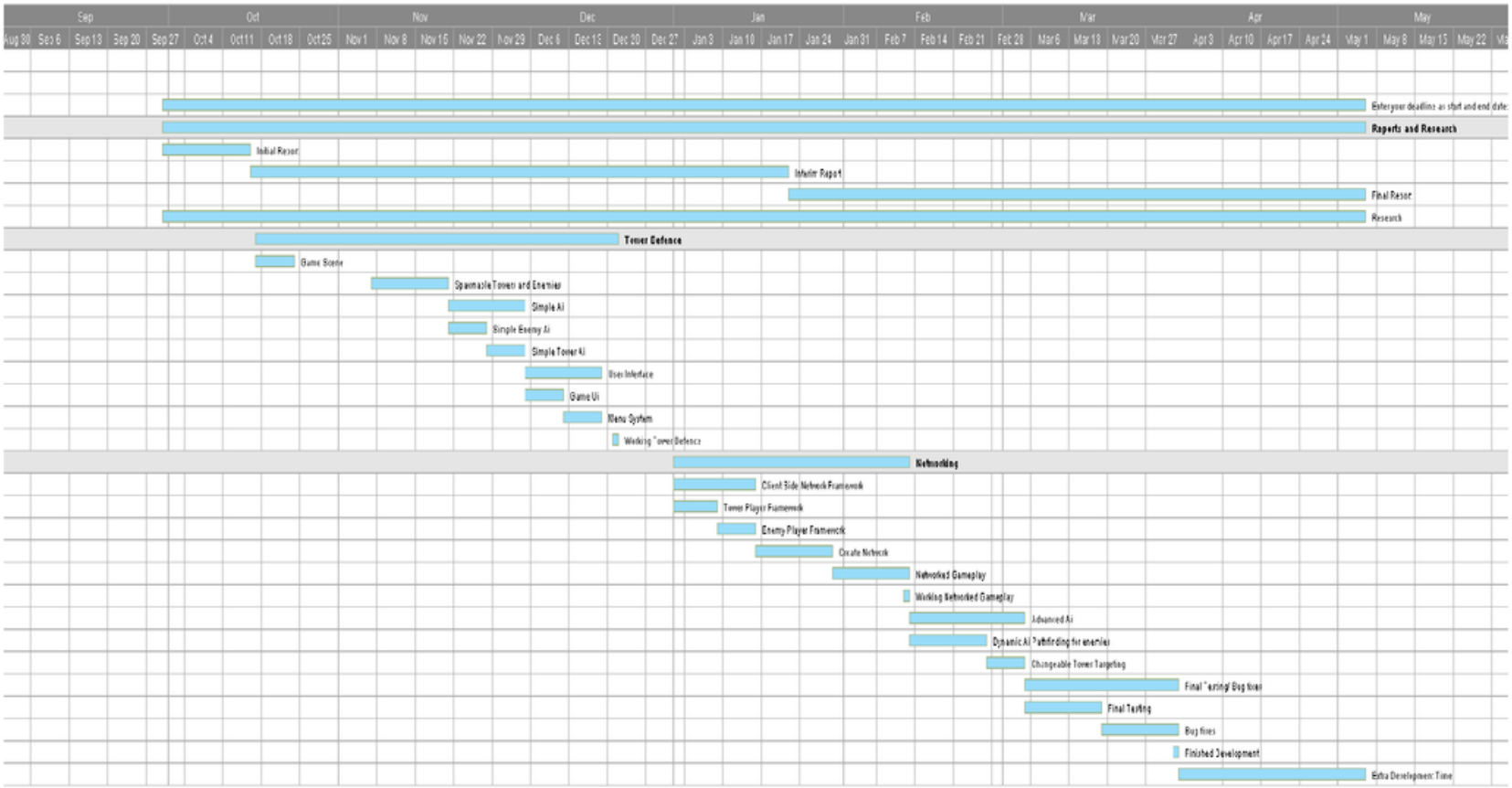
Objective 3 – Scripting/AI pathfinding

The enemies that are created should follow a set path, this path could be predetermined or created dynamically as towers are placed, and is essential for the enemy movement. The towers should also be able to track the enemies within their range. To succeed this aim when spawned the enemies should follow a set path depending on the tower positions until they reach the end or are destroyed.

4 Task List

	Task Name	Duration	Comments
1			
2			
3	**Enter your deadline as start and end date:**	**157d**	
4	**Reports and Research**	**157d**	
5	Initial Report	12d	
6	Interim Report	70d	
7	Final Report	75d	
8	Research	157d	
9	**Tower Defence**	**46d**	
10	Game Scene	6d	create a working game scene Framework that everything else will be built on
11	Spawnable Towers and Enemies	11d	add functionality to place towers on mouse click and spawn enemies at a set position
12	Simple Ai	11d	
13	Simple Enemy AI	6d	follow a hardcode path from start to finish
14	Simple Tower AI	6d	track enemies closest to finish that are within range
15	User Interface	11d	
16	Game UI	6d	add ui so players can pick different towers and enemies as well as see other game related information eg. sound, money etc.
17	Menu System	6d	add menu system to choose single player and multiplayer and cycle through correctly
18	Working Tower Defence	0	by this point I should have a basic working tower defence game
19	**Networking**	**31d**	
20	Client Side Network Framework	11d	create separate ui/Gamescene for each player as well as determining the data that is need to be sent over the network
21	Tower Player Framework	6d	tower ui and tower data to be sent
22	Enemy Player Framework	6d	enemy ui and enemy data to be sent
23	Create Network	11d	create network between clients
24	Networked Gameplay	11d	put together network and messages to be sent from either player
25	Working Networked Gameplay	0	by this point the game should be able to be played with 2 players
26	**Advanced Ai**	**16d**	
27	Dynamic Ai Pathfinding for enemies	11d	use path finding algorithm to determine path dependant on tower positions
28	Changeable Tower Targeting	6d	towers can target different positions within range etc. first, last and strongest
29	**Final Testing/ Bug fixes**	**21d**	
30	Final Testing	11d	test everything
31	Bug fixes	11d	fix everything
32	Finished Development	0	by this point is should be finished if everything has gone according to the time plan
33	**Extra Development Time**	**25d**	this is extra time for any eventuality

5 Time Plan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Reports and Research
Initial Report
Tower Defence
Game Scene
Spawnable Towers and Enemies
Simple AI
Simple Enemy AI
Simple Tower AI
User Interface
Game Ui
Menu System
Networking
Client Side Network Framework
Tower Player Framework
Enemy Player Framework
Create Network
Networked Gameplay
Working Networked Gameplay
Advanced AI
Final Testing
Bug fixes
Finished Development

6 Risk Analysis

Risk	Severity (L/M/H)	Likelihood (L/M/H)	Significance (Sev. x Like.)	How to Avoid	How to Recover
Loss of data	H	M	HM	Keep backups on multiple devices and svn where possible	Reinstate from backups or recreate svn
Loss of backups	H	L	HL	Keep Multiple Backups	Use alternate backup or svn
Software Failure	L	L	LL	Test and debug repeatedly	Save as much data as possible

Appendix A: Each appendix should have a title

7 References

Grey, S., 2015. *Project Catalogue: Networked Multiplayer Tower Defence.* [Online]
Available at:
http://intra.net.dcs.hull.ac.uk/student/modules/08341/Selectable%20Projects/DispForm.aspx?ID=618&Source=http%3A%2F%2Fintra%2Enet%2Edcs%2Ehull%2Eac%2Euk%2Fstudent%2Fmodules%2F08341%2FSelectable%2520Projects%2FNewDef%2Easpx
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