210 D1 Design Report: PuzzleBomber

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1. Introduction and Project Ideas

1.1. Introduction

This document presents this group's design ideas and further implementation planning of our game PuzzleBomber. From the project specification, we decided to make a game inspired from the 1983 Nintendo classic, “BomberMan”. A game like this is well suited for this project as it’s a game that we can easily expand upon. This keeps the game easy to develop, but has the potential to be complex in terms of visualisation, the difficulty of the game, added levels, and so on. This document also highlights further plans for Term 2, in terms of schedules and deadlines which the group will follow as strictly as possible.

The game itself had to be PG-12 and generally something that could catch the attention of anyone, making them involved with the game and actually raising their interests. Of course, it shouldn’t be something really complicated, rather more beginner friendly, while also managing to keep the intricacies for those more advanced and familiar with these types of games.

Before we came to our chosen game, we individually voiced our own ideas on what we thought could be a good candidate. Gathering as many ideas as possible was vital in choosing the correct basis for the game. Choosing the game wasn’t just a process of choosing something we could comfortably finish within the time that we had. We also had to choose a game that would appeal to everyone in the group. If every member of the group has a high level of motivation and commitment, we are more likely to produce a detailed, high quality game. We discussed and critiqued each other’s ideas, outlining the advantages and disadvantages of each concept that was proposed, with each game having its own mechanics and detailed characteristics. This resulted in narrowing down to one game.

The remainder of this section outlines our idea in detail, while also providing such for the ones we disapproved of.

1.2. Chosen Idea

As stated previously, our chosen idea is inspired by the original BomberMan, a game released in 1983, consisting of a simple 2D game board and a character (bomberman). The aim of the game was to place bombs that exploded, to destroy destructive walls, in order to locate the key and progress to the next level.

Each level would consist of a handful of monsters, which if touched ended the game. When they lose the player would have to restart the level and try again. To win, the player had to navigate BomberMan through each level, defeating the monsters and destroying walls, progressing through as many levels as possible without dying.

We fancied that idea because beyond everything written above, we would be easily able to add a lot of other features to the game as well. We would be able to customise it and mix it with some concepts from the other ideas initially proposed and this way it would become unique.

Further design details can be found below.

1.3. Other Ideas

1.3.1. Tank Game

The aim of this game would be to destroy the enemy tanks without getting destroyed yourself. Your tank is able to shoot bullets, making impact with the environment, thus constantly reducing the approachable territory. The bullets have gravity effects added to them, so they don't just fly off the screen but gradually decline and hit the desired location. There are power ups available that spawn around the map as time progresses, and if a winner isn't announced in the time limit, the winner will be decided based on the tank with the higher amount of health. There would be customisable skins and map themes, as well as varying enemy types for bigger diversity, which would probably attract even more players. Summarised, the game could be presented like that:

Key Features:

- Single, Two Player and MultiPlayer modes available.
- Shooting bullets with actual area impact.
- Gravity effects and graphic effects for authenticity.
- Customisation available.
- Power ups and fun gameplay.
- Easy for beginner players to adjust to the game.

After discussing all of the key features of the game and outlining everything that we did and didn't like, the group took the unanimous decision that this is not going to be the right idea for our game project. This decision was based on the few following facts.

We believed that even though the whole gameplay might be fun, the game feels a little dry, after all it's just two tanks shooting each other. There is no context to the game, no story, simple rules and in terms of game design it would eventually be way too easy to implement and harder to modify after, just because there wouldn't be too much left for what to be done. We wanted something more adventurous with more skills and mechanics involved in actually winning the game.

1.3.2. Puzzle game

The concept behind this idea was to create a game similar to Candy Crush, Tetris and other such well-known types of an arcade. It would generally include an infinite amount of levels, with randomly generated rows and columns of different coloured blocks, with the sole aim of destroying unavailable blocks and achieving a new high score with more matched similarly coloured blocks. Those would happen when 2 or more being placed right next to or above each other in either a row or a column. No diagonal directions would be allowed, as to limit the players decision making and make it a little bit harder. Bombs, Rockets and other available miscellaneous objects would be present when bigger combos are made so that the player gets the chance to achieve a higher score.

Key Features:

- Single mode available, though rankings and high scores allow competition amongst friends.
- Two or more similarly coloured blocks matched next to or above each other would allow them to be popped and points generated.

- Simple and easy to play
- Scalable with many levels and different formations
- Score boosting objects
- Top down sliding of blocks

There are various reasons why we didn’t choose this game. First of all, it’s a pretty overdone genre of game and browsing the internet lets you directly play thousands of versions of similarly done arcades. It’s easy to build, and frankly, the whole team agreed that it is overall not as fast-paced and fun as we wanted. It is too repetitive and limited as to what other features we can add. No customisation would be available, as there is nothing that actually could be personalised.

1.3.3. Escape room

Another idea was an Escape room type of game. It would allow a player to collect items in order to complete tasks and move on to the next room. This would involve a lot of strategy as we were thinking about including mazes and generally difficult obstacles for players to overcome in order to obtain a certain object. The player would need to collect a few items and use them to solve what couldn’t be solved before that. The story and context of the whole game would be easily creatable and surely engaging in a good way so that the players actually stick to the game and complete as many mysteries as possible. Many levels would be available and Players would be able to choose between multiple characters with different hidden abilities.

Key Features:

- Adventurous type of game.
- Various obstacles, mazes and mysteries to be solved so that players are intrigued.
- Many levels to be solved.
- Story and context available.
- Different characters with hidden abilities available.
- Fun, colourful and brain enhancing.

Even though this idea seemed great at first, after discussing it, the team decided to not go through with it for a couple of reasons. In order to actually make it as we would have liked to, it was going to be really complicated to integrate all of those features and create such an engaging environment around the game. It would simply be way too time consuming and skills heavy. Also, we would need a lot of time to implement the story into the game and create different characters with various abilities so that it doesn’t get boring and repetitive. We thought some of the features were good though, so have taken an idea or two for our chosen game idea.

1.3.4. Guitar Hero

The aim of the game would be to press colours (with different buttons attached to each colour) along strings to produce music, with each one missed being out of tune. The more correct buttons you press corresponding to the right colour, the more points you get combining for an overall high score at the end of the track. If you succeed in not missing any buttons, a streak shall appear, multiplying the points you have until you eventually miss. The streak gives coins and awards and its proportional, the higher the streak, the more coins you earn. This way you would be able to customise your guitar or buy new tunes with the coins that have been earned.

Key Features:

- Allowing you to play tracks by pressing buttons corresponding to different colours on the screen.
- Streaks introduced, which earn you coins and awards.
- Customisable guitar skins bought with those coins.
- More tracks depending on how many awards and coins you have.
- High Scores are kept and regarded as competition.

We didn’t go with this idea, as similarly to the Puzzle one, it was way too repetitive and simple to be included in a group project like that. Also, we wouldn’t be able to include the most interesting thing in a game like that, and that’s the tracks that are going to be available to be played. We would only be able to use non copyrighted music, which ruins the fun and interest of players to play the game. It doesn’t have much else to be added as additional features, which limits us and on top of everything above from the negative side of things, it was a hard pass.

2. Game Design

2.1. Game Features and Gameplay

The game takes place on a square map, allowing the player to move around. The player can place bombs in order to break breakable walls and access more of the grid (unbreakable walls cannot be broken with bombs). The player can pick up abilities by walking into them and they will be used automatically. Upon the player (Bomber) placing a bomb there is a delay, giving time for the player to move away from the blast, (it will have a three second detonation time) before exploding.

Most levels start with a mixture of hard (undestructable) and soft (destructible) walls (every level has a layout of hard indestructible walls and random soft destructible ones). Placing a bomb in clear line of sight (x or y axis) of a destructible wall will break the wall. However, if a bomb explodes and the player is within range of the explosion with no form of protection, the player will lose a life. If a hard wall is within the blast zone, the hard wall will absorb the impact and not be destroyed. The bomb explodes in the shape of a plus sign (+) with a starting base range of 1 tile from the original blast point.

Enemies will walk around the level on a set path, and can be killed by placing a bomb near them. However if a player touches one of these enemies, without an ability that gives them an extra life, the player will die. Enemies of Bomber will roam the field as Bomber completes the puzzle.

Abilities will spawn by the player completing “tasks” (Killing enemies / breaking walls / solving puzzles) and can be activated by walking into the dropped icon. The chance of an ability dropping after a task is completed is randomized and the type of ability is also randomized. When the ability is activated, the ability will remain active for the duration of the game.

PuzzleBomber Possible Expansion Ideas: (Expanded below)

- Minigames (Influenced by mario party)
- Puzzles (Influenced by Professor Layton)
- Player ability types (Influenced by dungeon crawler)
- Single roomed bomber man (Influenced by pac-man)
- Two player
- Different enemy types (Influenced by pac-man)
- Different wall types (Influenced by tank trouble)

Mini Games:
Throughout the game, players will have the ability to play certain, small puzzle games that will allow them to progress to the next level.

Puzzle Types: (1 Per Level)
The end game scenario has been changed, so that rather than having to find a key to progress to the next level, the player will have to solve a puzzle to progress. The three puzzle games that we have so far chosen are a colour coding puzzle, memory puzzle, and moving an object to an endpoint.

In the colour coding mini-game, there will be various colours hidden within the walls. The player must walk on two of the same colour in order to complete the task. When all colour combinations have completed the mini-game will be won. If the Player gets into contact with another colour before completing a previous combination, the colours will reset and the Player will have to start over.

The memory game will follow the concept of the colour coding, presenting buttons around the map that the player can interact with. The level initially will briefly show an order for the buttons to be pressed to unlock the door. The code length will be dependent on how far the player has currently progressed, getting longer per level the player has completed. Upon a player activating a button in the wrong order, the code will reset and the level will show the player the correct combination for a brief moment. Allowing the player to attempt the code again until correct.

The final mini-game will require the Player to move a pushable object from its origin point to a designated endpoint. This object also acts as an indestructible object and can be used to the Players advantage if used correctly. For example, trapping monsters or using the object to protect themselves from the monsters. However, the object can only be pushed in the direction it is being pushed from. To move the object in a different direction, they will have to maneuver around the object to move it from that angle.

Completing these puzzles without dying will unlock a door for the player to progress to the next level.

Player Ability Types

Throughout the game the player can pick up different abilities types by completing tasks, such as destroying walls or solving puzzles. However, there is a chance the player will pick up negative effects that will debuff the Bomber. These types of items impact the player temporarily and will deactivate after a short period of time. The chance of the ability spawning from these tasks being completed is random, as well as the type of ability that is also randomized.

Ability Options:

Positives	Negatives
Speed: Grant speed boost to the player character Slowness: Slows the enemy down Invisibility: Enemies stand still and cannot see the player (End when the player places a bomb) Invincibility: For a short time the player cannot die from enemies Bigger Bombs: The explosive range is increased. Nukes: All enemies within that level will die Shield: The player is granted an additional life	Slowness: Slows the player character down Enemies speed increase: Increase enemy speed Invincibility: For a short time enemies can’t be killed. Shield: A random enemy is granted an additional life

Single Roomed PuzzleBomber

Rather than progressing through multiple levels upon completing tasks, the gameboard simply resets and the difficulty increases. This could be achieved by increasing the amount of enemies and / or speed of the enemies. Increasing the number of walls, thus encasing the player within a smaller space and creating tight corridors.

Two Player PuzzleBomber

Add functionality for a two player version of bomber man where two players work together in order to defeat enemies and progress. The Players must be careful as they can kill each other with their own bombs so coordination and communication will be key. The number of monsters will also be increased to ensure difficulty remains at a similar level of the single player version.

Additionally, there is the possibility that we could provide a gamemode where two players go against each other, to be the last one standing. This would create a “battle” mode of sorts allowing for pvp. Also provides the ability to add enemies as well for extra difficulty increase.

Different Enemy Types

Add different types of enemies, that the player is slowly introduced to throughout the first few levels, so that completing levels requires more caution and thought.

Possible Enemy Types:

Normal Enemy	Only 1 life
Bomb Carrier	Enemy that picks up a bomb and moves with it until it explodes. Will die when the bomb explodes. This enemy will run randomly with increased speed whilst carrying the bomb
Bosses	Increased health (Requires multiple bombs or an ability to kill)
Invulnerable enemies	These enemies cannot be killed with regular bombs (Must be killed with special bombs / abilities). However, they can be pushed to the end of the bomb range with normal bombs.

Different Wall Types

Add different types of walls so that the player has to use different amounts of bombs to clear a path and make them think more about how they are going to navigate the level.

Wall types

- Soft walls - Takes one bomb to destroy
- Reinforced walls - Takes two bombs to destroy
- Hard walls - These walls are indestructible and can't be destroyed

2.2. Game Design Principles

Costikyan Game Design Principles

Decisions

- The player has to decide whether to be offensive or defensive. Although placing bombs can kill enemies, they can also be risky for the player.
- Whether to focus on killing the enemies to make the level easier, or revealing the gameboard to gain power-ups and finish the puzzle to progress

Goals:

- To survive as long as possible
- To solve the puzzle on that level in order to unlock the door to the next level
- To kill enemies on the level

Opposition:

- Enemies will spawn within the game space and walk along random paths
- The players own bombs can also kill the player if they get too close when they detonate

Managing Resources:

- The player will have to manage abilities as well as bombs, not placing them in positions that could put the player at risk
- The player will also have to complete a puzzle. Providing an opportunity for the player to prioritize and manage either survival or progression.

Game Tokens:

- Abilities provide the player an opportunity to adapt to the game
- The ability to destroy walls and enemies provides a chance for the player to play the game in a variety of ways

Information:

- The GUI will consist of the level number
- Whether the player has an active ability (In the form of an icon)
- Number of enemies remaining

- If the puzzle has been completed
- Whether a wall can be broken or not (Different wall texture / colour)

2.3. Game Rules

Constitutive

- The player loses by running out of lives (colliding with an enemy or blowing themselves up)
- The player will never run out of bombs to place, however can only place one bomb at a time
- The game can be played by one player
- The player must defeat enemies by placing bombs near them or using abilities

Operational

- Player moves when WASD keys are pressed (up, down, left and right)
- The player cannot move outside of the play area
- The player cannot move through walls
- Only one bomb can be placed at the same time (Unable to “spam bombs)
- The player loses a life when they collide with an enemy
- Bombs are placed on the tile the player is currently on when space is pressed
- The bomb will wait a period of time before exploding
- Bombs will only destroy one wall in each direction that is within range
- Enemies within the bombs range when it explodes will die
- Upon solving a puzzle the door to the next level is unlocked
- When the player moves through the door, the next level is loaded
- Completing “tasks” results in the possibility of a random ability spawning
- Running over an ability will activate it
- Initial enemies will be spaced out around the level
- Progressing to the next level will increase the power/range of bombs
- The player will get a temporary buff when collecting an ability

Implicit

- The player should decide whether to be offensive or defensive
- The player should think about player movement and bomb placement (Would completing that action compromise them E.g. corner the player around enemies)
- The game can be quit at any point
- The game will not influence the computers performance significantly

3. Software Engineering

3.1. Software Requirements

Functional Requirements and Non Functional Requirements

“Shall” statements mean the requirement will be completed before the deadline to produce the end game. “Should” statements are not a priority for the end product, but would add an additional feature to the game.

F1: Shall equip user-friendly GUI with information, including:
- F1.1: A functional start menu
- F1.2: Current level
- F1.3: All walls (Destructible as well as indestructible)
- F1.4: Placed bombs
- F1.5: Abilities (In use and pending collection to activate)
- F1.6: Puzzle complete

F2: Shall make objects disappear from the GUI upon consumption, interaction or death
- F2.1: Exploded bombs
- F2.2: Enemy death
- F2.3: Abilities collected (When picked up and when ability runs out)
- F2.4 Destroyed walls

F3: Shall kill the player (Unless prevented by an ability) if in contact with an enemy or explosion range
- F3.1: Shall result in the game ending
- F3.3: Shall allow the player to restart

F4: Shall allow enemies to move around the level
- F4.1: Should have path be altered by newly destroyed walls

F5: Shall allow the player to move around possible spaces according to an appropriate input
- F5.1: The player shall not be able to walk through walls that aren't destroyed

F6: Shall allow the player to place bombs on free spaces throughout the level
- F6.1: The player shall not be able to place more than one bomb at once
    - Must wait until previously placed bomb has exploded
- F6.2: Bombs placed within range of a wall shall interact (Breaking / weakening)
- F6.3: Indestructible walls shall not be breakable

F7: Upon completion of a puzzle, the player shall be able to progress to the next level

F8: Shall have multiple levels
- F8.1: Shall have the ability to know when that level is completed
- F8.2: Shall increase difficulty as level increases
- F8.3. Should provide each level with a different puzzle to solve

NF1: Shall run on all operating systems

NF2: Shall take no longer than 25 seconds for the option menu to appear once the game is run

N3: Shall take no longer than 20 seconds for the game to load levels on an average computer system

NF4: Shall take no more than 20 seconds for the game to be loaded up, when the player restarts the game

NF5: Shall immediately update settings, when settings are changed

NF6: Shall run at no more than 30 frames per second on the average computer system

NF7: When a player dies it should take no longer than 25 seconds for the option menu to appear
NF8: Shall be able to run smoothly on the Lancaster University virtual machines without crashes

3.2. Acceptance Tests

ID	Description	Input	Expected Output
1	Should be able to run on various operating systems like Windows, Linux and MacOS .	Launch the game on all of the 3 specified operating systems and start a level.	The game runs without any issues and is totally playable.
2	Menu should be clickable and easily accessible, when the game is launched.	Launch game	Menu appears with all buttons being able to be chosen, following with a specific button reaction.
3	Escape should be able to pop up a menu while playing a level.	Press the “Escape” button.	Escape menu appears, buttons can be clicked and reactive.
4	The Gameboard should appear on the screen whenever the game is started.	Start a level.	Gameboard appears on the screen.
5	The Character should be movable in all 4 directions (WASD) and should go to a specific location as instructed.	Press direction (WASD) buttons.	Character goes in all possible directions and follows inputted instructions.
6	The Character should not be able to move outside of the map or in non-designated paths.	Press direction (WASD) buttons.	The Character will be stopped and won’t be able to go out of bounds or in non-designated paths - won’t go into the specific field.
7	Enemies should be able to move randomly and constantly starting from the moment the level is launched.	Launch a level.	Enemies move randomly.
8	Enemies should be able to interact with the Character.	Character touched by an enemy.	Character either loses a life or dies and the game ends.
9	The Character should be able to drop a bomb by pressing the space bar button.	Press space bar key.	A bomb is dropped at a valid field on the Gameboard.
10	Bombs should be able to destroy walls.	Press space bar key.	Bombs destroy walls.
11	Bombs should be able to kill enemies.	Press space bar key.	Enemies are killed by being in a bomb's radius.
12	Wall should be randomly generated.	Launch game.	Walls are generated in random positions creating random paths.
13	Different types of walls should take different numbers of bombs to destroy them.	Press the space key and spawn a bomb near a wall.	Different types of walls take different amounts of bombs in order to be destroyed.

14	Whenever a wall is destroyed, there should be a random chance that a special ability is dropped and could be obtained by the Player.	Press the space key around a few different walls for effectiveness.	An ability is dropped randomly whenever a wall gets destroyed and is obtainable by Player, he gets powered up.
16	A level should be beatable by passing through the open door.	Use the WASD keys to navigate through the map towards the open door and then go on the door’s specific field.	Level ends, Character passes through it and gets rewards.
Minigames Colour code Puzzle			
17	Pairs of colours generated randomly under walls	Enter new level	Mini-game start
18	Buttons can be pressed	Walking on top of the coloured buttons	Either pressing the first colour in the combination or completing the combination for the colour pressed.
19	Completion recognition when buttons pressed in the correct order	Stepping on the second colour of that combination	Completing the combination and allowing the Player to move to the next colour. Or, finishing the mini-game, thus gaining a reward or moving on to the next level.
Memory Puzzle			
20	Shuffle combination	Start memory game	Each level, the combination should be different. Shown to the player for a brief time
21	Win conditions	Enter the correct combination	Allows the player to move to the next level
22	Combination shown upon incorrect input	Enter incorrect combination	Inputs all reset and combination shown to player for brief period of time
Object Pushing Puzzle			
23	Object placed at random location on the board	Entering a new level	Moveable object located randomly on the map
24	Random location of endpoint	Moving the object	Location of the endpoint will become available to the Player
25	Win conditions	Place moveable object on the endpoint	Will open the gate to allow the Player to move to the next level

4. Implementation

4.1. Task List for Term 1

Task				Dependencies
1	**Think of game ideas**			**N/A**
2	**Build on ideas for chosen game**			**1**
3	**Possible abilities**			**2**
4	**Think of puzzle ideas for minigames**			**2**
5	**Think of different enemies**			**2**
6	**Think of different wall types**			**2**
7	**Write up**			**1, 2, 3, & 4**
	a	Start task list - Writing the D1		N/A
	b	Original game ideas		1
	c	Introduction		N/A
	d	PuzzleBomber game expansion ideas		2
		i	Minigames	N/A
		ii	Puzzles	4
		iii	Abilities	3
		iv	Single roomed PuzzleBomber	2
		v	Two player PuzzleBomber	2
		vi	Different enemy types	2
		vii	Different wall types	2
		viii	Write expansion for ideas	5d
	e	Game functionality and gameplay		1 & 5d
	f	Game rules		5d & 5e
	g	Costikyan game design principles		1
	h	Software Requirements		1, 5e, & 5f
	i	Acceptance tests		5e & 5f
	j	Task list - Project plan for implementation		5d
	k	Activity Network		5

		i	Critical path	5j
		ii	Gantt chart	5j & 5kii
8			**Editing**	**5**

4.2. Project Plan for Term 2

Task				**Dependencies**	**Duration**
1			**Gameboard**	**N/A**	**3 days**
	a		Create grid	N/A	
2			**Walls**	**1**	**14 days**
	a		Collision Detection	N/A	
	b		Different Wall types	N/A	
		i	Normal Walls	N/A	
		ii	Reinforced Walls	N/A	
		iii	Indestructible Walls	N/A	
	c		Walls lose life to bomb	2a & 5	
	d		Random Ability dropped	7	
	e		Random chance of drop	N/A	
3			**Player**	**1**	**14 days**
	a		Player movement & Health	1	
	b		Collision Detection	N/A	
	c		Player picks up abilities	3b & 7a	
	d		Player drops bombs	5	
	e		Player loses life to enemies	3b & 4b	
	f		Player loses life to bombs	3b & 5	
4			**Enemies**	**1**	**14 days**
	a		Enemy movement & Health	1	
	b		Collision Detection	N/A	
	c		Different enemy types	N/A	
		i	Normal	N/A	
		ii	Bomb Carriers	4b & 5	

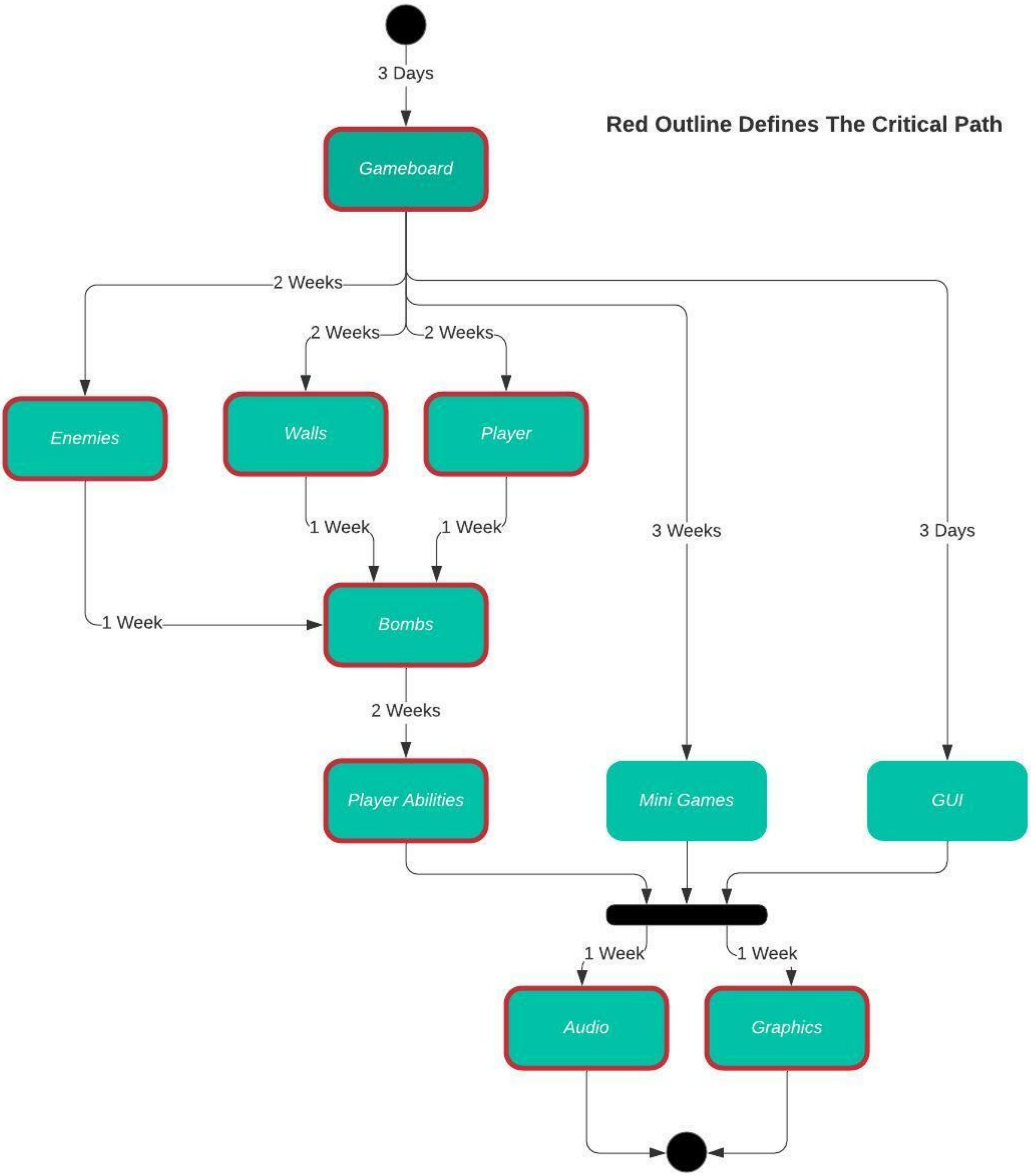
		iii	Invulnerable	N/A	
		iv	Bosses	N/A	
	d	Enemy loses life to bomb		4b & 5	
5	**Bombs**			**3**	**7 days**
	a	Collision Detection		N/A	
	b	Timer		N/A	
	c	Explosion		5b	
6	**GUI**			**N/A**	**3 days**
	a	Display enemy numbers		4	
	b	Display abilities acquired		7	
	c	Display minigame played		8	
	d	Level number		N/A	
7	**Abilities**			**N/A**	**14 days**
	a	Collision Detection		N/A	
	b	Player Speed Increase		3a	
		i	Increase player movement speed		
	c	Enemy Speed Increase		4a	
		i	Increase enemy movement speed		
	d	Player Invincibility		3	
		i	Player takes no damage		
		ii	Set timer		
		iii	End when timer runs out		
	e	Enemy Invincibility		4	
		i	Enemies takes no damage		
		ii	Set timer		
		iii	End when timer runs out		
	f	Player Shield		3	
		i	Display shield graphics		
		ii	Player gains Extra life		
		iii	Hide shield graphic on hit		

	g	Enemy Shield			4	
		i	Display shield graphics			
		ii	Enemies gain Extra life			
		iii	Hide shield graphic on hit			
	h	Enemy Speed Decrease			4a	
		i	Reduce enemy movement speed			
	i	Player Speed Decrease			3a	
		i	Reduce player movement speed			
	j	Invisibility				
		i	Change player sprite		3, 4a & 3d	
		ii	Stop enemy movement			
		iii	End on bomb drop			
	k	Bigger bombs			5	
		i	Increase bomb range			
	l	Nuke			4 & 5	
		i	Clear all enemies			
8	**Minigames**				**N/A**	**12 days**
	a	Colour Matching Puzzle			N/A	
		i	Create colour tiles			
		ii	Spawn in random location			
		iii	End when all tiles matched			
	b	Memory Puzzle			N/A	
		i	Create buttons			
		ii	Randomly generate order			
		iii	Finish when correct order entered			
	c	Object Puzzle			N/A	
		i	Object			
			1	Object Movement		
			2	Collision Detection		
		ii	Endpoint			

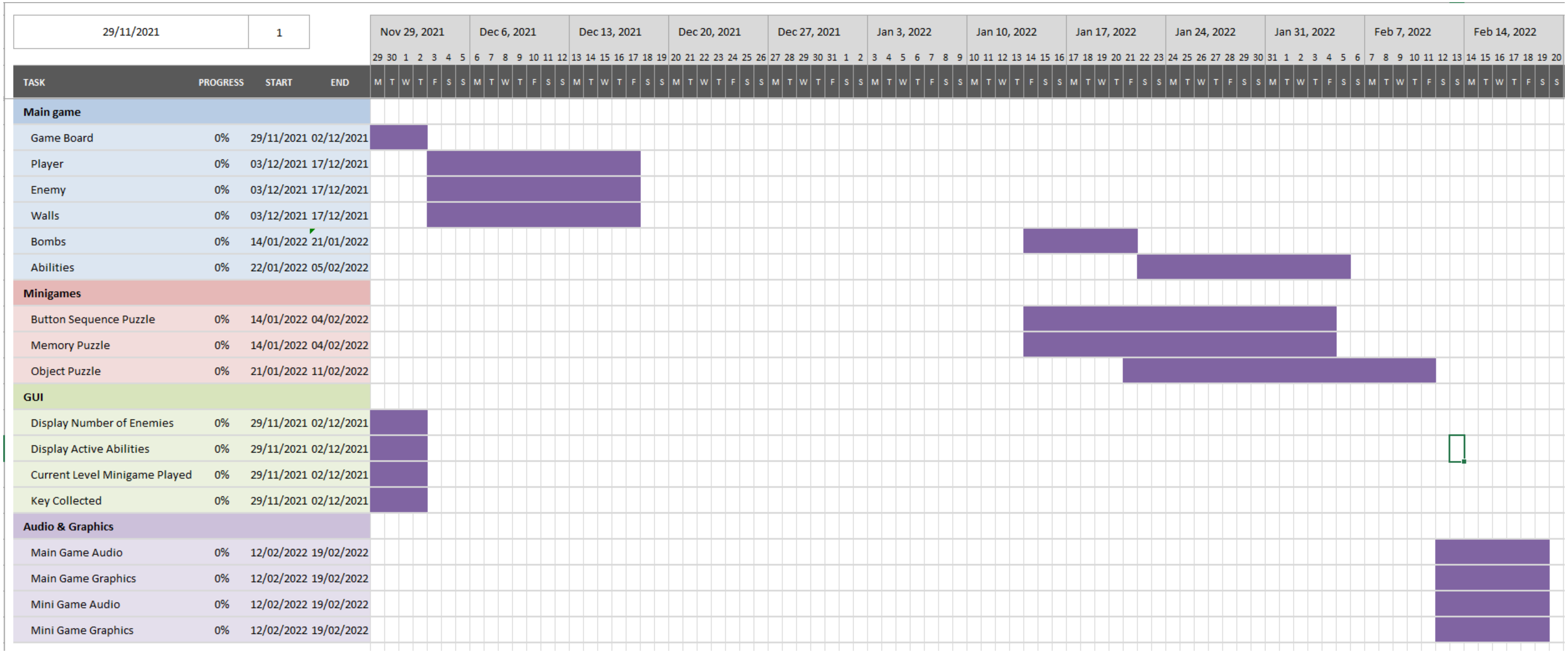
			1	Collision Detection		
		iii		Finish when object at endpoint		
	d			Minigame generation	8a, 8b & 8c	
		i		Random minigame selected		
		ii		Random minigame loaded		
		iii		Minigame run		
	e			End Puzzle	N/A	
	f			Player receives reward	7	
9				**Run Level**	**1, 2, 3, 4, 6 & 8**	**2 days**
	a			Display GUI	6	
	b			Show board	1	
	c			Auto generate walls	2	
	d			Auto generate enemies	4	
	e			Spawn Player	3	
	f			Randomly set key location	N/A	
	g			Load Minigame	8	
	h			Key to unlock next level	N/A	
	i			Finish level	N/A	
10				**Graphics Design**	**2, 3, 4, 5**	**7 days**
	a			Design Player	3	
	b			Design Enemies	4	
		i		Normal	4ci	
		ii		Bomb Carrier	4cii	
		iii		Invulnerable	4ciii	
		iv		Bosses	4civ	
	c			Design Walls	2	
		i		Normal	2bi	
		ii		Reinforced	2bii	
		iii		Indestructible	2biii	
	d			Design Bomb	5	

11	**Audio Development**					**7 days**
	a			Player Sounds	3	
		i		Damage taken	3a	
		ii		Player death	3a	
		iii		Player movement	3a	
		iv		Bomb Drop	3d	
	b			Enemy Sounds	4	
		i		Enemy Death	4a	
		ii		Enemy Movement	4a	
	c			Wall Sounds	2	
		i		Wall Damaged	2a	
		ii		Wall destroyed	2a	
		iii		Indestructible wall	2a	
	d			Bomb Explosion	5	
	e			Minigame Sounds	8	
		i		Minigame Found	N/A	
		ii		Button	8a	
			1	Incorrect		
			2	Correct		
		iii		Memory	8b	
			1	Shuffle		
			2	Match		
			3	Incorrect		
		iv		Object	8c	
			1	Objects move		
			2	Endpoint		
	f			Key Collected	9h	
	g			Ability Collected	7a	
	h			Level Complete	N/A	

4.3. Activity Network



4.4. Gantt Chart



29/11/2021	1		
TASK	**PROGRESS**	**START**	**END**
Main game			
Game Board	0%	29/11/2021	02/12/2021
Player	0%	03/12/2021	17/12/2021
Enemy	0%	03/12/2021	17/12/2021
Walls	0%	03/12/2021	17/12/2021
Bombs	0%	14/01/2022	21/01/2022
Abilities	0%	22/01/2022	05/02/2022
Minigames			
Button Sequence Puzzle	0%	14/01/2022	04/02/2022
Memory Puzzle	0%	14/01/2022	04/02/2022
Object Puzzle	0%	21/01/2022	11/02/2022
GUI			
Display Number of Enemies	0%	29/11/2021	02/12/2021
Display Active Abilities	0%	29/11/2021	02/12/2021
Current Level Minigame Played	0%	29/11/2021	02/12/2021
Key Collected	0%	29/11/2021	02/12/2021
Audio & Graphics			
Main Game Audio	0%	12/02/2022	19/02/2022
Main Game Graphics	0%	12/02/2022	19/02/2022
Mini Game Audio	0%	12/02/2022	19/02/2022
Mini Game Graphics	0%	12/02/2022	19/02/2022