

1. Introduction to the game and project:

This project delves into the Tower Defense genre, focusing on optimising and balancing gameplay, the essential elements that make the Bloons Tower Defense series engaging and compelling.

2. Proposed hypothesis

To investigate and recreate the way the various systems feel and how they connect together in harmony in Bloons TD.

Bloons has a lot of moving parts in the game. From the enemies, towers, and resources. All the numbers in the game have been fine-tuned to produce an extremely balanced and fleshed-out experience. The Bloons TD franchise has had many years and iterations of games to balance mechanics and slowly add more. We want to experience this balancing process that the developers have had to go through. Our goal is to make a game that feels as close to bloons as possible. We will be slowly adding the bloons mechanics as the time frame allows. We will then look into how to balance each system. We would like to gain insight into the thought process of the original Bloon developers.

3.Project Research and Scope

Part of what makes the design and gameplay of Bloons compelling includes :

-The streamlined gameplay and how it links with the Tower Placement System:

The tower placement mechanics create the need for players to apply strategy and think about how and where the placement of each tower would achieve the greatest damage output.

-Tower defence innovations which link with the Upgrade System:

In BTD1-4, they introduce new tower types and upgrade systems, which in turn refreshes the traditional tower defence formula. This is in the sense that the more refined towers there are , the more the upgrades have been created to reflect the strength and damage level they cause to the bloons to be popped.

-Strategic Depth and Bloon Types System:

Players need to balance tower placements with upgrades and resource management. Different Bloons require unique strategies to pop and thus players need to constantly adapt their tower placements and upgrades to counter various Bloon types. This adds a deeper layer of immersion to the different mechanics at play and increases the game's replayability.

So at best, we are looking at 4 Main systems:

-Tower Placement System.

-Upgrade System.

-Bloons Type System.

-Resource-Management System[also works with the stats tracking system].

4. Design Areas of Focus Ideas to make the clone systems better:

-Optimisations and Balancing[Probably the most importance overall goal and the main point of this clone]:

With the way the original game works, it optimises tower placements , upgrade usage and Bloon spawn rates to create a challenging yet manageable gameplay experience.

The game also balances the different tower strengths , weaknesses and costs to ensure that no single tower dominates the whole game or can do everything .

Ideas to refine the optimization and the balancing to avoid machine glitches and crashes in higher and more difficult levels in the clone include :

Optimization:

-Ensuring that the bloon spawn rates are at a fixed number in order of their increasing levels of difficulty to avoid making the player feel overwhelmed by not having enough defence mechanism to counter the challenge posed by the bloons.

-Ensuring that the round system works with balanced intervals .

Balancing:

- Adjusting the tower costs and upgrade prices to reflect their strength and utility in the game. That way, players manage their in-game currency strategically if they are aware of the strength and effects of

their purchase before actually buying and placing specific tower combos

- K: Towers need to fulfil a niche so that each tower has a time to shine. So balancing all towers to make them all feel like a viable option.

5. System Communication Delegation:

-Dumi = deals with the Tower Placement Systems and /or Resource Management system.

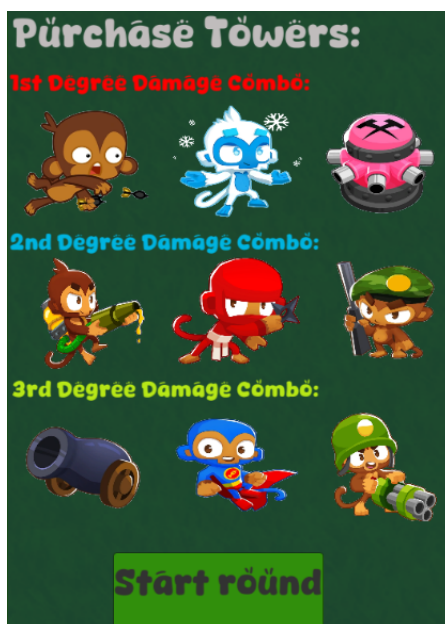
-Kellen = deals with the Bloons System specifically the optimization of the Bloon Hit calculations and spawn rates.

-Chris = deals with the Towers Upgrade inventory in depth and level expansion/paths. Deals with individual tower systems

Tower Placement System explained depth and the refining of mechanic(s) within the system[Dumi]:

-Streamline the gameplay mechanics a bit more[Tower Placement System]:

For the tower placement mechanic, we could allow players to choose specific tower placement combos that work together to be more effective to achieve ultimate damage outputs. So for example, if players choose to place two towers of the same type and one different tower, we could create a combo that allows them to choose how to upgrade those towers to unlock secret damage outputs. That way, players have more incentive to experiment with different tower placement combos and upgrades to maximise the damage to the Bloons popped and the overall money gained. Players also spend less time trying to figure out which towers work with which bloons spawned[i.e. A reduced trial-and-error] because the tower combos would be categorised to reflect the colour of the bloons to be spawned in each round. This relays the idea of the level of difficulty of bloons to be spawned and the defence mechanisms put in place to counter that.



For example; the red “1st-degree damage combos” would be the tower combo to use for the first few rounds of the

game where the red bloons would be spawned. As the level of difficulty of the bloons increases, the tower combos provide a visible strategy defense method to use to counter the bloons type challenge in each round.

The tower placement refined mechanic would refine the following systems of the clone :

-Upgrade System: Because towers can already be upgraded to increase damage, picking a combo of towers to place concurrently allows for players to maximise the damage effects applied to the Bloons and allows them to unlock special upgrade abilities in return for potential bonus lives and money.

-Resource management system: The management of the in-game currency to purchase towers and upgrades as well as activate special abilities would be collectively linked with which combos players decide to use for their tower placements and the overall special upgrades they gain to cause maximum damage. So it's almost like the refinement of one aspect of the mechanics in turn creates a stronger linkage of the systems that underpins that mechanic. As a result, the linked systems will require players to manage their resources more effectively, adding a new layer of depth to the game.

Refinement of Bloons System and how to balance and optimise better in the clone[Kellen]

The bloons are the enemies that the player has to defend against. They form the challenge for the player to overcome. The Bloons are simple in design with basic stats and mechanics. This always allows the player to easily understand the behaviour of all the bloons. It is this predictability that the player forms a strategy around.

The bloons have 2 major stats: the amount of layers (health) and speed. These are the 2 main factors that cause the bloon layers to be unique and challenging. The higher layers have that bloons have immunities that add to the complexity of the game. These immunities are always known to the player as they have to strategise around.

In Bloons TD there are often a lot of bloons on the screen and being popped at any one time. The quantity of bloons and projectiles that are on the screen results in a large amount of calculations. This needs to be taken into account when designing the structure of the bloons. The amount of calculations at one time should be limited.

SYSTEM AREA FOCUS FOR THE CLONE:

The clone will focus on communicating the bloon layers well and the tower functionality.

Refinement of the Tower Upgrade system(s) and the level expansion/paths[Chris]:

Extensive research was done on the towers and how they and each of their abilities interact with the environment. What once seemed simple was quickly realised to be a lot more complicated than expected. Each tower interacted with both the bloons, the environment and each other. To create the towers the placement system had to be developed which made sure the towers could only be placed within the map and could not be placed on top of each other or on the paths. Next the towers needed to have an upgrade an upgrade system that dynamically populated the upgrades for each tower when selected, this system had to have constraints so that the upgrades behaved the same as in bloons tower defence 5, for each tower once one upgrade path passed 2 upgrades then the other path is locked to a max of 2 upgrades. Checks had to be implemented so that only one tower of each tower type could max upgrade a path. So if a dart monkey tower maxed their path 1 upgrades the other dart monkey towers would only be able to upgrade their path 1 upgrades till the 3rd upgrade until the max upgrade tower is sold.

The two towers each have a max upgrade that introduces a unique ability which is linked to a button to activate the abilities. These abilities were complex to get to act as they do in the original bloons game, but we managed to get them as close as possible.

The descriptions and images for each upgrade are stored in dictionaries and called to populate the upgrade ui depending on which tower is selected so that the correct upgrades are shown and bought.

Playtest

First build: 1 tower & 40 rounds

Playtest 1 - one tower with upgrades:

observations:

With one tower, lost first life at round 16; had 3-2 dart.

Lost on round 20; had 4-2 dart.

Playtest 2:

Observations:

With 0-0 dart: lost 2 lives on round 4.

Lost 3 on round 7

Lost 11 on round 8

Lost 39 on round 9

Lost game round 10.

Playtest 3:

Error on round 20 – cause was the bloons splitting

Second build: 2 towers & 40 rounds

Playtest 4:

6. Changes made and design decisions made :

Recent Changes as of 02 August 2024 :

-We have decided to scope down the number of towers in the game to just 3 towers. Mainly the Dart Monkey, Tack Shooter and the Bomb Shooter Tower. This design decision to scope down the project to easier to achieve objectives was caused by the level of detail that would need to go into the implementation of the other towers.

Considering that a large part of Bloons doubles down to how balanced the numbers have been made to create an engaging experience, we needed to ensure that we stick to that while also ensuring that we don't deviate too much from the original game , lest we shift away from its core design. Not only was the time frame quite limited for each tower to be fully flashed out in its own individual system but the balancing of the altogether would have taken us longer to implement prior to our deadline.

- The Easy Level can play up to 40 Rounds including the Moab. This design decision was caused by the fact that we wanted players to play as long as they can in the game to get the same game feel as the original BTDD , if not close enough. By incorporating rounds as long as the original game, with bloons spawn rates increasing linearly to increase the amount of challenge , this allowed us to focus on intricacies of the balancing and the timing that went into the original creation of the game and its impact thereof.

-The Medium Level Inclusion can play up to 65 rounds. This design decision was caused by the intention to focus on the depth of the balancing of the systems in a higher level of difficulty than the easy level. In this level , a lot of aspects of the tower defence were tweaked such as the attack range , the pierce and damage taken to achieve a

game feel and level of complexity as close enough to the original
BTD as possible.

- We scoped down to two towers removing the bomb shooter. This decision was made so as to focus on properly implementing all the features present in the original game for the dart monkey and tack shooter.

Project Management:

