Analysis of Feedback Loops in Bomberman

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The purpose of this paper is to explain how feedback loops work and how they affect the gameplay of Bomberman (Hudson Soft, 1983). Bomberman is the perfect candidate for the simultaneous coexistence of both positive and negative feedback loops, which is an ideal situation to highlight as an example.

To prove my point I will analyse every single power up and how it affects gameplay and creates feedback loops. A brief introduction to Bomberman and to what feedback loops are will make the task easier for the reader.

Bomberman is a 1983 maze game developed by Shinichi Nakamoto. The player controls Bomberman, a robot that decides to escape the factory where he works to reach the planet's surface and transform into a human being. To do so he needs to go through 50 levels (the factory's floors). In every level the player uses bombs to either neutralize the enemies or to break the blocks which hide the level exit and power ups. The player dies when he's touched by an enemy or he's hit by the blast of his own bombs. Once all the enemies are defeated the player can leave the level and go on to the next one.

In the game design context, feedback loops refer to a chain of events which either gives advantages or disadvantages to the player. This chain of events is triggered by the player accomplishing a goal towards the completion or the victory of the game. Some games reward the player as he progresses, by giving him advantages which will make reaching his goals easier. This is known as a positive feedback loop. (Adams, 2009, p. 349).

Other games create impediments for the player, by burdening him as he gets through the game or by making him more vulnerable when he could potentially win. This is known as a negative feedback loop. Rosney (as cited in Salen &Zimmerman, 2003) stated that a negative feedback loop "leads to adaptive, or goal-seeking behaviour ... In a negative loop every variation toward a plus triggers a correction toward the minus, and vice versa. There is tight control" (p. 221). A negative feedback loop tends to diminish, rather than amplify, the output of a system (Adams, 2002).

This mechanics are particularly problematic in multiplayer games, when a player being empowered by a virtuous cycle often implies another one that is stuck in a vicious cycle. As written by Ham (2010) "When a game involves only a single player, providing "fun" can be the overriding design concern … Multiplayer games are trickier. At a certain point, one player will be advancing towards victory and the other(s) toward defeat.

Even though Bomberman is a single player game, an imbalance in feedback loops can still very much affect the player's experience. In this particular case an excessively positive feedback loop will be the problem. According to Despain (2013) "Although players want to be more powerful, what they really

want is an interesting and challenging game. Sometimes giving them more power goes to counter that goal" (p. 14).

Most games contain power-ups or feedback loops, but Bomberman is peculiar in that respect. The majority of Bomberman's power-ups fall in the game changer category. As defined by Rogers (2014) "Game changers alter the dynamics of the gameplay and the player's interaction with the game" (p. 386).

In-game power-ups are hidden by bricks and their collection is not compulsory in terms of completing the level. Every level contains one power-up and once they've been collected their benefits are active until the game is over (Wallpass, Detonator, Flamepass and Bombpass are reset when the player dies).

The first two power-ups found in game are part of a negative feedback loop: they are undeniably an improvement, but at the same time they present a new obstacle for the player. Despain (2013) stated that "Designers may wish to pair the positive feedback given with a kind of negative feedback" (p. 14).

The Flames power-up expands the blast radius of the bomb explosion to a maximum of 5 squares. More powerful bombs increase offensive capabilities, but there's a bigger chance that the player is going to kill himself with the blast of his own bombs. In the final floors not killing enemies right away is rewarded with special bonus items, and a huge blast radius makes it harder to obtain them.

In level 2 the player picks up Bombs: this power-up allows for the planting of more than one bomb at a time, with a maximum of 10 bombs. It's now even easier for the player to neutralize enemies or destroy bricks, but the player can't walk over bombs yet, so now it is more likely that he's going to trap himself and die.

As stated by Webel and Galtung (2007) "A positive feedback loop can be called a virtuous cycle if it reinforces a desirable trend, or a vicious cycle if it reinforces an undesirable trend" (p. 189). All of the following power-ups feed a virtuous cycle, considering they present no significant drawback and they increase the player's power considerably.

The 3rd level's power-up is one of the most significant: the Detonator. Now explosions can be triggered by the player, who doesn't have to rely on timing bombs anymore. Calculating when to plant bombs so that they would explode when the enemies pass was such a big challenge that removing it, rather than feeding the virtuous cycle, removes depth from the gameplay. The other power ups which eventually transform the way of playing the game are Flamepass, Wallpass, Bombpass and Speed.

Bombpass at level 9 allows the player to walk over bombs. Explosives being an obstacle on the player's path was another game mechanic which is now nullified by a power-up, and this will be a recurring trend in Bomberman. At this point in the game the player is already able to plant 4 bombs at the same time and, thanks to the Detonator power up, he can use them as a wall to contain enemies and detonate them when he is in a safe zone.

In the next level Walkpass is obtained, another game changing power up: this power up allows the player to walk over bricks. Bomberman can now walk everywhere in the level without having to worry about being trapped. Paired with the Speed power up, which is available in level 4, this power up gives the player enough speed to outrun enemies and enough freedom of movement to get out of danger in any situation.

Slowly all the elements which classified Bomberman as a maze game are overshadowed by a far too positive feedback loop. By level 10 it is now impossible for the player to be trapped by bombs or bricks. Game mechanics define what players are allowed to do in the game and how the game is played (Rouse, 2004), and only $1/5^{th}$ in the game they are being radically changed.

Found in level 26, the Mystery power up gives the player a hint of how life is going to be even easier: When Mystery is collected, the player can pass over everything and can't be killed by monsters or flames. Except surviving the touch of monsters, most of the other bonuses are already active at this point in the game. The only one left is Flamepass, which is obtained in level 30.

When this power up is active, the bomb's explosion doesn't harm the player anymore. This means that it is now impossible for the player to get trapped, and also that enemies are not a threat anymore. Coupled with the Bombpass and Detonator power ups the player can now drop bombs at his feet and detonate them when a threat approaches.

Flamepass is the last of a series of power ups which transformed Bomberman from a slow and vulnerable character into a war machine. What was a balanced character progression has turned into a complete revolution. Such a virtuous circle has drastically changed the basic gameplay concepts, and shows how much positive feedback can destabilize a game (LeBlanc, 1999), while a vicious circle can provide stability (Ranis & Stewart, 2006).

How does this positive feedback loop impact the overall game? It is arguable that, unlike in many other games, Bomberman's most challenging levels are the first ones. Standing by the definition of challenge as "a situation in which the outcome desired by the player requires an effort to accomplish" (Sicart, 2008), Bomberman gets less challenging as the player progresses.

The only case where the game gets gradually more challenging is when the player is trying to set a high-score. Some of the criteria required to achieve a high-score, such as destroying all blocks without killing any enemy, are hard to satisfy once the player has picked up all of the power-ups available. This was most likely a design choice: Bomberman was a home computer game, not an arcade game. It offered everyone the chance to complete the game, but it retained a high-score mechanic to challenge the more demanding players.

A balanced character growth was seen in the beginning of the game, but a positive feedback loop made the player almost invincible. Such a big change does not greatly impact the design of the levels: the

player's objective is sill to destroy all enemies and find the way out. An increase in the number of enemies and their faster movement speed are not enough to counter the power the player has obtained.

Such a positive feedback loop has taken away the challenge for those who only seek to play through the game and finish it. Koster (2004) stated the following: Games grow boring when they fail to unfold new niceties in the puzzles they present … This means it's easy for the player to get bored before the end of the game … The player might master everything in the pattern. He has exhausted the fun, consumed it all (p. 42-44).

Optimal experiences occur within a sequence of activities that are goal-directed and bounded by rules (Csikszentmihalyi, 1990), and in Bomberman almost all rules have been set aside. The continuous changes of game mechanics have altered the nature of the game, since mechanics can be regarded as a way to summarize game rules, and are often used to categorize games (Lundgren & Bjork, 2003).

This in depth analysis of every power up in the game has led me to the conclusion that an excessive positive feedback has ruined the game's balance. It has done so by changing the game's mechanics and rules to a point where the nature of the game has been altered.

References

Adams, E. (2002, Jan 4). Designer's Notebook: Positive Feedback. *Gamasutra*. Retrieved from http://www.gamasutra.com/view/feature/131426/designers_notebook_positive_.php

Adams, E. (2009). Game Balancing. In *Fundamentals of game design* (2nd ed., p. 349). Berkeley, Calif.: New Riders.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper & Row.

Despain, W. (2013). Feedback Loops. In *100 principles of game design* (p. 14). Berkeley, Calif.: New Riders.

Ham, E. (2010). Rarity and Power: Balance in collectible object games. *Game Studies, 10*(1). Retrieved from http://gamestudies.org/1001/articles/ham

Koster, R. (2004). What Games Are. In *Theory of fun for game design* (1st ed., p. 42-44). Scottsdale, AZ: Paraglyph.

LeBlanc, M. (1999). *Feedback Systems and the Dramatic Structure of Competition* [PowerPoint Slides]. Presented at the 1999 Game Developers Convention, San Jose'. Retrieved from http://8kindsoffun.com

Lundgren, S. & Bjork, S. (2003). Game Mechanics: Describing Computer-Augmented Games in Terms of Interaction. *Terms of interaction. Proceeding of* TIDSE 2003. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.13.5147

Ranis, G. & Stewart, F. (2006). *Successful Transition Towards a Virtuous Cycle of Human Development and Economic Growth: Country Studies*. Yale University Economic Growth Center. Retrieved from http://ssrn.com/abstract=920603

Rogers, S. (2014). Now you're playing with power. In *Level up! The guide to great video game design* (2nd ed., p. 386). Hoboken: Wiley.

Rouse, R. (2005). The Design Document. In *Game design theory & practice* (2nd ed., p. 361). Plano, Tex.: Wordware Pub.

Salen, K. & Zimmerman, E. (2003). Games as Cybernetic System. In *Rules of play: Game design fundamentals* (p. 221). Cambridge, Mass.: MIT Press.

Sicart, M. (2008). Defining Game Mechanics. Game Studies, 8(2). Retrieved from http://gamestudies.org/0802/articles/sicart

Webel, C. & Galtung, C. (2007). Peace as Self-Regulating Process. In *Handbook of peace and conflict studies* (1st ed., p. 189). London: Routledge.