Systemic Design and Game Design: The equilibrium gameplay loop

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Systemic Design and Game Design

The equilibrium gameplay loop

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Game design is a recent design discipline concerned with the making of games, especially digital ones. Game designers must often tackle complex, wicked problems; Indeed, in game design literature, games are increasingly referred to as “complex systems” (Fullerton, 2008; Maiorana, 2020; Salen & Zimmerman, 2003; Sellers, 2017; Zubek, 2020). However, research in game design using a systemic approach is still in its infancy, and the visualisation of game systems poses certain challenges for game designers. Firstly, a mechanistic approach still dominates the field of game studies (Koenitz & Eladhari, 2021). Secondly, representing game systems visually is a daring task, as stressed in various works about game loops and game diagrams (Berube, 2019; Francillette et al., 2017; Guardiola, 2016; Palavalli & Harsha, 2020). Therefore, the present paper asks: how can a systemic approach help designers understand and visualise core game systems? The theoretical framework comes from the French systemic approach (De Rosnay, 1979; De Rosnay, 1979 [1975]; Le Moigne, 1977, 1990; Morin, 2008) and builds specifically upon the work of Joël De Rosnay. This author showed how systems maintain themselves over time in a dynamic equilibrium. The result of this study is a visual representation of game systems, namely the equilibrium gameplay loop. In the end, equilibrium gameplay loops can be used to better understand game systems—both existing and new—and further develop systemic design research and practice.

KEYWORDS: video games, game design, game system, equilibrium, feedback loops, complexity.

RSD TOPIC(S): Methods & Methodology, Society & Culture

Games as systems?

Game design is an emerging discipline. While some of its aspects are related to the mathematical branch of game theory, this discipline is mostly built upon game studies and design research.

In the beginning, game studies focused on games and players (Zabban, 2012) and only recently have they turned toward game creators (Kultima, 2015). Major works in game studies often analysed the way games “function” and are “fun”, using a formalist approach (Mäyrä, 2020). By trying to find the “components” or “building blocks” of games, game studies leaned into trying to find the perfect formula, like a chemist would do with atoms (Cook, 2007). Therefore, the perspective that currently dominates the study of game design is decidedly mechanistic (Chiapello, 2017; Chiapello & Dumitrache, 2022; Koenitz & Eladhari, 2021). Professionals and researchers alike regularly use the term “game mechanics”, which has become a core concept within the discipline (Kultima, 2018).

However, the focus gradually turned toward design disciplines (from architecture to industrial design) to explain the practice of game creators (Chiapello, 2017; Kuittinen & Holopainen, 2009; Kultima, 2015). This acknowledgement of game design within the broader field of design disciplines has led to a growing trend of games being considered as systems (Chiapello & Dumitrache, 2022; Koenitz & Eladhari, 2021).

Mechanistic and systemic approaches to design are getting progressively intertwined in game design literature (Fullerton, 2008; Salen & Zimmerman, 2003). The importance of feedback loops in games has thus been established (Adams, 2014 [2009]; Rouse III, 2005; Salen & Zimmerman, 2003). However, if most of the “gameplay loops” depend on the idea that some tasks repeat themselves and constitute the “core” of a game experience, they are not truly linked with system dynamics or cybernetics (Berube, 2019; Francillette et al., 2017; Guardiola, 2016).

Presently, extensive studies of systemic approaches in game design can be found mainly in two books: Advanced game design: a systems approach (Sellers, 2017) and Elements of Game Design (Zubek, 2020). In those books, positive feedback loops, which lead to the paroxysm of a system, are accurately depicted. However, negative feedback loops are scarcely represented. Negative feedback loops are a major aspect of the gaming experience, as they allow the system to maintain itself in a balanced state. Indeed, a game experience can be seen as an equilibrium: an overly easy game is boring, while a too difficult one causes anxiety and reduce fun (Csikszentmihalyi, 1997; Sweetser & Wyeth, 2005).

To represent games as equilibrated systems, we turned our attention toward systemic design and asked ourselves: how can a systemic approach help designers understand and visualise core game systems?

Systemic Approach to Game Design

The theoretical framework used in this study refers to French systemists (De Rosnay, 1979 [1975]; Le Moigne, 1977; Morin, 2008). The French systemists triumvirate, namely De Rosnay, Le Moigne and Morin, elaborated on Heinz von Foerster’s second-order cybernetics (Breton, 2019) and developed the complexity paradigm (Morin, 2008).
De Rosnay specifically worked on the concept of autoregulation, self-organisation and autopoiesis (De Rosnay, 1995). We suggest modelling games based on De Rosnay’s equilibrium loops.

In his first major book, The Macroscope (1979 [1975]), De Rosnay expands mainly upon system dynamics (Forrester, 1971). He offers a balanced way of visualising systems. Using the infinity symbol, he demonstrated how a system could maintain itself forever in a dynamic equilibrium if nothing disrupts it. Figure 1 is a reproduction of such an equilibrated system: the regulation of mice population.

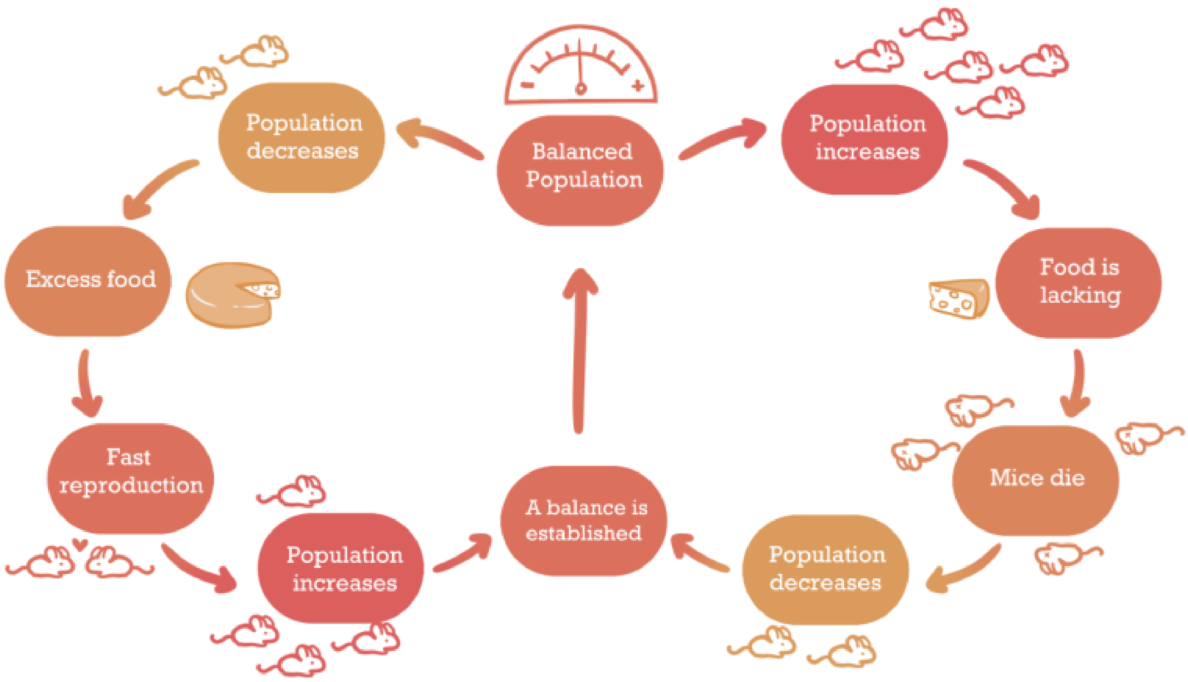

Figure 1. Systemic loop describing the regulation of mice population. Reproduced from De Rosnay (1975, p.17).

This diagram shows how balance is established within mice populations: if the population decreases, the mice will have an abundance of food and therefore reproduce faster. This increases their total population. However, an increase in population causes food scarcity, which in turn causes mice to die, leading to a decrease in population. The cycle then repeats, and the system re-balances itself continuously. Taken separately, the two loops form positive feedback cycles. Together, however, they become an equilibrated system (the last item of the left loop is the first item on the right side, and vice versa).

Following De Rosnay's model, we represented the classic video game Tetris (Alexey Pajitnov, 1984) in figure 2 as an equilibrated system. Tetris is a two-dimensional puzzle game. The objective of the game is to create horizontal lines by arranging various geometric shapes (otherwise known as tetrominoes), which award points to the player. Though, the real goal resides in achieving a "Tetris": arranging four lines at the same time using the 4-block straight bar for maximum points. The completed horizontal lines disappear, freeing up space so the puzzle can keep going. But desired shapes (like the aforementioned straight bar) do not necessarily appear at the ideal time. Thus the players will often have to deal with ill-fitting tetrominoes, constructing half-finished lines which leave "gaps" on the board. These gaps eventually fill up the board until it is completely oversaturated, and the game is over.

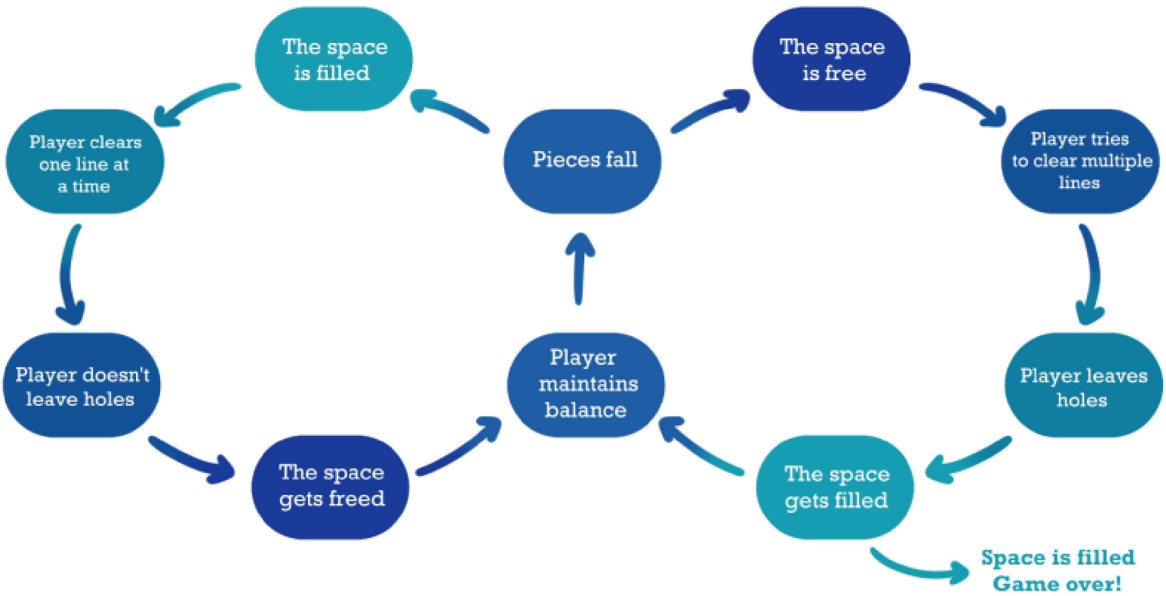

Figure 2. Tetris Systemic Equilibrium Gameplay Loop (Chiapello and Dumitrache).

Another type of game that can be represented with equilibrium gameplay loops are management and simulation games, like the Roller Coaster Tycoon series (Chris Sawyer, 1999), in which the player runs a theme park and must manage innovation and investment (figure 3).

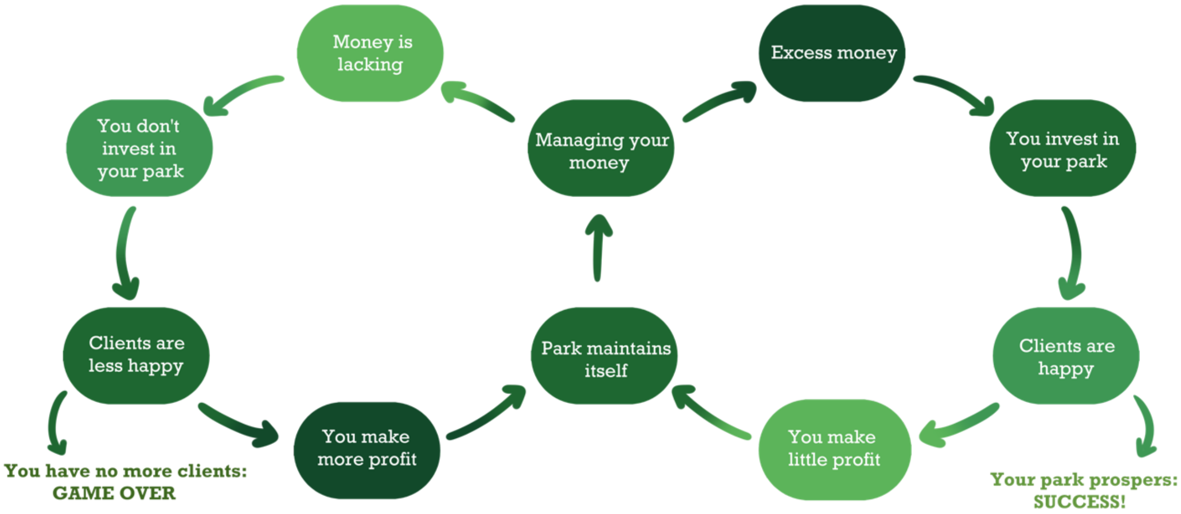

Figure 3. Roller Coaster Tycoon Systemic Equilibrium Gameplay Loop (Chiapello and Dumitrache).

In conclusion, De Rosnay's equilibrium loops are useful to visualise game systems; they stress the importance of positive and negative feedback loops. These gameplay loops can help designers and researchers understand existing games without having to read long analyses or play them for hours. They can also facilitate the making of new games and help prototype complex systems (Maiorana, 2020; Palavalli & Harsha, 2020). Finally, the study of game design offers another example of the relationship between design and system thinking, and we hope that game designers will become more and more aware of the potential of system thinking to enhance their practice.

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