

The History and Significance of Jumping in Games

Jason Begy

Singapore-MIT GAMBIT Game Lab

5 Cambridge Center

Cambridge, MA 02142 USA

jsbegy@mit.edu

This paper was originally published as “The History and Significance of Jumping in Games” in GAME//PLAY//SOCIETY: Contributions to Contemporary Computer Game Studies. Proceedings of the 4th annual Vienna Games Conference. Kopaed: Munich, Germany, 2010.

Abstract

Why is it that so many board games and video games feature jumping mechanics? This paper argues that the reason is rooted in positive associations with height, which manifest in the form of orientational metaphors. Through unit analysis this paper traces jumping mechanics from early board games to modern platformers, arguing that in each jumping constitutes an act of dominance: jumping over something improves the jumper’s position within the game. In this way jumping over something reflects the orientational metaphor GOOD IS UP. In so doing this paper shows how games offer further insight into the study of metaphor, and into how games express meaning through metaphor.

Intro

As a game mechanic, jumping has become nearly ubiquitous. Board games featuring jumping have existed for over one thousand years (Bell [1973] 2008; Murray 1952; Parlett 1999), and are still being designed today. Among video games jumping appears in numerous genres, including first-person shooters, action-adventure, fighting, and even the occasional driving game.¹ Platformers as a genre are defined by their emphasis on characters that jump. The widespread use of this mechanic suggests that it is more than convention or convenience, but rather there is something about jumping that is fundamentally appealing to a wide range of players.

In this paper I argue that jumping's appeal is rooted in our positive associations with height. I begin by introducing Lakoff and Johnson's concept of orientational metaphors, which are ideas and values connected to spatial orientation. In particular I discuss the metaphor GOOD IS UP,² which is a constellation of concepts associating positive values with height.

I next introduce unit analysis, and argue that orientational metaphors can be located in a game's unit operations (Bogost 2006). As an example I show how a particular unit operation that I call the "dominating jump" is a reflection of GOOD IS

¹ Notably *Bump 'N Jump* and *Crazy Taxi 2*.

² Lakoff and Johnson capitalize references to metaphors for purposes of clarity; I maintain this convention for similar reasons.

UP, and locate this unit in several board games and video games. Following this I provide a comparative unit analysis (Bogost 2006) of several board games and video games that feature jumping, and I argue that in these cases jumping is a manifestation of GOOD IS UP. I conclude by arguing that games support Lakoff and Johnson's view that metaphors originate in our physicality in that the dominating jump is present in games from many different cultures, and hence GOOD IS UP is not necessarily culturally situated. I also discuss how studying orientational metaphors can broaden our understanding of how games communicate and express ideas.

Throughout this paper I will be using the term "rules" to refer to the properties of a system or space that enable interaction, and "mechanics" to the methods whereby an agent modifies the game state (Sicart 2008). In a typical *Mario Bros.* game that levels are timed is a rule, that Mario can jump is a mechanic. I will also be using the term "fiction" in the sense that Juul has defined it: as referring to the setting or world in which the game takes place (2005, 121-162), which includes characters. For example, Mario's status as an Italian plumber is part of the game's fiction.

Oriental Metaphors

To explain why jumping is so prevalent in game design it is first necessary to understand the extent to which we attach positive values to height, which manifest in what Lakoff and Johnson refer to as "orientational metaphors" ([1980] 2003).

In *Metaphors We Live By* Lakoff and Johnson argue that our conceptual systems—how we perceive and understand the world—are fundamentally metaphorical in nature. Johnson defines metaphor as “a process by which we understand and structure one domain of experience in terms of another domain of a different kind” ([1987] 1990, 15). Orientational metaphors are so-named because they have to do with spatial orientation, such as up-down, in-out, center-periphery, front-back, on-off, and deep-shallow ([1980] 2003, 14). One of the more prevalent orientational metaphors is GOOD IS UP, through which we conceptualize “good” and “bad” in terms of “up” and “down.” This metaphor can be seen in common expressions such as “my spirits rose” or “I’m feeling low today.” We also talk about “high status” and “low art,” concepts that are rooted in the same metaphor. Taken literally these phrases do not make sense, yet we have no trouble understanding them. Furthermore, orientational metaphors organize “a whole system of concepts with respect to one another” ([1980] 2003, 14). The metaphor GOOD IS UP systematizes several other metaphors that are more specific, such as HAPPY IS UP, SAD IS DOWN; HAVING CONTROL IS UP, BEING SUBJECT TO CONTROL IS DOWN; MORE IS UP, LESS IS DOWN; and HIGH STATUS IS UP, LOW STATUS IS DOWN ([1980] 2003, 15). All of these metaphors make intuitive sense because of their relationship to GOOD IS UP; that this metaphor has been so extended indicates that it is a fundamental aspect of our conceptual systems.

Because Lakoff and Johnson rely on linguistic evidence to support their claims about the nature of orientational metaphors it seems that these metaphors must be culturally situated, which they readily admit ([1980] 2003, 15). However,

they also locate the origin of these metaphors in our experience of our physical bodies. For example, they suggest that the basis for HAPPY IS UP is that “drooping posture typically goes along with sadness and depression, erect posture with a positive emotional state” ([1980] 2003, 15). Similarly, the basis for HAVING CONTROL OR FORCE IS UP is the fact that “physical size typically correlates with physical strength, and the victor in a fight is typically on top” ([1980] 2003, 15). If orientational metaphors do originate in our physical bodies, then we should be able to locate them in a variety of cultures. One way to do so is to examine cultural artifacts, such as games. Games are ideal for such a project for two reasons. The first is accessibility: many games, particularly board games, require much less culturally situated knowledge to be studied and understood than language does, and as such are easily transferred from one group of people to another. This is especially the case when studying a game’s unit operations, which are the actions that occur within a system (this will be further discussed under “The Dominating Jump”). Second, early board games are “folk” games in the sense that they were developed and refined by many players over an extended period of time. This suggests that a game’s evolution was driven by popularity, and that what was changed and what was not is significant. In other words, the rules and mechanics present in such a game signifies something about the people who developed and played it. To determine whether there is a link between jumping and GOOD IS UP, however, it is necessary to narrow-down the study and focus on a particular mechanic: the dominating jump.

The Dominating Jump

As noted above, countless games feature jumping mechanics. However, these take myriad different forms, and while jumping does imply an upward direction it is not necessarily positive: *Q*bert* and *Frogger* feature characters that jump merely as a means of locomotion. Some games express GOOD IS UP in other ways, such as the classic children’s game Snakes and Ladders, in which players race to the top of the board. To show how jumping mechanics specifically can relate to GOOD IS UP it is necessary to focus on a specific manner of jump that I will be referring to as the dominating jump. As I will show, the dominating jump is an expression of GOOD IS UP within a game mechanic. Because I will be focusing on specific game mechanics that occur across a wide range of games—as opposed to the games themselves as wholes—it is useful to frame the dominating jump as a unit operation.

Unit operations are “modes of meaning-making that privilege discrete, disconnected actions over deterministic, progressive systems” (Bogost 2006, 3). Unit operations are the individual functions that comprise a larger system; in the case of a game the game mechanics can be framed as unit operations. Bogost refers to the practice of locating meaning in a work via unit operations as “unit analysis,” which he defines as “the general practice of criticism through the discovery and exposition of unit operations at work in one or many source texts” (Bogost 2006, 15). A unit analysis of a game would look for significance or meaning in what the players can and cannot do, not in how the system functions or is experienced as a whole. In the case of a game such as Chess, this might involve locating meaning in

the movement of the pieces as opposed to the larger patterns of play. Unit analysis privileges the meanings expressed by unit operations over that of the system in which they take place, and does not allow for a separation between “meaning-making” and discrete actions; the actions themselves create meaning.

As noted above, the ubiquity of jumping suggests that the appeal is intrinsic to the action itself, which further suggests that said action is meaningful in some capacity. Because unit analysis locates meaning in the actions that comprise a system, and not the system as a whole, it is an ideal method for examining a range of games that all feature jumping. In the case of the dominating jump, the action of the jump expresses GOOD IS UP.

As a unit operation, the dominating jump includes mechanics wherein the jumping object is in a dominant position relative to that which is being jumped over. The latter can be the opposing player’s pieces (as in numerous board games), computer-controlled enemies, or the environment in which the game takes place (as in video games). The dominating jump can be a means of attack or avoidance, but dominance is always present. Many games feature characters or objects that jump only as a means of movement. As noted above, the titular characters in games such as *Q*bert* and *Frogger* move by jumping, but they do not jump over other objects or entities in the game world. Similarly, the knight in Chess could be said to jump over other pieces, but this just one aspect—not the focus—of its movement. In these examples jumping is incidental, and nothing is dominated through it. By focusing on the dominating jump we can isolate and connect similar mechanics across a variety

of games, while simultaneously distinguishing them from related mechanics. Jumping in Chess and *Q*bert* is fundamentally different from the jumping in Draughts and *Super Mario Bros.*, as I will show.

Games of Leaping Capture

The earliest examples of the dominating jump in games come from a category of board games that historian David Parlett has labeled “games of leaping capture.” These tend to be strategy games played by two opposing players, each of whom is attempting to capture the opponent’s tokens by jumping over them with his or her own tokens. Leaping capture is a clear implementation of the *dominating jump*: to capture an opponent’s token is to assume control over it by removing it from the game; Murray even classifies these types of games as war games (1952). While this control is limited in the sense that only one action may be performed on the token, in many games it is also an absolute control in that the token is removed permanently. In this sense the *dominating jump* is closely tied to UP IS GOOD: jumping over something is frequently positive in that it reduces the opposing player’s strength. Jumping over an opposing token is a key attribute of the dominating jump, and distinguishes it from leaping capture more generally. For example, Peg Solitaire implements leaping capture, but jumping over one’s own peg is not dominating in the sense I am using it here. Domination entails an opposing entity to dominate (i.e. another player, or hostile entities in a video game), which peg solitaire lacks.

Games of leaping capture have been found in a wide variety of locations, historical periods, and cultures. The games described by historians such as Parlett, Bell and Murray are predominately folk games, meaning that they developed and evolved over a period of time rather than being the creation of a single person. As such it is impossible to determine exact dates of creation, so historians must rely on written references to the games. This results in an “existed by” system of dating that, while inexact, it is sufficient to illustrate the dominating jump’s longstanding presence.

Today the most popular example of this category in the West is probably the game known as Checkers or Draughts. In brief, Draughts is played on an eight-by-eight grid of alternating light-and-dark colored squares. Each player begins with twelve tokens, which are placed on the dark squares of the first three ranks, and the goal is to eliminate the opponent’s tokens. Tokens move one square at a time diagonally. Capture is performed by jumping one’s token over an opposing token, which removes it from play, into an empty space beyond. When exactly the game came into being is uncertain, although Parlett notes that “unambiguous references to Draughts are few and far between prior to 1500, after which it suddenly achieves widespread popularity and analytical attention throughout Europe” (Parlett 1999, 257),³ in which case it seems reasonable to assume that the game had achieved its modern form significantly before 1500.

³ Parlett devotes considerable space to Draughts alone, citing over twenty variants from a range of European and North American countries (1999, 250-275).

The leaping capture mechanic, however, is significantly older. The earliest example mentioned by Parlett is a game called Alquerque. Parlett traces the game to at least 1283, where it was mentioned in the Alfonso manuscript (1999, 243). This manuscript is a “Spanish treatise on games commissioned by Alfonso the Wise,” covering Chess, dice games, and Alquerque (Parlett 1999, xii).⁴ As with Draughts, Alquerque is played between two opponents, each controlling a group of twelve tokens. To begin, the tokens are positioned on “all but the centre point of a 5 x 5 recticular grid” (Parlett, 243), as shown in Figure 1.

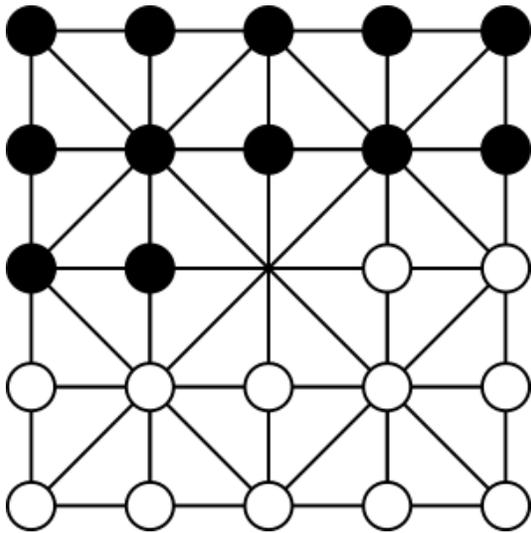


Figure 1: An Alquerque board and tokens in starting position.

⁴ Bell dates the game even earlier: in his view, Alquerque evolved from a Moorish game known as Quirkat, which was in existence by at least the tenth century A.D. (2008, 33). Murray does not connect Alquerque to Quirkat, but does say that the former was brought to Spain by the Moors (Murray 1952, 65). While the debate is an interesting one, for my purposes here it is sufficient to say that the game is, in a word, old.

The goal is to remove all of the opponent's tokens. Parlett describes the play as follows:

Each in turn moves a piece along a line to the nearest vacant point, the first move being necessarily to the centre. If the nearest line-connected point beyond it in the same direction of travel is vacant, it captures and removes the enemy piece by jumping over it to the further vacancy (1999, 243).

While not as widespread as Draughts was to become, Alquerque nonetheless experienced an impressive geographic spread, reaching Catalonia,⁵ Italy, Sicily, Switzerland and Britain; furthermore, variants have been found in Northern Africa, the Middle East, India, and South-East Asia (Parlett 1999, 244-5).

Parlett also briefly describes a handful of games that are similar to Alquerque but whose relation to it is uncertain, including Ko-na-ne (Hawaii); Tobi-Shogi, or "Jumping Chess" (Japan); and Kolowis Awithlakkannai, or "Fighting Snakes" (Mexico). A variant on the dominating jump is found in a Korean game called Four Field Kono, which is played on the points of a four-by-four grid. Each player has eight tokens, and capture is performed by leaping over one's own token to land on an opposing token (Bell [1973] 2008, 31).

The examples described so far are notable in that they all are lacking an identifiable fiction (Juul 2005): the tokens used to play the game do not represent anything, or if they do it has been overlooked by otherwise thorough historians who deemed the fiction unimportant. This suggests that the appeal of the dominating

⁵ At the time of Alquerque's introduction Catalonia an independent political entity.

jump is intrinsic to the unit itself, and this appeal is rooted in GOOD IS UP. As Bogost notes, “unit operations privilege function over context” (2006). The presence of jumping is more significant than the nature of the thing that jumps.

This is not to say that all games of leaping capture are without fiction: Parlett and Bell do describe a handful of these games that have fictional elements. Dablot Prejjesne is a Sami game discovered in Sweden, and first described in English by Bell ([1973] 2008).⁶ Played on a grid of seventy-two points, one player controls a group of twenty-eight warriors (lowest rank), one prince, and one king (highest rank). The other player has twenty-eight tenant farmers (lowest rank), one landlord’s son, and one landlord (highest rank). Pieces cannot capture above their rank. For example, the landlord’s son can capture warriors and the prince, but not the king. (Bell [1973] 2008, 42-45; Parlett 1999, 247-248). Pulijudam is played in India, where one player’s tokens represent tigers, and the other’s lambs. The tiger player captures lambs by jumping over them, while the lamb player tries to prevent this through the arrangement of his or her tokens (Bell [1973] 2008, 39). Hala-tafl, or “Fox and Sheep,” is a Norse game dating to at least the fourteenth century. One player controls a fox, the other a group of sheep. The fox player captures sheep by jumping over them, while the sheep attempt to force the fox into a position from which it cannot make a legal move (Bell [1973] 2008, 40).⁷

⁶ Bell writes that, as far as he knows, his description in 1973 was the first in English (2008, 42). Parlett confirms this (1999, 247).

⁷ For more on asymmetric games of this type see Parlett 185-204 and Murray 98-112.

What is noteworthy about this latter set of games is how little impact the fiction has on gameplay.⁸ While the names assigned to the various pieces could conceivably help one remember their function, fidelity to the source was clearly not a concern. In other words, these games were not designed to simulate social orders or hunter-prey relationships. As in the games without fiction, the key element in these games is the dominating jump. Currently, folk games such as those described here are still played, but the creation of new games tends to fall to individual designers or companies. Modern games featuring leaping capture can be found with and without fictional elements. Examples of the former include *Chicken Cha Cha Cha* and *Camelot*, while examples of the latter include *ZÈRTZ* and *Cabale*.

All of these board games manifest GOOD IS UP through the dominating jump. In each of these games the objects used to play with are jumping over opposing objects and removing them from play: the physical act of moving an object over another results in an improvement in one's own position within the game.

The Dominating Jump in Video Games

Considering the ubiquity of games of leaping capture, it is hardly surprising that the dominating jump has persisted into video games. One of the first video game genres to come into existence is the "platformer." Platformers typically

⁸ Murray also lists over sixty games with leaping capture, although for many of these he provides little more than a name and place of origin (1952, 65-83). His brevity combined with his use of the term "man" to refer to any type of game piece makes it impossible to determine which games have fictional components.

require the player to navigate a character through a fictional world, with a heavy emphasis on jumping over enemies and environmental hazards, as well as between platforms of varying height. In some platformers jumping is also a means of attack—by jumping on to an enemy the player defeats it—but both are instances of the dominating jump, as the jumping entity is in a superior position. The following overview of the first platformers shows that the dominating jump came to video games extremely early in the medium’s development, which further indicates how compelling this unit operation is.

Nintendo’s *Donkey Kong*, released to arcades in 1981, established many current genre conventions and was the first commercial video game produced to feature a character that can jump (Arcade History). The player controls the aptly-named Jumpman (later renamed Mario), whose girlfriend has been captured by a gorilla, the titular Donkey Kong. Jumpman must climb up a series of scaffolds, jumping over barrels, fireballs, and other obstacles on his way to the top of the screen. To what extent the term “platformer” was applied to the game is difficult to determine, but as Figure 2 shows the description certainly fits.



Figure 2: *Donkey Kong* is arguably the first platformer.

In *Donkey Kong* jumping onto an enemy or obstacle kills the player; jumping is only a means of avoidance, not an attack. However, jumping over obstacles still constitutes an act of dominance: once leapt over they effectively become harmless. In the case of the barrels, after they have been jumped over they simply continue to roll down the level, eventually leaving the screen and ceasing to exist. Dominance here is admittedly indirect, but clearly the still-existing Mario is in a superior position to the nonexistent barrel. Gaps that have been jumped over rarely need to be re-traversed and hence become irrelevant.

Additionally, jumping over barrels awards the player points, and accumulating sufficient points rewards the player with an extra life. Jumping thus

not only puts the player in a superior position to obstacles but potentially the game itself, as more lives means a greater probability of completing the game.⁹

Soon after *Donkey Kong*'s release came several other video games with a focus on jumping. In 1982 Activision released *Pitfall!* for the Atari 2600, shown in Figure 3. In *Pitfall!* the player must navigate his or her way through a jungle, jumping over rolling logs, scorpions, snakes, and onto swinging vines.



Figure 3: In *Pitfall!* the player must jump over numerous obstacles and can use vines as a swing.

As with *Donkey Kong*, once an object has jumped over it ceases to be a threat, effectively becoming irrelevant. However relevancy and threat are functions of the direction the player is moving. The world of *Pitfall!* is composed of numerous discrete spaces that can be returned to. Thus the player may traverse one unit of space by hopping over obstacles, and as long as the player maintains the same

⁹ As with many older arcade games, *Donkey Kong* cannot be completed in the usual sense; the game has no designed end. Rather, due to a bug in the game the player dies automatically at the start of the twenty-second level (the so-called “kill screen”), thus this level is considered to be the end.

direction those obstacles remain harmless. However, if the player decides to change direction those obstacles suddenly return to relevancy. While this may seem like a lesser degree of domination than in *Donkey Kong*, the player still controls whether an object is relevant by deciding which direction to move in.

In *Moon Patrol* (1982; Figure 4) the player controls an ever-moving vehicle ostensibly on the surface of the moon. Gameplay is a mixture of shooting enemies and jumping over obstacles.



Figure 4: Moon Patrol requires players to jump their moon buggy over craters and other hazards.

As with the barrels in *Donkey Kong*, an obstacle that has been jumped over simply scrolls off the screen. Because the player's vehicle is always moving to the right there is no way to turn around, so obstacles cannot be re-encountered as in *Pitfall!* Here as well we see the dominating jump.

In 1983 Bug-Byte released *Manic Miner* (Figure 5) for the Sinclair ZX Spectrum. In this game players must navigate Miner Willy through a series of rooms, jumping over various obstacles and collecting objects.



Figure 5: The first level of *Manic Miner*.

Jumping in *Manic Miner* is similar to *Donkey Kong* and *Pitfall!*: it is a means of avoiding obstacles while in pursuit of a larger goal. These obstacles are either stationary or move within a predefined area. The level design often requires the player to jump over a given obstacle multiple times, but the jumping is still dominant: successfully leaping over an object effectively renders it harmless and irrelevant, even if only temporarily so.

The next major platformer was *Super Mario Bros.* (Figure 6), released in the United States in 1985 and Europe in 1987. According to the Guinness Book of World Records, more than forty million copies of *Super Mario Bros.* have been sold worldwide, a figure that does not include ports to other platforms, remakes and

sequels. According to Chaplin and Ruby, *Super Mario Bros.* was probably the first game labeled a platformer: “Enthusiasts dubbed Mario Bros. a ‘platformer,’ because gameplay largely involved guiding Mario or Luigi through a series of jumps, bumps, and leaps in order to progress through the game world, all the while negotiating a near endless onslaught of kooky enemies” (2005, 78).



Figure 6: Super Mario Bros. for the NES is one of the best-selling video games of all time.

Super Mario Bros. emphasized jumping even more than prior video games, where each and every jump was exactly the same. In *Super Mario Bros.* the shape and speed of the jumps are determined by the game’s rudimentary physics model, which factors in the character’s acceleration, velocity, and position (Swink 2009, 207). The game also implements a gravitational force, and jumping is treated as an oppositional force whose power is determined by the duration of the button press (Swink 2009, 213). In other words, the longer the player holds the button the greater the jump, to an extent. The height and length of a jump is also determined

by the player's current velocity; a jump made while running will be longer than a jump made while walking. This is significant because when the NES was released it was the one of the most computationally powerful home game consoles available, yet the first thing done with this power was to build a better jump. Not only is the jumping more complex, it is even more dominating. As with *Donkey Kong* and *Moon Patrol*, once an obstacle has been jumped over it ceases to be a threat, as it is impossible for the player to return to previously visited areas. In *Super Mario Bros.* jumping also serves as an attack: Mario can defeat most enemies by jumping on to them (a mechanic reminiscent of Four Field Kono). This addition of jumping-as-attack has become a genre convention, featured in a majority of platformers released post-*Super Mario Bros.* These modern-day games maintain the dominating jump, notably in titles such as *Braid*, *LittleBigPlanet*, the *Sonic the Hedgehog* and *Prince of Persia* franchises, and the ever-present *Mario* series.

As this brief survey has shown, the dominating jump was implemented very early in video game history. This further indicates that jumping itself is fundamentally appealing to a wide range of players: despite games of leaping capture existing for hundreds of years, and despite the myriad new possibilities offered by computation, game designers turned to jumping almost immediately.

Conclusion

In this paper I have argued that the ubiquity of jumping as a game mechanic can be attributed to our positive association with height. This association is deeply

ingrained in our conceptual system, and manifests as the orientational metaphor GOOD IS UP. Considering the dominating jump unit operation in terms of GOOD IS UP reveals that jumping is not just a simple game mechanic, but rather a reflection of how we perceive and understand the world.

Studying this unit operation illustrates two key points. The first is that the type of linguistic evidence presented by Lakoff and Johnson ([1980] 2003) is only one possible approach to the study of metaphor: the games I have presented here further demonstrate the significance of orientational metaphors. That the dominating jump exists in multiple games from multiple cultures, places and time periods further supports Lakoff and Johnson's ([1980] 2003) and Johnson's ([1987] 1990) speculation that these metaphors originate in our embodied experience, and are not cultural in origin.

The second point is that orientational metaphors represent a potentially vast and unexplored means of expression in games. A key element of the unit operation framework is that the operations themselves contain meaning. As I have shown here, the meaning contained within the dominating jump unit operation is the metaphor GOOD IS UP. Focusing on this unit operation shows us that this meaning can be located in a wide range of games that appear, when considered holistically, to be about very different things. This point in particular calls for further research into how other game mechanics express values and ideas, potentially opening-up a vast area for study and design research that can enrich our understanding of games as a medium. There are many other orientational metaphors besides GOOD IS UP, and

further investigation into how and why games use these metaphors is clearly called for.

Bibliography

- Arcade History. *Donkey Kong*. [Online.] Available at: <http://www.arcade-history.com/?n=donkey-kong&page=detail&id=666> [Accessed: 4 December 2009]
- Bell, R. C. ([1973] 2008) *Discovering Old Board Games*. 2nd ed. Oxford: Shire Publications.
- Bogost, Ian (2006). *Unit Operations*. Cambridge: MIT Press.
- Chaplin, Heather and Ruby, Aaron. (2005) *Smartbomb*. Chapel Hill: Algonquin Books.
- Johnson, Mark. ([1987] 1990) *The Body In The Mind*. Chicago: The University of Chicago Press.
- Juul, Jesper. (2005) *Half-Real: Video Games Between Real Rules and Fictional Worlds*. Cambridge: MIT Press.
- Lakoff, George and Johnson, Mark. ([1980] 2003) *Metaphors We Live By*. Chicago: The University of Chicago Press.
- Murray, H. J. R. (1952) *A History of Board-Games Other Than Chess*. Oxford: Oxford University Press.
- Parlett, David. (1999) *The Oxford History of Board Games*. New York: Oxford University Press.
- Sicart, Miguel. (2008) Defining Game Mechanics. *Game Studies*, 8 (2). [Online.] Available at: <http://gamestudies.org/0802/articles/sicart> [Accessed: 4 December 2009]
- Swink, Steve. (2009) *Game Feel: A Game Designer's Guide to Virtual Sensation*. Morgan Kaufmann Publishers, Burlington.

Ludography

Activision. (1982) *Pitfall!* Activision. Atari 2600.

Bug-Byte (1983). *Manic Miner*. Bug-Byte. Sinclair ZX Spectrum.

Burm, Kris. (2000) *ZÈRTZ*. Rio Grande Games. Board game.

Data East. (1982) *Bump 'N Jump*. Data East. Arcade.

Gottlieb. (1982) *Q*Bert*. Gottlieb. Arcade.

Hitmaker. (2001) *Crazy Taxi 2*. Sega. Sega Dreamcast.

Konami. (1981) *Frogger*. Sega. Arcade.

Media Molecule. (2008) *LittleBigPlanet*. Sony Computer Entertainment. Sony PlayStation 3.

Nintendo. (1981) *Donkey Kong*. Nintendo. Arcade.

Nintendo. (1985) *Super Mario Bros*. Nintendo. Nintendo Entertainment System.

Number None, Inc. (2008). *Braid*. Number None, Inc. Microsoft Xbox 360.

Parker, George. (1930) *Camelot*. Parker Brothers. Board game.

Siegers, Roland. (1999) *Cabale*. Rio Grande Games. Board game.

Sonic Team (1991). *Sonic the Hedgehog*. Sega. Sega Genesis.

Williams. (1982) *Moon Patrol*. Irem. Arcade.

Zoch, Klaus. (1998) *Chicken Cha Cha Cha*. Rio Grande Games. Board game.