

A Certain Level of Abstraction

Jesper Juul
Copenhagen, Denmark
www.jesperjuul.net

ABSTRACT

This paper explores levels of abstraction: Representational games present a fictional world, but within that world, players are only allowed to perform certain actions; the fictional world of the game is only implemented to a certain detail.

The paper distinguishes between abstraction as a core element of video game design, abstraction as something that the player decodes while playing a game, and abstraction as a type of optimization that the player builds over time.

Finally, the paper argues that abstraction is related to the magic circle of games and to rules as such.

Author Keywords

Abstraction, simulation, representation, fiction, player response, magic circle.

INTRODUCTION

Video games are approaching their 50-year anniversary, and the history of games spans millennia. The game developer and the game player are equally immersed in the culture of video games: a new game is developed borrowing from and referring to conventions and genres of previous games, and a player picks up a game and understands it in relation to conventions and genres that the player already knows.

The video game researcher is no less immersed in the culture of video games, and many conventions may be taken for granted. Perhaps the best thing to do is to ask naïve questions. I will begin by asking: *Why am I not allowed order take-out?*

No take-out

Cooking Mama (figure 1, Office Create 2006) is a game about cooking: The player must prepare ingredients, chop vegetables, and control the heat on the stove in order to create a number of dishes.

The game is a type of double signal: The game illustrates a kitchen, a person in the kitchen, a number of ingredients - that is, a fictional world. But the game also signals that this is not a kitchen. The player cannot do everything that can be done in a kitchen: *Cooking Mama* lets the player slice a cucumber, but only a specific type of slice. The player can cook, but the player cannot decide to order take-out instead

A version of this paper with illustrations can be found at www.jesperjuul.net/text/acertainlevel

of cooking.

Cooking Mama, like other representational games, has a *level of abstraction* - the player can only act on a certain level, outside which the world is either crudely implemented as in the case of the ingredients, simply represented as in the case of the table cloth, or simply absent, as in the case of the world outside the kitchen.

If we assume the perspective that games have two complementary elements of *rules* and *fiction* [5], all content in a game can either be purely fictional and not implemented in the rules (such as in the case of a game's back story), purely rules and unexplained by the fiction (such as the multiple lives of a player), or in the zone in between, where the rules of the game are motivated by the game's fiction (cars that can drive, birds that can fly, etc.). (Figure 2). The combination of rules and fiction is sometimes described as *virtual* or *simulation* [1].

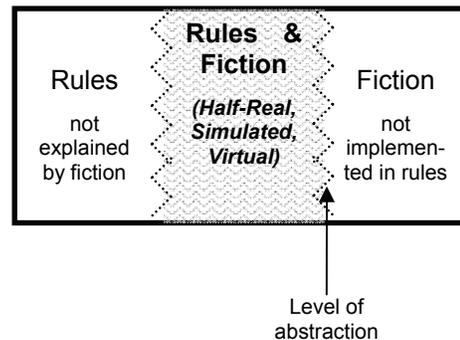


Figure 2. Level of abstraction: A line between the purely fiction and the fiction that is implemented in the rules of a game.

The level of abstraction concerns the border between the content that is purely fictional and the content that is presented in the fiction as well as implemented in the rules of a game.

Abstraction as design

Abstraction can be illustrated through a language metaphor. Language can describe action on different levels of detail. Going to work can be described as exactly that - "going to work", or it can be listed as a number of individual steps

such as "open front door, walk to subway, take subway, leave subway, walk to work", going down to a description of the concrete path to walk, or even the individual muscles to activateⁱ.

This demonstrates that there is no natural level of *description* for a specific action. In the cooking example, any level of detail from selecting the dish, to controlling the muscles of the hand holding the knife can be imagined. However, changing the level of abstraction would make *Cooking Mama* a different game: the level of abstraction identifies a specific game and game genre. For example, the casual game *Diner Dash: Flo on the Go* (figure 3, PlayFirst 2006) is about running a restaurant. Plausibly, the chef in the game is cooking food like in *Cooking Mama*, but that action is not available to the player. Though the two games could be conceived as being part of the same fictional world, they are completely different games due to their differing level of abstraction.

The level of abstraction is *the level on which the player can act*: The actions that are available to the playerⁱⁱ.

Decoding abstraction

This discussion of abstraction in *Cooking Mama* and *Diner Dash: Flo on the Go* is a view of the two games *in retrospect*, from the vantage point of having played these games for a while. But playing games is actually a process of exploring abstraction. As players, we come to new games and especially new game genres not knowing the level of abstraction. Consider two classic real-time strategy games, *StarCraft* (Blizzard 1998) and *Age of Empires* (Ensemble Studios 1999) (figure 4). The initial impression of these two games is very different depending on the player's experience with real-time strategy games.

The **novice game player** will likely try to make assumptions about the game based on the something that the already player knows, in this case the game's fiction. *Age of Empires II* has units and a setting that the player can recognize from other media: The knights presumably have some sort of battle function; the catapult is probably for attacks on castles. There is a town, there are fields. The people on the fields probably gather food in some way. From the setting, the player has the possibility of making assumptions about the rule structure of the game. But to a player unfamiliar with real-time strategy games, *StarCraft* (and especially the *Zergs* pictured here) yields little information about the rules of the game: what are the blue crystals? What do the little critters do? This makes *Age of Empires II* more accessible to new players, because they can use the fiction to make inferences about the rules.

The **experienced game player** can identify the genre of the games above based on the number of units, the placement of resources, the birds-eye view, and the general interface layout. That is, the experienced player comes to the game with an idea of the rule structure of the game, and the

general limits in which the interaction take place: Tell units where to go, but don't deal with the path finding of the individual unit. Deal with battles, but not with making food. Accept that human units can be "built" in a few minutes. However, the experienced game player does not know where the borders lie in this specific game. Perhaps this is a game that adds political or social structure as new component to the real-time strategy genre? Perhaps in this game, resource units become fatigued?

This means that the player's view of the game changes over time, while playing the game. The designer's or theorists' view of the game is a retrospective view, the view of an ideal player that has spent all the time needed in the game and discovered all its secrets.

Problem or opportunity?

It could be tempting to assume that given the right technology and sufficient amount of resources, we could make a game that photo realistically looked like a kitchen, simulated to an arbitrary level of detail. This was the dream of virtual reality, or the holodeck [7], to have a game-like experience without a level of abstraction: a game where anything was possible and everything was simulated to any detail. In the virtual reality *Cooking Mama*, we would finally be able to order take-out or cook food just like in a real kitchen.

Aarseth [1] has argued that there is an important ontological difference between game doors that *can* be opened compared to game doors that *can't* be opened. Aarseth argues that the latter *cannot* be considered *simulated* because they do not have the *function* of opening. This argument rests on the assumption that for a given object, we can list the functions that it *must* have in a game in order to be considered part of the game. On the other hand, normal doors have an infinite number of possible functions such as letting people in, keeping people out, being painted, being removed from their hinges, and so on. It is hard to imagine any object or action being simulated "fully" in a game.

With improvements in video game technology and increasing game development budgets, the idea of a hypothetical, perfect simulation has come to the forefront, but some critical voices have also been heard. As game designer Frank Lantz has put it:

I think there is a widespread and largely unexamined belief in this community that computer games are evolving towards an infinitely detailed and utterly seamless simulation. That this is their destiny. To evolve to a star trek holodeck, a seamless simulation indistinguishable from real experience.

[...]

Even if you could by some magic create this impossible perfect simulation world, where would you be? You'd need to stick a game in there. You'd

need to make chess out of the simulation rocks in your world. It's like going back to square one. I don't wanna play chess again. I wanna play a game that has the dense simulation and chess combined. This requires a light touch. This requires respect for the gap. The gap is part of your toolset. [11]

Furthermore, it could be argued that the role of abstraction is not simply to make the game different from what it represents, but to make it different *for specific purposes*. Chaim Gingold has compared game development to the aesthetics of Japanese gardens:

A miniature garden, like a snow globe, model train set, or fish tank, is complete; nothing is missing, and nothing can be taken away. Clear boundaries (spatial and non-spatial), overviews, and a consistent level of abstraction work hand in hand to make the miniature world believable, complete, and tractable for both the author and player. [2]

Gingold's view presents abstraction as a productive way of representing a world. As a supplementary view, since games can be both abstract and representational, abstraction can be seen as the process by which *any* given subject matter is transformed into game form. Consider the fighting game *Dead Or Alive 4* in figure 5 (Tecmo, 2005).

Even in this lavish 3-dimensional game world, the fighting is placed on a single axis where the players are always facing each other. This can be motivated in several ways - the amount of possible actions is more manageable when players can only attack each other from the front or the back; it makes the game easier to learn. More importantly, two-dimensional gameplay is part of the genre's history, going back to early fighting games such as *Street Fighter* (Capcom 1987) or *Karate Champ* (figure 6, Data East 1984).

This is an example of an abstraction that remains part of the fighting genre, even when technological advances would allow games to remove the abstraction. Game design and game playing is not just oriented towards realism or fidelity, but also towards the history of video games, and to the conventions of a specific genre. The fighter genre retains the convention that fighting should take place with the opponents placed on a single axis, and thereby proves that the history of video games is not simply driven by technological advances. Rather, a genre that is well understood by game players and game designers can remain stable over time.

Abstraction of what?

In the example of *Cooking Mama*, I stated that it is a game *about cooking*: If we assume this to be the case, it is straightforward to point to many actions that are possible in a normal kitchen setting, but which are not implemented in the game. From a player point of view, this relies on being

able to compare a set of assumptions about the represented world (a kitchen), with the possibilities that the game offers. In other words, the experience that a game is an abstraction depends on the player identifying what the game is an *abstraction of*.

Consider the game in figure 7. This game features a number of geometrical objects in different colors.

Rod Humble's experimental game is called *The Marriage*, and is meant to illustrate the tensions and developments in a marriage, with the two squares representing the partners and the circles representing the external influences upon the relationship. As the author notes, this is not something that players can generally intuit from seeing the game.

This is a game that requires explanation. That statement is already an admission of failure. But when working with new art forms one has to start somewhere and it's unfair to an audience to leave a piece of work (even if its not successful) without some justification. It's probably some kind of record to have such a small game give hundreds of words of explanation. [18]

The Marriage can only be perceived as radical abstraction of the workings of a relationship if the player understands that the game represents a marriage at all. An element of communication is integral to representational games: the player must in some way be convinced to see the game as a representation of something. The player can *then* consider the difference between his or her assumptions and what actually happens in the game. In *The Marriage*, the title certainly suggests that the game can be interpreted as a representation of a marriage, but the author still feels the need to further explain the game:

The size of each square represents the amount of space that person is taking up within the marriage. So for example we often say that one person's ego is dominating a marriage or perhaps a large personality. In the game this would be one square being so large that the other one simply is trapped within the space of it unable to get to circles and more importantly unable to "kiss" edge to edge.
[18]

Abstraction as optimization by the player

To play a game is to learn, and to examine that game's level of abstraction. Additionally, games often push the player towards optimizing his or her strategy, and that seems to influence the way players perceive a game. As in the discussion of real-time strategy players above, an experienced player may understand the game as a variation on a genre, but a player not used to the genre may use the fiction to understand what type of actions are possible in the game. In a study of first person shooter players, Retaux &

Rouchier [9] found that acquiring proficiency in a game was often accompanied with turning down the level of detail of the graphics. It would be possible to make the argument that this constitutes a wholesale shift of focus from the subject matter of the game - the game as fiction to the game as rulesⁱⁱⁱ, and that in certain types of games, this is the standard: the player starts playing with a focus on the game fiction, and ends up thinking only about the game as an opportunity for optimizing strategies. However, for psychological reasons there is great variation between different games.

One of the theories of skill acquisition examines how users learn to separate task-relevant from task-redundant information:

[...] we argue that people learn, over the course of practice, to separate task-relevant from task-redundant information and to limit their processing to relevant aspects of the task. Thus, the information processed early in skill acquisition may be qualitatively different from the information processed late in skill acquisition. [performance improvement] may at least partially reflect systematic reductions in the amount of information that is processed, rather than changes in the efficiency with which task components can be performed. [3]

Any game that enforces its goals strongly or is highly competitive, pressuring the player to improve his or her performance, *will* push the player towards information reduction, in order to only think about what is relevant for the present task. If the fiction is not relevant for the player's task, it becomes possible for the player to play the game as if it were an abstract game.

To *ignore* fiction means that when thinking about the game, you plan your strategy by focusing on the rules of the game only, not using the knowledge that you have from the game fiction. In a game like Chess, this is straightforward: It is possible to play chess without considering the societal roles of the pieces, and thinking about the societal roles of the pieces is unlikely to be of any help when playing the game. On the other hand, while *Sims 2* (figure 8, Maxis 2004) theoretically could be played as an abstract game containing a number of entities with parameters that had to be optimized ... it is hard to imagine playing the game without thinking about people with emotions^{iv}.

Finally, the player's attitude towards a game cannot be simply reduced to one of optimization: The player may also possess a certain *will to fiction*: many players *desire* make-believe.

Space: The unabstractable

There is no space inside the snowboarding game *SSX 3* (figure 9, EA Canada 2003). There is no snow, there is no

snowboarder, there is no mountain, and there is no space. Some of this just happens to be partially implemented in the rules of the game: The spatial layout of the mountain; a somewhat abstracted version of normal laws of physics. Klevjer has argued that concerning the issue of space, "the rules-versus-fiction model is dangerously close to the breaking point" [6].

Klevjer has a point: Analytically, we can explain why the space is a fiction, but it is hardly possible to play the game without *perceiving* it as space. Space in video games is special because video games mostly take place in a space, and because the space usually is part of the fiction of the game, *and* is implemented in the rules. In the same way that *Sims 2* could theoretically be played as an abstract game of numbers, so could *SSX 3*: this would involve a long series of calculations determining which different variables were close to each other in value and so on. In practice, this would be a very hard game.

Most video games have a straightforward mapping of either a 2d space to a 2d space, or in 3d games of the 2d space of the screen to the 3d space of the game world. *The Marriage*, discussed above, has a 2d allegorical representation of a relationship - a spatial representation of something non-spatial. Video game versions of card games are another example of space that *can* be abstracted by the player, as the spatial layout of the screen is irrelevant to the player's performance in the game.

Humans are not just general purpose calculators: we have limited overall processing power, but specialties in certain areas. It is by comparison straightforward to make a computer program perform long series of complex mathematical calculations, but much more complicated to program a character to navigate a complex landscape in a way that does not look unintelligent to a human observer. Compared to computers, humans generally have amazing spatial skills. This also means that problems which can be solved in a spatial way tend to be solved spatially by humans. This is why it is hard for a player to abstract from the space in a game.

To stick a game in there

"To stick a game in there", as Lantz was quoted, is then about reducing the number of possibilities available to the player in order to make a *game*. Incidentally, this ties into Salen and Zimmerman's description of game *rules* as limiting player action:

Rules limit player action. The chief way that rules operate is to limit the activities of the player. If you are playing the game *Yatzee*, think of all the things you could do with the dice in that game: you could light them on fire, eat them, juggle them, or make jewelry out of them. [10]

From this perspective, the level of abstraction has a parallel

in non-digital games: the rules that decide what actions are or are not allowed on a soccer or baseball pitch can be considered a type of abstraction, abstractions that remove certain parts of the physical world from the game. The soccer ball can only be handled in certain ways; the baseball player actually runs on a 1-dimensional line with a few discrete bases. The *magic circle* of games [4] that delineates what is inside from what is outside the game, is in this perspective not just a visible spatial boundary, but can be seen as dividing every single object, action, and player into a component that is part of the game, and a component that is not a part of the game. Like soccer is a type of removal or abstraction of many aspects of the world, *Dead or Alive 4* is an abstraction of fighting, and a video game version of soccer is an abstraction of the physical game of soccer.

From a player perspective, the experience of abstraction is anything but fixed: The player must identify the genre and the fiction, and then begin to explore the abstraction of the game: what can be picked up? What actions are available? And then, perhaps, later abstract away the fiction and setting of the game while playing the game.

Certain recurring discussion in video game theory are perhaps really about choosing between the initial and the retrospective view of a game. But there is no choice to make: Actual game playing is about building and modifying one's understanding over time.

There is a first and a final impression of game. A player picks up a game, explores it, and puts it down.

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ⁱ Although humans are generally not conscious of the muscles involved in walking.

ⁱⁱ Some games allow the player to select the level of abstraction: In *North & South* (Infogrames 1989), the player moves units on a strategic map, and can then choose whether to partake in specific battles or let the outcome be determined by odds.

ⁱⁱⁱ See (Juul 2005, p. 139).

^{iv} A player with autism would perceive *Sims* as a different type of game, since the player would lack an existing set of skills for processing people interaction and emotional issues.