

Procedural Minimalism

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### **Introduction**

Digital games consist of a multitude of prior forms: visual art, music, literature, and computer programs, to name a few. In part because of this mixed heritage, games have resisted the formalization of their aesthetics. While researchers from game studies and other fields have attempted to poeticize games, working designers have tried to communicate their processes ever since Crawford (1984) wrote the first book on game design. The gallery of aesthetic approaches has addressed some major facets of games—immersion, interaction, semiosis, space—and the toolbox of production approaches has explored some important concepts—communication, modularity, self-expression, and the enabling of player creativity.

Unfortunately, these two worlds meet only rarely. Aesthetics of academic appreciation are often deprived of the insights and instincts of working designers, who in turn lack a broader perspective that would help them employ and expand on existing traditions in their style of production. Mateas & Stern (2005) agitated for game researchers to become game creators, and this paper hopes to contribute additional language and ideas to help bridge the gap between game thinker and game maker.

An aesthetic of game production is more likely to be employed by a designer in the field than one of game criticism. This paper therefore recognizes and classifies an authorship mode focused on player agency: procedural minimalism. Procedural minimalism is explicated and placed within the context of game history and the tradition of minimalism as an aesthetic category. Procedural minimalism is concerned with two projects: 1.) reducing critical emphasis

on the audiovisual and programmatic elements that serve digital games; and 2.) maximizing perceived agency rather than actual agency by managing players' perceptions.

Game developers will find value in procedural minimalism's pragmatism and aggressive avoidance of invisible complexities; game researchers will take interest in the historical moment of procedural minimalism, its relationship to minimalism in other forms, the verifiability of its assumptions, and its compatibility with existing studies of agency in human interaction and play.

## **Literature Review**

### **Game Aesthetics**

More attempts have been made than can be listed here to formalize aesthetics of computer games. The history of the ludology versus narratology debate can be seen as a struggle over the establishment of game aesthetics. As if to illustrate the dysfunctional relationship between game makers and game researchers, designer Mark Barrett lambasted a 2004 article by academic Janet Murray for ignoring designer Doug Church's 1999 article on agency—evidently unaware that Murray had first written on the topic in 1997 (as cited in Wardrip-Fruin, Mateas, Dow, & Sali, 2009). Even outside of academia, game aesthetics are prized definitional turf.

The field of game studies has advanced to the point where it is impossible to list every attempt to establish a critical approach or an aesthetic of appreciation of games—there are as many approaches as there are fields. Some perspectives include:

- applying aesthetics and norms of narrativity to games (Ryan, 2009);
- explaining game aesthetics in terms of audiovisual elements (Hutchison, 2008);
- evaluating games as cybernetic systems (Kücklich, 2002);

- investigating how technological affordances can lead to unifying aesthetic properties (Montfort & Bogost, 2009);
- comparing and contrasting game aesthetics to those of film (Consalvo et al., 2010);
- filmic social realism as applied to narrative games (Galloway 2004);
- considering games as formalized virtual spaces (Aarseth, 2004);
- the synthesis of games, narrative, and architecture (Jenkins 2003); and
- a variety of other architectural perspectives (von Borries, Walz, & Böttger, 2007).

Bogost (2009) describes Proceduralism as a distinct game art movement situated in the greater context of art movements. Proceduralism, as Bogost defines it, requires introspection, abstraction of assets, support for subjective interpretation, and a strong sense of authorship. It offers “metaphorical treatments of ideas” (§ 4 ¶ 4) rather than “realistic simulation of experiences” (§ 4 ¶ 4). Game designers may be more comfortable with such game-historical categories, scenes, movements, and periods than with the more abstract critical theories.

### **Aesthetics of Production**

Aesthetics of production—sets of unifying principles guiding creators’ hands, a sort of invisible critic on the designers’ shoulders—are often individual styles painstakingly accreted from years of experience. Designers who try to share their processes draw on their backgrounds:

- gallery artists such as Harvey & Samyn (2006) write manifestos distancing themselves from industrial game production;
- computer programmers Björk, Lundgren, & Holopainen (2003) follow architect Alexander (1979) via Gamma, Helm, Johnson, & Vlissides (1994) and game designer Church (1999) in classifying recurrent features, tradeoffs, and modes of interaction among games;

- another group of computer scientists, Hunicke, LeBlanc, & Zubek (2004) describe game design as mediated communication of play aesthetics; and
- artist and researcher Loyer (2010) relates the iterative development process of games to the jazz practice of “woodshedding” and to the design of new musical instruments.

### **Minimalism**

Minimalism in pictorial arts emerged in the middle of the 20th century. Judd (1965) described his contemporaries as merging painterly with sculptural traditions and focusing on whole forms rather than component parts. The focus on essence and whole rather than representation sparked a violent reaction best represented by Fried (1967), who challenged minimalism on the basis of its theatricality. For Fried, minimalism forced viewers to become aware of the contrived occasion of observing art—it took viewers out of the work of art and into the art gallery. Fortunately, theatricality and performance are part of the occasion of playing games. Emphasizing these can even be a desirable goal, as Bogost (2009) describes the importance of reflection and self-awareness in the Proceduralist style.

Minimalism as a class of aesthetic has been broadly applied. It has labeled art movements in music (Bernard, 1993) and even technical writing practice (Brockmann, 1990). Writers who consider games’ relation to minimalism tend to focus on reduction and abstraction in audiovisual elements. Wolf (2003) asserts that the technological affordances of early video games lead to abstraction and minimalism as privileged styles. For Wolf, the move towards texture mapping and representational graphics was as much about privileging empathy over abstraction as it was about technological progress. Some designers, notably Crawford (1984), have also advocated for minimalism as the elimination of the inessential in both design and code. Crawford encourages

designers to avoid “dirt” (p. 52), game rules that come into play only rarely. He similarly derides “lazy bytes” (p. 54) that fail to earn their space in memory. Both of Crawford’s views represent a vision of minimalism closely related to Mies van der Rohe’s architectural adage “less is more”.

### **Agency**

A defining characteristic of the play of games is agency, and it has been analyzed from both theoretical and experimental perspectives. Klimmt, Hartmann, & Frey (2007) conducted a test with a two-part working definition of agency. Their first element of agency was effectance, the provision of direct influence and feedback. Second was the ability to plan for and reach desired outcomes: control. They found that of the two, reduced effectance had a more severely negative impact on player enjoyment than reduced control. This suggests that players’ perceptions of their agency may be more important than their actual agency.

Signaling, a related third element of agency, is explored by Wardrip-Fruin, Mateas, Dow, & Sali (2009). Signaling is the suggestion by the game’s processes, signs, and symbols of what is possible and reasonable for a player to do. For agency to exist, “the actions players desire” must be “among those they can take as supported by an underlying computational model” (p. 7).

Since agency relies on perception, conceptual frameworks that connect the rules of a simulation with the intentions of players must be developed. One such analytical tool is the operational logic. As defined by Mateas & Wardrip-Fruin (2009), “operational logics connect fundamental abstract operations, which determine the state evolution of a system, with how they are understood at a human level” (p. 1). In other words, they combine representational strategies, implementation strategies, and the underpinnings of game mechanics into a single concept.

## Procedural Minimalism

### A Production Aesthetic of Agency

Any discussion of games will produce a discussion of what games are not. Aarseth (2004) asserts that “games are not ‘textual’ or at least not primarily textual”. Lantz (2009) declares boldly that “games are not media”—that our habit of putting discs into consoles tricks us into thinking that the game exists inside of the computer rather than the inverse. A game cannot be said to be merely its playerless program or its inert audiovisual and textual assets, though to some extent, a game is all of these things. Many of the existing aesthetics of these forms are applicable to games, but it is at the intersection of all of these, within the feedback loop between game and player, where agency is to be found. Agency can be said to possess its own aesthetics apart from those of the signs, symbols, and programs surrounding it.

It is easy to imagine that many aesthetics of game production might seek to maximize agency. A minimalist aesthetic of production, in pursuit of such a goal, could trade sophisticated simulations and photorealistic graphics for sufficient approximations and evocative art. Such an aesthetic would focus on perceived rather than actual sophistication, simplistic programming rather than beautiful code, and perceived agency over actual agency. In fact, this style—procedural minimalism—can be clearly identified both in the early days of digital games and in some independent game designers of the early 2000s.

### Classifying Procedural Minimalism

The simplest historical example of procedural minimalism is the compromise of the plastic graphical overlay or insert. Before color display technology was feasible for coin-operated arcade machines, games such as *Space Invaders* (1978) and *Asteroids Deluxe* (1980)

supported limited color display via acetate sheets attached to the screens. Home consoles including the Magnavox Odyssey came with a pack of overlays to tape over the television during play. The arcade racer *Night Driver* (1976) even represented the player's car with a plastic insert; moreover, its total lack of scenery besides white fenceposts was acceptable, since it signaled to players that they would be driving in pitch-dark night.

Procedural minimalism requires creators to be aware of an important distinction: Perceived complexity versus actual complexity. Perceived complexity is the player's mental model about the underlying simulation, and it is about this model that the player will form plans and develop opinions. Even though the ghosts of *Pac-Man* (1980) follow specific strategies to chase down the eponymous dot-eater, most players do not perceive the ghosts' behavior this way. In many cases, players imagine them to be directly chasing Pac-Man or even moving randomly (Mateas, 2003, p. 4–5). In other words, *Pac-Man* may have been just as effective even with simpler ghost behaviors. As the experiments of Klimmt, Hartmann, & Frey (2007) showed with a brick-breaking game, as long as effectance (e.g. direct control of Pac-Man) was maintained, less interesting ghost patterns might not have negatively influenced the fun of the game. A tenet of procedural minimalism is to maximize perceived complexity and minimize actual complexity.

When Richard Bartle and Roy Trubshaw designed the Multi-User Dungeon (MUD) in the late 1970s, they felt that ice should melt in warm places but chose not to simulate all of thermodynamics (Bartle, 2010). This sort of pragmatism is at the heart of procedural minimalism. *PONG* (1972) uses a simplistic model of reflection, bouncing the ball at a different angle based on which segment of the paddle it hit rather than complex modeling of elastic



collisions. This simpler approach is better because it is less realistic and closer to players' existing models.

Another minimalistic approach is exhorted by Crawford (1984), who recommends that game makers “design around the IO” (p. 51-52). He designed *Eastern Front* (1981) from the perspective of user interface and player input rather than simulation fidelity, and the game was more successful than his earlier, more sophisticated *Tanktics* (1978). More recently, Boxerman (2009) described his minimalistic development of *OSMOS* (2009) and the rejection of complex game modes including one that required deep knowledge of orbital mathematics.

Players may fail to perceive agency either because a game is too difficult to mentally model or because the player is not led to believe that the game is complex. *Pac-Man*'s ghosts are an example of the latter case; Mateas & Stern (2007) explain how *Façade* (2005) fell victim to the former. A lack of feedback about the player's standings in the various social games that compose *Façade* causes players to doubt their ability to influence the game's outcome. A similar problem bedevils *FarCry 2* (2008), according to the game's narrative designer Redding (2009). Players perceived the game's sophisticated simulations as random events because of distances in time and space between cause and effect.

In tension with the need for clear exposure of simulation state is the Eliza Effect: The mere suggestion of a complex simulation can amount to a priming effect such that players will assume causality where none exists (Wardrip-Fruin, Mateas, Dow, & Sali, 2009). As long as no player interrogates the system for too long and finds the implied model inconsistent with reality, intentionally leveraging the Eliza Effect can be an extremely productive tool for game designers. Creators who are interested in pursuing unusual styles or ideas might do well to play such tricks

—to combine pure randomness or preset values with strongly suggestive signs and symbols rather than develop sophisticated simulations.

Every aesthetic has its counterpart, and one concurrent to procedural minimalism is the procedural baroque. MIT's Tech Model Railroad Club held an aesthetic of sophisticated elegance in their programming for the PDP-1, an early minicomputer of the 1960s. This sentiment was best exemplified by Peter Samson's highly accurate *Expensive Planetarium* starfield display, merged into *Spacewar!* (1962) soon after its development. Samson's motivation: he "was offended by [Steve Russell]'s random stars" (Graetz, 1981).

### **Conclusion**

The 1970-1980s, despite their limited computer hardware and representational fidelity, saw a Cambrian explosion of video games and game concepts. In the 1990s, simple personal computers became broadly available and another wave of novel games were designed. The independent game designers of the early 2000s are armed with tools such as Game Maker and Flash whose constraints seem to have helped produce another major movement in games.

Modern procedural minimalists often adopt additional constraints on their design process, production schedule (as in time-limited game jam events), budget, or other elements of production, effectively reenacting the small development teams and short schedules that typified the arcade era. As William Morris famously opined, "You can't have art without resistance in the materials." Applying minimalism in a highly constrained production process can lead to innovative, unusual designs produced in short periods of time. Ultimately, procedural minimalism can help designers avoid intellectual cul-de-sacs that sap their will to create.

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