Do Videogames Simulate?

Virtuality and Imitation in the Philosophy of Simulation

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Simulation. The concept of **simulation** has been contested in academia since its proliferation in the 1960s. This is hardly the case in **videogame research**, the subject of which is commonly discussed as a simulation or something that simulates with little analytical consideration of the term's other scientific roles.

Comparison. The article **compares** the simulation of videogame research to the ways in which other scientific sectors utilize the term.

Problematic science communication. It turns out that **videogame research has found an eccentric use for simulation** with none or little relation to the term's scientific (knowledge-driven) and etymological (imitational) predecessors. This becomes a **problem in cross-scientific communication**.

Intentional philosophy. In order to overcome the problem, the article encourages scholars to adopt an **intentional philosophy of simulation** according to which videogames and their components may be structured as computerized simulators or simulations if **functional evidence for a reference system** exists. For those cases that lack functional evidence, the article (re)proposes the conceptual framework of **virtuality**.

Keywords

animation, experiment, material ontology, materialism, metaphor, model, non- disciplinarity, ontology, philosophy, reference system, rules of correspondence, science, videogames, virtuality, videogame research

Philosophers have enjoyed a heap of problems with *simulation* (Crookall, 2011; Fox- Keller, 2002; Frigg & Reiss, 2008/2009; Galison, 1996; Grüne-Yanoff, 2011; Grüne- Yanoff & Weirich, 2010; Guala, 2002; Hartmann, 1996; Humphreys, 1991, 2009; Morgan, 2004; Parker, 2008a, 2008b/2009; Pias, 2011; Rohrlich, 1991; Schweber & Waechter, 2000; Stöckler, 2000; Vallverdúl, 2014; Winsberg, 1999, 2001, 2003, 2009, 2014; see Bostrom, 2003; Vidal, 2008). On the other hand, in the academic discourse of videogames the concept appears rather trouble-free. More often than not, for a videogame scholar "All computer games are simulations" (Parker & Becker, 2013, 1).

If the conceptual role of simulation in videogame research is something that video- game scholars widely agree with, one must be careful in its criticism. Consensus of terminology is often a positive state, and an attempt to unbalance it might easily do more harm than good. Once in a while, nevertheless, it so happens that discourse- sharing people end up borrowing words from other discourses uncritically. In such duty free interdisciplinarity (see Livingston & Sauchelli, 2011) terminologies get stan- dardized not via circumspect analytical examination, but via early access language games. That is what could have happened to the videogame as a *narrative*, and as most of us know, that is what has actually happened to the videogame as a simulation. This chain of events—which seriously undermines cross-scientific discussion—is signifi- cant also for simulation research (or s/g research) that has so far relied on the broad notions of gaming and modeling.

The humble goal of this article is to show how several scholars practicing video- game research (also referred to as game studies) have ended up theorizing with the concept of simulation in ways that conflict with its relatively stabilized meanings in related and potentially collaborative scientific sectors; such as philosophy of simula- tion, simulation research, and educational gaming. While I do happily respect the right of videogame research (and all other sectors of research) to build their terminology in exclusive ways, my belief is that the confusion at hand hinders the conceivably fruitful communication between it and other simulation-related scientific discourses. Thus, I will not claim that we have a right way to talk about simulation; rather, I will claim that in the current situation the ways that most videogame researchers have chosen are less useful than those presented here.

Throughout the first two sections I compare the simulation of videogame research to the ways in which simulation research and science in general utilize simulation. The primary observation is that videogame research has come to use the term in a unique way that hinders cross-scientific discussion. In the third section I aim to reconcile the situation by endorsing *virtualization* as an alternative for simulation when evidenced reference systems are lacking or functionless. In the fourth and final section I prob- lematize the notion of *reference systems* and conclude that an intentional philosophy of simulation appears to offer the most useful framework for its comprehension. This leads to a final suggestion: simulation research should pursue *non-disciplinarity* by identifying its subject of study as a cross-scientific concept.

Simulation Outside Videogame Research

The steady scientific use of the term simulation commenced in the 1960s. It started as an umbrella term (Morgan, 2004), yet soon began to gain foothold as a concept that deals with certain ways of imitating or mimicking systems—that is, as a specific type of model. In Jan Klabbers' (2009) formal terms:

> If *M* is used as an image (substitute) of *Rs*, then *M* is by definition a model of *Rs*. ... The connotation of the term *simulation* implies that the related models imitate or mimic reference systems through valid rules of correspondence. (455–456)

Perhaps the most known modern philosophical definition for simulation was given in 1991 by Paul Humphreys, whose particular object of interest was *computer simula- tion*. In simulation research computer simulation has settled to indicate a certain pro- cessual model that does not involve human or other intelligent agents. The term computerized simulation, in turn, has standardized into a more open processual model that may involve intelligent agents. While for most people computer simulation and computerized simulation may be somewhat synonymous, in the scientific discourses the difference is important.[1]

What I find more interesting in Humphreys' contribution than its working defini- tion (which he revised in 2004) is the list of what he considers, based on previous simulation research, the central usages of computer simulations. Instead of the defini- tion, let me cite those usages:

1. *To provide solution methods for mathematical models where analytical meth- ods are presently unavailable.*
2. *To provide numerical experiments in situations where natural experimentation is inappropriate (for practical reasons) or unattainable (for physical reasons) …*
3. *To generate and explore theoretical models of natural phenomena*. (1991, 502)

The full significance of the above will be unveiled later on, but for now it is enough to see the essential: the generic functions of computer simulation are first and foremost *instrumental*. In other words, computer simulations are normally tools that are used to pursue methodological solutions, perform experimental data processing, or test the theo- retical validity of an empirical phenomenon, currently existing or envisioned in the future.

The (cor)relation between computer simulation and *empirical*[2] phenomena is sig- nificant here; for instance, the mathematical models of the topmost listing cannot be mere abstract equations but they must always "be applied to a specific scientific prob- lem in order to be part of a computational simulation" (502). That remark well respects the word's etymological origins from Latin *simulāre* (imitate, counterfeit). To reiter- ate, one cannot simulate without a counterpart that is *being simulated*.

In an extensive literary review on the scholarly use of the term simulation since 1998, Louise Sauvé, Renaud, Kaufman, and Marquis (2007) went through 1063 academic articles (98 of which were given an in-depth analysis) within simulation and educational gaming research. Their results cohere perfectly with the empirically imi- tational understating of simulation held by philosophers of simulation, such as Humphreys. Sauvé et al. conclude as follows:

> the literature allowed us to reassert that simulation is a simplified, dynamic and precise representation of reality defined as a system ... Through its model, judged by its fidelity and its similarity to the reality it represents, a simulation is distinguished from a game that makes absolutely no reference to reality (although a simulation game combines these) (252–253)

It is notable that a large share of the reviewed literature was indeed from the studies of educational gaming, which appears to have a closer relationship to simulation research than to videogame research (due to the evident needs of imitation in educa- tion). This is why I mention the above results here, as part of simulation research.

The empirical nature of the counterpart—the reference system, source system, or target system—that is being simulated is likewise the first point of departure in the vast literature on the philosophical enigmas of simulation (recall earlier citations). The basic recipe of those enigmas goes like this: simulations are models that function as tools for gaining knowledge about their (existing or possibly existing) empirical refer- ence systems, but since simulations are imitative counterfeits by definition, how can they offer any significant knowledge?

While I do not have the need nor space to tackle those epistemological dilemmas here,[3] they do lead me to the counter- view that videogame researchers have taken as their founding premise, viz, that the reference system of a simulation need not be empirical. It may, this is the claim, also be fantastic, imaginary, or fictional. A propo- nent of this view is regularly found consulting the second pioneering philosopher of modern simulation, Stephan Hartmann (1996), whose oft-cited definition of simula- tion is fairly open for such applications: "a simulation imitates one process by another process" (5). While for Hartmann the term process refers broadly "to some object or system whose state changes in time" (5), he too, nonetheless, emphasizes "the function of a simulation to *investigate* real dynamic system" (5–6, my emphasis).

To wrap up the deep-rooted mantra of simulation research: the functions of com- puter (and computerized) simulations are to operate as knowledge machines that pro- vide empirically significant knowledge for practical (education and training) or research (scientific) purposes. Let me also remind the reader of the useful distinction between simulators and simulations:

> A *simulator* is the structural basis of a simulation. It is the machine and the program, the form and the content, existing in latent state ... A *simulation* is the actualization of the simulator, the operation or experience of it, the on-going, live performance (Crookall, Oxford, & Saunders, 1987, 153)

After these remarks, let me move to explore the simulation of videogame research.

Simulation in Videogame Research

I begin with Seth Giddings (2014), who has recently listed three popular answers for the question "What do simulation games simulate?" in videogame research. These answers reflect the conceptual disorder quite well:

> Answer 1 is "not always what we might first think";
> Answer 2 is "nothing" – or rather something imaginary and hence "nothing actual"; Answer 3 is simply "they simulate themselves" (264)

While the first answer points at those previously hinted cases in which the refer- ence of a simulation is not an actually existing system but a system that *could* exist (cf. Wolf, 1999), the self-explanatory second and third answers stand as somewhat disobliging views when compared to the notions of simulation above. In what fol- lows, I will go through those problematic answers in order to show how they conflict with other discourses in science. This will hopefully clarify the state of affairs: if videogame scholars wish to share their results with simulation-related research, it would be a good idea to adapt their conceptual framework with respect to other sciences.

Gaming has been closely tied to simulation since the latter's academic emergence. Already a decade before *Simulation & Gaming* instigated its long-lasting line of pub- lication in 1970, games were discussed as an allied topic with simulation next to experiments, models, and computers (see Galison, 1996). In that historical context the notion of game operates mainly as a representative of game theoretical (von Neumann & Morgenstern, 1944) standpoints, which has little to do with the videogame research of today. I might as well recycle videogame scholar Gonzalo Frasca's (1999) encyclo- pedic finding, originally written by Lloyd Shapley:

> Although the terminology of players, moves, rules, and payoffs might suggest a preoccupation with sports or recreation, the theory of games has seldom been of practical use in playing real games (n.p.)

While I do not believe that videogames really have much in common with many real games (either), the dissimilarity between videogame research and game theory is evident. Thus, to discuss simulation in *video*game research, I need to move from the first steps of scientific simulations to the 1980s and Chris Crawford's (1984/1997) still-cooperative opus:

> A simulation is a serious attempt to accurately represent a real phenomenon in another, more malleable form. A [video] game is an artistically simplified representation of a phenomenon. ... The fundamental difference between the two lies in their purposes. A simulation is created for computational or evaluative purposes; a [video] game is created for educational or entertainment purposes. (8)

Two points of possible contradiction need to be noted before going further. First, Crawford uses the term representation in place of model. Second, videogames (let alone games) need not always be representations or models. Crawford's comparison thus concerns only those instances in which the videogame represents or models an empirical reference system. As such, Crawford's purpose-based outline is somewhat fitting with the general view of science. Klabbers' (2009) study concerning the grounds of simulation research (reflecting on First International Conference on Simulation and Gaming) confirms:

> The key question was whether [game and simulation] were using the same techniques while pursuing different goals or using different techniques while having similar goals in mind. (447)

The instrumentally determined contrast—that simulations and simulators are struc- tured for knowledge-driven purposes (Crawford's "computation or evaluation") and that videogames are structured for self-contained ludic

purposes (Crawford's "enter- tainment")—could still be taken as the cornerstone of ludo-philosophical discussion on simulation. If simulations "are arguments, not experiences" (Stöckler, 2000, 369), then videogames function first and foremost as experiences.

By adding education as the second purpose for videogames, Crawford reveals the fundamental problem of the educational videogame: since the videogame is indeed designed to serve experiential functions, an educational videogame is always a com- promise in proportion to the delivery of its referential, educative message. David Myers (1984) observed this not a year later to Crawford: "whatever is learned from games [is] how to *understand*, and not, in the strictest sense, how to know" (182) (see also Myers, 1999, 2003, 2005; cf. Gee, 2003; Law-Yone, 1996). While the act of play- ing is always educative as a learning process, an intentional delivery of information through it as a videogame turns out as a paradox, "a bastard child of [real] simulators" (Atkins, 2003, 139).[4]

Notwithstanding, one does not need to fully reject the simulative potential of enter- tainment artifacts. An artifact like a videogame may be designed for entertainment purposes and at the same time model a reference system. The duty free theoretical misstep (if you may) surfaces when the concept of simulation is applied in the absence of the latter, that is, in the absence of the intention to model a reference system. For the proliferation of those applications it is not least to thank for Jean Baudrillard's philoso- phy of the hyperreal, the appropriation of which, in videogame research, "has today become almost a cliché" (Kingsepp, 2007, 366; see also Coulter, 2007; Galloway, 2007; Simon, 2007).

While Baudrillard's treatment of simulation and simulacrum as self-reflective anti- concepts was done with an indubitable awareness of the terms' historical and scientific forerunners, his sardonic rejection of imitational aspects was first and foremost rhetoric:

> It is no longer a question of imitation, nor duplication, nor even parody. It is a question of substituting the signs of the real for the real (Baudrillard, 1994/2010, 2)

Rearticulating Baudrillard's politically charged theory (see Crogan, 2007; Gane, 2006; Giddings, 2007b; cf. Deleuze, 1983), in videogame research the original idea of simulation as imitation and counterfeiting are replaced with the idea of simulation as self-ruled structuring of dynamic systems; a designation that has little in common with the consistent notion of simulation as an imitational and counterfeiting act.[5]

While Anthony Niesz and Norman Holland (1984), in their seminal analysis of text- based videogames, were still careful to employ simulation only in the imitational sense to the artifacts themselves, it seems that Richard Ziegfeld's (1989) ambitious ludo-ontology becomes the breaking point after which the term starts to appear frequently in its twisted hyperreal form: first as a general design strategy of dynamic systems; and then—not pointing only at videogames themselves but also at the materiality of their components[6]— as self-simulating substance (see self-referential meanings in Klabbers, 1996). One of the most sophisticated advocates of this perspective has since been Espen Aarseth (2006):

> Simulation should here be understood as dynamic modeling in general, rather than the faithful mapping of real phenomena: we may simulate a dragon in a computer game, and even if no real-world counterpart exists, the dragon is still a simulated dragon and not a fictional dragon. (846)

Similar reasoning has been plied by numerous other competent scholars; not least Giddings (2007a), for whom the videogame is "an automaton [and] all automata are simulacra" (427). In the theories of these scholars, videogames and their components may well simulate even if the representational relationship between them and empiri- cal phenomena has completely withered away.

One way to defend such theoretical views (as does Aarseth, 2006) is to claim that the entities of videogames like dynamic dragon automata have always been made to resem- ble at least its designer's thought processes (of a dragon). In this reasoning, even if a simulation or simulator derives from something that has never existed or will never exist, it could be said to imitate its designer's thinking. Yet a serious problem material- izes if one accepts thought processes as reference systems: if thought processes are accepted as valid reference systems, one must also accept that *all* simulations and simu- lators are imitations of thought processes by essence. It is, after all, the very thoughts of

phenomena that designers are working with, not the empirical phenomena from which the thoughts derive. To accept immaterial reference systems is to deny material reference systems; which also means the denial of testing as a means of simulation validation.

While I do not want to disavow the design of entertaining systems like videogames and their dragons, theorizing them and their components as simulations or simulators does lead into an epistemological predicament that was already revealed earlier: does one still talk about simulation if the defining relation between it and its presumed ref- erence system is irrelevant?

Simulation and Virtualization

My guess is that philosophers of simulation will eventually answer the preceding question negatively. Many have already done that in fact; for instance, one of the leading figures, Eric Winsberg, has recently (2009, 2014) analyzed the "useful ways of thinking about what the term means" (2009, 835) and none of his submissions fits the dragons of videogames. Just as the critical interrogation of narrative taught videogame researchers not to redefine but to take advantage of their borrowed terms (in order to be able to share cross-scientific results), a proper handling of the topic at issue should encourage videogame researchers to treat simulation with equal respect.

To probe the concept of simulation that has developed in the hands of scientists who employ it to gain knowledge for heuristic, predictive, and research purposes, I appropriate an alternative concept, virtual, from one of the founders of artificial life research, Christopher Langton (1986). Deriving from Latin *virtualis* (potency to pro- duce an effect) and French *virtuel* (relating to a faculty of the soul), Langton employs virtuality as an ontological category; a realm in which models can be "so life-like that they cease to be *models* of life and become *examples* of life themselves" (147). This realm is not a singular *space* or *place*, for it is possible for scientists to build there several "artificial universes within which we can embed artificial molecules in the form of *virtual* automata" (148).

Being aware that the notion of virtuality has its own contested history (see Karhulahti, 2012, 2015), I think Langton's *virtual realm* (ontological macro category), *virtual universe* (ontological micro category),[7] and *virtual automaton* (dynamic com- ponent in those categories)[8] are, more often than not, healthier terms for ontological videogame research than *simulation*. This suggestion is, of course, not a totally new one; for instance, Aarseth (2003) (differing with his previously cited positions) has made this point once:

> [Virtual worlds] could also be called (computer) simulations [sic], but sometimes (e.g., a fantasy world) there exists no real counterpart that is being simulated, and so it cannot be called a simulation, although simulation techniques are indeed used. Let us call these systems virtual worlds (431)

Interestingly again, Giddings (2007a) has entertained similar possibilities by remarking how "videogames both model *and generate* new, virtual worlds" (424). He does not, however, try to solve the conceptual contradiction that emerges from simulations and simulators being potentially both; imitations of empirical phenomena and non-imitational virtual automata. He calls it a "mistake" to define computer simula- tions as "representational or mimetic" with the help of a 1980s *Predator-Prey* simulation in which

> declining rabbit population meant restrictions on food supply for the foxes, and so their population began to fall ... But what was being simulated here? ... the boundless complexity of the natural world was reduced to a relationship between the population size of two species (423)

For Giddings, the problem with imitative simulations in general and *Predator-Prey* simulation in particular seems to be that they do not always reference *specific* empirical entities (in this case a specific population of rabbits and foxes), but they might also reference generic empirical phenomena that are immaterial entities (cf. Doležel, 1998; Fullerton, 2008). Nonetheless, a crucial difference exists between empirically observable generic phenomena, like rabbit-fox relationships and, say, imaginary zombie-alien relationships. While both can be presented via software as virtual ecologies, only the former have functions as simulations with clear empirical interest and reference.

To provide another illustrative case, the distinction between functional simulation and imaginary imitation also explains those well-founded criticisms given to US Senator Tom Coburn (2012) after his official government report that revealed how taxpayers' dollars had been spent "to put on a *zombie-driven show* designed to simu- late a real-life terrorism event" (25). In any case, using imaginary entities for any functional imitation of empirical phenomena is dubious.

Thus, despite some already existing remarks that could have been used to clarify issues, it seems fair to state that ontological theories concerning the simulation-virtual setting are far from finished and clear. In videogame research, the monopoly of simu- lation as *the* onto-theoretical framework is so great that further references would read tasteless here. I shall hence dedicate the rest of this section to the differences (and similarities) between simulation and virtualization (as I see them).[9]

First, let me note how in videogame research the videogame artifact is almost never referred to as a *simulator* (except as a genre), but always as a *simulation* or *computer simulation*. To repeat, this seems to be in conflict with the terminology of simulation research (recall first endnote and Crookall et al., 1987). Yet what is perhaps even more scientifically crucial than the simulative status of the videogame artifacts themselves is the material-ontic status of their components: the substance of dragons, butterflies, stones, and other existents that belong to the realms of videogames. Predictably, in videogame research, such components are also called *simulations* or *simulated objects*, whether they had a reference system or not.

It is true that once in a while simulations and simulated objects are defined in terms of imitation by videogame scholars too (see Bogost, 2006; Dormans, 2011; Juul, 2005; Klevjer, 2002; Montfort, 2007; Mosca, 2013; Salen & Zimmerman, 2004). That, however, does not negate the increasing tendencies in videogame research to identify *all dynamic models* as simulations; usually in contrast to *static models* that are typically labeled *representations* (see Frasca, 2003) or *fictions* (see Aarseth, 2007). Although the way things have been is never an argument for the way things should be, let me remind you that science has so far associated simulation as well as representation with both dynamic and static models (see Grüne-Yanoff & Weirich, 2010).

To clarify the above ambiguities of videogame research, it seems reasonable to identify all dynamically behaving components of videogames (and other virtual envi- ronments) simply as *virtual components*; with the caveat that in those specific conditions under which a functional reference system exists, as in historical, documentary, and educational videogames, the virtual component in question can be identified also via simulation. Simulated components of videogames (and other virtual environments) are thus a category of the large group of different virtual components.

In sum, videogames and their components can and should be discussed as (computerized) simulations or simulators in cases where they can be given a functional role as a model of a valid reference system. The problem addressed by this article concerns cases in which simulation is associated with videogames and their dynamic components

i. without admitting any imitative functions to it; and as it happens in the worst scenario,
ii. when their counterfeiting status is additionally rejected in the advocacy of ontic autonomy.

The idea of videogames and their components as ontically autonomous real sys- tems with self-governing dynamic behaviors is starting to gain a footing in academia (see Giddings, 2005; Klabbers, 2003; Lofgren & Fefferman, 2007; Myers, 2010; Zimmerman, 2009), and I see no reason to question that significant finding. Videogames and their components should certainly be discussed as ontically autonomous (mate- rial) entities rather than replicas or make-believe. Importantly, however, an entity may be ontically distinct from *reality* or some other realm, yet still be designed to imitate that other realm to which it does not belong (or to which it belongs in a way that is worth an ontic distinction).

Thus, employing the fake-related term *simulation* for an ontically autonomous videogame or its component is not incorrect, but manifestly misleading. As Brian Massumi (2014) points out in his ontological analysis, the virtual must be understood "as a *dimension of* reality, not its illusionary opponent or artificial overcoming" (55).

Yet, if some videogames and components thereof have reference systems and oth- ers do not, how does one know whether they simulate (imitate) or not? One way to answer the question is to claim that sometimes an object resembles, that is, has recog- nizable correspondence with a reference system, in which case it can be considered a simulation. This answer is not, however, a very solid basis for a theory. As Nelson Goodman (1968) pointed out some while ago, any picture may represent any object, for which the finding of correspondences without predetermined reference is merely a matter of interpretive skill (and endless debate):

> whether an object is really fixed or a picture is realistic depends at any time entirely upon what frame or mode is then standard ... If representation is a matter of choice and correctness a matter of information, realism is a matter of habit. (38)

Epistemologists have wrestled with the dilemma of mimetic legitimacy for ages and in several philosophical contexts. Nevertheless, the principle of representation as a *matter of choice* seems like the most resourceful one for a theory of simulation. Having said that, I certainly do not wish to deny that some systems can be empirically proven more correct or more recognizable imitations than others. In the below section I offer my argument concerning the next logical question: *whose* matter of choice is the reference system of a simulation?

A Simulation and to Simulate

In a timely analysis on what its author calls the *metaphor-simulation dilemma*, Sebastian Möring (2012) poses the question whether some videogames are better understood as metaphors rather than simulations. He speculates whether "any procedural object or phe- nomenon can simulate another procedural object or phenomenon" (12), and in a later article continues by saying that "simulations as such also have to persuade the user— namely that they successfully simulate what they pretend to simulate" (2013, 53).

Statements like the ones given by Möring seem to repeat a confusing notion. The majority of conceptual difficulties concerning the question whether a phenomenon is to be taken as a simulation or something else derive from perceiving the videogame *itself* as an intentional entity that *simulates* and *persuades*. Imitation, as Walter Benjamin (1999/2005) wisely put it, "is at home in the *playing*, not in the *plaything*" (116). Artifacts never simulate or persuade by themselves; however, people may well see them as *instruments* of simulative and persuasive intentions. To make this and other related perplexities manageable, I adopt a view according to which the video- game and its components cannot simulate anything by themselves, but their *designers* may choose to structure them as simulators or simulations *of* something that they wish to simulate (see Möring, 2013, 64-66).

Like metaphorization, "the action or process of treating something metaphorically, or making a metaphor of something" (OED, *metaphorization*, n.), the simulative pro- cedure appears to be most rationally understood as an intentional act, just as it has been understood in the history of science. Yet unlike in metaphorization, in the act of simu- lation the projection of intention needs to be (as it generally has been) connected to the *designer* of the entity, not to its *interpreter*. Simulation is not in the eye of the beholder, but in the eye of the architect.

It is important to stress that in the present context *intention* has a very concrete, material role. By intention I do no refer to those thought processes that some scholars, as discussed earlier, have proposed as reference systems for simulations. Here inten- tions derive from empirically existing textual, verbal, or suchlike evidence, which provide good reasons to believe that the artifact in question has been designed to imi- tate a phenomenon *for a reason*. Only after such evidence can one validate and esti- mate correspondence.

According to this intentional philosophy of simulation, the processes of computer and computerized simulation are not related to interpreters treating them as such, but to designers producing them as such, intentionally. This philosophy is supported by practical reasons that are in fact pretty obvious: because simulations and simulators (outside videogame research) are tools that are employed to gain knowledge of empiri- cal phenomena, interpretive liberalism is out of question. If someone has designed a simulation of Western economy and you interpret it as a simulation of Eastern popu- lace, the aftermath is eroding for all parties concerned. Likewise, you would not want to take a plane that is flown by a pilot trained in a submarine simulator.[10]

In (non-educational) videogames, on the contrary, interpretive and intentional falla- cies are hardly an issue. If you interpret *TETRIS* (Pajitnov, 1984) as a simulation of the "overtasked lives of Americans in the 1990s" (Murray, 1997, 144), the worst that can happen is someone stamping down your interpretation as reckless. The only setback here seems to be a theoretical one: if players can freely choose the reference systems for what videogames and their components are simulations *of*, the concept of simulation loses its theoretical value as a knowledge-driven, functionally intended model. So why not just let literary theorists have their metaphors as readers' free interpretations, and simulation theorists have their simulations as designers' practical intentions?

In this frame, what is left for videogame researchers are the videogame as a dynamic *virtual universe* (or *world*) and its dynamically behavioral components as *virtualiza- tions* (virtual dragons, virtual characters, virtual florae, etc.). It does not matter who has designed what and how it is interpreted: the virtual status is determined solely by the ontic presence of dynamic behavior; a concept that future research needs to define more accurately. This approach finally enables also the conceptual accommodation of those videogames and videogame components that have not been constructed to resemble any reference systems. I am sure something like abstract expressionism hap- pens in videogame design too.[11]

Recommendation

I have offered reasons for considering the videogame and its components *virtual* rather than *simulated* in order to strengthen (or perhaps restructure) a communication rela- tionship between videogame research and other simulation-related scientific sectors. The formerly argued reasons are these:

i. Most *videogames* do not seem to be very good computerized simulations (or simulators) in the sense that non-videogame research conceives of the term.
ii. Most *videogame components* do not seem to be very good (computer) simula- tions in the sense that non-videogame research conceives of the term.

I recommend videogame scholars not to pass the word simulation through duty free interdisciplinarity, but to reserve the word simulation for those already-numerous, well-established purposes that have been recognized above.

David Crookall (2000, 2010) has called for a discussion of interdisciplinarity in simulation research. He suggests non-disciplinarity (2000, 18) as a more descriptive term for the present journal, but is afraid of the term's negative element. This article can hence be read as a support piece for non-disciplinarity in simulation research: one must not disavow videogames as potential computerized simulations or simulators in cases in which they appear as such, but neither must one do the opposite and study all videogames automatically as simulations just because they relate to computers and gaming (that relate to simulation).

I end with Myers (1999), yet by associating his words with a meaning that probably differs from the one that he had in mind: "Simulation may be truly valuable and unique only insofar as it is about the otherwise hidden reality of the semiotic process" (159). Not all videogames are simulations or simulators, and not all videogame components are simulated. Videogames may not contain simulation at all.

Acknowledgements

I presented this article in Philosophy of Computer Games Conference 2014. The feedback that I received there was more than valuable; special thanks go to Andreas Gregersen. After the blind peer-review round, this article went also through an additional coaching peer-review round. Let me express my gratitude to all anonymous reviewers as well as to the three non-anonymous ones: David Myers, Seth Giddings, and Emil Winsberg. It was one of the most productive reviews that I have ever been through. The critical comments from Gordon Calleja and Jonas Linderoth were likewise essential for making the piece readable. It is awesome to have you as colleagues.

Declaration of Conflicting Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author disclosed receipt of the following financial support for the research, authorship, and/ or publication of this article: This research was funded by University of Turku Foundation post-doctoral grant.

Notes

1. The guidelines of *Simulation & Gaming* instruct: Use the term computer-mediated simulation or computerized simulation for simulations involving human participants (other terms are computer-assisted, computer-based, computer-controlled, computer-dependent). Use the term computer simulation for computer programs that operate with insignificant or no human participant interaction. Ergo, videogames, with intelligent players, should not be discussed as computer simulations to begin with. As artifacts, the proper way to address videogames in simulation research seems to be computerized simulator. This might also be a good place to stress that simulations (according to most theories) need not be computer-related at all.
2. I prefer the term empirical to natural, although it does not do much better in its job of signifying the *reality* for which English-speaking philosophers have not yet been able to find a proper word. Note that empirical does not equal material, for which our economical, social, and other immateria phenomena exist in the empirical sphere as well. Also, while simulations always require an empirical reference system with an imitational function, fantasy-themed virtual environments are empirical phenomena too and can thus be objects of simulation; for instance, it is possible to construct a simulation of a virtual environment like WORLD OF WARCRAFT if one day such need occurs.
3. I cannot resist the temptation to give a perspective on the quandary between computer simulation and experimentation, which is often (see especially Fox-Keller, 2002; Frigg & Reiss, 2008/2009; Guala, 2002; Parker, 2008b/2009; Rohrlich, 1991) at the center of simu- lation epistemology: in computer simulation one knows almost all functional behaviors of the components that are dealt with (the designer has programmed them her- or himself), but less about their relation to the targeted system (the targeted system normally consists of a different material matter than the computer simulated component); in experimentation one knows almost all about the relationship between the experimented components and the targeted system (the targeted system normally consists of the same or alike material matter than the experimented component) but less about their functional behaviors (the material matter of experimented components is usually biological or chemical and thus subject to an increased unpredictability in comparison to algorithmic components). Things get (more) complex when computer*ized* simulators (e.g. flight simulators) are used for experimental purposes (e.g. to test human pilots).
4. I believe one of the reviewers of this article knows why such paradoxes still exist: “I cyni- cally suspect that many have remained vague and indecisive about declaring games something entirely different from simulations because of various benefits accruing from justifying the use (and marketing) of games in educational contexts as education tools.”
5. The notion of dynamic as an element of simulation is fairly ambiguous within both simulation and videogame research. Whereas in the former, dynamic tends to be described through tem- porality as the “development of the simulated system” (Grüne-Yanoff & Weirich, 2010, 23), in the latter, the defining feature is often configurative: “static relations can only be interpreted but dynamic relations allow manipulation” (Eskelinen, 2001; see also Bateman, 2014).
6. *Component* is my word choice for all the existents, entities, and elements in the virtual worlds of videogames. The behavioral variety of these components is great. Dragons in the videogame *SKYRIM* are components with multiple interaction options; e.g. you can interact with them by talking and battling. Some flowers in *SKYRIM* are components with multiple interaction options; e.g. you can pick them up and sell them. The sun in *SKYRIM* is a component without obvious interaction options, but it does still cast a shadow on your avatar and many other components in the virtual continent of Tamriel. Also, of course, some of the rocks on the ground do not seem to behave in any way at all; call them orna- ments if you will. See the eleventh endnote.
7. I would not mind replacing the perhaps-too-flamboyant *universe* with something earthier like *world*.
8. As my criticisms should make clear, one must weigh carefully how faithful to be to the consulted context. See Langton’s (1986) distinctions between physical automata, virtual automata, first-order automata, second-order automata, finite automata, virtual finite automata, Turing machines, virtual Turing machines, and virtual state machines (130–131). I believe the term *virtual* has not conventionalized academically or colloqui- ally to any extent that would disallow videogame (and related) scholars from appropriat- ing the term in the currently proposed way (see Lehdonvirta, 2008; Ryan, 1999; Shields, 2006).
9. You might want to take a look at Clément Vidal’s (2008) distinction between *real-world modelling* and *artificial-world modelling*. It is a pity that moving pictures emerged before videogames and reserved the term animation for their less animate images.
10. The condition of acknowledging authorial intent is why Winsberg (2003) calls simulations not autonomous, but semiautonomous.
11. In future research it will be important to identify the degrees, types, and modes of virtual- ity. These considerations go naturally way beyond the inspirational text of Langton (1986) whose main concern was the self-sustaining (128) and

self-regulating (133) vitality of vir- tuality. Again, Aarseth (2012) has already shared a few ideas about the distinctions at issue (noninteractable, usable, destructible, changeable, creatable, and inventible objects), but in their currentundefined state it is hard to tell how much use those categories will come to be.

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