

Simulation Modelling in Fiction

Conrad Aquilina

University of Malta

Abstract

This essay assesses the claim that model structures have features in common with narratology and fiction-making. It proposes that simulation—a form of modelling—is amenable to literary narratives which are hypermimetic, in the sense that their cognitive or material reception by the reader demands a phenomenology attained through the heightening of a mimetic secondary reality. Simulation models construct frames of reference for target systems through self-validating mechanisms, and the same is true of narratology. I specifically argue that the modelling of a world out of text, one which is written and read into being, needs to be discussed in simulationist terms. To an extent, narratives or entire fictional worlds, are modelled by an author and a reader since properties, laws and behaviours are imputed on the basis of tacit agreement and shared knowledge. Readers self-identify (or not) with the author's fictional world, and its constructs. A process of verification and validation, analogous to the modelling and testing of simulations, follows. I conclude this essay by proposing a model in which elements from simulation modelling are carried over to narratology to demonstrate permeation between both representational systems.

Keywords: Simulation, Modelling, Narratology, World-Construction, Reader-Reception.

1. Introduction

Simulation is a process which involves modelling, a form of scientific representation that is highly mimetic, function-driven and outcome-oriented. Various simulation theorists, such as Jeff Rothenberg and Pau Fonseca i Casas, have specified most, if not all, of these aspects in their definitions. For Rothenberg, “simulation is a process in which a model of any kind is used to imitate (some aspect of) the behavior of its referent” (1989: 80), while Fonseca i Casas explains that “the act of simulating something first requires that a model be developed [to represent] the system itself, [with] the simulation represent[ing] the operation of the system over time” (2014: 265). Both definitions crucially distinguish between the system model, as mimetic or representational system, and the finished model, the simulation run itself. Furthermore, the dynamic rather than the descriptive aspect of modelling has been noted by John Casti, who specifies that dynamic simulations can be manipulated

“so as to modify the reality the model tries to represent” (1997: 19). We can therefore assert that, as far as simulation modelling goes, a finished model simulates X by functionally representing it. It is also the case that while all simulations are necessarily models, not all models are capable of simulation (such as small-scale models or three-dimensional rotatable illustrations of the solar system).

Thus, any representation which functionally models behaviour must also maintain a number of correspondences between the physical (or source) system and the system model (Kheir 1996: 5). These correspondences are chosen based on the referential aspect being modelled, since a model is never fully identical to its source but is always an abstraction based on design selection (Rothenberg 1989: 78). Therefore, choosing which model best simulates the referent means making a conscious choice on how the referent will be re-presented while maintaining a number of fidelity conditions (Van Fraassen 2010).

A model therefore refers to, and substitutes for, a source through a series of referential moves—according to Van Fraassen, “Z uses X to depict Y as F” (2010: 21), even if the source is fictional. This is particularly interesting for fictional narratives which are constructed and enacted along similar principles of representation and referentiality. However, when the model does not ostensibly represent or refer to an actually existing object, such as pseudoreferents in fiction, the model structure must be such that it lends itself to permissible simulation (Rothenberg 1989: 78). In this case, the real-world and its laws sanction the non-actual object which is in turn synthesised through simulation modelling within the narrative in much the same way that simulation permits replicatively and predictively valid behaviours in non-fictional models (Kheir 1996: 5-6).

Roman Frigg’s argument that models construct frames of reference for target systems through make-believe mechanisms which validate their truth as fictions (2010a) is also true of narratology. In Frigg’s fiction view of modelling (2010a), a system only becomes a model when it is deliberately used as such, and as in literature, combines actual and non-actual elements within the model for which the reader extrapolates content and rules. Fictional worlds are more than mimetic narrative constructs; they are foremost approaches to narrative phenomenology and simulation. This means that the textual model adopted must construct—in some cases, even simulate—its narratives in such a way that its reader feels or experiences the text-world as possible (Ryan 2001; Gerrig 1998). This passage from a primary (source) to a secondary world (target) requires a near-instantaneous decoding of words into semantically and phenomenologically relevant content (Birkerts 1994; Ryan 2001).

An objection to the idea of narrative-as-simulation might be the claim that fictional counter-factuality, in which descriptions or propositions which may not be true to fact are nonetheless used, is not the end objective of any simulation and neither does a simulation run on counter-factual rules. I counter this objection by explaining that textual distancing (where the reader ‘travels’ from the world of origin) does not warrant ontological distancing and that in the simulation of narrative worlds, “suspension of disbelief”, to use Samuel Coleridge’s term (1817: 168-174), does not imply a suspension of primary reality but merely the heightening of a secondary one.

In making my argument for simulation modelling in literary fiction, I adopt the following positions, supported by the relevant literature:

- i. Common principles underpin narrative fiction and simulation modelling. These are explained in section 2 (‘A Fiction View of Modelling’).

- ii. The construction of a textual world model, with its properties, behaviours and laws, involves various make-believe mechanisms that need to be tacitly agreed upon by a minimum of two parties. In this respect, the successful modelling of a fictional world is an act of joint authorship involving an author and a reader. These mechanisms are discussed in section 3 ('Make-Believe Mechanisms').
- iii. The modelling of a world out of text, one which is written and one which is read into being, needs to be discussed in simulationist terms in cases of narratives which make additional mimetic demands from the reader. Certain fundamentals of world-modelling are discussed in section 4 ('World-Building as Simulation Modelling') while their reception is discussed in section 5 ('Reader-Centric Modelling'). Since readers self-identify (or do not) with the author's fictional world, approaches similar to verification and validation processes present in simulation theory are also quite evident.
- iv. I conclude this essay in section 6 ('Simulation-Type Modelling in Literary Fictional Worlds') by proposing a model for the construction of a fictional world in which elements from simulation modelling are carried over to narratology to demonstrate permeation and overlap between both representational systems.

2. A Fiction View of Modelling

Roman Frigg's "fiction view of model-systems" (2010a: 99) can be used to explain what common principles underpin narrative fiction and simulation modelling beyond figurative analogies. Frigg's concept of modelling as fiction serves a dual purpose: it relates scientific representation to fictional/semi-fictional constructions such as those found in literary texts and it does so precisely by establishing prescriptive rules typical of narratives. Frigg's fiction view of models, and one which has Kendall Walton's prop theory (1990) as its basis, thus indirectly provides further evidence for a mode of simulation that is quite amenable to narratology. Central to Frigg's argument is that model systems are often composed of fictional and non-fictional elements, which come together through an imaginative exercise in pretense. Hans Vaihinger, Nancy Cartwright, Peter Godfrey-Smith and others have also construed scientific modelling in terms of "intellectual construction", as-if philosophy, and "epistemic practices" (2010b: 255) shared by artistic and imaginative fiction.

Frigg departs from the assumption that scientists adopt models which are abstractions of more complete physical systems. They are "hypothetical systems", distinct from the "target system", the actual source reality which is being represented or simulated (2010b: 253). Hypothetical systems or hypothetical entities "would be physical things if they were real" (Frigg 2010b: 253), yet they are not, and neither do these models—proffered in lieu of a target system—represent the world *per se*; they represent only their own structures.

A model therefore can only start representing its referent (its target, in Frigg's discourse) once its underlying structure has been "endowed with representative power [enclosed in] a physical design" (2002: 3). But this is not apparently what structures can do on their own—a structure must be made to become a model. Frigg's concept of a model requires "(at least) a structure, a physical design and a process that hooks up the two" (2002: 3). In this manner, Frigg discounts struc-

turalist model theories where a structure and its attributes have direct correspondence (isomorphism) with the object they model, mainly because structures “are not representations of anything in the world” but “pieces of pure mathematics, devoid of empirical content” (2002: 5). Since representation is based on a substitution-for principle (representing X as Y), it requires “semantic content” (2002: 5) in order to stand for something else. Only then will a model acquire representational status since “structures per se do not stand for anything at all [and] do not indicate any real-world system as their object” (2002: 5).¹

We can posit the same rules for literary fiction. Like Frigg’s model-systems, which are an “ensemble” of “things that do and [...] do not exist” (2010c: 257), literary plots “are mixtures of existent and non-existent elements” (2010c: 257) whose design prescribes to the reader how they ought to engage with them, despite not characteristically portraying an actual state of affairs. A model system is introduced in the same way literature is introduced, “by giving a description [through] sentences specifying its features” (Frigg 2010c: 257), although a good number of model systems are ‘described’ non-textually through the use of diagrams and so on. This description is not intended to denote real persons or objects and may or may not have “counterparts in the real world” (Frigg 2010c: 257), yet the reader is aware of this when they engage with the storyworld (a fictionally narrated world/reality) or with a model system for that matter. Moreover, the description of a model system, of which a fictional storyworld is an example, “specifies only a handful of essential properties, but it is understood that the system has properties other than the ones mentioned in the description” (Frigg 2010b: 258).

Essentially, what Frigg is stating here is that model systems—and by extension, fictional worlds—operate on principles of implicit or “extra content” (2010b: 258) which are generated when the reader extrapolates from the model system/narrative itself. (Narrative or genre-models therefore contain self-inscribed or pre-written ‘rules’ or conditions for their own readability or interpretability, the same as simulations). This extrapolation is also carried out, inevitably, with the target system, and although Frigg has made a case for model systems not being structurally isomorphic to real world counterparts, he concedes that “on every account of representation one has to compare features of the model system with features of the target at some point, even if only to assess how good an approximation the former is of the latter” (2010b: 258).

3. Make-Believe Mechanisms

Both model systems and fictional narratives are nevertheless presented (read: ‘structured’) as descriptions which function as props in games of make-believe (Frigg 2010b: 260), in which a conscious form of non-deceptive pretension (New 1999: 69-73) is adopted. This analogy is important to keep in mind as conditions of truth or factuality are waived, according to Christopher New, when one considers the nature of fictional texts as “invented narrative[s], consisting of sentences which the author invites the audience to make-believe are true, or to make-believe

¹ Frigg treats scientific modelling as a conceptual rather than material process, in which case the assertion that structures on their own have zero semantic or representational value until they become invested as models is true. Models are contained in the head rather than the hands. However, Frigg does not discount the presence and use of material models, which decidedly requires less structuring.

are authentic utterances of a real or imaginary utterer” (1999: 48). To give one over-cited example, we know that there is no actual historical person called Anna Karenina, yet this person exists in the world of Leo Tolstoy’s titular novel. This Anna Karenina is therefore “fictionally true” (New 1999: 108) while claiming that Anna Karenina is not Alexei Vronsky’s lover is fictionally false. As readers, we accept the conditions imposed by the game of make-believe, which leads us also to infer fictional truths through logical implicature rather than explicit description when information is deliberately withheld. Thus, Tolstoy writing that “at the very moment when the midway point between the wheels drew level, she threw away her red bag, and [...] threw herself forward on her hands under the truck” logically implies Anna Karenina’s suicide, albeit a fictional one (New 1999: 109). Therefore, according to New, “fiction involves nondeceptive pretending to oneself, or make-believe”, inviting a form of “voluntary imagining” (1999: 69-73) in which we remain somewhat in control of the fictional scenario (unlike a dream or a delusion) and willingly accept the events portrayed (by another), while in the knowledge that they are fictional.

Frigg advances a similar theoretical starting point for his fiction view of modelling, basing it on Kendall Walton’s pretense theory in which fictional truths are generated by props, prompting readers (or designers of models) to indulge in a consensual ‘game’ of intentional pretense where they imagine objects as possessing certain attributes for the duration of this game (2010b). For Walton, fiction and fictional propositions are contingent on props as they act as “generators of fictional truths” (1990: 37). Thus, for example, to claim that a snow construction represents a fort is to say that the snow fort acts as a fictional prop of a real fort, complete with turrets and a moat.

One other condition of a prop is that it is capable of generating fictional truths regardless of people’s ability to imagine or not imagine these fictions as long as this prop is prescribed a function and there is social agreement on what this function is. Children may pretend to ‘use’ the snow fort as the real thing while to a disengaged passerby the snow fort remains a pile of drift (Walton 1990: 38). This highlights the functional aspect of modelling. Props (even within their theatrical context) serve specific functions and are denotative, treated as literal. In Walton’s pretense theory, the “principle of generation” (1990: 38) describes what is going to serve as a prop, how it is going to be used, and by whom. If in a game of make-believe, a tree stump is taken to represent a bear, the tree stump acts as a prop only for this particular game and not for others. If a tree stump can be a ‘bear’ in one (private) game, a ‘dragon’ in another, and a ‘portal to a fantasy world’ in yet another game, then the principle of generation becomes what Walton calls “ad hoc” (1990: 51). Frigg adds: “games based on public rules are ‘authorized’; games involving ad hoc rules are ‘unauthorized’” (2010b: 259). Both involve pretense and imagination, the generation of fictional propositions, yet only in the case of authorised games does a prop acquire stable representational status. (Frigg eventually extrapolates this to mean modelling, whether scientific or, in the case of fictional narratives, the writing of a literary text whose reception depends on sanctioned principles of generation as a prop).

This aspect of fictional pretension is a matter of belief, rather than imagination, since although in ordinary circumstances “we are free to imagine as we please”, “we are not free to believe as we please” (Walton 1990: 39). Fiction therefore necessarily places strictures and mandates on the imagination. In Tolstoy’s *Anna Karenina*, the literary conventions of the novel prescribes the kind of props

it utilises—in this case, a train is a train is a train—and we are meant to believe and imagine that Anna Karenina intends to commit suicide and in fact (or in fiction) succeeds. It could not be otherwise.²

The way truth statements operate in fiction is seen by Frigg to have correlations with model systems. If fictional truths can exist “independently of people’s actual imaginings” (2010b: 262), as long as there are props to sustain them with generational rules then model systems can be similarly constructed. This occurs by: i. replacing fictional propositions (such as ‘Macbeth is the only person to see a floating dagger’) with claims about the model; ii. replacing descriptions of the type of fictional work (text, play, performance, film etc.) with descriptions of the model system (what Frigg calls the hypothetical model), and iii. replacing the principles of generation innate to that particular work with principles assumed to be operational within that model system (2010b: 262).

While decidedly interesting, Frigg’s fiction view of modelling presents various problems for simulation modelling in general, especially since it cannot (just) be considered a conceptual form of modelling, which is what Frigg bases most of his arguments on. On the other hand, the fiction view of modelling proves to be perfectly amenable to discussions of narrative simulation, which this essay seeks to advance. Before proceeding further, however, it might be appropriate to explain which of Frigg’s claims are problematic, and why.

That models or literary fictions “are not defined in contrast to truth” (2010b: 260) is only partially correct. A model is not constructed as distinct to what it is held to be true (fidelity principle), so much so that a two-tiered process of verification and validation of the model (especially in functionally accurate simulations) is typically carried out before the model can be called ‘good’ (see section 5). Likewise, it is true that in fiction we can definitely “ascribe concrete properties to nonexistent entities” (Frigg 2010b: 261) such as in the modelling of pseudoreferents, and this because we are entitled to do so within the operational parameters of make-believe, yet I find it problematic to carry this analogy over to modelling, as Frigg does, especially in a model system which is intended to simulate an actual one.

In the main, simulation modelling does not involve imagining imaginary properties but imagining that a model has been attributed actual ones and seeing what emerges when these properties are applied and set in motion. Finally, since simulation modelling involves a very particular form of scientific representation, we cannot concede Frigg’s claim that “a structure is not about anything in the world, let alone about a particular target system” (2010b: 254) since the very hypothetical system he proposes as the object of study (the simulation itself) needs to be grounded in laws and behaviours of the actual target system. Therefore, in simulation modelling (at least) it would also be imprecise to assert that a “hypothetical system [is] distinct from the target system” (2010b: 254) and while this may be true of the modelling of literary fictions (what is conveyed in fiction may or may not resemble or correspond with an actual state of affairs), it is certainly not the case with simulation modelling. Simulation modelling and fiction modelling part ways in their target outcome since they adopt a different teleology (simulation modelling, for instance has epistemic functions while the modelling of fictional characters and worlds is not necessarily so, and in general, is not). But

² Walton in fact claims that in a novel such as *Gulliver’s Travels* or the play *Macbeth* the nature of the work itself leads the reader or spectator to specific imaginings. Thus, Walton concludes, “the work is a prop” (1990: 51).

we also need to consider what happens in the case of narrative simulation, which combines aspects of simulation modelling with conditions prevalent in fiction, and one where games of make-believe become structurally complex.

4. World-Building as Simulation Modelling

Following Roman Frigg's proposition that scientific modelling and fictional representation have rules in common, correlations can also be drawn between simulation modelling and narratology. In 1969, Tzvetan Todorov proposed a "narratology" that went beyond the study of text-based discourse to an actual scientific theory that would address the logic and structural properties of narrative as "a universe of representations" (Meister 2014). This would open the study of narratives to new modes and disciplines. Out of necessity, in this argument I adopt a text-based approach to narratology while explaining how specific structures embedded in narrative attribute it the quality of narrative simulation, as opposed to conventional mimesis. If narrative can be conceived of as a "universe", as Todorov has claimed (Meister 2014), then we can theorise about the construction of entire, possible worlds as textual models.³ However, while the construction of fictional worlds is conventionally based on mimeticism, some fiction ventures beyond conventional mimesis to acquire the status of text-based simulation, with narratives that either simulate cognitive processes in real-time or simulate actual reader behaviours beyond the phenomenological.⁴

We should ask: what makes a fictional world a 'complete' world, one which is sufficiently cross-referential to sustain belief in its constructs? Michael Heim describes a world's "totality" in terms of "a felt totality or whole" (qtd. in Ryan 2001: 91), "not a collection of things but an active usage that relates things together [in a] total environment or surround space" (qtd. in Ryan 2001: 91). While Heim uses this concept of a total world for virtual realism, specifying the interoperability of the fictional world's constituents (X acts on Y) as a form of causality, his concept can be reduced to one phenomenological imperative: affect. This condition is also present in textual worlds. A fictional world, whether a visual and interactive one or one which simply relies on cognitive immersion, must construct its narrative/s in such a way that its user/reader feels or experiences the game/text as possible. This is why apart from the interconnectedness of objects and individuals and their habitable environment, Marie-Laure Ryan has added phenomenological requisites to the structuring of complete fictional worlds, such as the "intelligible totality for external observers" and "field of activity for its members" (2001: 91).

Fictional worlds are more than mimetic narrative constructs; they are approaches to narrative phenomenology. For Ryan, this means experiencing "the text as world", of being "immersed" in the textual world (2001: 90) while for Richard Gerrig this experience is akin to being "transported" (1998: 10) to a secondary

³ Other obvious narrative modes such as film and digital games also permit this, the latter being the most convincing due to their immersive and interactive nature.

⁴ While it is beyond the scope of this essay to engage in narratological analysis, it may still be worth mentioning works by Virginia Woolf such as 'Kew Gardens', James Joyce's *A Portrait of the Artist as a Young Man* and 'The Dead', and Bret Easton Ellis's *American Psycho* as examples of cognitive simulation, and Michael Cunningham's *The Hours*, Ian McEwan's *Atonement*, and Mark Z. Danielewski's *House of Leaves* as examples of affective modelling.

world, making some aspects of the reader's "world of origin [temporarily] inaccessible" (1998: 11). Similarly, what Victor Nell has called "reading entrancement", or being absorbed or "lost in a book" (qtd. in Ryan 2001: 96), implies an almost effortless passage from physical reality to fictive reality, provided that the narrative is structured in such a way that it does not place increasing demands on a reader's consciousness during the largely unconscious decoding of the information presented. These approaches to world-building focus on the reader's experiencing of the fictional world through a very active make-believe process which sufficiently simulates, if not the texture, then at least a mentally intelligible perception of that world. At this point the question moves from the ontological to the phenomenological. As Pimentel and Teixeira have observed, it is not "whether the created world is as real as the physical world, but whether the created world is real enough for [the reader] to suspend [their] disbelief for a period of time" (qtd. in Ryan 2001: 89). Considering that the world-as-text is a linguistic construct requiring near-instantaneous conversion of letters into semantically relevant content, this is no mean feat.

Modelling a textual world goes beyond mimetic representation. If it is meant to elicit behaviour or affect, it requires simulationist strategies which often go unnoticed. Ryan explains that the

idea of a textual world presupposes that the reader constructs in imagination a set of language-independent objects, using as a guide [...] textual declarations, but building this always incomplete image into a more vivid representation through the import of information provided by internalized cognitive models, inferential mechanisms, real-life experience, and cultural knowledge, including knowledge derived from other texts (2001: 91).

The terms Ryan uses for her description of linguistic structures which generate virtual scenarios and characters—"constructs"; "objects"; "declarations"; "representation"; "import of information"; "internalized models"; "inferential mechanisms"; "real-life"—recalls a discourse of simulation modelling where virtual objects are imputed properties and rules based on external real-life targets. But curiously, while Ryan seems to downplay the idea of the text-as-world by treating it as metaphor (2001: 90-93), the modelling of successful microcosmia out of text—one which is written, but more significantly, one which is read⁵—needs to be discussed in nothing less than simulationist terms. This is rendered more imperative in the light of Frigg's declaration that structures are non-referential, becoming meaningful model systems only when they are used as such. Similar to Walton's make-believe scenarios involving props whose function must be "authorised", the properties of a textual world model must be tacitly agreed upon by a minimum of two parties. A fictional world only comes to 'exist' upon its moment of narration (and consequently, its moment of reception).⁶

How does a fictional world's structure become both referential and meaningful? Ryan argues that a textual world "entails a referential or 'vertical' conception of meaning" where "language is meant to be traversed toward its referents" (2001: 92). This goes against the poststructuralist view that signification exists solely as

⁵ Narrative simulation is eventually an end-process that is triggered through the act of reading similar to the execution of computer code.

⁶ In what can be compared to a dry run or testing of the writing process, the fictional world can be assumed to be self-narrated at first—the author doubling as a first critical reader in the same manner that the first critical gaze cast upon a work of art is the artist's.

a set of “horizontal relations between the terms of a language system” (2001: 92) and assumes a referential base, a primary world or an actual reality, from which signification emanates.⁷ In other words, textual worlds need to primarily subordinate language use from the semiotic to the purely semantic during the reading process, for, as Sven Birkerts has argued, “when we are reading a novel we don’t, obviously, recall the preceding sentences and paragraphs. In fact we generally don’t remember the language at all, unless it’s dialogue” (qtd. in Ryan 2001: 92). A fictional world may be constructed out of text, but it is read into being. The act of reading “is a conversion, a turning of codes into contents” (qtd. in Ryan 2001: 92) claims Birkerts, much like the systematic attribution of representational value to structures in Frigg’s model-systems or the rendering of abstract digital inputs into meaningful and complex visual outputs in a computer simulation. In turn, it can be assumed that any linguistic or fictional construct that suppresses or delays the decoding process gradually diminishes the reader’s suspension of disbelief so necessary for the reading-simulation to run.

A number of assumptions are being made here. Ryan’s assertion that “language is meant to be traversed towards its referents” (2001: 92) holds true only of mimetic texts “devoted to the representation of states of affairs involving individual existents situated in time and space” but not for “universals, abstract ideas, and atemporal categories” (2001: 92). ‘Vertical referentiality’ is possible for referents which ostensibly exist in the primary world but certainly not possible when abstract ideas are introduced in the fictional world, to which we can add impossible referents or pseudoreferents which owe their ontology to language. We can therefore question whether fantastic other-worlds or surreal representations of this world are less believable models if their description impedes vertical referentiality.

We are faced with two constraints here: the linguistic structure that permits the system model to cohere (the world-as-text) and the source system which it is meant to emulate (the world). Both are unavoidable in textual world-building and are interdependent—the fictional world only exists because of its linguistic composition, as text. We can see how Ryan’s concept of ‘vertical referentiality’ starts breaking down in instances where mimeticism cannot be sustained linguistically or indefinitely, especially in the description of textual worlds which are possible but nonactual, such as in Philip K. Dick’s alternate histories, or the downright impossible, as in most of Jorge Luis Borges’s fiction.

While it is true that Ryan treats “the text as world [as] only one possible conceptualization among many others” (2001: 90), we must look beyond the metaphor to locate the model and its functional relationship with the real. Simulation is not analogy but surrogacy. If we respond to a fictional text we do so precisely because we “imagine it as a physical, autonomous reality furnished with palpable objects and populated by flesh and blood individuals” (Ryan 2001: 92). “How could a world be imagined otherwise?” (2001: 92) adds Ryan. How indeed. We do not explicitly treat narrative as metaphor, and in cases where it is, we still seek

⁷ As narratology shows, it is not just desirable but vital for the process of fictional mimesis—and simulation itself—to preserve an irreducible materialist ontology in the form of connections or indices of accessibility with the actual world. These relations have been extensively discussed in the work on possible worlds theory of Saul Kripke, David Lewis, Thomas Pavel, Marie-Laure Ryan, Umberto Eco, Lubomir Dolezel and Ruth Ronen (among others), to establish what conditions of necessity and accessibility are imposed in the creation of alternative, non-actual possible worlds (APWs).

an irreducible mimetic element that enables us to sound out the fictiveness and solidity of its referents—a principle of minimal reality. In Heim’s words again, a fictional world must have “a felt totality” (qtd. in Ryan 2001: 91). Fictional worlds are therefore “existentially centred around a base we call home” (Ryan 2001: 91). The ‘homeliness’ or familiarity of fictive experience which grounds it to a ‘felt’ reality, and any reactions it invites, are well-documented, from Viktor Shklovsky’s *ostraneine* (defamiliarisation) to Sigmund Freud’s *unheimlich* (the uncanny; the unhomely). Literature is meant to open a ‘window onto the world’, allowing us to gain insight into the very world that generated it, thus the baseline for world-building is “home”, the familiar, “the node from which we link to other places and other things, [the] thread weaving the multitude of things into a world”, according to Heim (qtd. In Ryan 2001: 91). Ryan concurs by stating that “the most immersive texts are [in fact] the most familiar ones” (2001: 96).

5. Reader-Centric Modelling

The notion of ‘home’ also correlates with what Kathryn Hume refers to as “consensus reality” (1984: 23), that which “immediately refers us both to the world of the author and that of the audience” (1984: 23), in other words the real or actual world which is the basis of all forms of simulation modelling.

Consider the diagram by Hume below and reproduced in various studies on literary realism. For Hume, the work of fiction results from the reciprocal influence

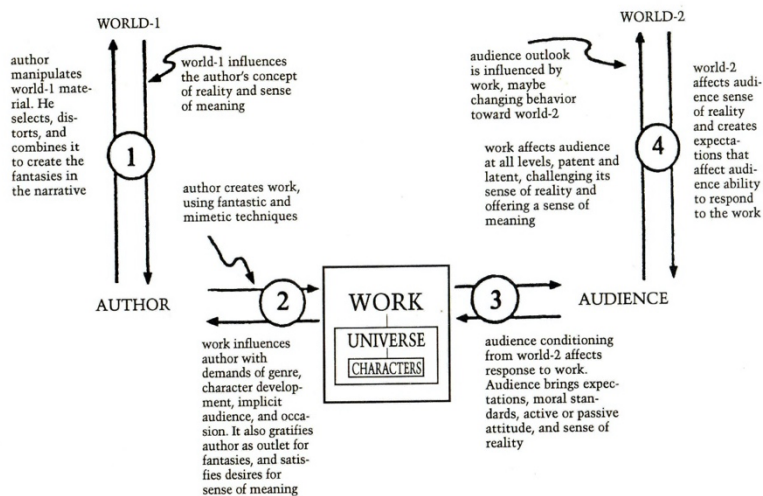


Fig. 1: World-reflection: real world phenomenology giving rise to mimetic fictional world (Hume 1984: 10)

and mediation occurring between “world-1” and “world-2” but although “world-1 is everything outside the author that impinges upon him” (1984: 9) this is not necessarily the world shared by the reader. Says Hume:

These worlds of experience, world-1 and world-2, differ even if the artist and reader are contemporaries; world-2 indeed differs for each member of the audience. If artist and audience are separated by time, language, religion, culture, or class, the amount of shared reality may be small (1984: 9).

Hume's model of mimetic world-building is based on shared and unshared individual phenomenologies (experiences and sensations of both real and fictive worlds). The model suggests a bi-directional and intersecting process of creation: (i) the writer draws on shared/unshared reality for experience and imagination; (ii) crafts his fictional world complete with life-like or fantastic characters, settings or plots by recouring to structures, both fantastic and mimetic, that use consensus reality as a referential base; (iii) readers self-identify (or do not) with the fictional world, which has both vestiges of world-1 (the author's) and world-2 (their own); (iv) readers' reactions to the fictional world prompts discussion and critique, and (v) the fictional world influences generic trends in fiction writing, thus opening up the mimetic-reflexive process again.

From Hume's diagram one can infer that what links author and audience is the text, which she calls "work", implying a joint authorship. However, this is inexact. Base reality is missing from the model. This serves both as the writer's point of departure in creating the work in world-1 but also the readers' benchmark for assessing and self-identifying with this work in world-2. Hume's model appears to separate writer and audience by having them occupy, influence and be influenced by their respective worlds, as if the world of the text, or the work itself, were the livable domain of the audience rather than its affective domain. From Hume's annotation to the diagram we read that "world-2 affects audience sense of reality and creates expectations that affect audience ability to respond to the work" (1984: 10). This is not wholly correct. It is the source for the modelled world which is occupied by, and phenomenologically influences, both writer and reader. This is the (mostly) shared reality from which stem both the writer's and reader's knowledge, emotions and expectations of the fictional world. This connection is not displayed in Hume's diagram, leading to the unfortunate conclusion that major divergences seem to exist between worlds-1 and 2, when in reality these only serve as metaphorical labels which have been used by Hume to represent different personal, historical or political realities (or instances of the same world) rather than different worlds.

Hume's concept of world-construction underplays the significance of a dominant and common non-fictional world for the sake of social relativism (what is represented as worlds-1 and 2 in her diagram). This is curious as she still bases her argument that "literature is the product of two impulses" (1984: 20) on "consensus reality" (1984: 20). Mimesis is "vraisemblance to the world we know" (1984: 21) while fantasy "is any departure from consensus reality, an impulse native to literature and manifested in innumerable variations, from monster to metaphor" (1984: 21). Therefore world-construction as a form of simulation modelling must take into account what aspects of the world are to be modelled, but the author must also assume a priori what aspects will diverge—or 'depart', to use Hume's word—from the dominant, and to what extent.⁸ But for this to occur, a dominant must be acknowledged. Alan Palmer calls this the "source domain, the real world in which the text is being processed by the reader" (2008: 34), as opposed to the "target domain, the storyworld that constitutes the output of the reader's processing" (2008: 34). This clear distinction between a source domain and a target domain does not imply that features are not shareable or common to

⁸ Conventionally, if we regard literature as the product of both mimetic and fantastic impulses, as Hume does, any convergence or divergence from the core of consensus reality is responsible for the various genres and sub-genres that are to be located along the entire spectrum.

both; in fact Palmer explains that access to the fictional storyworld occurs when readers process and negotiate knowledge from both domains (2008: 34). Access to fictional worlds is therefore reader-centric.

6. Simulation-Type Modelling in Literary Fictional Worlds

At this stage, we can synthesise concepts from narratology such as Palmer's concept of source and target domain, Hume's notions of world-1 and world-2 author-audience reciprocity, and Birkerts' assertion that reading is an act of converting code into contents to propose a valid text-as-world model (to borrow Ryan's phrase) which is fully consistent with simulation modelling and which treats it as a fully-fledged system rather than metaphor (see Figure 3 further down).

Hume's mimetic model might have its minor shortcomings however it still bears obvious similarities to simulation modelling in most respects, mostly in situating a reality external to the simulated world as its source (worlds-1 and 2); in devising a medium (the work) for users (the writer and audience) to engage with and manipulate; in suggesting an individual phenomenology (audience affect) and finally in validating personal experience (epistemology). The last two are perhaps the most crucial aspects of this model. For a simulation to matter—how we engage with it, what it can do and what we can learn from it—we demand credibility from the model. This is possible only after we have assessed the model in terms of its functional relations to the source domain.

Naim Kheir's diagram of the simulation process (Figure 2) demonstrates how properties of the physical system (reality) are modelled through a structure (system and computerised models) while the model-designer validates and verifies the system's processes. In this way, the desired match between "observed behaviour" and "predicted behaviour" is obtained in the final or system model (Kheir 1996: 5).

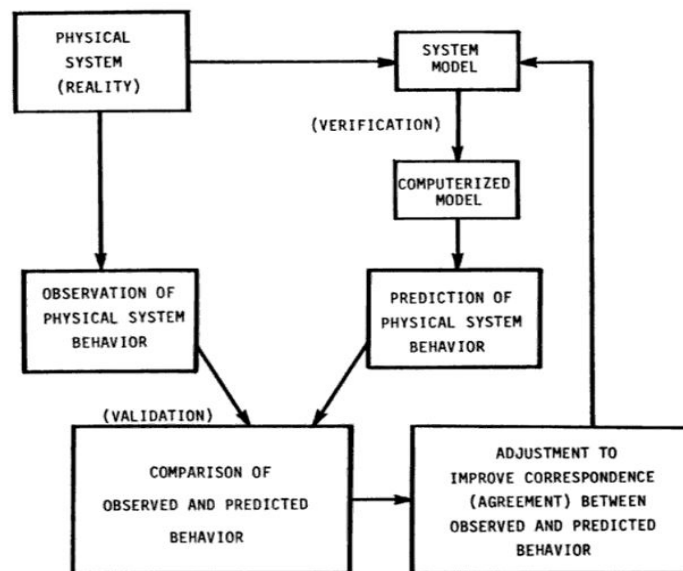


Fig. 2: Cross validation of system and real-world behaviours (Kheir 1996: 5).

The role of the model-designer is to ensure that the data generated by the system model corresponds to that acquired from the physical system to permit accurate replication. (Kheir's model implies a pre-test design and implementation phase where users are absent). Hume's model suggests a similar practice. However, while Kheir's model mostly assumes an epistemological approach to validate system behaviours, Hume's model is mostly phenomenological since it takes audience response and affect into account. Thus, in Kheir we find that an interplay of verification and validation processes is necessary to ensure that "the computerized model represents the system's model within specified limits of accuracy" (1996: 6). Until this is achieved, the model is "modified to reduce the differences between model and system behaviors" (1996: 6). In Hume's mimetic model, this process of verification and validation is implicit in the audience's reception (or rejection) of the work, which might also lead them to changing their behaviour towards world-2 (1984: 10). In the final analysis, both Hume and Kheir's models assume that faithful modelling/simulation of target behaviour or phenomena, whether rendered through text or digital medium, depends on a constant interplay between source-user-target systems, lending more credence to the idea that Ryan's text-as-world can be construed in simulationist rather than figurative terms.

The observation that narrative-as-simulation is different to other fictional narratives since it cannot be based on counter-factual rules would therefore be correct, but only insofar as the distinction with other narratives is made. It is true that while certain liberties may be, and frequently are, exercised by narratives, this cannot absolutely be the case in simulation modelling, where accuracy and credibility are *sine qua non*s. Thus, the argument might run, total immersion in a fictional world is possible only by removing oneself and one's experiences from the non-fictional world of external reality—a willing suspension of disbelief in the fictional world which is facilitated by readerly transportation from the actual world (Gerrig 1998). In this manner, the fictional and non-fictional world are kept distinct domains with distinct entities and rules of behaviour.

However, as we have seen, this argument is not entirely correct. Even if the reader (or "traveler" in Gerrig's words) "goes some distance from his or her world of origin" (1998: 13) this certainly does not imply that textual distancing warrants complete ontological distancing. According to a "principle of minimal departure" (Ryan 1980: 406) "we reconstrue the world of fiction [...] as being the closest possible to the reality we know [making] only those adjustments which we cannot avoid" (1980: 406). Extreme variations and deviations are permissible only in the case of specific narrative genres or works where the internal laws of the fictional world hold sway. Therefore, in the simulation of narrative worlds, suspension of disbelief does not imply a suspension of primary reality but merely the heightening of a secondary one. One does not preclude the other. Indeed, as narratology shows, it is not just desirable but vital for the process of fictional mimesis—and simulation itself—to preserve an awareness of, and an anchorage, to the real.

A simulation-type model for fictional world construction is thereby being offered below (Figure 3) by assimilating some core concepts of narratology explored in this essay.

My proposed model integrates elements from simulation modelling with narratology to demonstrate areas of permeation and overlap between two representational systems:

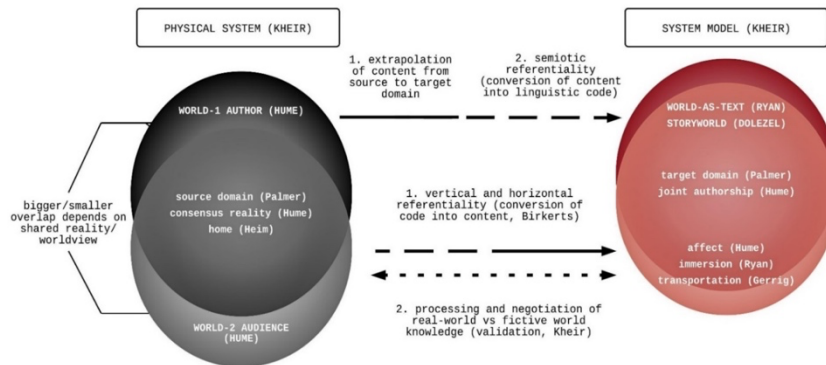


Fig. 3: Simulation-type model for the construction of a fictional world.

1. The physical system and system model are terms used by Kheir to denote the source and target systems in a simulation model. Similar to the construction of a simulation model, the construction of a fictional world entails extrapolation of content (properties, attributes, laws, reference) from the physical system to the system model. A first and irreducible materialist ontology on which behaviours are modelled and compared is therefore also present in fictional world-construction. Palmer's narratological terms for these two distinct domains are the source and target domain, both indistinguishable from any scientific discourse on modelling or simulation.
2. The source domain is essentially distinguished by its referential physicality, although it does encompass idiosyncratic worldviews, personal experience and highly individual realities. Hume treats this domain from the perspective of two worldviews (World-1 the author's, World-2 the audience's) and acknowledges that these views overlap. I have not only preserved this overlap but accentuated it since an irreducible materialist ontology—a principle of minimal reality—which enables us to sound out the fictiveness and solidity of all referents is necessary. For the sake of clarity, the source domain therefore encompasses much more than individual realities but is a (mostly) shared and therefore consensus reality (Hume 1984: 23). Cross-referencing of properties between source and target systems therefore requires a departure from consensus reality or a departure from the familiar, the concept of home according to Heim (qtd. in Ryan 2001: 91).
3. This departure occurs as a parallel and inverse process. The construction of a simulation model entails a process of substitution of content to code which maintains a valid relational status between the source and target referents. Similarly, both author and audience maintain this relational status of referentiality in the construction of a fictional world through the conversion of content to linguistic code, according to Birkerts (qtd. in Ryan 2001: 92). This referential dissolution from referent to sign and from sign to (virtual) referent is denoted by straight and broken lines in the diagram above and occurs as a near-simultaneous and inverse process in the performative act of reading (physical referent in source domain \rightarrow linguistic code (system of signs) \rightarrow virtual, textual referent in target domain). While this process is assumed to be natural or quasi-instantaneous, this only applies to instances

where reference is vertical and not horizontal (direct from sign to referent rather than indirect, from sign to sign, as distinguished by Ryan).

4. Depending on the complexity of the fictional world, its constituents and its narrative(s), approximation and relatability become conscious processes akin to verification and validation in simulation modelling, as proposed by Kheir (1996: 6). Knowledge, rules and laws pertaining to the fictional world are counter-checked against consensus reality until the audience is sufficiently convinced by the internal consistency of the fictional world.
5. Finally, the audience's active participation in world-(re)construction (transportation for Gerrig; willing suspension of disbelief for Samuel T. Coleridge) solidifies the construction of the storyworld (Dolezel). If the text world can be read into (imaginative) being, then its ontology becomes a shared responsibility. The extent of this joint authorship—how much of the text world is 'written' by the author and how much is 'rewritten' (reimagined) by his audience—is denoted by the overlap where the audience's immersion (Ryan) allows for full phenomenological response (or affect in Hume) to this world. In simulationist terms this effectively means that the user is the final gauge of a system's strength or correctness.

7. Conclusion

Correlations can definitely be drawn between simulation modelling and narratology. This is evident in the way models construct frames of reference for target systems through make-believe mechanisms which also validate their truth as fictions—a mechanism readily seen in narratology as a form of textual modelling. While the rules outlined in my proposed model can be applied to the construction of any type of fictional world, narratives which adopt simulationist strategies require a greater degree of audience participation and a discernible amplification of the reality principle in their construction. In this manner, the “accessibility relations”⁹ (Ryan 2001: 100) of the target domain to the source is hardly questioned. Or, put otherwise, narrative simulations can therefore be said to describe possible worlds in fiction in the most possible of terms, even if the target outcome is non-actual. This is achieved purely on the basis of modelling, which finally owes much to simulation theory.

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⁹ Accessibility relations are extensively discussed in possible world theory to establish what conditions of necessity and accessibility are imposed in the creation of alternative, non-actual possible worlds.

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