Narratology for Interactive Storytelling: A Critical Introduction

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Abstract. Most research in Interactive Storytelling (IS) has sought inspiration in narrative theories issued from contemporary narratology to either identify fundamental concepts or derive formalisms for their implementation. In the former case, the theoretical approach gives raise to empirical solutions, while the latter develops Interactive Storytelling as some form of "computational narratology", modelled on computational linguistics. In this paper, we review the most frequently cited theories from the perspective of IS research. We discuss in particular the extent to which they can actually inspire IS technologies and highlight key issues for the effective use of narratology in IS.

Keywords: Interactive Storytelling, Narrative Theory, Virtual Actors.

1 Introduction

Since the early descriptions of Swartout et al. [19] and Young [26], most Interactive Storytelling systems have integrated Artificial Intelligence (AI) techniques, which generate narrative actions sequences, with 3D graphics and animations, staging these narrative actions to produce the actual interactive story. However, AI formalisms can only succeed with appropriate processes for knowledge acquisition. When investigating which domain knowledge could best support the IS endeavour, most researchers turned to narratology as the main discipline that could support narrative analysis and formalisation.

In this paper, we review the main narrative theories that have inspired IS research and provide a critical insight into how these theories can support further developments of our discipline[1]. One key question here would be to which extent narrative formalisms facilitate computational description [25]; as we shall see, many IS researchers have already embraced them with some success, although much remains to be done to take full benefit of these theories. Our goal is not to judge on the appropriateness of past use of narrative theories by IS colleagues; rather, it is to provide a perspective and some critical comments, which hopefully should prove helpful when considering the use of narratology to support research in IS.

[1] We have restricted ourselves to the most often cited, "traditional", narrative theories, most of which have been developed in the course of the XXth century.

S. Göbel, R. Malkewitz, and I. Iurgel (Eds.): TIDSE 2006, LNCS 4326, pp. 72 – 83, 2006.

2 Aristotle and the Foundations of Drama Theory

Aristotle provided the earliest analysis of what (throughout later centuries) became known as traditional drama, insisting in particular on its progression through climax and the final resolution (denouement). It is the strength of the classical model to have imposed itself virtually unchallenged almost until the 20th century, and as such its descriptive power has been considerable. This has led IS researchers such as Mateas, in his early work [15], to subscribe to a neo-aristetolian vision of Interactive Drama (also following [12]). However, Mateas acutely identified the lack of emphasis on agency as a limitation of the Aristotelian model, and consequently proposed an extension to the Aristotelian model precisely incorporating user interaction. Although Aristotle's Poetics is often cited in IS work for its description of narrative evolution (see e.g. "narrative arcs" in [27]), only Tomaszewski and Binsted [22] have proposed an IS model based on its principles.

To which extent can Aristotelian theory assist in the development of IS systems? As its discussion in previous IS work suggests, it does provide a model for story progression that encompasses important aesthetic properties of the story. Aristotle also introduced the important concept of *proairesis* (or "deliberate choice", which we will see developed in Barthes' work) as a central aspect of narratives. On the other hand, the Aristotelian model's descriptive power is not sufficient to be considered as a narrative formalism *sui generis*. The main reason is that it does not include a fine-grained description, or even a proper formalisation, of narrative actions. In IS, the Aristotelian model seems to have been primarily used as an inspiration, a theoretical framework in which to describe narrative concepts, rather than a source of narrative formalisms, let alone their implementations in IS systems.

3 Propp and the Formalist Turn

Morphology of the folktale [17] is probably the best known essay in narratology, and is certainly the most cited amongst researchers in IS. Propp was the first to uncover stable structures underlying Russian folktales and to describe these structures using the first ever formalism in narratology, together with a symbolic notation. Propp introduced *narrative functions* as the basic representational unit of a narrative. These constitute narrative primitives, describing prototypic narrative events encountered in all (Russian) folktales, such as *Transgression*, *Deception*, *Struggle*, *Punishment*, *Wedding*, etc. For Propp, all Russian folktales follow a common structure and can be described through a sequence of narrative functions, of which he has identified 31 in the corpus he studied.

Propp's approach can be summarised into four major points:

- narrative functions are the basic primitives of folktales; as such, they are stable and invariant elements; they are independent from the characters that executes them, as well as from the modalities of their execution.
- there exists a limited number of narrative functions describing Russian folktales (narrative functions thus behave as primitives; the canonical description identifies 31 such functions).

- functions always occur in the same order (Fig. 1), although each given tale only comprises a subset of functions. This means that if functions in general (across all folktales) are described in the order A→B→C→D→E→F, only subsequences of the type A→D→E→F and B→C→D→F would be "well-formed" folktales (the order of functions is unalterable, and no "backtracking" is allowed).

$$\alpha\beta^{3}d^{1}A^{1}B^{1}C \uparrow H^{1}\text{-}J^{1}K^{4} \downarrow w^{3}$$

Fig. 1. A typical sequence in Propp's formalism. Each basic function is associated a symbol [B^1: Abduction; J^1: Antagonist killed during fight]. The up and down arrows correspond to the Hero's departure and return.

It is worth citing here Bremond's criticism of Proppian hypotheses, especially from the perspective of IS [4]. Because of the fixed nature of the functions sequence, Propp's approach inherently prohibits any kind of "branching functions" that could alter the course of the folktale to provide alternative paths. In other words, we would say that narrative functions prevent all forms of *proairesis*, and that functions have fixed conditions for their applications and always produce similar outcomes.

Provided that the narrative genre considered is isomorphic to folktales, Propp's narrative functions can be adopted almost as a ready-to-use formalism, and there have been good examples of such use in IS by Grasbon and Braun [8], Machado et al., [13][14] and Peinado and Gervas [16]. On the other hand, Hartmann et al. [11] have extended Propp's formalism to describe "branching points", trying the address the above limitations of the original approach.

Yet, fundamental limitations, such as the lack of character perspective, the lack of a psychological level of representation (for emotions, feelings or self-appraisal) would make it unsuitable to other forms of interactive drama.

4 Greimas: A Linguistic Perspective on Narrative Analysis

Greimas developed his contribution to narratology as an extension of his work in (natural language) semantics. The two keys for accessing his work are indeed its preoccupation with semantics and his strong structuralist stance; hence the emphasis on paradigms, oppositions and semantic roles. He introduced what can be described as the first role-based analysis of narratives. More specifically, he used the concept of *actant* [21] to formalise the roles of Propp's *dramatis personae*. In Barthes' terms, Greimas proposed to define and categorise characters, "not for who they are, but for what they do" [2].

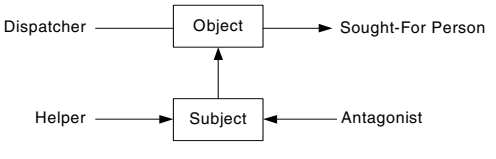

Fig. 2. Greimas' generic actant model. The basic roles described above are instantiated to the specific domains of the "narrative" considered.

Greimas' hypothesis is that a small number of formulas organised around actors could account for the organisation of the narrative universe [9, p.176]. He starts by considering Propp's 31 narrative functions from the perspective of the characters enacting these functions, to conclude, with Propp, that Russian folktales are based on a 7-actants model. He then takes a first step towards formalising a system of oppositions between narrative actants, which is freely based on generic syntactic roles such as *subject vs. object*[2]. Through the definition of oppositions such as *Hero vs. Sought-for Person* and *Helper vs. Opponent* he proposes a generic model of mythical roles[3], which is summarised on Figure 2. Now, where this model really acquires descriptive power, is through the notion of *thematic investment*, which posits that each element of that model can be instantiated by a specific semantic field. He shows that this model can be instantiated by such diverse semantic fields as Philosophy, to describe the quest for knowledge as a narrative, or even Marxist politics to describe class struggle and revolutionary processes.

Greimas further identifies several such semantic fields, whose relevance to storytelling requires no justification: *love*, *political or religious fanaticism*, *greed/ambition*, *jealousy*, *patriotism*, *frustration with one's life*… (with a potential to describe narrative topics from *Romeo and Juliet* to *Madame Bovary*).

Greimas contribution was not limited to actors, as he also revisited Propp's functions themselves from a paradigmatic perspective, analysing the opposition between narrative functions to propose a more systematic classification. One of his findings is the "crescendo" of functional oppositions throughout the story progression [10, p. 200]. This, however, falls short of providing a self-contained formalism for analysing story progression in general, and only constitutes an analysis of story progression within the fixed framework of the Proppian description of fairytales.

Again, despite being often cited in IS work, few implementations have really sought their inspiration in his work, to the exception of [23].

5 Barthes and the Interpretative Codes

Roland Barthes was a celebrated semiotician and one of the most prolific authors in the field of narratology during the seventies. Most remarkable is the fact that he has produced comprehensive narrative analyses of classical novels, such as Balzac's *Sarrasine* [3] as well as of popular literature, such as Ian Fleming's *Goldfinger* [2]. His paper on structural analysis of narratives [2] remains still today one of the best and most accessible introductions to narratology for the IS researcher. In the structuralist tradition, Barthes studied both syntagmatic and paradigmatic aspects of narratives. His syntagmatic approach extends the linear sequencing of Propp to give the story an actual structure, possibly opening space for choice points. His first attempt consists of the stemmatic[4] description of a scene of *Goldfinger*, which identifies the structure of

[2] Greimas explicitly states that his model is "an extrapolation of syntactic structures" [10, p. 185].

[3] Greimas has generalised the Proppian opposition between Hero and Sought-for Person into sender and recipient.

[4] In Tesniere's grammar [21] the *stemma* is a graph-like dependency structure formalising the syntax of a sentence or an utterance. This use of stemma by Barthes probably emphasises structure, although from the example itself, the relations appear rather trivial.

the scene in terms of action ramifications. This kind of analysis has been further refined in *S/Z* to produce a tree-like structure organising narrative actions from the explicit perspective of *proairesis* [3, p.135], which corresponds to the choice of actions and their possible consequences (Fig. 3).

Barthes has introduced a paradigmatic organisation of narrative functions which Propp's approach was certainly lacking (despite paving the way for such a description when he associated narrative functions to character categories). Barthes' notion of action goes significantly beyond the elementary narrative function that describes a specific action taking place at a given stage of the story. Barthes' actions have the dimension of semantic field, and as such are not constrained to a specific occurrence.

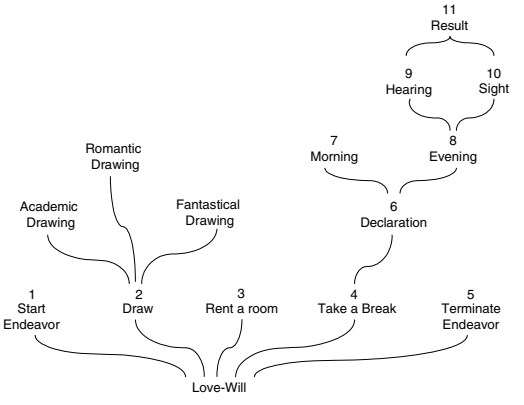

Fig. 3. A Tree-like structure for actions in Sarrasine, according to Barthes. The emphasis is on the proairetic aspects related to a choice of actions, e.g. the type of drawing in (2) or the time for the declaration in (6).

For instance his MURDER action [3, p. 261] subsumes different narrative events such as the warning, the act of murder itself (Sarrasine killed by the Cardinal's men) and even the explanation of the murder's reasons. These events are semantically related but most importantly do not constitute a continuous sequence (a significant departure from Propp's syntagmatic approach). One such illustration lies in the 48 action categories described in *S/Z*. Barthes posits in particular that actions constitute the real basis for *proairesis* [3, p. 259] and that applies to the whole set of 48 actions identified. On closer examination, these actions play the same role that narrative functions did in Propp's theory, but without the limitations imposed by a strict temporal sequence and with a broader semantic coverage (as illustrated by the above MURDER example).

Barthes' narrative theory is based on five "codes", each of which indicating how to interpret the current text segment (*Sarrasine* being broken down into text segments each corresponding to a basic narrative unit). The ACT (for ACTion) code corresponds to the actions discussed above and can be considered a generalisation of narrative functions [3, p. 267]: it also addresses the issue of action sequences, whose canonical form is the tree rather than the list [3, p. 67] (Fig. 3). The REF (for REFerence) code indexes a narrative event into background knowledge required for its interpretation; most often this knowledge is prototypical (with prototypes describing

feelings, women or social situations). These provide contextual knowledge for the narrative, improving the understandability of actions in context. The SYM (for SYMbolic) code, on the other hand, captures major cultural objects that are heavily symbolic (e.g. money and fortune, the human body, etc)[5]. The SEM (for SEMantic) code appears specific to the textual aspect of the written narrative: it relates the choice of words to the narrative events (hence is of moderate relevance to IS as it does not extend to dialogue). Finally, the HER (for HERmeneutic) code signals those items that should trigger interpretation (from the reader); in other words, important narrative events which contain cues for future events, or elements of mystery whose solution is an important part of the narrative. In Barthes' words, "to defer truth helps reassembling it at a later stage", which would be the motto for a progressive resolution of the narrative. The HER code is invoked by Barthes to explain how narrative cues can be interpreted by the reader (and need to be interpreted for the story to produce proper effects). In *Sarrasine*, these cues will refer to the femininity of the Zambinella[6], a central topic of the novel.

Of particular relevance to IS is the fact that two of these codes, HER and ACT, are described as determinants of suspense in storytelling: the former because it forces interpretation to "fill the gaps", the latter because the perplexity associated with an action possible outcomes[7] (*proairesis*) will generate expectations, tension and surprise. A related notion is Barthes' description of *dispatchers*[8], as being narrative objects which constitute affordances for key narrative actions. These implicitly introduce branching points corresponding to the potential use of the object and the subsequent outcomes of that use. This offers interesting perspectives in IS for the role of virtual objects, which has been used, to some extent, in [5]. Zagalo et al. [26] have based their approach in part on Barthes' early work [2] using nuclei and catalyses to distinguish between *proairetic* actions which can alter the course of the story (nuclei or cardinal functions) and those whose main role is to support story presentation/staging (catalyses).

6 Bremond and the Reintroduction of Characters

Bremond developed a narrative theory centred on the description of character's roles. Not unlike Greimas, his theory starts with an opposition between *Agent* and *Patient*.

[5] This code also includes famous metaphors, and is not exempt from psychoanalytic influences as it sometimes happens with Barthes' writings.

[6] The plot of Sarrasine is that of a French sculptor falling in love with an Italian singer, the Zambinella, unaware that he is actually a *castrato*, according to the codes of theatrical interpretation in Italy at that time. Sarrasine will end up murdered by the henchmen of Cardinal Cicognara, his protector.

[7] It is also important to realise that the example so often associated with the proairetic code, which describes a character drawing a gun, is most likely to be taken from Tomachevski's analysis of the Russian novel "The girl without dowry" by Ostrovsky. The object (handgun) associated with the proairetic action is termed a *dispatcher*.

[8] Once again this should not be confused with the term "dispatcher" as used by Greimas, following Propp, which represents the character who sends off the hero to accomplish his quest. This potential confusion is a consequence of translation (Barthes uses the English word in the original French text).

A Patient is any character that will be influenced by the narrative actions to occur, while an Agent is responsible for changes in the narrative universe (which can also affect other characters as Patients, in which case there are "psychological" changes rather than "physical" changes to the world).

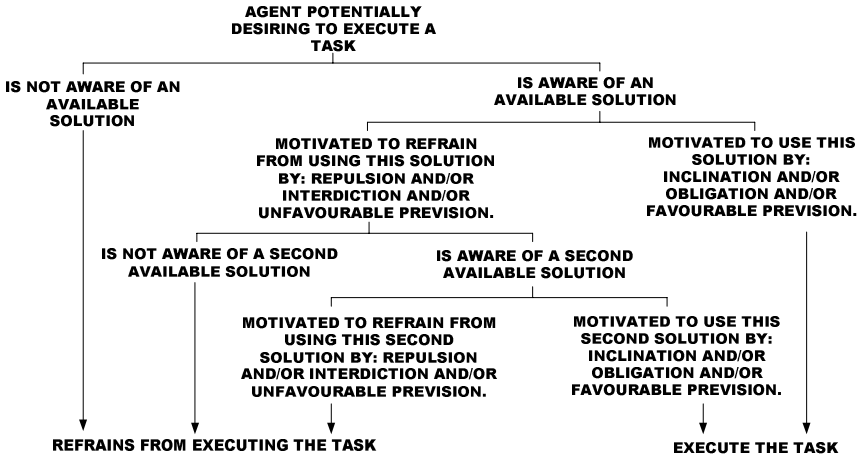

Fig. 4. Action deliberation in Bremond's model addresses the Agent's beliefs, motivations as well as the anticipation of possible consequences / appraisal of his own situation. Importantly, it also includes potential contradictory influences.

Yet, the important difference is that the status of Agent or Patient is a transient one, and that most characters can alternate between the two roles, i.e. the Patient being prompted into taking action subsequently assumes an Agent's position. A comprehensive, sophisticated framework unfolds from that dichotomy through the progressive description of sub-types of agents and patients, how they are affected by narrative processes, and how they perceive and experience their situation. Patients can be the object of two different kinds of narrative processes: i) those influencing their awareness of their situation, which are information-transmitting processes, generating, as a consequence of increased knowledge in the Patient, satisfaction or frustration, hope or fear, and ii) those objectively altering the patient situation, improving it, worsening it, or preserving it (although preservation can mean both absence of deterioration and absence of improvement). Each of these processes is mediated by a corresponding agent type, such as (in Bremond's original terminology) the *influencer*, the *improver*, the *protector* (Fig. 5), the *frustrator* …

As far as Agents are concerned, Bremond distinguishes the *voluntary* Agent, who purposefully initiates a goal-oriented process (Fig. 4), from the *involuntary* Agent, whose narrative impact derives from some unintended side-effects of his intentional actions. Voluntary agents are defined by a set of motivations (which can themselves result from influences by other Agents or actions affecting them as Patients), and by their actions' goals (e.g. overcome an obstacle, obtain favours, etc.). Involuntary Agents, on the other hand, are better defined par those circumstances that impair their understanding of the actual consequences of his actions, and by the logical relations

between intended and actual consequences of the actions they undertake. One example of the latter is Kriemhild revealing Hagen which part of Siegfried's body is vulnerable: while trying to protect Siegfried, she is actually causing his demise (she becomes the involuntary Agent of his death).

A central aspect of Bremond's model is that it re-introduces character's psychology in a quite sophisticated manner, with characters having beliefs (which may turn out to be accurate or inaccurate), motivations (see below) and goals. Of particular importance is the fact that some of these beliefs relate to an appraisal of their own situation, leading to a narrative recognition of the character's psychology. As an example of this, let us consider the possibilities for a Patient who is affected by property X (where X could be as diverse as: *bankruptcy*, *progressive illness*, *being of noble descent*):

A. The Patient has no information about X
B. The Patient has information about X and:
- believes s/he actually has property X
- believes s/he has property not X
- is unsure about whether s/he is X or not X

These correspond to various states of mind such as: lack of awareness, (right or wrong) belief, open doubt, etc. This can be further complexified by introducing a truth value for the information given to the Patient by another character, who may deceive him etc. One instantiation of this situation would be in *The Matrix* film, the successive beliefs that Neo is "The One", going from lack of information (early stages), to information he doubts (Morpheus), to false information he believes (the oracle), etc.

Another important aspect corresponds to the appraisal that a Patient makes of her situation, meaning that she can be satisfied (that the situation changes or on the contrary is stable), dissatisfied or neutral. These states of minds are explicitly termed affects by Bremond and, like other psychological properties, they are subject to various influences that the Patient can be exposed to. And these can be further extended to the anticipation of future satisfaction or disappointment, serving as a basis for generating hope or, conversely, fear.

Now is the time to illustrate (for Patients) the influencing processes through which the Patient's state of mind is altered. Bremond exemplifies this using the Odyssey [4, p. 159]: Ulysses and his crew are potentially Patients of an influence process (seduction) by the Sirens: his crew evade that influence altogether (by plugging their ears with beeswax), while Ulysses who has instructed his crew to tie him to the mast, is actually under that influence, which alters his state of mind but is prevented from any hazardous action by his being tied.

A refined description of influences relies on a categorisation of a character's motives. These are defined by considering the temporal relations between an action and its reward. Pragmatic motivations correspond to actions that will result in a subsequent reward (Socrates drinking a remedy to be cured of an illness). Hedonistic motivations refer to actions whose reward is concomitant to their execution (Socrates drinking wine at a banquet). Finally, Ethical motivations are those for which the reward actually precedes the undertaking of the action (Socrates drinking hemlock rather than going into exile).

It is possible to define an influence matrix considering that for each motivation, influences can be positive (incentives) or negatives (inhibition). The table below illustrate this:

Table 1. Influence matrix

Motivation	Incentives	Inhibition
Hedonistic	Seduction	Intimidation
Ethical	Obligation	Interdiction
Pragmatic	Advice	Negative Advice

The above model has been used, for its communicative aspects, by Cavazza and Charles [6] to generate dialogue acts in IS, representing influences from one character to another. In recent years there has been a growing interest in Bremond's theory for IS: Szilas et al. [20] have proposed to use it to support their narrative logic, and Schaefer et al. [18] have adopted Bremond's model, although mostly as a direct translation of some of Bremond's patterns (see Fig. 5 for an illustration) into decision trees, somehow losing the expressive power of the formalism. Finally, Donikian and Portugal [7] have shown how extensive drama maps could be constructed from logical formulas derived from Bremond's action description.

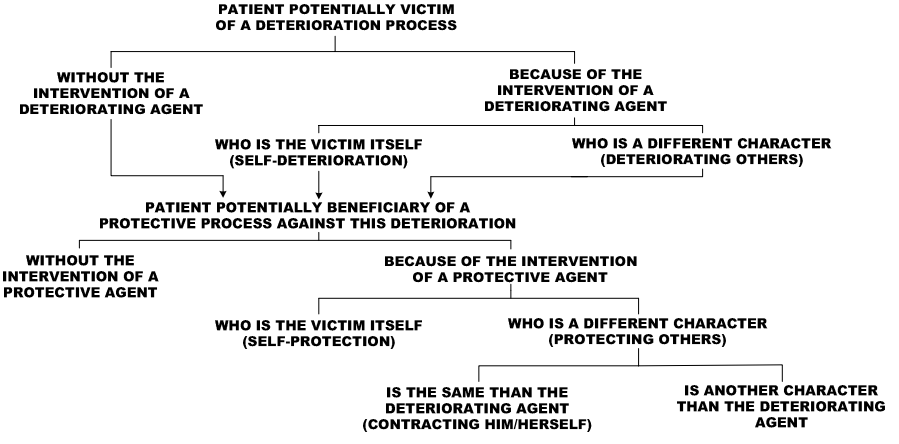

Fig. 5. The role of "Protector" according to Bremond illustrates the complexity of the formalism. On one hand, the intervention of a Protector assumes that the Patient is first the object of a deterioration process, which is a necessary context for this role to occur. On the other hand, there are multiple possible instantiations of the "Protector" role, summarised on the above figure. The original formalisation is probably excessively procedural and lacks compositionality to serve as a direct inspiration for computer formalisations.

Table 2. Use of Selected Narrative Theories by Previous Work in Interactive Storytelling

Narrative Theory	IS Approach
Aristotle	[22]
Propp	[8] [11] [13] [14] [16]
Greimas	[23]
Barthes	[5] [27]
Bremond	[6] [7] [18] [20]

7 Conclusions

Throughout IS research, there are constant references to narratology. These references range from illustrations of fundamental problems to the theoretical underpinning of narrative formalisms used in the research described.

In the field of Computational Linguistics, Wilks [24] cautioned long ago that "systems do not always work by means of the formalisms that decorate them". This makes it even more important to assess the actual rationale for the proper use of narratological theories. Further, the problem of narrative formalisms cannot be dissociated from the narrative genres considered.

This point has not often been discussed, to the exception of Anstey [1] who has identified genres (implicitly) through representative authors, namely Aristotle, Brecht, etc. This is worth emphasising, as there has been no extensive discussion of the genres actually targeted by various works in IS. Even leaving aside the too obvious criticism that Propp's narrative functions constitute an attempt to generalise across genres a description developed for folktales, the narrative's genre constrains the type of narrative formalism that can be used to represent it.

Acknowledgments. David Pizzi is funded through the DTI Technology Programme "BARDS" Project, in collaboration with Eidos Interactive Ltd.

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