Theoretical Considerations towards Authoring Emergent Narrative

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Abstract. Unlike linear storytelling, an Emergent Narrative only truly exists at run-time and can only be visualized retrospectively. The author is engaged in creating a hypothetical narrative space on the basis of individual character behaviors, story interventions and likely occurrences. While an Emergent Narrative approach allows for a flexible and adaptable run-time rendering of a scenario, it also causes considerable strains on the authoring process. If such a concept is to prove both tangible and produce qualitative outputs, creative writers need to be able to relate to it as a potential mode of expression. In this discussion article, we aim to explore theoretical considerations towards authoring Emergent Narrative, provide a discussion on the context surrounding the authorial process and the structure it should follow. Finally, we introduce the concept of Intelligent Narrative Feedback as a necessary core element for an efficient authoring process for EN experiences.

Keywords: Discussion Paper, Emergent Narrative, Authoring, AI, Autonomous Agents, Non-Linear storytelling.

1 Introduction

Interactive Storytelling (IS) systems are intrinsically complex dynamic mechanisms. These systems necessarily require some level of story understanding at run-time and tend to rely heavily on sophisticated Artificial Intelligence (AI) in order to inform the dramatic decisions they take. While this level of complexity is necessary if one is to dynamically manage an unfolding narrative experience, it consequently blurs the lines between dramatic and technical authoring. The authoring generally associated with low-level AI action-selection mechanisms (ASM) creates a gap between drama-oriented non-functional authoring and purely functional system-oriented authoring. This is a well-known issue faced by most that can be illustrated by the reportedly considerable development efforts for both the Façade [1] and Fearnot! [2] applications in the mid 00's. Nearly a decade on and despite significant research in IS authoring [3, 4, 5], the balance between technology and craft still represents a hurdle for most. More recently, Chris Crawford, for instance, partly attributed the failure of the

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Storytron storytelling system [6] to its inability to craft a compelling scenario. It is our opinion that the generally highly-coupled nature of IS systems makes it difficult to clearly define the boundaries between the underlying technology, the authored content and the drama value resulting from the end user's act of co-creation [4, 7].

This problem is however particularly acute when authoring Emergent Narrative (EN) scenarios. The EN approach is quite particular in the sense that it is conceptually removed from articulating or sequencing narrative artefacts (e.g. events, staging, actions etc.) [8]. As a result, a narrative performance is the product of a real-time simulation rather than the orchestrated journey of a user/audience. The EN concept is primordially based on the principle that it is easier and more effective to maintain narrative coherence via goal-based character decision-making (autonomous agents) than to rely on an extensive set of specifically written rules [9]. The point being that as a scenario grows in complexity (number of characters, locations, etc.) the rules set necessary to maintain narrative coherence disproportionally grows as it is conditioned by an exponential number of distinct narrative possibilities. In essence, the EN concept circumvents the issue by lowering context-based decisions to the character level, thus dissociating narrative potential outcomes and contextualized information. In this context, a character is limited to make decisions based on action availability, a condition determined by both the context of the story environment and goal activation. In essence, a character cannot, in any case, carry out a decision that is contrary to the current narrative setting or its role/personality goals.

While theoretically sound, it is however practically very difficult to develop a scenario for an EN experience. For instance, the complexity issue discussed thus far tends to be exacerbated by the fact that character authoring is generally done at a very low operational level and requires the author to fully understand the inner workings of complex agent goal structures [4, 10]. Furthermore, it is also difficult to manage EN authoring due to the relative dissociated structure of the narrative space. An EN scenario consists of character agents, story events, personalities, goals and actions. These are all developed independently from one another and do not form a whole until a simulation is run. Thus, the benefits gained from simulating autonomous and independent narrative components at run-time are counter-balanced by a distinct lack of visibility and usability at authoring time. The hypothetical and dynamic nature of the narrative space also requires a radical re-think of the authoring paradigm as authoring EN focuses on the development of a set of individual narrative components written so that their hypothetical synergies contribute towards a specific narrative experience. This represents a very different proposition than the traditionally accepted definitions of narrative authoring processes.

In this article, we propose to discuss the conceptual boundaries to authoring EN with a view to develop a process model through which it can be done more intuitively. In section 2, we first discuss, in-depth, the conceptual roadblocks impeding an effective authoring process for EN artefacts and make the case for an Intelligent Narrative Feedback (INF) mechanism (Section 3). Finally, in section 4, we outline the dimensions for such a mechanism, propose a conceptual model and investigate the practical considerations towards its development.

2 Conceptual Considerations towards Authoring Emergent Narrative

Previous work in the field have provided us with relevant considerations, classifications and requirements for IS systems. Spierling and Szilas [4] approached IS from a structural perspective and proposed for its artefacts to be considered as two separate components (story world and runtime engine) which, once combined to user interaction form the complete IS experience. Thus identifying the story world authoring as the prime authorial effort. Madler and Magerko [11] decomposed the authoring process and identified six necessary requirements, in addition to content creation, that a good authoring tool should possess:

- ***Generality***-The authoring process should (as much as possible) be independent of the story world representation and of the runtime implementation.
- ***Debugging-***As IS systems increase both in size and complexity, we can expect an increase in possible problems in both the content and system behavior. Poor design or a lack of understanding of the runtime engine can result in unexpected agent behavior, redundancy in the storyline, dead-ends, and poor pacing or timing.
- ***Usability-*** The tool should in fact make the process of authoring stories easier. This includes issues surrounding learning curves, efficiency and stability.
- ***Environment***- *Stories* are written for different interactive environments that differ in narrative structure, mechanics and user interaction paradigms.
- ***Pacing and Timing***- Pacing and timing are crucial components of any story. They help to structure the narrative and bring dramatic considerations to the narrative. The tool should allow the author to define considerations to this end.
- ***Scope***- IS story worlds consist of many elements (characters, dialogue, plans, etc.). The authoring tool should preferably cover all these elements.

Swartjes and Theune, still with authoring in mind, proposed an iterative authoring approach based on co-creation [12] in which a rough version of the story world (representative of the author's intent) is first created and then further refined through successive iterative cycles. Similarly, Kriegel and Aylett investigated co-creation through crowd sourcing as a method for IS content generation [13]. Finally Pizza and Cavazza [7], focused on the purpose of authoring tools and proposed to classify them along two dimensions: ***Visibility*** and ***Generativity***. They determined, that current authoring tools favour one property over the other, while, ideally an authoring tool should grant access to both the generative power of its representation and visibility of long-term dependencies between actions to carried out during planning operations.

While all relevant to this discussion, a number of these considerations, namely: debugging, visibility, generality and pacing are particularly problematic when discussed in the context of the EN concept.

2.1 Dissociated Authoring

As previously mentioned (see section 1), the EN concept is primordially a bottom-up approach to IS and this is reflected in the way scenarios are created and authored. It is thus necessary to author characters based on their role within the scenario rather than the role they play from a narrative perspective. There is a subtle difference but it means that actions/decisions should not be forced on characters but that dramatic situations must be engineered in order for these to happen in-line with a character's own set of emotions and motivations [9]. This aspect particularly blurs the boundaries between the realities of bottom up authoring and our nurtured experience of top down authoring. The risk being that if one does not willingly refrains from doing so, EN authoring could amount to something akin to scripting. This is a difficult issue to content with and while its root cause resides in the hypothetical nature of EN (see section 3.2), authoring complex interdependencies is not an exercise that comes natural to most. The current authoring process for character-based IS such as the EN concept primarily consists of authoring narrative components (e.g. characters, agents, goals, story events, and user interventions) independently from one another while still keeping track of their potential interactions and interdependencies. For instance, if one is to author a specific action for a character, it is essential to take into consideration and input its impact on other characters or potential significance for the overall narrative (for drama-management purposes) [14, 15]. In the context of the authoring process, these inputs need to be incorporated to the task of creating an action as otherwise, the set of interdependencies would grow to the point where it would be very difficult to consider them all retrospectively. This approach is diametrically opposed to the common authorial paradigm of creating direct causal relationships between narrative elements towards a determined set of narrative structures. In the case of emergent narrative, narrative elements, while carrying emotional values, are not created with direct causal relationships in mind (just their emotional impact for others) and cannot be referred towards pre-determined narrative constructs.

Practically, EN authoring is essentially dissociated from its potential outcome, a direct consequence of the conceptual decision to adopt a bottom-up approach to narrative unfolding. This, in turn, raises the issue of authoring hypothetical narrative structures where causal relationships are determined by indirect factors (such as emotional impact [14]) rather than a direct and more predicable mechanism. The current authoring process is akin to the way in which expert systems perform knowledge elicitation tasks and offers no direct or indirect feedback as to how a scenario development could relate to potential narrative artefacts. Feedback, at this stage can only be gathered through simulating the environment and observation.

Our position is that the lack of qualitative feedback between authoring narrative elements and potential outcomes (i.e. visibility of long term dependencies [7, 16] does not allow, even at a hypothetical level, to visualize the narrative space being created. While conceptually bound to a dissociated form of authoring, it is essential for the author to still gather information regarding the likelihood of character goals being fulfilled or the potential levels of emergent storylines (see section 3.2) potentially

generated by the system. Furthermore, it does not provide feedback as to the emotional context in which character actions are or are not being triggered. Going back to the points made earlier by Pizza, and Cavazza [7], Madler and Magerko [11], it is clear the there are very limited visibility for the author in the context of the EN.

We have determined, in this section that authorial feedback, in the specific case of EN, should relate, in order to be effective, on 1) Providing the author with a clear representation of the narrative space (depicting interdependencies) at story-world level and 2) Providing the author with a good understanding of the narrative unfolding at run-time from the perspective of the characters' internal motivations and decision making. Thus practically exploiting the conceptual nature of bottom-up narrative unfolding in order to inform authorial decision-making, thus aligning with the iterative approaches proposed by Swartjes et al. [12] and Koenitz [17].

2.2 Hypothetical Narrative Space

We have in the previous section touched upon the common issue of visualizing interdependencies at authoring time. In this section, we focus our attention to the hypothetical nature of EN at run-time and the discrepancies between authored and simulated narrative spaces.

As previously stated, an EN story only truly exist at run-time and can only be visualized retrospectively. By this, we mean that the diversity or depth of the narrative space created by the author is not necessarily representative of the realities of run-time simulations. It is often the case, when authoring EN, that certain character actions or decisions consistently precede others and thus prevent other potential dramatic actions to ever take place. While in-line with the conceptual approach of the EN concept, we argue that this specific issue sums up perfectly the intricacies of authoring EN scenario. Practically, this means that the author would have to revise his/her initial emotional mapping of actions and interdependencies in order to ensure that the narrative space's diversity is actually represented/possible at run-time. This again blurs the boundaries between story world authoring and the system's execution of the authorial intent and points us back to our discussion in the previous section on the important difference between direct, traceable causal interdependencies and indirect causality. The two main practical consequences to this are that 1) Feedback has to be based on run-time simulations and is, in its current form, an approximate in that it does not represent the whole narrative space spectrum (just what happens in a specific simulation) and 2) There are no built-in mechanisms preventing individual actions to have unforeseen consequences and lead to potential dead ends. Both of these issues are key to efficiently represent (visually) the narrative space at both story world level and run-time. The EN approach makes this task a little bit more difficult by conceptually advocating for the author to exercise less authorial control at run-time than most other IS approaches. Thus effectively dissociating authorial and run-time responsibilities.

There are no current solutions to this problem, although Weallans et al. [15] implemented a drama management solution in which EN characters would co-ordinate their decision-making with regards to a pre-determined user-character

emotional trajectory. This, in effect, allowed the author to gain visibility as to whether or not a scenario would support a specific experience and to exercise some level of authorial control at run-time. It does not, however, provide any level of visibility as to how much of the narrative space is represented nor does it give a clear analysis of what actions should be taken in order to 1) Fully exploit the narrative space and 2) Optimize the way in which an emotional trajectory (akin to authorial intent) could be achieved. The EN concept blurs the lines between the role of author, system and user and it becomes clear that some mechanism must be engineered in order to better relate story world authoring to run-time execution. We argue, in this article, that the search for an intuitive authoring mechanism for EN must exercise some level of narrative intelligence if it is to succeed. The process of authoring EN must allow the author to draw clear conclusions from run-time simulations as to the state of the narrative space, the emergence spectrum it offers and the root causes of limitations and dead ends within a scenario. We propose to develop a model for INF in which both story world and run-time interdependencies are represented and guidance is provided with regards to specific user-character experiences and narrative specificities (e.g. genre, timing and form).

3 Towards an Effective Authorial Feedback System

In this section we propose a feedback classification, consisting of several feedback mechanisms (operating on increasing levels of abstraction) and discuss the existing conceptual issues that must be addressed if we are to provide authors with an effective authorial feedback system towards designing EN scenarios. Finally, we address the need for Intelligent Narrative Feedback as a mean of not only designing meaningful stories but as an effective mechanism towards expressing specific authorial intent.

We have previously determined (section 2.1), that authorial feedback, in order to be effective, must provide the author with a clear representation of the narrative space (i.e. depicting interdependencies) at story-world level and an understanding of the potential narrative at run-time from the perspective of the characters' actions and motivations. Within EN, the narrative space is often compared to a surface or landscape across which the user may traverse. The user's journey through the narrative landscape is determined by their interactions with characters and the environment, with their decisions determining the path they take. The highly conceptual nature of this process proves problematic for authors who are accustomed to designing narratives in linear progressions of events structured via plots, acts and scenes.

3.1 System Feedback

EN systems are highly complex software artefacts. They include characters equipped with sophisticated Artificial Intelligence algorithms, dynamic story world representations, and high level Drama Management concerns. System level feedback should serve to increase the usability of the authoring tool, while distancing the author from the specific runtime implementation. EN Scenarios may exist as a product of

several distinct configuration files (such as XML documents) for characters, goal libraries, world information and dialogue. While, an authoring tool may serve to abstract the technical complexity of authoring through graphical representation, the remaining complexity may still lead to authoring activities that allow for the input of erroneous content. We must therefore, include efficient debug mechanisms so as to ensure conformity to syntax, correctness and completeness of representation. This is the lowest form of feedback and should be performed at the point of authoring prior to simulating aspects of the narrative environment in order to prevent erroneous results or runtime errors.

3.2 Structural Feedback

While the EN approach to IS allows for a greater number of stories and thus, a greater variety in the narrative structure, it is unlikely for any singular path to result in a dramatically interesting narrative. We must therefore structure our scenario description in such a manner as to maximize its potential to produce both meaningful and believable narratives. Many IS develop narrative structures from a modular perspective based on pre-defined narrative components. The user advances through the narrative in stages of interaction. These stages may be represented by events, scenes actions or sequences of actions [1, 18]. Completing an event or sequence of events allows the story to progress to the next stage. Each possibility must be pre-defined, with respect to the stages that both precede and follow it. These approaches can require an enormous amount of pre-definition for even the simplest scenario [1]. However, while lacking in generative capability such methods do allow us as authors, to visualize any one of the many paths through the narrative spaces prior to runtime with simple plot-graph representation. [18].

The EN concept, on the other hand, is conceptually removed from pre-defining sequences of narrative artefacts. The resultant narrative structure is the product of a real-time simulation as opposed to a pre-defined set of stages through which the player may navigate. Thus, we are presented with a number of authorial challenges which prevent the author from knowing, with any degree of certainty, the likely sequencing of events.

As with any emergent system, a critical mass of content is required before emergent properties can arise. Thus, in terms of EN, it is expected for the author to develop a certain level of narrative content before interesting narratives start to emerge from the scenario design. It is therefore important to determine a way to assess the narrative potential of an EN story-world at authoring time as a matter of feedback. This ‘emergent potential’ should be measured not only in quantity but also in density (i.e. how well the content serves to promote different paths through the narrative space) [10]. Structural feedback should thus determine when a particular EN scenario reaches the required critical mass for an EN and whether each particular addition (e.g. character, action, goal, etc.) widens or reduces the boundaries of the narrative landscape.

Furthermore, It is possible to author an EN such that a number of dead-ends exist, that is, that the narrative reaches a point where no more story development is possible. These generally result from a lack of content e.g. a character with a goal whose

preconditions for activation can never be achieved. However, achieving 'emergence potential' does not guarantee a lack of dead ends or that the EN has the potential to tell the story the author desires. Thus, we conclude that the main functions of structural based feedback should be to detect dead-ends, measure 'emergence potential, and ensure that complete narrative structures can arise from the hypothetical narrative space.

3.3 Experiential Feedback

While each possible path across the narrative landscape may represents a unique story, they do not necessarily represent a unique experience. Weallans et al. [15] approach to Distributed Drama Management (DDM) allows EN characters to co-ordinate their decision-making with regards to a pre-determined user-character emotional trajectory. While, this allows the author to gain visibility as to whether or not a scenario maps out for a specific experience, this approach, however, is still reliant of the intuition of the author to craft a narrative landscape which has at least the potential for his/her envisioned path to be realized. In other words, the author must have prior experience regarding how the scenario should be structured in order to target a desired emotional trajectory.

Furthermore, even when a correct trajectory has been designed we cannot guarantee it will prove successful under end-user conditions. Every user is different in terms of age, gender, preference and experience. Thus, while two user may take the same path across the landscape they may have widely different emotional experiences. It is necessary when simulating a virtual user for the user character to make different choices so as to explore the wealth of options for the player and explore the potential paths through the narrative space.

Finally, while emotional trajectories allow us to target specific emotional journeys they again do not take into consideration the wider narrative experience and it is thus possible that widely different stories share the same emotional trajectories.

3.4 Towards Intelligent Narrative Feedback (INF)

An EN scenario is a complex dynamic representation, as it grows in complexity (number of characters, locations, etc.) it quickly becomes too difficult, if not, impossible for authors to visualize the hypothetical narrative space, determine the inherent dramatic potential, and then produce a compelling end-user experience. As a result, generated scenarios rarely conform to the author's initial intentions. In order to target specifics experiences and realize authorial intent the hypothetical narrative space should be represented to authors and support the provision of informed recommendations or interventions.

However, while a great deal of research has been conducted towards narratives and dramatic structures [1, 18], we lack a deeper understanding of how to structure meta-narratives towards different types of end-user experience. We argue, however, that role play practitioners already exercise this level of narrative intelligence [20] in the design and implementation of Pen and Paper (PnP) and live action role playing games (LARP). Storytelling in pen and paper (PnP) and larps shares many aspects with the

"Emergent Narrative" hypothesis [9, 19]. In particular, both approaches can be expanded upon by inviting the prospect of a drama manager; either in form a human storyteller or digital drama management system. Role-play, as with EN, comprises of narrative functions to be distributed between actors in order to drive the story and incorporate them in meaningful actions. Both forms of storytelling, therefore result in an experience that is at the same time unique, yet difficult to manage, structure or enforce. One participant in particular, the Game Master (GM) designs, structures and manages the overall plot of the games story [19]. They are required to interpret player actions, anticipating and compensating for those action which may skew or disrupt the plot. PnP role-play can last for days, years or even decades. The GM is therefore, tasked not with simply designing plots but an open-ended experience dynamically adapted for participating players. We argue, that they are actively involved in managing a hypothetical narrative space in real-time and maintaining an unfolding experience towards their intended experience.

It is likely therefore, that existing PnP role playing games form pure examples of EN systems and that their design and specifically, how games masters handle character interactions in real-time may inspire the design of more capable INF mechanisms.

4 Proposed Model for Narrative Feedback

Having examined the theoretical considerations towards authoring EN, we have discussed the need for the treatment of EN as an ongoing process as opposed to that of complete authored artefact (Section 2), and finally, we have proposed the concept of INF as a potential solution to current EN authorial problems (Section 3). The EN concept is essentially one of simulation. Thus, we propose to leverage this characteristic through a continuous run-time simulation of the story world, and provide real-time feedback throughout the authorial process. With this simulative approach we can provide the author with informed authorial feedback at the time of writing and enable the construction of a compelling experience.

However, the question remains as to what role the Intelligent Feedback should play within the authorial process. In this section, we present a model for narrative feedback based on the authorial process for EN. We also further discuss the boundaries of narrative feedback and the functions of INF within an iterative approach to EN authoring.

The pre-authoring stage (Fig. 1) is where the author outlines the goals and requirements of the narrative that will ultimately influence the decisions made by the INF mechanism. This may include elements such as the type of experience being targeted (i.e. educational role-play), the time over which the experience is to last, aims of the experiences and settings for expected audience preference or prior experience. This information allows us to generate a generic template from which the author can begin constructing the individual characters and events that will define their specific scenario. The authoring stage (Fig. 1) is where the author further defines his/her scenario in terms of the characters and individual story components. Authoring

individual characters for EN involves defining characters personalities, behaviours through goals and actions, as well as emotional and reactionary tendencies to specific actions and events. This process aims towards the design of low level character actions in terms of pre-conditions, post-conditions and tendencies.

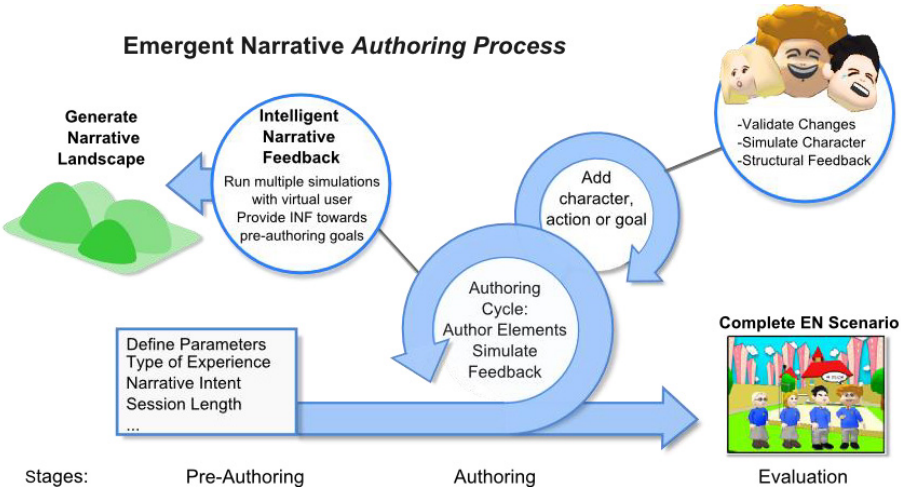

Fig. 1. Proposed Feedback Model for an Emergent Narrative Authoring process

As the author builds up the scenario, each addition is validated against the system requirements of the current run-time environment in terms of validity and completeness, with respect to the constraints (i.e. XML Schemas) of the targeted run-time engine. This system level feedback serves to further abstract the author from the specific run-time environment and inform towards structural errors in the story worlds data representation. Furthermore, through continual character simulation at this authorial level stage we aim to address the structural concerns of redundancy, dead-ends and emergence potential (Section 3.2). By examining, actions or goals as they are added, structural feedback can inform the user whether the conditions for goals activation are satisfied and prompt the user to author appropriate actions. While, validating the ability to meet the criteria for goal activation can be seen as strictly system level activity, it is the problem that some goals can be met, yet do not elicit enough emotional reaction to elicit further responses and the story stalls. Thus, it is necessary that simulation be carried out to further verify the structural completeness.

Finally, in order to address the desire for emergence potential, as each element is added we must provide the user with data regarding their likely effect on the narrative structure. For example, if an action replicates the effects of a pre-existing authored actions but fails to expand the boundaries of the narrative space, leading to further possible states it can be considered redundant and the author may wish to have it removed.

The role of the Intelligent Feedback mechanism is twofold 1) To expose the hypothetical narrative space to the author and 2) Provide recommendations towards the realization of the the pre-process description. As the author constructs the scenario it falls on the INF mechanism to make informed suggestions based on these

meta-structural considerations. Again, at this evaluation stage (Fig. 1) we provide further simulation of EN scenario being constructed by the author. However, while at the authoring stage we simulate with respect to individual characters, we now simulate the scenario with respect to a virtual user. As each user is potentially unique, in both their initial emotional state and reactions to story events, we are required to run multiple simulations for a variety of users. This allows us to explore the wealth of options for the player and get an idea of the possibilities present within the hypothetical narrative space. The author can now view the space in terms of long-term dependencies and the narrative trajectories that exist between characters and with regard to the virtual user. As the user interacts with the narrative representation, it falls on the INF to provide informed feedback towards their intended end-user experience. INF serves to determine when characters goals and actions work towards achieving the authorial intent, what these actions may be and where they should be placed to further refine the narrative experience.

5 Conclusion

In this discussion paper, we investigated the theoretical context surrounding the EN concept in order to develop a better understanding of the issues related to the authorial process and proposed, we believe, an appropriate authorial process. In doing so, we explored the theoretical considerations such as narrative visualization, structural representation and experiential design. We proposed the importance for the existence of efficient feedback mechanisms within the authorial process. Finally, we positioned the concept of INF mechanisms as key element towards meaningful authoring of EN scenarios and presented a model for its implementation.

We have touched upon the similarities between the authorial activities performed by a Games Master during traditional role-playing games and the goals of INF. We greatly suspect that by studying the techniques employed by GMs in traditional role-playing games, we can identify techniques and strategies employed at both the authorial stage and during run-time that can be adapted to serve our INF mechanisms.

While a number of questions remain towards the application of efficient INF, we have established research avenues that may provide those answers and contribute to the advancement of EN, specifically towards the authorial process. In this article we aimed to position our research so as to establish the basis and potential for INF, towards authoring meaningful EN scenarios with consideration towards specific authorial intentions. We aim, with future research to paint a clearer theoretical and practical picture of INF and how it can be translated into applications for entertainment or education.

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