An Iterative Approach towards Interactive Digital Narrative – Early Results with the Advanced Stories Authoring and Presentation System

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Abstract. Narrative has always played an important role in knowledge transfer between human beings. The Advanced Stories Authoring and Presentation System (ASAPS) was developed as the practical side to a research effort Interactive Digital Narrative (IDN) that combines theory and practice in a tightly coupled relationship. The first implementation of ASAPS foregrounds a robust and flexible architecture based on an extensible markup language. The early ASAPS narratives described here are an indication for the potential of this approach, which will incorporate additional technologies in the future.

Keywords: Interactive Storytelling Tools, Authoring System, Interactive Narrative, Digital Knowledge Transfer, Story, Plot, Instantiation, Protostory, Narrative Design, Narrative Vectors.

1   Introduction

The role of narrative has always been the transfer of knowledge in the form of re-telling human experiences. A contemporary form of narrative is Interactive Digital Narrative (IDN), an emerging practice that applies digital media and its procedural, participatory, spatial, and encyclopedic qualities to create new expressive forms, which are focused on moving beyond the restrictions imposed by more traditional media. An important aspect of IDN research is the creation and analysis of experimental artifacts. Toward this end, many researchers in this field have created specialized authoring tools, including Storyspace [1], Agent Stories [2], Art-E-Fact [3], the authoring part of the IS engine [4], DraMachina [5], Adventure Author [6], Scenejo [7], Bowman/Zócalo [8], Scribe [9], Inscape [10], FearNot! authoring tool [11], Rencontre [12], and Wide Ruled [13]. While these capable software packages certainly allow the creation of IDN artifacts, they are wedded to particular theoretical and pragmatic positions, which influence users in their choices and potentially limit the scope of works created with it. From this perspective, existing IDN authoring tools can be broadly described as belonging to three categories: tools incorporating particular traditions, tools incorporating specific approaches, and tools designed to be more general. Examples in the first group include Storyspace (Hyperfiction), Inform [14] (Interactive Fiction), Recontre [12] (Hyperfiction), and Korsakow system [15]

(Interactive Cinema) The second group contains tools created for specific approaches in IDN research and include Agent Stories (Agent-based narrative with story clips), Art-E-Fact (directed graph based dialogue), IS engine (Character-based approach with hierarchical plans), Bowman/Zócalo (Domain Elaboration Framework with a planning system), Adventure Author (Branching dialogue trees), Scenejo (Story graphs in combination with dialogue patterns), Scribe (Front end for interactive drama in a training environment), FearNot! (Emergent narrative from the interaction of planned agent behavior), Wide Ruled (Text-based author-goal driven story planner), and DraMachina (Story Blueprints).

An example for the limitations of particular traditions or approaches is Storyspace, a tool designed around the assumptions of the Hyperfiction (HF) tradition in IDN [1], which incorporates a metaphor based on nodes and hyperlinks, but only limited procedurality in the form of conditional hyperlinks. While similar restrictions exist with all the tools in the first and second group, the emphasis here is not to point out flaws in any particular approach but to suggest that a combination of approaches will be beneficial and allow a wider range of IDN experiments.

The third group (represented here by Inscape) exemplifies a pragmatic approach. What is missing in the Inscape project is a general definition of IDN shared by the project partners, as evidenced by a mid-project review reflecting very different perspectives, from suggestions to apply narrative theory [16] to a proposal for making stories by recording interactive experiences [17]. Since Inscape is lacking a clear distinction of IDN vs. other forms of digital expression such as digital movies it becomes difficult to evaluate the resulting artifacts as IDN works.

From this perspective, authoring tools that only incorporate specific traditions or particular research approaches are limiting as a basis for bold IDN experiments, since practitioners should ideally have all available tools and methods at their disposal. At the same time, the an IDN authoring tool should be grounded in a broad definition of interactive narrative to provide a theoretical framework for the analysis of the resulting artifacts. Also, the new architecture should make provisions for future revisions and sustainable continuous development, in order to avoid adding to the long list of discontinued and no longer available IDN projects like Agent Stories [18], Inscape [10], and Placeholder [19]. Last, but not least, the tools should be easy to use and thus spur IDN creation to gain a greater body of works for analysis.

Consequently, the approach discussed here aims to incorporate and integrate multiple traditions and various practical approaches within IDN. At the same time, it places a focus on the creation of a solid basis for continued development and attempts to lower the threshold for IDN creation by providing a simply UI and thorough documentation.

2   Advanced Stories Authoring And Presentation System (ASAPS)

In 2006, the author started a long-term research project, which combines a broad theoretical perspective aimed at producing an integrative theory for IDN with a

practical implementation for narrative experiments. The result on the practical side is the Advanced Stories Authoring and Presentation System (ASAPS), an open software platform for IDN experiments.

The architecture of ASAPS reflects the focus on extensibility and sustainability in its initial implementation. The systems architecture combines a modular approach with an extensible markup language and thus takes cues from the architecture of the World Wide Web. The current version of ASAPS combines a markup language (ASML), an authoring tool (ASB), and a playback engine (ASE). (Figure 1)
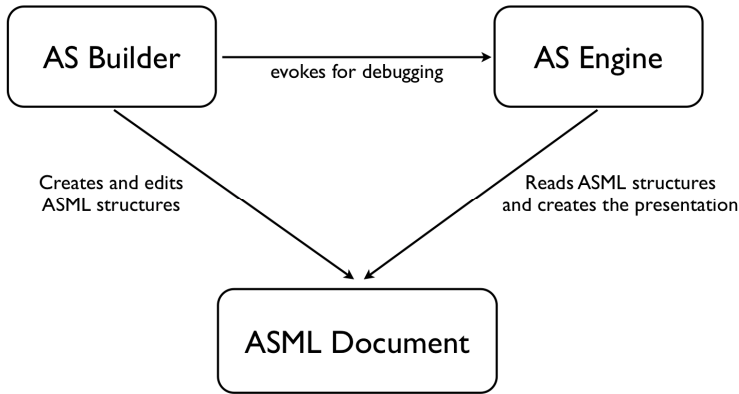
Fig. 1. ASAPS modular structure overview

ASAPS implements a flexible theoretical framework (for a full discussion see [20]), which posits IDN as distinct from more traditional narrative forms, and encompassing three different stages- System, Process, and Product. The IDN system is comprised of a space of potential narratives, termed protostory. Contained in a protostory are the four categories of settings, environment definitions, character definitions, and narrative design, a malleable structure, which supersedes the traditional notion of plot. The contents of the categories of environment and characters supply material for the narrative design. A concrete narrative design consists of assemblages of atomic narrative units, called beats, a metaphor taken from stage drama [21]. Combinations of beats constitute narrative vectors, or substructures of the overall narrative design.

The long-term goal for ASAPS is to integrate many of the theoretical strategies and pragmatic approaches embedded in the aforementioned tools and make them available to practitioners by either replicating them directly within the platform or by providing software "hooks" which enable ASAPS to communicate with other systems. In that way, the project aims to improve collaboration between different researchers and to provide practitioners with an extensive toolset that was so far unavailable, since the different approaches have not been available in combination. Ideally, ASAPS will in the future be able to produce a wide range of IDN works, spanning a range from Hypertext Fiction to the application of advanced AI strategies as exemplified in Mateas' and Stern's *Façade* [21]. At the same time, ASAPS is intended to serve as a test-bed for the continued refinement of an IDN-specific narrative theory.

2.1   Current Implementation and Early Results

The first implementation of ASAPS foregrounds an extensible, robust architecture and a user-friendly interface with full documentation over advanced computational functions. ASAPS is currently implemented in the form of an XML-based markup language, which describes complete IDN experiences in human-readable form. The current ASML (Advanced Stories Markup Language) specification consists of four top-level entities (Settings/Environment/Characters/Plot) and 14 beat functions (TitleScreen, DurScreen, IntroText, ConversationChoice, MovementChoice, PickProp, VideoBeat, SWFBeat, SetGlobal, ConditionCheck, RandomBeat, AddRemoveInventory, SetCounter and EndScreen). Media types supported by the current version of ASAPS include images, 2D animations, video and audio.

ASAPS has been in continuous development by the author since 2006. The ASML language has seen about 30 revisions, while the ASE playback engine has reached version 78, and the builder application ASB is at version 9.13. The software together with a 60-page user guide and several example narratives is currently available by request as part of a private beta distribution for MacOS X and Windows platforms from the project website [22] The following sections discuss the components and early results in more detail.

2.2   ASB (Advanced Stories Builder) and ASE (Advanced Stories Engine)

ASB provides a graphical interface for all current ASML functions. In ASB, a designer designates image files, animations, or videos as nodes, props, and character states. Then, she creates the narrative design by adding and editing beats. The structure of the narrative design is plotted out in The *Graph* view (Figure 2). In turn, the graphical contents of individual beats are edited in the *Graphics Editor* (Figure 3).
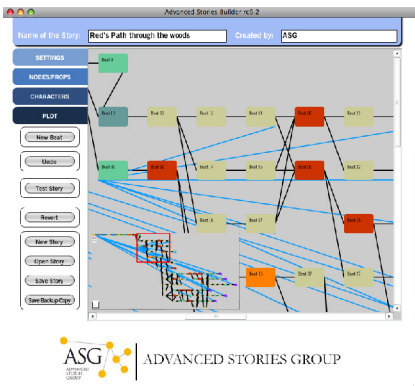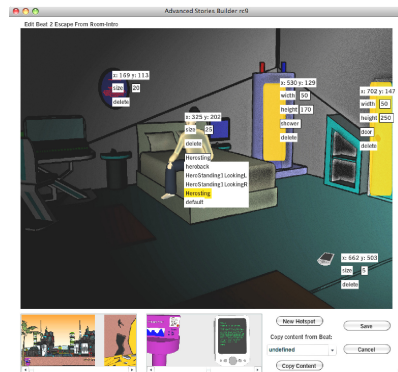

Fig. 2. Graph View   **Fig. 3.** The Graphics Editor

The ASE component reads ASML files and referenced media assets and generates the presentation for the user. Repeated play-through is fully supported in ASAPS, and the ASE engine automatically resets all parameters for each repetition. A user can also save the current state of an IDN and resume at a later date. ASE is tightly integrated with ASB and aids during development with a debug function. (Figure 4)


Fig. 4. ASE presentation with debug overlay visible

2.3   Early ASAPS Narratives

Given the focus on creating a solid architecture for the first completed iteration of ASAPS, early ASAPS narratives are not expected to push the boundaries for IDN artifacts in terms of computational sophistication; rather, they serve as test cases for the overall "meta approach" in that they embed narrative approaches so far available in different tools like Storyspace [1], the Korsakow system [15], or Adventure Author [6]. At the same time ASAPS exceeds these tools by enabling combinations of their respective narrative strategies.

Red's Path Through the Woods (2006) was the first ever ASAPS artifact, and is loosely based on the brothers Grimm's fairy tale *Little Red Riding Hood*. The main motive in this new version is character development as a result of an accumulation of decisions. The interactor is given a "blank" Red character and forms her persona by making choices. Oftentimes such actions do not yield immediate repercussions. Instead – and is as often the case in real life – the consequences of several actions are presented only at a later stage.
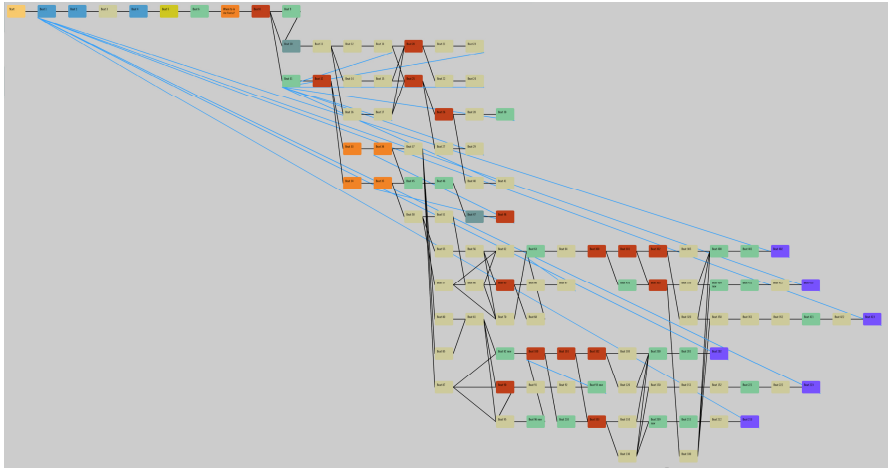
Fig. 5. Structure of *Red's Path Through the Woods* in ASB's Graph view

Red's Path is a branching narrative comprised of 112 interconnected beats with several return paths (Figure 5). The concept of delayed consequences is implemented by variables, which are used to track different character traits; *friendly* for the nice, shy, and a little naïve girl, *aggressive* for the determined, forceful girl, and *adult* for the flirtatious girl in the process of discovering her sexuality. Every decision in *Red's Path* influences the character trackers, while great care was taken to make choices non-obvious, yet causally related to the respective character trait. Condition checking beats are used to determine overall development and the options available to the interactor's character Red. For example, if Red's character has flirted frequently before and consequently has a high *adult* counter, she has the option of "talking her way out" when attacked by the wolf later on. *Red's Path* has six possible outcomes, but a much larger number of possible walkthroughs, as a consequence of a narrative design with return paths and accumulated counters. The structure of *Red's Path* represents a branching narrative strategy reminiscent of Hyperfiction Narratives created with Storyspace, but enhanced with graphics and procedural branching based on accumulated variables.

Tonguc Sezen's *Tears* (2009) is a work in the tradition of adventure games. In *Tears* the interactor assumes the role of a journalist who lives in a colony on planet Mars and wakes up to an emergency alert. The journalist receives an assignment to investigate the catastrophe that has struck the colony and must first escape from his own apartment, which proves to be difficult. *Tears* applies rendered nodes that give the appearance of a 3D game engine. The narrative design represented in the overview of the structure (Figure 6) reflects a spatial narrative strategy akin to work possible in Adventure Author based on different interconnected places, which are visible as clusters of beats in the structural overview.
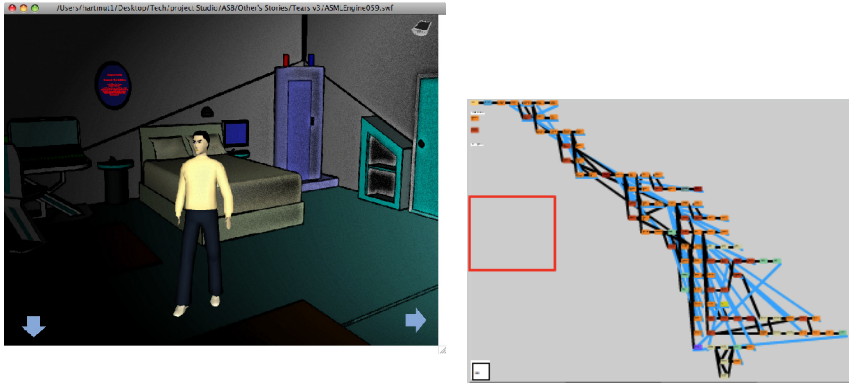
Fig. 6. Scene from Tears by Tonguc Sezen and structural overview

Hank Blumenthal's work *Reflections* (2009) puts the interactor in a New York apartment filled with the memories of a couple that lived there expressed in movie clips. By exploring the spaces and viewing movie clips placed there, slowly a story of love, betrayal, and finally, murder emerges from the discontinuous parts. Blumenthal uses ASAPS to create an interactive experience that is initially bewildering, but rewards the interactor with a rich and captivating narrative. The structure represents a spatial narrative design with tightly grouped representation of staggered beats based on the rooms of the apartment (Figure 7). This narrative design enhances narrative strategies available in the Korsakow system for movie clips with spatial placement.
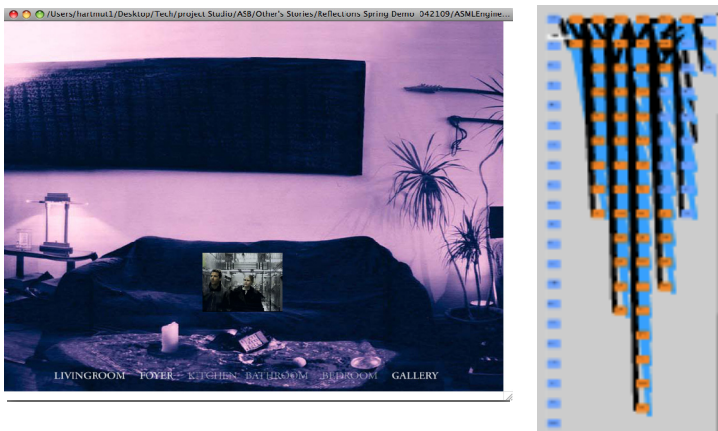

Fig. 7. Scene from *Reflections* and structural overview

3   Early Evaluation and Future Plans

The works discussed in the previous section show how ASAPS in its current form is able to accommodate different narrative strategies while maintaining the focus on IDN. Parallel to the development process, informal user studies have been conducted on a regular basis in order to evaluate and improve ASAPS. So far, about 30 works have been created with ASAPS and the feedback from the authors of these works has been used to enhance the current version by changes to the UI and additional features in the form of new beat types.

Informal criticism of ASAPS by the research community has mostly centered on the lack of more advanced computational functions, for example natural language processing. This was expected, since the focus for the first version was on designing and implementing a solid architecture as a robust foundation that facilitates future revisions and extensions. ASAPS authors have most prominently asked for the addition of a 3D environment, as ASAPS currently only supports 2D graphics.

Consequently the focus for the next major version of ASAPS is to integrate ASAPS with a 3D game engine like the open source version of quake [23] and to create "hooks" to other systems in the form of "networked Beats", with the ability to send parameters to and receive beat content from remote servers or local applications via standard TCP/IP protocols. This will enable many additional functions in ASAPS without burdening the system itself. For example, in concert with a text input function, a conversation could be realized by sending text to an online chatterbot service like A.L.I.C.E [24] or cleverbot [25] and displaying the reply in a beat. In a similar way, a query could be sent to the knowledge-based commonsense reasoning engine OpenCyc [26] or similar projects and the reply processed by ASAPS, thus integrating AI functionality. Additionally, a function will be added to send the current state of an ASAPS narrative to a remote server and integrate the answer as "remote Beat" in the existing structure. In this way, beats could be created entirely by other systems, making ASAPS even more accessible for collaboration with third party software and other research projects. To support such developments, both the ASML language specifications and a Document Type Definition (DTD) for verification will be made available at the ASAPS website. This will only be a first step towards a more open process. In the long term, development of ASML and the related communication protocols is envisioned to progress in a similar fashion to how HTML revisions as handled by the W3C [27] organization. Towards that end, we are currently working on open licensing terms for ASML-related technologies.

Another area of focus for future revisions is improving the use of the platform for the analysis of user's interaction with IDN artifacts. A future revision of the ASE playback engine will include anonymous tracking of user's moves in order to provide quantitative data for the analysis of user behavior.

We are encouraged in our efforts towards continued development of ASAPS by the feedback we have received so far and by a similar effort towards an integrated software architecture for IDN by Szilas et al [28]. Their project OPARIS (OPen ARchitecture for Interactive Storytelling) defines distinct functions for different modules and a central director component tasked with translating and mediating

between different modules. In comparison, the architecture of ASAPS is less defined, which provides more flexibility for diverse implementations.

4   Conclusion

The ASAPS architecture has so far lived up to the expectations of creating a usable platform, which can implement narrative strategies from different traditions and approaches within the field of IDN. Also, the platform was flexible enough to integrate user's requests for added functionality like additional beat types. To this extend the implementation of the concept of protostory in ASB has been successful in getting authors to experiment.

The plans for future revisions are designed to strengthen ASAPS as a platform for IDN experiments and critical analysis. The long-term goal is to establish ASAPS as a standard interchange format and middleware between diverse systems. Similar to the way the WWW enabled access to different media types and communication between different software systems, ASAPS could serve this function in the IDN space.

To implement the plans for future development, the author has applied for an NEH digital startup grant and drafted a plan that includes a more formal evaluation of ASAPS by a group of advisors. In the mean time, a comparative analysis of narrative experiments created by a class of 24 students is underway and work on an ASAPS playback engine for mobile devices continues, which will enhance the appeal and reach of the ASAPS platform.

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