Web Presentation System using RST Events

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ABSTRACT
Constructing presentations as stories is about presenting events that receive their relevance and meaning within the context of the presentation, and about means to define a well-structured relationship between events and the whole presentation scheme. Information in the form of annotated web content has become the most preferred source to create functional and interesting presentations because of its flexibility and availability. Nevertheless, due to the large and diverse amount of information contained in the web, the automatic construction of presentations becomes increasingly difficult in terms of the content annotation and selection in order to define events and the arrangement of such events in a coherent and story-like manner.

In this paper, we present a novel method for the construction of web presentations by implementing a simple event annotation scheme based on Rhetorical Structure Theory and an ontology-based reasoning engine that handles event sequencing to produce presentations in the form of dialogs between character agents.

Categories and Subject Descriptors
H.3.3 [**Information Systems**]: Information Interfaces and Presentation – *web based interaction.*

General Terms
Algorithms, Documentation, Human Factors.

Keywords
Storytelling, Narrative Construction, Story Ontology, Rhetorical Structure Theory

1. INTRODUCTION
Throughout the course of our lives, we are constantly incorporating experiences to enrich our personality. These experiences, perceived in the form of world events, are organized by our minds, so we can better grasp their significance. Narrative construction through stories helps us not only to organize these experiences, but also to communicate them to others. In this context, stories are unique sequences of events, mental states, or happenings involving human beings as characters or actors [1].

The notion of "story event" is defined in several ways, each one to suit a particular way to deliver the intended message to the audience. Events can be represented as plain text, speech with intonation features, video fragments, or multimedia content based on web technology (web events). Of all these types of events, web events are the most easily accessible and flexible in terms of construction and content delivery. However, given the large and diverse body of information, the creation of a coherent sequence of events that conforms to the principle of narrative construction can become a difficult task, not only in terms of event selection, but also in terms of event sequencing.

In this paper, we will propose a new method for story construction for presentations using web events with a simple annotation scheme based on Rhetorical Structure Theory (RST Events) [5], and an ontology-based story event arrangement engine.

The rest of the paper is organized as follows. The next section will present related work in the field of story construction applications. Section 3 discusses our approach to story construction using RST. Finally, our plans for future research topics and a summary will conclude the paper.

2. RELATED WORK
Several researchers assume a concept of "event" in order to organize the content of their storytelling applications. In the work of Silva et. al [9], the story construction process is implemented through the creation of events called StoryBits. Here, each event corresponds to a piece of text that will be read out by an agent. The author defines the links between StoryBits prior to the execution of the storytelling, which makes story updating cumbersome when the number of events increases.

Similarly, Wolff et. al [11] used the concept of domino tiles to let children construct their own story, based on beginning and ending conditions of each event, which in this case are video clips from a TV show. Other works dealt with different kinds of output like text [3,10] and 3D characters [2,6]. In most of these cases, events were generated for the particular purpose of the application,

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which renders them unfit for reusability in other scenarios or even in other kind of stories. Other research like that of Geurts et. al [4] used ontology driven mechanisms to select and present events (in this case multimedia content) with very interesting results, but the dependence on highly customized annotated information may complicate their deployment in a more heterogeneous medium like the Web.

3. STORY CONSTRUCTION USING RST EVENTS

3.1 Basic Definitions

An RST Event is defined as a single utterance in the context of dialog acts, performed by an Agent. As implied by its name, this utterance corresponds to the minimal unit within a rhetorical relation as established in RST. In most cases, this unit is a sentence, although it could also represent a phrasal clause. Linking RST Events through rhetorical relations forms a Dialog structure. In terms of RST, Dialogs represent the tree formed by the rhetorical analysis on a set of RST Events, and help us establish the conditions under which Events will be presented.

On the other hand, Concept Ontology refers to a hierarchical organization of concepts relevant to a unique main topic, also defined as Taxonomy of Concepts. In our model, a Concept is the description of a topic that will constrain the scope of a Dialog, that is, to define what a particular Dialog is about. Thus, a Scene is defined as a set of Dialogs that have a Concept as their common topic. In practical terms, Scenes are organized around the Concept Ontology, with one Scene object per Concept.

3.2 RST Event Organization

As stated before, RST Events are linked through rhetorical relations to create Dialogs. In order to allow easy content creation and dialog flexibility, rhetorical relations in our model are classified as either Inferable, which are relations that can be automatically generated during the presentation, or Non-Inferable, which are relations that cannot be generated and must be included as content to guarantee dialog coherence. The *Non-Inferable relations* that have to be determined for RST Events in the present version of our model are: Background, Enablement, Evidence, Circumstance, Elaboration, Solutionhood, Cause, Result, Purpose, Evaluation, and Restatement. By using these relations, the application combines the events located in Dialogs to create an inferable relation, through the use of discourse markers. For example, to create a Justify relation, the application can use Events related by an Evidence relation and emphasize through verbal cues such as "I am sure because …", or "I believe so because …" When this construction is uttered by an Agent, it will produce the sense of justification of one Event for another. *Inferable relations* defined in the present version of the model are: Motivation, Concession, Contrast, Sequence, and Joint. For a detailed explanation of the meaning of each relation, please refer to the work of Mann and Thompson on Rhetorical Structure Theory [5].

3.3 RST Event Presentation

The concepts outlined in the previous sections define how information is stored. In order to use that information to create presentations, our model defines the concepts of Talk and Conversation.

A Talk is a unique path in the set of Dialogs defined for a Scene that determines the precise, sequential way in which Agents present RST Events. In order to comply with narrative principles, Talks are centered in the notion of Intra-Talk Conflict, which is primarily defined as a question in an Elaboration or Solutionhood relation when events are taken from only one Dialog. This type of conflict is solved in the model when a solution of detailed information is given to the initial question. Additionally, an Intra-Talk Conflict can include Contrast or Sequence relations. In this case, taking events from more than one Dialog creates Talks. Therefore, a Talk can be represented by the following pattern of relations (in Extended Backus-Naur Form-like notation; ">>" denotes the "next state" relation):

```
Background >>
((Elaboration | Solutionhood) >>
(Circumstance | Purpose | (Result >> Cause) | Interpretation)+ >>
(Motivation | Enablement | Evidence | Justify | Concession)* >>
(Restatement)* >>
(Evaluation)*) >>
(Sequence | Contrast)*
```

A Conversation is defined as a set of different Talks. An appropriate selection of Concepts (as determined by the designer) characterizes a Conversation. Like in the case of Talks, narrative principles are ensured through the use of a particular type of conflict called Inter-Talk Conflict. Inter-Talk Conflicts are mostly attained by the use of a Contrast relation between two Talks, and its resolution is mainly based on a direct comparison on the number of non-inferable relations in both Talks. Nevertheless, the use of conflicts between Talks is not restricted to Contrast relations, since Talks can be performed one after the other without any conflict at all, as in the case of Talks that constitute a list of events (defined by a Sequence or Joint relation). Thus, a Conversation can be represented by the following sequence of processes:

```
Opening >> Talk1
        >> (Sequence | Joint | Contrast)
        >> Talk2 >> … >> TalkN >>
Closing
```

The Opening and Closing processes refer to discourse markers that the system uses in order to introduce the Agents to the Conversation, and their utterances are defined depending on the role of each Agent in it. The present version of our model supports two main roles: Knowledgeable (the Agent that gives the explanation) and Not-Knowledgeable (the Agent that receives the explanation as a listener). Therefore, in this paradigm, the conversation is guided into the context of a person who looks for information from another regarding a particular topic, and the use of such utterances as greetings is in accordance to this environment.

Fig. 1 shows a code example in OWL [8] of a Conversation object that has one Scene with one Dialog and a Concept named "Multimedia", which means that each Dialog defined inside that Scene is about the Multimedia topic.

```
<Conversation rdf:ID="Conversation_Multimedia">
   <hasScenes>
     <Scene rdf:ID="Scene_Multimedia">
       <belongsScenes rdf:resource="#Conversation_Multimedia"/>
       <hasResolutionOutcome
rdf:datatype="http://www.w3.org/2001/XMLSchema#int"
       >0</hasResolutionOutcome>
       <hasConcept rdf:resource="#Multimedia"/>
       <rdfs:comment
rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
       >Scene about the Multimedia Concept</rdfs:comment>
       <hasDialogs>
         <Dialog rdf:ID="Dialog_Multimedia_1">
           <hasRelName
rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
           >CONCESSION</hasRelName>
           <hasNucleus>
             <Event rdf:ID="RU_3">
               <hasUtterance
rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
               >Transmedial research turns them to attractive and useful
information</hasUtterance>
               <hasEventTypes rdf:resource="#Response_Uncertain"/>
             </Event>
           </hasNucleus>
           <hasSatellite rdf:resource="#RU_2"/>
             <Event rdf:ID="RU_2">
               <hasUtterance
rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
               >Raw digital data which consist of 0/1 are hardly
meaningful for human</hasUtterance>
               <hasEventTypes rdf:resource="#Response_Uncertain"/>
             </Event>
           </hasSatellite>
         </Dialog>
       </hasDialogs>
     </Scene>
   </hasScenes>
 </Conversation>
```

Figure 1. Content Code in OWL

3.4 Putting Everything Together: RST Event-based Story Ontology

Using the above-mentioned concepts as guidelines to implement our application, we have developed an OWL-based [8] story ontology to guide the decision process of constructing the story. The ontology diagram is shown in the Figure 2.

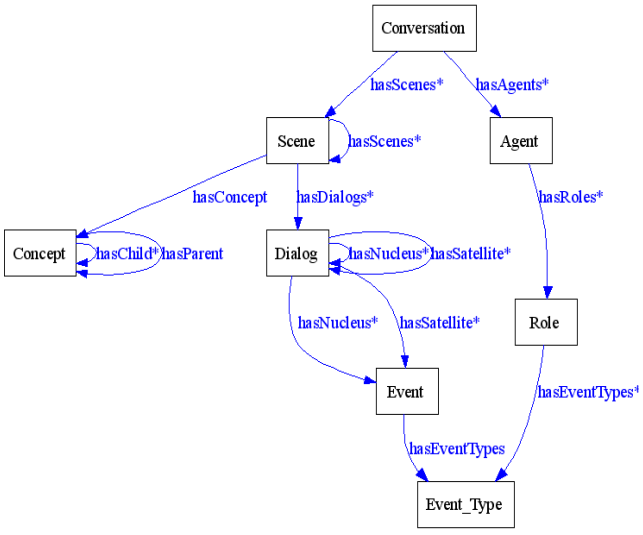

Figure 2. RST Event-based story ontology diagram

4. CONCLUSION AND FUTURE WORK

In this paper we briefly outlined a new method that may flexibly construct coherent stories using existing web content in the form of annotated events using RST.

Our most immediate consideration to improve this model is the addition of user interaction in the form of personalized, emotion-based stories. To this effect, we plan to use our emotion recognition module that detects the user's affective state and may thus support a user-dependent event selection process [7]. In this way, the application will be able to create presentations considering the user's sensitivity to the content being presented. For instance, if the user perceives certain events as boring or frustrating, the application may decide to skip that part of the story or introduce new events based on rhetorical relations that increase user's motivation.

Since there is still a fairly good amount of information that has to be manually annotated, another model improvement is to transform non-inferable relations into inferable ones. In this way, we can make the content creation task easier.

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