

# Dramatization Meets Narrative Presentations

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## Abstract.

In recent times, information presentation has evolved towards sophisticated approaches that involve multi-modal aspects and character-based mediation.

This paper presents a novel methodology for creating information presentations based on a dramatization of the content exposition in two respects. On one side, the author plots a character’s monologue that aims at achieving presentation goal and exhibits an engaging inner conflict; on the other side, the system architecture dynamically assembles the elementary units of the plot scripted by the author by implementing a tension between contrasting communicative functions.

The methodology has been applied in the implementation of a virtual guide to an historical site.

## 1 Introduction

A wide range of recent multimedia applications, from virtual assistants to video-games, exhibit sophisticated approaches to information presentation that involve multimodal aspects, narrative forms [13] and character-based mediation [29].

The use of artificial human-like characters improves the naturalness of the interaction with the user, making the system appear more responsive and cooperative. Much research has addressed the capability of engaging a natural face-to-face dialogue in the framework of Embodied Conversational Agents (ECA [7, 6]). The methodology for building ECAs ranges from synthesizing behavior from an abstract specification of the character to assembling pre-defined units [3, 25, 26]. In the latter case, the methodology usually involves a repository of elementary units in terms of synthetic speech, facial expressions, head movements, that are used to fill in pre-defined dialogue structures in response to user queries.

Most of the research in the field of embodied agents has focused on accounting for the emotional and expressive aspects in the multimodal presentation of contents, while the organization of content in the exposition usually relies on simple templates derived from narrative theories like those by Propp [27] and Greimas [14]; the role of the author and the consequent production pipeline in the ECA-based system design remains unclear.

This paper focuses on methodological aspects of designing interactive information presentation systems based on artificial characters. The methodology we propose, called DramaTour, assumes that the generation of expressive behavior relies on the editing of audio-

visual elementary units in response to user input. In the DramaTour methodology, the interactional and communicative strategies of the artificial character are explicitly driven by the notion of *drama*: the presentation delivered to the user is characterized by the inner tension and the sense of direction that are typical of dramatic narrations. Information presentation becomes a dramatic monologue, in which the character exhibits an inner conflict in front of the audience, who reacts to the character’s behavior. Dramatization applies to both the production of dramatic elementary units (from the writing of the script to its interpretation by the virtual character through animation) and the editing operated by the system in delivering the content to the user.

The idea of dramatizing the content, i.e. the fact that the information to be presented is encoded in a dramatic form has been recently explored, especially in the entertainment context, by the novel field of interactive storytelling. Posited at the junction of computer graphics and AI, interactive storytelling techniques aim at controlling both plot generation and real-time character behavior, mostly through planning systems [8]. Interactive storytelling involves the creation of an engaging story and its factorization into elementary units, the implementation of an AI system that reacts to the user’s inputs in real time in order to assemble a dramatic performance from such elementary units, the organization of the story material within the framework provided by the AI system. These issues have been explored in some depth in the context of game design [19] and interactive drama for entertainment [22, 23].

In this paper, we apply interactive storytelling to information presentation. The working assumption is that a dramatic character, who acts in first person and shares the user’s present time and space, yields a powerful effect of physical and emotional presence, especially when conveyed through an audiovisual display (cf. Esslin’s notion of *dramatic media* [11]). This results in a greater effectiveness on content reception [20].

In order to create an effective system and test the practical effectiveness of the approach, the generation of the character behavior relies on pre-defined audiovisual behavior units that are assembled in real time. These units are categorized through meta-data, that serve the function of identifying their interactional and informational purposes. The applicative domain in which we are currently testing this methodology consists of guided tours in an historical site accompanied by a virtual character on mobile devices.

The structure of the paper is the following. First we describe how the notion of dramatization is put at work in this paper. Then, we present the methodology, both AI system architecture and content organization. Finally, we present the test application.

## 2 Dramatic issues put at work

In this section, we illustrate the aspects of the methodology that introduce the notion of dramatization in the design of a presentation

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system of the type sketched above i.e. an interactive guided tour to be played by an artificial character on a mobile support in a museum, exhibition or historical site.

In line with the notion of drama formalized in [9], we see drama as the combination of two main features: the fact that drama displays action at present time and the fact that it enacts a relevant conflict related to an emotional-dramatic value concerning the characters. Drama moves toward the solution of this conflict, yielding the typical impression of movement, and does it through a sequence of elementary units, called beats [24]. Beats are pure actional units formed by a action-reaction pair.

The solution of the the conflict is called “direction”: it derives from the notion of “unity of action”, originally expressed by Aristotle [2] and clearly stated by Stanislavsky and Styan [28, 30].

## 2.1 Drama in Information Presentation

The principle of first-person, present-time action must be enforced by the authoring of the behavior units. The character’s behavior, in fact, is not synthesized from an abstract specification of the character, its personality, its will. So, the methodology poses some constraints on the form of data: the data encoded by the author must contain an explicit description of their informative content and of their interactional function, that the system can rely on to sequence the units according to a consistent communicative and interactional strategy.

The dialectics between different presentation modalities substantiates a dramatic conflict. The emergent behavior of the presentation system should resemble as much as possible to a carefully authored monologue, in which an internal conflict of the character is exposed to emotional response of the audience. For example, in the test application described below – a guide to a historical site – describing objects and narrating stories about the site may be put in a dialectical opposition, in which the descriptive task leaves the way, as the visit progresses, to the narration, thus realizing a shift of the character from “guide” to “storyteller”.

The advancement of drama performance, i.e., the realization of the drama direction, depends on a continuous exchange between the presentation carried out by the character and the response of the audience - intended here as the individual user - who manifests acceptance or rejection of the presentation through the input she/he provides to the system. Going back to the museum guide example, by moving to a different location, the user may implicitly communicate interest or lack of interest for the presentation, while pen-pointing on the interface controls, she/he may signal the desire to direct the presentation focus on a different object.

By applying the overall schema described above, the engagement of the audience/user is achieved by the emotional involvement in the satisfaction of the character’s goals. The characterization of emotions which the methodology implicitly refers to is the cognitive model of emotions by Ortony, Clore and Collins, in which the activation of emotions directly relates to the motivations of a rational agent [1]. The character on the virtual stage clearly wants to please the audience: as long as this goal is achieved, the character feels more and more satisfied, concretizing its initial feeling of hope into increasing self-gratification. However, this change cannot be accomplished without the passive or active intervention of the user: this fact projects the user/system interaction schema into a *meta-theatrical level*, in which the user is, at the same time, the ultimate object and an instrument of the performance.



Figure 1. Carletto the spider.

## 2.2 An Example of Information Presentation

The test application of the methodology presented here is currently being tested in the historical location of a former residence of the Savoy family. The application consists of an interactive guided tour on a mobile device enacted by a teenage spider, which we will refer to as “Carletto”, whose family has inhabited the palace from ages. Carletto not only knows the history of the palace in detail, but knows a lot of funny anecdotes about the people who have lived there through the centuries, and is striving to tell them to the visitors.

The conflict between the role of an “audioguide”, who exposes facts orderly and plainly according to the topology of the location, and the desire to recount all the trivia and the anecdotes he knows from an historical perspective - most of which see him or his family personally involved - meet the methodology guideline of centering the presentation on an internal conflict of the character to gain the attentional and the emotional engagement of the users. Following the author guideline according to which the character itself must be carefully dramatized in the behavior units, Carletto engages in a continuous fight with the janitors, who would like to kick him out of the place.

The application is run on a mobile device. The user input consist of pen pointing on the graphical interface and localization through the use of wireless infrastructure. Abstracting from aspects of social interaction and visiting protocol, we give a short sketch of how the presentation is delivered to the user by Carletto. The visit is structured along a topological dimension, that models the palace as a set of rooms. At the beginning, Carletto follows a topological order, based on the current localization of the user. Each time the user enters a room, Carletto starts (or resumes) the presentation of the objects (furniture, artworks) in the room. When a certain amount of the room subtopics have been illustrated, Carletto happily switches to an anecdotic presentation style for a while, then gently starts inviting the user to a new room. If the user does not move, Carletto activates a “phatic function”, by playing funny games and gazing to the user from time to time.

### 3 The DramaTour methodology

The DramaTour methodology addresses the three issues sketched in the Introduction (story factorization, interactive story composition, drama-based and narrative-based content organization). In particular, it defines a system design that on one side provides a framework for conceptually organizing the behavior units of the system, and on the other side provides an architecture that reacts to user's inputs and assembles the units in real time. Consequently, it requires the author to create the presentation by thinking of a factorization in elementary units that the system will subsequently shape into a coherent drama direction along the interaction with the user.

The system architecture has a modular structure (see Section 3.1): the handling of the interaction with the user is mapped onto the *interaction manager*; the content organization is mapped onto the *presentation manager*; the ultimate delivery to the user in a well-edited, audiovisual continuum is handled by the *delivery manager*.

The author categorizes the units (that are scripted, interpreted and visualized) according to an ontological representation of the presentation topics and the communicative functions that contribute to the dramatization of the content delivery. The specification of the form of data (detailed in Section 3.2) concerns the set of meta data which describe the informational content conveyed by the behavior units, the interactional functions they realize and the audiovisual properties that characterize them.

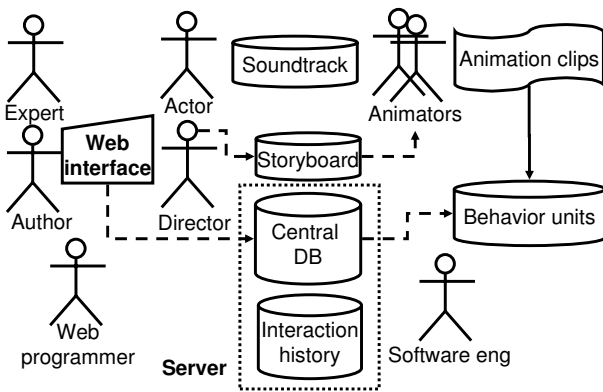


Figure 2. The production pipeline.

#### 3.1 System architecture

The system architecture is inspired by the BDI agent model [5]: the system first selects a high-level communicative goal, then, given its library of actions, forms the intention to achieve the appropriate action; finally, it brings about the intention it is committed to by performing the action. However, the DramaTour methodology does not incorporate a full-fledged BDI model. The system does not represent goals and intentions explicitly, and does not monitor the effects of actions, as the properties of intentionality would prescribe: in fact, the context of information presentation requires only a simplified, limited interaction.

The input to the system is given by the interaction history and the user input. The system is reactive, i.e., it responds to the user input by displaying an appropriate social and communicative behavior. The system executes a *decision-execution-sensing* loop. Decision

addresses the selection of the next behavior unit; execution concerns the delivery of the unit; sensing concerns the processing of the user input.

The system views all the presentation as the realization of some communicative function [18]: in line with Grice's principle of cooperation [15], together with the presentational (informative) issues, the character must address interactional and social aspects. All of the communicative functions are hierarchically organized and, given the interaction history, some interactional functions have priority over informative functions (e.g. the character must introduce itself before providing any information).

The *informative* function is the primary task of the system, i.e., the task of providing the user with useful and relevant information during the visit. The execution of this function is assigned to the presentation manager, which handles the selection and the organization of the conveyed content through a sequence of behavior units. This module is responsible for realizing different presentation styles, according to a criterium of alternation of the presentation styles that enforces the principle of dramatization at the level of the character behavior (see next section).

The interactional functions are divided into *social interaction*, *directive* and *phatic*. Since the virtual character should qualify itself as a social agent, in order to gain believability and improve the user engagement, the system must perform some basic *social* behaviors. The *directive* function includes all the actions that the character performs in the attempt to force the user behavior in some way, like signalling conditions that may require the user to perform some action (for example, executing maintenance actions on the device on which the presentation is run, when prescribed by the visiting protocol in which the guided tour is embedded). In general, the directive function has no priority over basic social aspects (in order to enforce the notion of personification and autonomy of the virtual character) but has priority over the informative function. A relevant exception is given by the actions that, according to the visit protocol, should be executed only at the end of the presentation. The *phatic* function is activated when all other functions are applicable. Its purpose consists of signalling to the user that the character is active and willing to receive input. For example, it may be activated when the character has requested the user to perform an action of any kind - necessary for the prosecution of the interaction for maintenance reasons, and has not received any input after a given time interval.

#### 3.2 Content organization

The behavior units, that factorize the behavior of the virtual character, constitute the knowledge base of the system. They contain multimedia content (an audiovisual clip with 3D animation and sound) and are tagged with the information that the system uses to generate the interactional and presentational behavior of the character.

The meta-data according to which the units are tagged are divided into three sets: *topic*, i.e. the description of the informative content of the unit, *communicative*, i.e. the communicative function accomplished by the unit, *editing*, i.e. the information needed for assembling the audiovisual clip with the adjacent ones. Figure 3 represents how meta-data are used by the modules of the architecture.

The *topic* section of the meta-data contains the description of the informative content of the units. The informative content is classified with respect to an ontological representation of the domain that is the object of the presentation. Topic description is necessary for the presentation manager to shape a coherent selection and exposition of the content of the presentation.

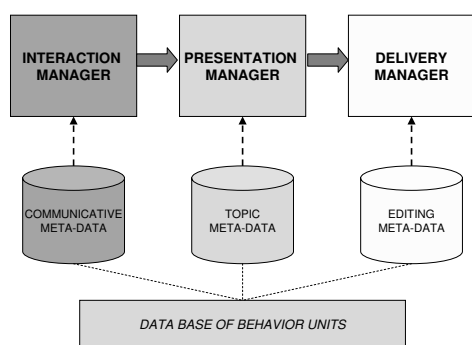
The presentation manager relies on the ontological representation of the domain information to select the content to be conveyed to the user and to structure it in a coherent way. This module follows a general strategy inspired by the focussing rules stated by Grosz and Sidner [16]. Since Grosz and Sidner's focussing heuristics have been elaborated for task-related discourse, in this methodology they have been adapted to the presentation of a set of domain facts. Task decomposition relations are mapped onto sub-topic relations, yielding the following preferences for discourse focussing:

1. Maintain focus on current topic. For example, by describing the domain according to mereological ontology, the current focus may be a piece of furniture - located somewhere in an historical location. Following a biographic description of the domain, the current focus may be an artist whose works are exhibited in a museum.
2. Move focus to a sub-topic of the current topic. With reference to the previous example, move to a subpart, a detail of the piece of furniture, or move to a certain period of the life of the artist.
3. Move focus to a the following sub-topic of the current topic. Again, the new focus may be a different detail of the previously focused detail of the piece of furniture, or a later period of the artist's life

Following sub-topic relations in an ontology according to the focussing heuristics corresponds to structuring the presentation along a certain dimension of meaning. Since the ontology is hierarchical, the focussing heuristics determine a depth-first visit of the ontology.

In principle, several meaning dimensions may be proposed to structure the same domain, corresponding to different presentation modalities. For example, the facts about an historical site may be "described" according to a topological dimension or "narrated" following a chronological dimension. In order to enforce the dramatization principle incorporated in the system design, the methodology requires the author to encode domain knowledge according to at least two different ontologies. This requirement serves the function of establishing a dialectic conflict between presentation modalities. The methodology postulates the presence of this conflict in the way the character accomplishes its presentation task, and aims at making it emerge along the interaction as a means to achieve the emotional engagement of the user.

The methodology assumes that the interaction with the user regulates the dialectic alternation between presentation modalities. So,



**Figure 3.** The system architecture according to the DramaTour methodology

the methodology specifies a meta-theatrical schema according to which, as described in Section 2, user input along the interaction is interpreted as a positive or negative clue of user engagement (depending on the type user input allowed for by the specific application) and determines the presentational behavior of the character. If the user shows to dislike the current presentation modality, the character is disappointed and consequently switches to a new presentation modality. On the contrary, if the user likes the current presentation modality, the character maintains it until the related ontology has been completely explored (or explored to a sufficient degree), then switch to a different ontology.

In order to avoid abrupt transitions from presentation modalities, the domain ontologies to which the presentation refers should not be completely unrelated. For this reason, the topic of a behavior unit is expressed by encoding its position on all the available ontologies: the topic is a tuple of ontology-value pairs, where the first element of a pair refers to one of the ontologies encoded by the author, and the second element refers to a concept in that ontology.<sup>2</sup>

The system design exploits the topic description to enforce the focussing heuristics illustrated above on the set of all available ontologies: at each moment, one ontology (the reference ontology) drives the presentation, determining the active presentation modality. Each time a set of presentational units match the current topic on the reference ontology, they are ordered according to how they satisfy the focusing heuristics on the remaining ontologies, according to an author-defined preference order. In this way, when a presentation modality must be abandoned (according to the meta-theatrical schema described above, the reference ontology changes), the transition to the new one (the secondary one) will be smooth in most cases.

The other two sets for unit categorization are the *communicative* function accomplished and the *editing* features involved.

Each behavior unit accomplishes a primitive communicative function belonging to one of the four communicative functions described above (informative, social interaction, directional phatic). It is up to the author to make sure that at least one unit matches each of the communicative functions acknowledged by the system. Moreover, each unit realizes only one communicative function. Clearly, the coordination between the system designer and the procedural author who develops the data of an application is the key to consistent scriptwriting with the system design. Moreover, it is up to the author to individuate and dramatize the character through the use of scriptwriting techniques in the authoring of behavior units.

Editing features connect some unit with another unit by interposing an audiovisual segment (called a *Transition Unit*) between them, with the aim of obtaining visual fluency [4]. The system incorporates a set of editing rules, that implement a number of editing techniques, e.g., graphic qualities (including framing, mise-en-scene, etc.) and spatial continuity. Transition units, like behavior units, are selected by the delivery manager from a repository according to the editing rules, and performs limited audiovisual adaptation if needed.

In order to assist the authoring task, a web-based authoring interface has been created to enter the application data (behavior units and transition units) and to define the meta-data according to which data are classified by the system (topics, communicative functions and editing features).

The system assumes that behavior units are self-contained, i.e. that

<sup>2</sup> If the topic of a behavior unit is not present in one of the domain ontologies, the value element for that ontology will refer to the root of the ontology, meaning that it may equivalently subsume any specific topic in that ontology.

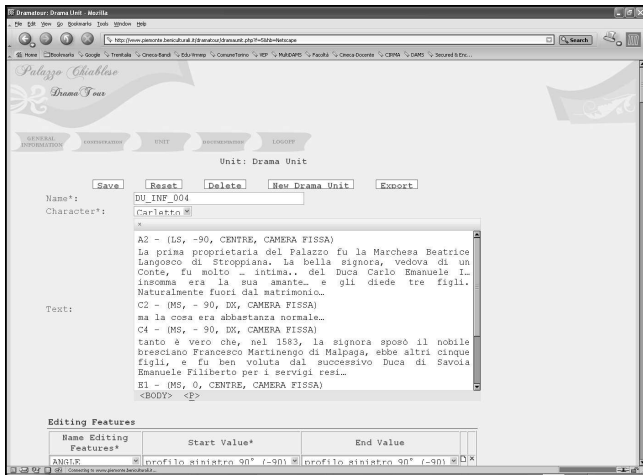


Figure 4. Authoring web-based interface

each of them accomplishes the execution of some specific communicative function, or, if its function is tagged as presentational, that it conveys a unit of meaning according the ontological representation.

### 3.3 Implementation details

The current implementation is based on common hardware available on the consumer market and mostly on open-source software. The visit server, that follows the specifications described in Section 3.1, is implemented in Java (<http://java.sun.com>), while the data base system is MySQL (<http://www.mysql.com/>). The web-based authoring interface has been developed in PHP (<http://www.php.net/>).

The client is written in Java and runs on an ASUS A636 PDA (PocketPC series). The video clips implementing the behavior units are encoded in Macromedia Shockwave Flash (<http://www.macromedia.com>). The client pilots the media player by sending text-based commands to localhost. The PDA also supports a localization client, that provides the user's current location, i.e., it identifies the room in which the user is currently situated.

Since the DramaTour methodology is media-independent, beside the PDA-based version of the virtual tour, a web-based guided virtual tour of the same location has been developed by using the same visit server. The web interface simulates the tour in the virtual space, by proposing to the user a PMVR (QuickTime VR) representation of each room, accompanied by the sequence of clips in which Carletto provides information about the room.

## 4 Conclusions

The DramaTour methodology presented in this paper is modeled on the typical workflow required by the production of a semi-automatic character-based presentation. Such a simplification of the process of system design and on-the-fly multimedia generation poses some expressiveness limitations to the author. However, we believe that the task assignment devised by the methodology between the system designer and the author represents a reasonable trade-off. Author's scripting is guided by a set of well-defined constraints on data content and form which are functional to the needs of the system. System design guidelines, in turn, enforce the key notions of character, storytelling and dramatization in an explicit way, by posing the method-

ology half-way between fully intelligent, experimental systems and off-the-shelf scripted systems for practical applications.

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