

# NarToo: a tool based on semiotics to support the manipulation of a narrative

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## ABSTRACT

New communication technologies can be used in the design of multimedia communication artifacts to support the early stage of a creative process: the heuristic project. In this work we give a proof of concept of an application addressed to a specific kind of heuristic project: given the logical sequence of episodes of a narrative, the *fabula*, the goal is to obtain different plots expressed in multi-modal language. The case study is provided by the task of transposing a written synopsis to the multi-modal language of a movie. We adopted the semiotic theory of Greimas to analyze the narrative and reveal its deep structure. The application enables users to interact with this structure in order to simulate and anticipate the effects of meaning resulting from their manipulation.

## General Terms

Design, Human Factors

## Keywords

Structural Semiotics, Narratology, Multimedia Communication Artifacts.

## 1. INTRODUCTION

The research is focused on the role of the new communication technologies applied to the design of multimedia communicative artifacts in an heuristic project of. By *heuristic project* we mean the early stage of a creative process [2], when the designer hasn't yet achieved a structured knowledge of the task he is facing, but is still combining tentative elements, applying a trial-and-error method in order to evaluate different project solutions. Our field of investigation is restricted to the project of *multimedia communication artifacts* [1]: objects designed for communication purposes, which integrate heterogeneous information (written text, sound, animation and images) and are provided with interactive features.

Information technologies support a wide range of design praxis, varying from product and communication design to architecture, urban planning or photography, where they provide powerful tools that can be employed during both the project execution and its post-production review. But information technology rarely supports the very first cognitive activity faced by the designer: matching the specification and the data of the task to his knowledge.

Our purpose is to investigate this matter by providing an example where new technologies are profitably used beginning with the heuristic stage of the inventive activity. To this end we present a

prototype of an application, named NarToo (Narrative Tool), addressed to an author dealing with a specific kind of heuristic project: given the logical sequence of episodes in a narrative, the *fabula*, the goal is to obtain different *plots*, expressed in multimodal language, therefore enriching the expression of the narrative with different media, that synergically act to convey the ultimate message. The terms introduced by structural semiotics are discussed in the following § 2. and § 3. The case study is provided by the task of transposing a written synopsis to the multimedia language of a movie as it is explained in § 4.

We apply an interdisciplinary approach to the research, involving different epistemological approaches. Semiotics discloses a very powerful perspective to look at the empirical field of design. In particular the structural semiotics applied to narratology, which is the tradition that links Propp [7] to Greimas [6], define the elements system and the combination rules that users manipulate to accomplish the task of generating new plots from a *fabula*. The theory provides a user interaction model as well, imposing the degree of freedom by defining legal and illegal operations, and suggesting an inventory of samples and hints that are helpful during the inventive process.

Interface design, on the other hand, plays an important role in the application development. The design discipline can help to reduce cognitive complexity, allowing a wider audience to access a cognitive domain in the process of knowledge distribution and assimilation [4]. The design process contributes to structure *data* into *information* and information into *knowledge*. Raw data, when structured, becomes information so that an interpreter can receive and perceive it. The designer, therefore, enhances understanding and action effectiveness. He makes the knowledge sharable among people, preventing it from being abstract, neither accessed nor experienced.

## 2. SCOPE OF THE APPLICATION

The application concept is grounded on the theory of narratology. Russian formalism [9] introduces the distinction between *fabula* and *plot*: the first one refers to the logical sequence of the episodes in a narrative, whereas the second one refers to a potentially different sequence altered in order to express the *fabula* following artistic rhetoric guidelines, i.e. flashback or flash-forward, elision. To obtain different filmic plots from the linguistic plot of the treatise, it is necessary to refer to the underlying structure of the *fabula*. Disregarding the order of the episodes in the treatise, the author of the new plot has to consider the *fabula* in order to recompose a chain of episodes suitable for the new medium. The tale analysis reveals the *substratum* of the narrative underlying and supporting the expressive surface. The independence of the

substratum from the *expression* grants the possibility of shifting the content from one medium to another. A novel can be transposed into a movie or a ballet: although, at the level of expression, the audience perceives it as completely different, the narrative maintains a consistent form.

The target user of the application is supposed to be anyone coping with the task of de-structuring a written text before producing a new story in a different expressive medium: for instance, a trainee director and a movie based on a given synopsis. The task deals with two different subtasks, addressing the different levels of *expression* and *content*. At the first level, the trainee has to shift from a mono-medium expression, which employs just the linguistic medium, to a multimedia expression, involving several perceptive registers and triggering sensorial interaction phenomena and synesthetic perceptions. At the level of content the trainee manipulates the chronological sequence of the events in the *fabula*, applying for instance flashback or flash-forward, in order to produce different kinds of filmic plots. He or she assigns to actors their functional roles in each episode of the narrative and decides upon the point of view in a scene, attributing the role of first-person voice to an actor.

A problem inherent in the transposition of a written text into a movie consists in the segmentation of the authorship into several professional roles: the director, the play writer, the art director, and the costume designer. This process faces a risk of heterogeneity [3]. The application provides a project tool to prevent possible interpretations in conflict with the original *fabula*. Moreover, transposing the original, homogeneous, linguistic expressive mode into heterogeneous significant - images, sounds and video for instance - it is necessary to keep under control, from the perspective of epistemology, the new significant in order to prevent the corruption of the original communicative program.

From users' perspective the application addresses two goals: to increase the users' cognitive competence about the narrative substratum and the logical chain of events in the *fabula*; and to support users on an operational ground, when they become authors of the new plot. Indeed, the application provides a means to interact with the narrative substratum, so that it will appear with more evidence. In addition, the application provides an archive, initially empty, where users will store and retrieve their first attempts of iconographic and multimedia material, gathered or created to express the new plot, in order to test the accomplishment of different effects of meaning.

Users achieve a robust understanding of the deep structure while interacting with the system before facing the film production with the appropriate professional tools. The goal of film making is obviously beyond the scope of the present application, that instead grants users the possibility of anticipating and simulating different effects of meaning in their initial creative process, by matching experimentally images, sounds or videos, according to their poetics. The application provides a useful tool to evaluate in advance different project solutions, preventing costly changes in later reviews.

### 3. THE THEORETICAL BACKGROUND

Greimas provides a semiotic interpretation of a narrative [6]. He proposes a structural interpretation of a narrative, by defining six types of Actant: the *Subject*, the *Object*, the *Helper*, the *Opponent*, the *Destinateur* and the *Receiver*. The main character is the hero

(the Subject) who wants to reach an object of value (the Object). In his quest, someone or something is helping him (the Helper) and someone or something is hindering him (the Opponent). The other two types of Actant define who or what is pushing the subject towards his goal and who or what receives the object of value obtained by the subject.

Adopting Greimas' model, a story evolves according to several *narrative programs*, arbitrarily complex, developing different *themes*, i.e. the conquest of love, jealousy among rivals, search for power, through some stages, called *narrative units*. At first, an agreement is established, which set the frame and the conditions under which the events will occur, and the Subject receives a task by the Destinateur; this stage is called *contract*. For instance, the hero accepts the task of freeing the king's daughter from the seven-headed dragons. The hero performance presupposes a competence, which retrospectively explains why the hero will be able to reach his goal. The acquisition of the *competence* and the *performance* together form the *action* stage, in which the Helper and the Opponent will intervene contributing to a successful outcome or a failure. According to the result of the undertaken action, the Destinateur will reward or punish the hero. This final stage is said to be the *sanction* stage. Each narrative program that develops a theme is segmented into these four narrative units: the contract, the competence, the performance and the sanction. A story has not to make explicit each narrative unit, but even if any of them is unexpressed it is logically implied: for instance, often in the literature we find successful actions that are not explicitly rewarded.

These semiotic categories should not be thought as able to explain the structure of fairy tales only: for instance, the Opponent could easily be the a limited resource of time or money and the story could be about someone trying to achieve a goal whatsoever within limited resources. Actually, the Greimas' model can be adapted to analyze a general text, regardless its expressive medium: a novel, a ballet, a painting or a picture or even human transactions, such as the establishment of a trusting relationship between a company and a customer [5].

### 4. THE CONTENT ARCHITECTURE

The case study is based on a synopsis about the story of the Borgia's, a very powerful family active in Rome between the XV and XV and the XVI centuries. The story, starting in 1492 and extending through 1503, tells us how Rodrigo ascended the pontifical seat and managed his religious and secular power in an unscrupulous and unbiased manner. The plot has been exploited several times because of its muddled nature and complex mix of human and political feelings, and because it is strongly related with a dark phase of the history of the papacy.

The application core is fueled by data from this story but it could be used with other subjects as well. We chose this particular one because the unpublished synopsis is intended for a movie, not yet realized. This leaves users free of conditioning from previous staging and artistic choices.

Users access the narrative structure through three keys: the narrative themes, the characters and the scenes.

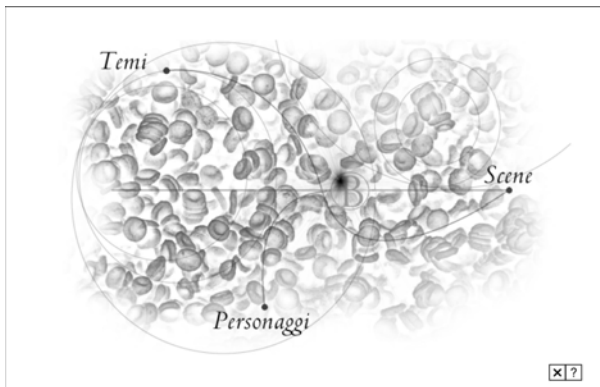


Figure 1. Access by themes, scenes or characters.

Some of the themes involved in the story are: the struggle for the papacy, the rivalry between brothers for the father's love, the political alliance between powerful families and many other.

Each theme develops along several scenes in the synopsis, which are not necessarily contiguous in the fabula chain, and sequential scenes may refer to different themes. The correspondence between themes and scenes is not one-to-one but one-to-many both ways. Actors, appearing in a scene, embody a functional role, assuming one of the Actant mentioned in the previous paragraph, according to the theme or themes in that scene. Different themes are weaved together to create the plot.

Scenes and themes are related to different levels of a narrative: while themes are deeper in the narrative substratum, scenes are immediately perceived by readers and are related to the expression level. When we read a synopsis we learn the partition of the text in different scenes, and the details herein described, such as names, dates or places. Below this easily perceived level, there is a thread that links together different scenes, possibly apart in the text, one is not immediately aware of and that need to be reconstructed analyzing the text. The thread acts as a guideline for the theme that is developed over different scenes. To gain a good comprehension of the story it is important to have a global vision of the threads of themes developing over the scenes.

In our case study the theme of *Lotta per il papato*, the struggle for papacy, develops over five scenes, as illustrated in Figure 2. The first scene in the prologue, *L'allestimento del conclave*, the setting up of the conclave, corresponds to the narrative unit of the contract, in which the reader is told that the last pope is dead, that the papal seat is vacant and a new one is to be elected by the cardinals. The scene of *I torbidi*, the riots, constitutes the narrative unit of competence and describes the political atmosphere in Rome and how alliances between the powerful families of papal candidates are sought in order to gain the majority of cardinals' votes in the conclave. In the scene of *L'avvelenamento*, the poisoning, represents the performance stage of the action, where one of the two main competitors kills political enemies. The final sanction of the Cardinals Council, acting as the Destinatureur in this theme, states the winner of the political competition and selects the new Pope, Rodrigo Borgia. This narrative unit is split in two non-contiguous scenes: *Il conclave*, the conclave, and *L'incoronazione*, the ceremony of crowning. In these scenes Rodrigo acts as Subject, the papal seat is the object of value to be conquest, Giuliano Della Rovere competes with Rodrigo Borgia for the seat, the families Borgia and Sforza act as Helper and

Orsini and Colonna as Opponents.

The actantial roles of the actors is shown in the interface displaying special icons, as it can be seen in Figure 2.; as well as the role of first-person voice attribute to an actor.

The content is structured also by scenes and characters, besides by themes. Accessing the content by characters discloses their functional roles in themes, that is the actantial role they assume in each context, according to the theory. Whereas, accessing by scenes allows gaining an overall picture of the themes developed in that scene. The content architecture provides, therefore, a dissection of the plot at a structural level, revealing the deep semantic structure of the story and allowing its separation from the expressive level.

## 5. THE INTERACTION

The application interface provides two interaction modes: *editing* and *browsing*. A working session may imply going back and forth between these two modes. The editing mask is a matrix chart: a rectangular grid along two axes, which can be used to reveal features in the data against two categories. The matrix can record four features: the relationship between the categories, the types of data in these relationships, the data quantities and the combination of all three [8].

In the case of an access by theme, see Figure 2. below, the matrix chart displays the scenes on the Y-axes, taken in the order given by the fabula rather than by the synopsis. On the X-axes, the characters are displayed. The line corresponding to a scene relative to the chosen theme is highlighted in a given color code, according to the narrative unit of the scene, as visualized in the interface as well. Scenes that do not develop that theme are not colored at all. In the matrix the cell corresponding to the couple Character-Scene shows the icon symbolizing the actantial role of the character in that scene.

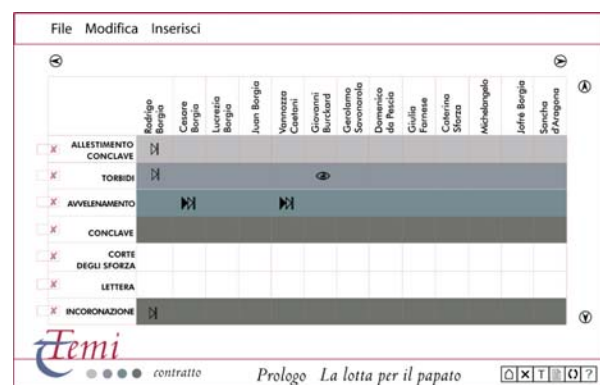


Figure 2. Editing matrix chart.

In the figure, the chosen theme *Lotta per il papato*, the struggle for papacy, develops over non-contiguous scenes and the interface shows the narrative units in which the theme is treated. Therefore, users can at a glance visualize the scenes developing a specific theme and those unrelated, besides getting the occurrence of characters in the themes and the role they are playing.

The interface design relies on diagrammatic representation of the narrative structure. When the model used to represent a content

structure is in good correspondence with the matter, the model itself enhances the cognitive comprehension and assimilation of the subject matter that becomes easily readable and intelligible. The use of the matrix, the line and organizational charts does not require users a specific skill in narratology and makes the subject more comprehensible.

The editing functionalities enable users to produce a new scene order; to elide scenes that will not be explicitly rendered in the new plot; to change the first-person voice role, that is the point of view of a specific character, through whom the entire scene will be narrated.

The interface allows also collecting the multimedia material in a meaningful organization and overall to associate it to scenes or characters. The multimedia material has to be prepared before hands and the system is not intended as a multimedia editing tool. These data are structured in a database and users can also store together with the data itself the association to an element of the discourse: a theme, a scene or a character.

The *browsing* mode enables users to test different effects of meaning while manipulating the narrative. Interacting with the application in this mode, given the selected theme, at first a line chart is shown, outlining the theme through the scenes, in which it is articulated, and representing the narrative units. Upon selection of a scene an organizational chart is loaded, that visualize symbolically the Object, at the centre of the chart and the couples Actant-Actor represented in the scene: in Figure 3. The selected scene is the *Allestimento del conclave*, in which the Actants actually present are the Destinateur, played by the Cardinals, the Subject, played by Cardinale Rodrigo Borgia and the Anti-subject, Cardinale Giuliano Della Rovere. The Anti-subject is generally competing with the Subject for the same Object of value; he could have undertaken the Subject role himself in a different setting where the narration would develop according to his point of view.

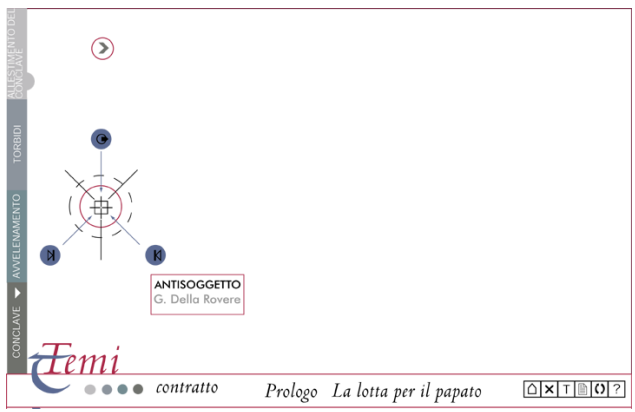


Figure 3. The browsing organizational chart.

Browsing further in the theme, users start an interactive session to sort and organize the multimedia material temporarily stored in a multimedia library, in order to analyze their poetic choices and test different effects of meaning, see Figure 4. Through a dialog box they will decide upon the material they are concentrating their attention on and will be able to select videos, audios and images.



Figure 4. The browsing window.

The visualization of videos and images can be accompanied by different audios. This allows the user to test the synergism of multimodal stimuli. The collected images are displayed as icons and can be zoomed in. Navigating a scene, users can also read the related text in the synopsis, which will appear with a different color in the screen; besides opening and editing note cards stored during an editing session and to open related URL.

6. THE IMPLEMENTATION

The application is stand-alone and written in Java2. The core of the application is an object-oriented database, whose objects model the elements of semiotic analysis: themes, scenes, narrative units, actors and actantial roles.

The database is implemented in Java and we adopt Jeevan from W3apps Inc., as support platform. Jeevan cannot give us a fully-fledged client-server DBMS but a structured file system archive like the well-known gdbm library from GNU. This solution is suitable for our needs since the software module is not very large; no external database is spawned nor need to be administered. Moreover, adopting this library makes programs easier to code.

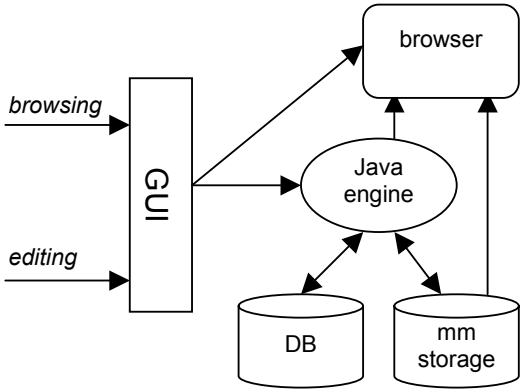


Figure 5. NarToo architecture.

Information in the database can be accessed in two modes: the database management mode, through a java administration panel, to directly query and modify the database or to perform the initial population with preloaded data and the normal working mode, through an appropriate graphic interface.

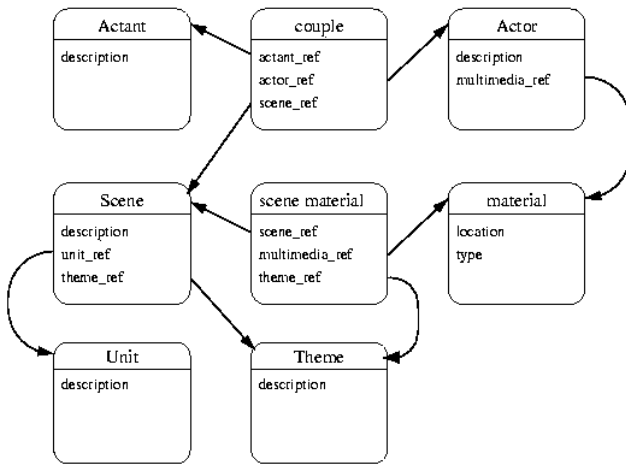


Figure 6. DB objects.

For some class of objects images, animation or sounds can be stored in different formats. The multimedia material is not stored in the database itself but in the file system and it is manipulated by Java. When a multimedia file is selected from the file system to be associated to some objects, during an editing session, it is copied in an internal directory. This approach has the drawback that it takes up more space on the local disc, but solves some other problems: if we would store in the database the file location, the application will no longer work properly when the file is moved from the original folder or removed. Moreover, this design choice leaves more flexibility for re-organizing the multimedia material in a meaningful scheme for the author. The multimedia material is sorted by assigning labels to local copies. Care must be taken when adding and removing material to an element, a scene or a character, because of other pending references.

The browsing takes place in a browser window called by the GUI interface and displaying the material assembled by the Java engine. This choice is dictated by the opportunity of leaving the highest flexibility in terms of the file formats that authors may want to use.

The graphical interface is implemented in Macromedia Flash, by means of a different thread. In our application we deal with two different technologies that need to communicate: Java and Macromedia Flash. Java can make our application portable and platform independent. It's easy to master but has poor GUI capability, even when using the graphic library, swing. Programs that need graphic user interface are difficult to code and it is hard to cope with the requirements from the designer. On the other hand Flash is a GUI oriented technology.

There is no way to integrate a Flash application with a DBMS engine or store efficiently data on the local drive. The problem is how to let data flow from one side of the application to the other one. Flash cannot call Java classes but only stand-alone programs. A solution would be to code a separate application for any implemented functionality. But this would be too expensive in term of performances, because at every new call the database needs to be opened, modified and closed. Java, on the other side, cannot be used to drive everything happening during interaction, since GUI events are coming from the interface.

To overcome these problems we use Java as the master program, the Java engine in Figure 5. Upon initialisation of the engine, the GUI module is launched, as a new separate process. The engine then waits for requests coming from the GUI module in Flash. Such requests are performed using the HTTP protocol on a loop back connection. The GUI performs the request of a URL with the following syntax:

```
http://localhost:port/COMMAND&parameter&parameter&parameter
```

Where `COMMAND` is the requested operation and `parameter` indicates one or more parameters, separated by character `&`. The Java application parses the string sent by the GUI, acts on the database and returns data as text that will be interpreted and rendered by the Flash application or by the browser.

As an example, the command to ask for information is `SND` (send) that can have different parameters:

```
http://localhost:port/SND&SCN0
```

asks for labels of scenes (`SCN`), the numeric suffix `0` means all scenes, other numbers specify a given scene. The information sent back are a number of strings separated by `&`, in the following order:

```
SCN0=3
```

to indicate that there 3 scenes in total and then the successive strings with the requested labels:

```
SCN1=<scene_name>
SCN2=<scene_name>
SCN3=<scene_name>
```

To ask for the attributes of a given scene, say scene 1, we would use the command:

```
http://localhost:port/SND&SCN1&ATS0
```

the result of which will be, for instance:

```
ATS0=21
```

that according to the syntax means that scene 1 represents a narrative unit *contratto* (2) and that it has been elided (1).

In a similar fashion we can get data about actors with the command:

```
http://localhost:port/SND&ACT0
```

that will retrieve the number of actors in a given scenes and their names and their roles.

These streams of data from the database are used by the GUI to fill the charts and the matrices in the interface. This approach is preferable to the use of a web server with cgi scripts, because we don't need a local web server. Moreover, in the same way we can perform operations that are more easily implemented using Java, rather than Flash, e.g., dialog boxes to catalogue multimedia material.

## 7. FINAL REMARKS

As we mentioned in the introduction, this research and application originated from the intention to investigate the role of communication technologies in the initial stage of the inventive

process. We need a model of the inventive behavior and a working definition of the heuristic stage of any project process. Talamo [10], in a series of interviews about the dynamical process actuated by a project, points out two facts common to all interviewed. The first fact states that the core of the invention happens before the process of actually implementing the work. The second fact is that authors usually need a central initial hint, even a random occasional one, which will enable them to shape their early-unstructured reflections. It turns out that the inventive process takes form from a set of rules or guidelines assumed as the semi finished core to which the author applies a recombination process adopting assonance, dissonance, association and analogies. How these techniques will be combined depends on the individual poetic of the author.

The creative process starts from the assumption of the set of accepted guidelines but progressively leaves them until a new original piece of work is generated: it is the path that leads from the known to the new. Even the meaning of the word *heuristic* implies a process of discovering the truth by experimental trial-and-error methods. At the end of a heuristic project the solutions found are to be compared with the initial assumptions in a cycle that could be repeated more than once.

The application NarToo supports the early stage of the inventive process, both at the expression and the content levels. The author starting from the skeleton of the narrative substratum enriches the structural elements with figurative details: an Actant is instantiated with an actor and some expressive material, such as an image, a gesture, a voice tone-color or some costumes, is associated to that actor. The multimedia archive is growing with its use since authors store material with diverse expressivities, following successive phases of their inventive process: a contemporary musical excerpt, a more philological one or even a digitized noise; a sixteenth century painting, a colored abstract form or an animate picture combining the two. After accumulating the material they can proceed combining elements and by trial-and-error they can probe different perceptual effects by putting side-by-side different materials: e.g., an abstract motion picture with a philological musical excerpt. While they are working on the perceived surface of the narrative, authors are enabled to manipulate the content of the narrative to produce new versions of the plot, altering as we said the order of scenes or deciding to elide some of them.

The content architecture of the application is realized by a database, which can be loaded with different data to allow a different application context. Only the present graphical layout of the GUI is related to the content of the prototype and it should be changed to accommodate different and generic data, but the GUI itself can already deal with a different database.

The communication model between the core application and the GUI is enough generic to be general purpose and will be subjected to further investigation, because it is easy to implement and allows web-based applications with friendly and powerful interfaces implemented in different technologies, to access the host local resources.

The prototype is presently under testing by the synopsis authors as

the project of transposing it to a movie evolves.

One of the improvements that we foresee is to structure the text in XML in order to implement the semiotic analysis and to allow more meaningful association between the narrative substratum of the fabula and the text.

## 8. ACKNOWLEDGMENTS

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