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IEEE 1599 for Live Musical and Theatrical Performances

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***Abstract*— In the context of two relevant examples of intangible cultural heritages, such as music and theater, this paper presents an innovative approach to online fruition of live performances. Our proposal aims at adding both interactivity and multi-layer fruition to traditional Web viewers, as well as a way to manipulate and create new media. The premise to reach these goals is digitizing a number of heterogeneous materials in order to describe a single performance comprehensively. The format we adopt to encode such information is based on the XML international standard known as IEEE 1599. Finally, two case studies about music and theater respectively will be presented.** ***Index Terms*— IEEE 1599, Web application, multi-layer encoding, cultural heritage, collaborative approaches.**

I. Introduction

Among immaterial cultural heritage, UNESCO lists music and theater, thus recognizing their fundamental role for human culture, education and entertainment [1]. The relationship between art and technology represents one of the research fields where advanced applications are emerging. Among the actors interested in this wide range of possibilities, it is worth to cite institutions such as theaters and opera houses. These cases are particularly relevant, since on the one side they go on staging new live performances, but on the other side they usually keep archives with the related multimedia materials. As demonstrated by the case of the Teatro alla Scala [2], such materials and documents can include: scores and symbolic representations of music; audio and video recordings; œiers, playbills and posters; photos, sketches and fashion plates; costumes and related accessories; stage tools, maps and equipment; other textual documents, such as bibliography, discography, libretto, short descriptions and reviews of music works. This list does not claim completeness, however it illustrates the heterogeneity of data and metadata a potential database could store.

The main goal of these institutions is still the realization of live shows, which are characterized by the occurrence in a given place at a given time. The audience physically attending the performance in a certain sense takes part into the show, even when their interaction is not explicit.

On the other side, many theaters are experiencing activities such as the digitization and preservation of the documents related to live performances. Some of them simply store the original analog materials (e.g. playbills), some others produce *ad hoc* digital objects (e.g. stage photos), finally others perform digitization campaigns oriented to archiving. But usually such documents are stored for preservation purposes, whereas - thanks to emerging Web technologies - they could be used for the revivification of shows.

Our goal is transforming Web users into interacting actors for live performances, which implies geographical and temporal distribution as well as participation in creating new and enriched materials from the available ones. In fact, archived documents certainly have a historical function, but they can also play a participative role, since they allow the audience to be involved in interaction even if they were not physically present during the performance.

Current repositories for multimedia materials usually fall into two categories:

1) Extensive databases, geographically distributed but poor in relationships among contents or scarcely enjoyable from a multimedia perspective;
2) Databases very rich as regards heterogeneity of materials and semantic relationships among them, but having a data amount both limited and intrinsically difficult to increase.

This paper aims at presenting an innovative approach to overcome the mentioned limitations and to provide online fruition for live performances. In the following, we will describe an XML-based format, namely the IEEE 1599 international standard, which is fit to represent heterogeneous multimedia information inside a unique document. Such a format will be employed to code digitized materials coming from live performances. Finally we will present two case studies about music and theater initiatives respectively.

II. State of the Art

Nowadays theaters and other cultural institutions are experiencing an increasing interest towards Social Media and Web 2.0. For example, [3] presents an accurate overview of issues and research related to creating semantic portals for publishing cultural heritage collections

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and other content on the Web. For theaters, this is a way to build a privileged relationship with both their traditional and fresh new audience through initiatives such as online advertising, mailing lists, etc. Besides, the huge amount of information (both analog and digital) usually archived into their repositories could attract investments from partners potentially concerned in its valorization. Due to these reasons, the interest in digitization campaigns as well as Web-oriented tools with multimodal interaction is arising.

The reaction of theaters to the rapidly changing world of digital communication is the subject of a survey by the *CoOPERARE* (Content Organization, Propagation, Evaluation and Reuse through Active Repositories) initiative [4]. This project reviews the use of social media for performing arts as instruments to involve the audience and to induce participation by taking advantage of audiovisual materials.

The survey, which analyzes the presence of 70 Italian theaters and opera houses on the Web, illustrates the following results:

- 38 theaters manage a dedicated page on Facebook (they are all migrating to of ficial profiles), where they publish news and information about the season and allow users to share comments. Other Social Networks are used by 12 theaters, while 7 institutions maintain a blog;
- 58 institutions have an online archive, either as a structured database or as iconographic material simply exposed in their of ficial Web site;
- In their site, 36 theaters have a customized search engine that normally indexes the whole site and not only the online archive;
- Most common materials are texts (67 theaters) and photos (62 theaters), whereas only 6 theaters offer iconographic materials such as playbills and fashion plates;
- 30 theaters have a video archive, 15 present a proper video-gallery, 11 rely on YouTube channels and 4 broadcast contents through a WebTV;
- Only in one case (i.e. *Teatro dell'Opera di Roma*) users are allowed to process materials in order to make E-card and send them via email.

It is worth citing that Social Media can have a deep impact. For example the *Teatro San Carlo* of Naples (one of the earliest opera houses in the world) has 32000 fans on Facebook and normally sells half the available seats to the online community. *Ravenna Festival 2010* had an estimated participation of 25% of novices*f* coming from Facebook.

In conclusion, Social Media are usually considered by theaters as a showcase to enlarge their own audience, attracting young people and offering better (but somehow traditional) services to regular customers. Only a limited number of them is exploring the new possibilities offered by techical improvements in order to create new fruition models and to involve Web users in their activities. Our proposal goes beyond the traditional approaches, as it strives to overcome the *hic et nunc* aspect typical of theatrical performances by involving Web users in the process of fruition, interaction, and creation of new materials.

III. An Overview of the IEEE 1599 Format

IEEE 1599 was originally designed as a standard format to encode a piece of music [5]. We have chosen it to describe theatrical performances, thus stretching its original goals, because of its intrinsic characteristics that will be reviewed in the following.

Based on XML (eXtensible Markup Language), this format follows the guidelines of IEEE P1599, Recommended Practice Dealing With Applications and Representations of Symbolic Music Information Using the XML Language*f*. This IEEE standard has been sponsored by the Computer Society Standards Activity Board and it was launched by the Technical Committee on Computer Generated Music (IEEE CS TC on CGM).

The innovative contribution of the format is providing a comprehensive description of music and music-related materials within a unique framework. In fact, the symbolic score - intended here as a sequence of music symbols - is only one of the many descriptions that can be provided for a piece. For instance, all the graphical and audio instances (scores and performances) available for a given music composition are further descriptions; but also text elements (e.g. catalogue metadata, lyrics, etc.), still images (e.g. photos, playbills, etc.), and moving images (e.g. video clips, movies with a soundtrack, etc.) can be related to the piece itself. Such a rich description allows the design and implementation of advanced browsers. Please refer to [6] for an in-depth discussion of the subject.

Before starting the discussion, a point should be clarified. In our work, a format to encode music information is adjusted to theatrical performances. This is made possible by the œxibility of the XML encoding we adopt, but the concepts of score and music event must be generalized. In the following we will introduce the key features of the standard comparing their traditional meaning in the music field to our new goals, thus exploring the applicability of IEEE 1599 to theatrical performances.

The mentioned comprehensiveness in music description is realized in IEEE 1599 through a multi-layer environment. The XML format provides a set of rules to create strongly structured documents. IEEE 1599 implements this characteristic by arranging music and music-related contents within six layers [7]:

- *General* - music-related metadata, i.e. catalogue information about the piece;
- *Logic* - the logical description of score in terms of symbols;
- *Structural* - identification of music objects and their mutual relationships;
- *Notational* - graphical representations of the score;
- *Performance* - computer-based descriptions and executions of music according to performance languages;

- *Audio* - digital or digitized recordings of the piece.

In IEEE 1599 code, this 6-layers layout corresponds to the one shown in Figure 1, where the root element `ieee1599` presents 6 sub-elements.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE ieee1599 SYSTEM
 "http://standards.ieee.org/downloads
   /1599/1599-2008/ieee1599.dtd">
<ieee1599 version="1.0">
   <general>...</general>
   <logic>...</logic>
   <structural>...</structural>
   <notational>...</notational>
   <performance>...</performance>
   <audio>...</audio>
</ieee1599>
```

Figure 1. The XML stub corresponding to the IEEE 1599 multi-layer structure.

The previous list is strongly related to music contents, but in our work layers can be used in a wider context. Before discussing this matter in depth, we have to introduce a key concept of the format, namely the *spine*. This is a mean to organize contents into various layers allowing to keep heterogeneous descriptions together and to jump from one description to another. When a user encodes a piece in IEEE 1599 format, he/she must specify a list of music events to be organized in a linear structure called spine, located into the *Logic* layer. Inside this structure, music events are uniquely identified by the `id` attribute, and located in space and time dimensions through `hpos` and `timing` attributes respectively. Please refer to Figure 2 for a simplified example of spine.

Each event is spaced *f* from the previous one in a relative way. In other words, a 0 value means simultaneity in time and vertical overlapping in space, whereas a double value means a double duration of the previous music event with respect to a virtual unit. The measurement units are intentionally unspecified, as the logical values expressed in spine for time and space can correspond to many different absolute values in the digital objects available for the piece.

Let us consider the example shown in Figure 2, interpreting it as a music composition. Event `e3` forms a chord together with `e2`, belonging either to the same or to another part/voice, as the attributes values of the former are 0s. Similarly, we can affirm that event `e3` happens after `e0` (and `e1`), as `e4` occurs after 2 time units whereas `e1` (and `e2`) occurs after only 1 time unit. For further details please refer to the official document about IEEE 1599 standard [8].

In conclusion, the role of the structure known as spine is central for an IEEE 1599 encoding: it provides a complete and sorted list of events which will be described in their heterogeneous meanings and forms inside other

```
<ieee1599 version="1.0">
  ...
  <logic>
    <spine>
      <event id="e0" timing="0"
                       hpos="0"/>
      <event id="e1" timing="1"
                       hpos="1"/>
      <event id="e2" timing="1"
                       hpos="1"/>
      <event id="e3" timing="0"
                       hpos="0"/>
      <event id="e4" timing="2"
                       hpos="2"/>
      <event id="e5" timing="2"
                       hpos="2"/>
      ...
    </spine>
    ...
  </logic>
...
</ieee1599>
```

Figure 2. An example of simplified spine.

layers. Please note that only a correct identification inside spine structure allows an event to be described elsewhere in the document, and this is realized through references from other layers to its unique `id`. Inside the spine structure only the entities of some interest for the encoding have to be identified and sorted.

One of the most relevant aspects of the format consists in the loose but versatile definition of *event*. In the music field, an event is a clearly recognizable music entity (a note, a chord, a pattern, etc.) which presents aspects of interest for the author of the encoding. Nevertheless, this interpretation can be relaxed to be applied to other fields, as in the case we will present and in some previous works (e.g. see [9]). For example, each cue of an actor during a performance can be seen as the occurrence of an event. From this perspective, our work aims at discovering and exploiting the potentialities of IEEE 1599 format even when applied to theatrical shows.

IV. Case Study: the Music Application

After discussing the key features of the IEEE 1599 format, a first case study concerning its application to the music field is now presented. In this example, the concept of event refers to the most atomic elements of music syntax, namely notes and rests. Nevertheless, in other music-related cases other choices are possible, i.e. whole measures or tablatures. As a consequence, we can consider this case study as a standard application of IEEE 1599.

A. Background

The application we are going to present allows an integrated enjoyment of different media contents related to the same music piece. This case study is based on the Triumphal March*f* from G. Verdi s *Aida* - Act II. The choice of that piece was imposed by the leitmotiv of the exhibition Celeste Aida, held at Teatro alla Scala for the opening of 2006/07 opera season. Besides presenting a number of iconographic materials such as fashion plates and sketches, the software offers two versions of the score (an autographical version and a printed one), one video and three audio performances of the aforementioned piece. All the available materials are described in a single IEEE 1599 document: catalog metadata are contained in the *General* layer, the symbolic description of the score is presented in the *Logic* layer, and audio/video contents are linked from the *Audio* layer.

Three different performances can be compared: an audio clip of a 1928 version conducted by C. Sabajno, another audio track of a 1956 version conducted by H. Von Karajan, and both an audio and a video clip of a 1984 version conducted by L. Maazel. All the executions are performed by the Orchestra of Teatro alla Scala of Milan.

As regards graphical scores, both the autographical version by the composer and the version published by Ricordi editions are available.

B. IEEE 1599 Encoding

The IEEE 1599 format was originally conceived to represent music pieces having a number of multimedia materials attached. As explained in Section IV-A, the case study presented here illustrates this situation. In Figure 3 an excerpt of the corresponding IEEE 1599 document is shown. This short example summarizes the potentialities of the format by showing 4 different layers (*General*, *Logic*, *Notational*, and *Audio*). It is worth noting that the same identifiers are both listed in the *spine* and defined from different perspectives in the other layers.

C. The Interface

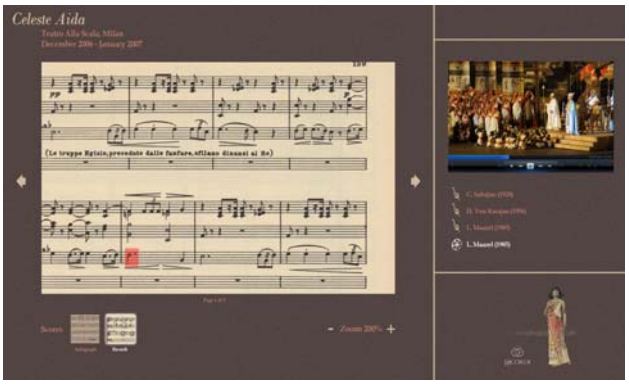

Figure 4. The Interface of Celeste Aida.

Many viewers have been implemented to render IEEE 1599 documents. Some of them have been conceived for an ofoine fruition, like the application described in [10]. On the contrary, this case study deals with a Web application based on HTML5 technology. For further technical details on such an implementation, please refer to [11].

Figure 4 shows a screenshot of the interface.

The central part of the Web interface is dedicated to display the score, as this is the main media in terms of visual extent and interaction. The upper right part of the window contains the controls related to audio/video interaction. When one of the aforementioned versions is chosen to be played, the corresponding audio and/or video is played. Since there are many parts and voices in the score and they are all coded into the IEEE 1599 file, the interface could show a list of the instruments to follow. In the central part of the interface, a red rectangle graphically shows the event currently playing in the clip. The lower section of the window houses the controls devoted to managing score visualization. Two buttons are used to switch between the two graphical instances of the score. It is worth to note that this operation is performed in real time, even when an audio/video clip is running. The red rectangle that indicates the current event is immediately repositioned to the same event in the new selected score.

This visual interface allows a number of different ways to enjoy music. First, it is possible to select a score version, an audio track, and simply follow the evolution of the instrumental parts. This is a first way to explore a music piece, as music can be listened to and watched in a synchronized fashion. A second way to enjoy music through this application is more interesting: it consists in switching from either a graphical or an audio/video representation to another. Thus it is possible to compare in real time different versions of the score (the autographical and the printed one) or different performances. Finally, the software allows a third way to enjoy music: it is possible to jump from a point of the score to another, both in its visual and in its aural representations.

V. Case Study: the Prospettiva09 Application

This application has been developed in order to demonstrate the potentialities of IEEE 1599 to describe live theatrical performances, too. This work is the result of the collaboration among the *Teatro Stabile di Torino* and two universities, namely the *Politecnico di Torino* and the *Università degli Studi di Milano*. The final goal was releasing a Web-oriented application that allows users to enjoy performance-related materials, interact with them, and create new ones starting from such materials. The three activities we have cited correspond to the macro-areas the application is subdivided into. Further details will be provided in the following subsections.

A. Background

Before describing the software, it is worth to clarify the framework in which it was developed. The application is focused on a subset of productions from *Prospettiva09* festival. This initiative, organized by the *Teatro*

```
<ieee1599 version="1.0">
  <general>
    <description>
      <main_title>Marcia trionfale</main_title>
      <work_title>Aida</work_title>
      <author type="music">Giuseppe Verdi</author>
      <author type="libretto">Antonio Ghislanzoni</author>
    </description>
    <related_files>
        <related_file file_name="bozzetto1.jpg" file_format="image_jpeg"
                encoding_format="image_jpeg" description="King's Palace" />
    </related_files>
  </general>
  <logic>
    <spine>
      <event id="ob_v1_0" timing="0" hpos="0"/>
      <event id="ob_v1_1" timing="2048" hpos="4"/>
    </spine>
    <los>
      <staff_list>
        <staff id="oboe_staff">
          <clef type="G" staff_step="2" event_ref="clef_0" />
          <time_signature event_ref="timesig_0" num="4" den="4" vtu_amount="4096" />
          <key_signature event_ref="keysig_0">
            <flat_num number="3" />
          </key_signature>
        </staff>
      </staff_list>
      <part id="Oboe">
        <voice_list>
          <voice_item id="Oboe_voice_1" staff_ref="oboe_staff" />
          <voice_item id="Oboe_voice_2" staff_ref="oboe_staff" />
        </voice_list>
        <measure number="23">
          <voice ref="Oboe_voice_1">
            <rest event_ref="ob_v1_0">
              <duration num="1" den="2" />
            </rest>
            <rest event_ref="ob_v1_1">
              <duration num="1" den="4" />
            </rest>
            <chord event_ref="ob_v1_2">
              <notehead>
                <pitch step="F" octave="6" actual_accidental="sharp" />
                <duration num="1" den="4" />
              </notehead>
            </chord>
          </voice>
        </measure>
    </los>
  </logic>
  <notational>
    <graphic_instance_group description="autograph">
      <graphic_instance file_name="pag1.jpg" encoding_format="image_jpeg"
              file_format="image_jpeg" measurement_unit="pixels" position_in_group="1">
        <graphic_event spine_ref="ob_v1_0" upper_left_x="628" upper_left_y="368"
                        lower_right_x="653" lower_right_y="391" />
        <graphic_event spine_ref="ob_v1_1" upper_left_x="718" upper_left_y="355"
                        lower_right_x="737" lower_right_y="401" />
      </graphic_instance>
    </graphic_instance_group>
  </notational>
  <audio>
    <track file_name="Aida1928.wav" file_format="audio_wav" encoding_format="audio_wav">
      <track_indexing timing_type="seconds">
        <track_event event_ref="ob_v1_0" start_time="51.18" />
        <track_event event_ref="ob_v1_1" start_time="51.33" />
      </track_indexing>
    </track>
  </audio>
</ieee1599>
```

Figure 3. The IEEE 1599 document which encodes an *aria* from *Aida*.

Stabile di Torino, took place in 4 locations in Turin: *Teatro Carignano*, *Cavallerizza reale*, *Teatro Gobetti*, and *Fonderie Limone*. *Prospettiva09* melted together different experiences and artistic forms, such as theater, dance, performing arts and music. It staged 50 contemporary productions - for a total amount of 72 performances - and hosted 350 artists and 40 companies from all over the world: Argentina, Belgium, Germany, Great Britain, Italy, United States, etc.

The experimentation was conducted on a small number of productions, heterogeneous as regards their artistic form but all characterized by the use of multimedia (e.g. prose works with video projections in the background, live music, multimedia shows, contemporary ballets, etc.). A number of digital materials has been directly acquired during each performance, thus obtaining stage photos, audio recordings and video takes from different angles. Besides, all the preparatory materials have been retrieved, if present: scripts, synopses, video interviews, multimedia projections, music scores, etc.

B. IEEE 1599 Encoding

All the heterogeneous descriptions for the same performance have to be grouped and synchronized in order to provide a unique vision of the single show. This is the reason why IEEE 1599 standard was employed. In fact, as explained in Section III, a unique XML document in such a format can incapsulate and synchronize heterogeneous information.

At this point, an example is called for. In Figure 5 a simplified IEEE 1599 code block is shown. The *General* layer contains a number of metadata about the show. As regard the *Logic* layer, the events listed and univocally identified within the spine correspond to script lines. In particular, the *Lyrics* sub-element is used to encode them. Of course, the document s author could choose any other granularity, either more accurate (e.g. syllables) or inaccurate (e.g. scenes). Needless to say, this choice has a deep impact on other layers, since it provides anchors to synchronize all materials, and ultimately also the fruition model to be implemented will be inœuenced. When graphical contents are available (e.g. scans of the script or the music score), ad hoc mappings are present within the *Notational* layer. Finally, the audio and video takes for each performance are synchronized with spine events through the *Audio* layer, which in our example performs the mapping of the script lines onto multimedia files. Finally, when graphical contents are available (e.g. scans of the script or the music score), ad hoc mappings are present within the *Notational* layer. Other types of description are available in an IEEE 1559 document, e.g. in the *Structural* layer, and they could be adopted to encode further aspects of theatrical performances, such as the structure of the plot.

When we analyze the terminology used inside IEEE 1599, its original goal - namely music-oriented description - clearly emerges. Here terms such as notational and lyrics , the use of an audio*f* layer mainly for video takes, etc. strain the normal interpretation. Nevertheless, this case study demonstrates that IEEE 1599 s multi-layer approach is suitable to the description of theatrical performances, too.

C. The Interface

The Web application, which is reachable at:

http://prospettiva09.lim.dico.unimi.it[1]

has been articulated into three sections.

The *Enjoy* section implements a traditional way to enjoy available materials. In other words, heterogeneous documents are organized into specific categories by their type (e.g. texts, audios, videos, etc.), but they are not synchronized: user interaction is limited to their fruition. This can be a good example of what traditional archives usually offer to Web surfers. Even if not innovative at all, this section was implemented in order to showcase the variety and the amount of available materials. Besides, in this way occasional visitors - accustomed to traditional tools to interact with digital archives - are not forced to change their approach. This section of the application is devoted to the preservation of digitized documents and to their fruition, geographically distributed and deferred in time.

Figure 6 shows a screenshot of the interface.

Figure 6. The Enjoy section.

By entering the *Interact* section, it is possible to enjoy metadata, text and multimedia materials in a synchronized way, by exploring the relationships and the synchronizations among them. The interface, shown in Figure 7, presents a number of controls and windows to navigate materials in an innovative way. Different fruitions models are available through the interface. First, it is possible to select a show and simultaneously follow its plot on the script and on a video or audio track (one of the many available versions). Even if this is a basic level of fruition, it proposes a more advanced model with respect to other similar Web applications, since the performance in its many aspects can be watched in a synchronized fashion. But a second way to use the interface is even more

[1]Please note that some sections are not available due to copyright constraints.

```
<ieee1599 version="1.0">
  <general>
    <description>
      <main_title>La canzone di Marinella</main_title>
      <work_title>Concerto senza titolo</work_title>
      <author type="music and lyrics">Fabrizio De Andre'</author>
    </description>
  </general>
  <logic>
    <spine>
      <event id="e0" timing="0" hpos="0"/>
      <event id="e1" timing="3" hpos="3"/>
      ...
    </spine>
    <los>
      <lyrics>
        <syllable start_event_ref="e0">Questa di Marinella
          e' la storia vera</syllable>
        <syllable start_event_ref="e1">che scivolo' nel fiume
          a primavera</syllable>
        ...
      </lyrics>
    </los>
  </logic>
  <notational>
    <graphic_instance_group description="score">
      <graphic_instance file_name="score/page01.tif"
                  encoding_format="image_tiff" file_format="image_tiff"
                       measurement_unit="pixels" position_in_group="1">
        <graphic_event event_ref="e0"
                               upper_left_x="1022" upper_left_y="1506"
                           lower_right_x="1076" lower_right_y="1610" />
        <graphic_event event_ref="e1"
                               upper_left_x="1670" upper_left_y="1526"
                           lower_right_x="1724" lower_right_y="1630" />
        ...
      </graphic_instance>
    </graphic_instance_group>
  </notational>
  <audio>
    <track file_name="videos/marinella.mpg" encoding_format="video_mpeg"
                                                 file_format="video_mpeg">
      <track_indexing timing_type="seconds">
        <track_event event_ref="e0" start_time="2" />
        <track_event event_ref="e1" start_time="9" />
        ...
      </track_indexing>
    </track>
  </audio>
</ieee1599>
```

Figure 5. The IEEE 1599 document which encodes a scene of *Concerto senza Titolo*.

interesting: it consists in switching from an aural/visual representation to another. In other words, it is possible to compare in real time different versions and perspectives of the multimedia contents related to the same performance. When the user decides to switch from one material to another, the execution continues just from the current point. Finally, the application allows a third way to enjoy the theatrical performance, namely the possibility to alter the original time sequence of events. This function is implemented by making all the parts of the interface sensitive to mouse clicks. For instance, it is possible to jump from a point to another in the plot or the music score, or dragging the scrollbar of the media player, and recreate the synchronization among materials in real time.

Such features of the interface are made possible by the IEEE 1599 standard, which encodes not only raw data about the theatrical performance but also all the information required to synchronize them.

First, this section gives to the Web audience some of the features typical of a live fruition, such as the possibility to change the point of view and to concentrate on a particular type of content, chosen by the user and not imposed by a director. Moreover, this model provides a sort of augmented reality if compared to a live view of the performance, since the elements mixed up on the stage can be enjoyed together - and from different perspectives - or even ungrouped and watched one by one. This possibility is particularly relevant for the shows with multimedia projections, which sometimes present an information overload very difficult to decode in real time.

Figure 7. The Interact section.

The objects previously digitized and organized in a unique IEEE 1599 document can also originate new materials. This possibility is explored within the *Create* section, where already available materials can be re-used inside a video editing environment (see Figure 8). The idea is letting Web users create their own clip about the show, by picking contents from the built-in archive. For example, it is possible to create cross-fadings among different scenes of the performance, to mix the original audio with other tracks, to superimpose free texts or parts of the script, and so on. Finally, the user-produced materials can be shared with other surfers.

It is worth noting that the obtained results can be noticeably heterogeneous. As a trivial example, short clips with advertising purpose can be realized; but a more creative use of this tool can originate brand new forms of art, for example by mixing zoomed particulars from still images, extrapolating single words, breaking audio contents into small pieces and editing them in an original manner, and so on. In other words, through this section each user can communicate his/her own perspective on a show, thus recalling the name itself of the festival, namely *Prospettiva09*.

Figure 8. The Create section.

There are some positive evidences of the outcome of the proposed on-line interactive interface. For instance, theaters, opera houses, and other cultural institutions can take advantage of this kind of approach in order to add new value and relive their own traditional materials. In this sense, a new audience " namely the community of Web users" can be attracted by theatrical works, including also people not usually attending traditional theaters.

Such an approach on the one hand creates a new market and new channels for cultural institutions to broadcast contents, and on the other provides users with new technological instruments to become active parts of the perfomances.

VI. Conclusions

In this paper we have presented a proposal for the valorization of traditional theatrical performances through XML, network technologies and social media. First, materials have to be either digitized or directly acquired in digital format in order to create a *corpus* of heterogeneous descriptions for the same performance. Starting from such materials, all related to a single show, an XML format - namely IEEE 1599 - has been employed to describe them within a unique document in a synchronized way. The concept of *event*, originally related to the music field in IEEE 1599, here has been reinterpreted to take into account the occurrence of given actions on the stage. Finally, a Web interface with advanced multi-modal functions has been designed and implemented. In this way, also Web users can participate to the performance and somehow interact with it.

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