

MPEG Symbolic Music Representation, history and facts



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<http://www.interactivemusicnetwork.org/mpeg-ahg/index.html>
<http://www.interactivemusicnetwork.org>



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Symbolic Music Representation



- logical structure based on symbolic elements representing audiovisual events, the relationships among those events, and how they can be rendered and synchronized with other media types
- generalizes music notation concepts to model the visual aspects of a music score, and audio information or annotations related to the music piece



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Symbolic Music Representation



- overcomes the limitations of MIDI, which is good enough to transport music event information (its main purpose), and it has limitations in producing satisfactory results on the audio and visual representation sides
- Overcome the limits of other well known and diffuse formats that are not suitable for multimedia integration



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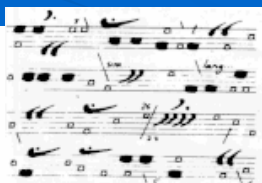
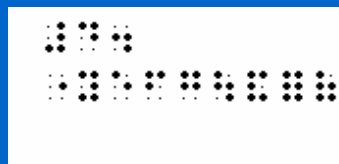
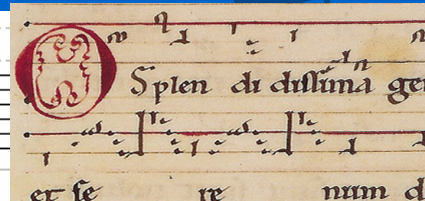
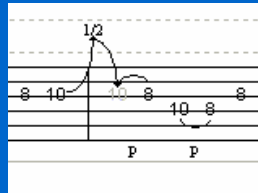


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Symbolic Music Representation



- The SMR is the information behind the different music notation models



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Preliminary activity



- Music notation requirements
- Creation and Management of the MPEG AHG on SMR
 - Set up and maintenance of several relationships with SMR actors and experts, > 300 now
 - Architecture for integration into MPEG-4 players
 - Study of existing MPEG technology
- Study and review of all Music related XML formats: MusicXML, SMDL, MML, etc. WEDELMUSIC, CAPELLA, etc.



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Integration



- Multimedia Music Notation: integration of music notation and multimedia
- Agreement/Integration of Music Notation with IEEE
- Notation and standardization with activities to follow the evolution of the MPEG AHG on SMR
- Consideration of the music notation description and their usage in the libraries
- Integration of SMR with
 - Braille and Spoken Music
 - Korean Music
- Etc.



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MUSICNETWORK WGs on Music Notation and Standards



- Results of: WEDELMUSIC XML and project, Cantate, Harmonica, CUIDADO, Play, etc.
- Starting with contacts with:
 - Standards: SMDL (ISO), NIFF, MIDI.ORG and MPEG
 - SMDL has been closed
 - Major format proposers of XML based Music formats and not only
 - Major Music Notation Editors: Finale (coda), Sibelius, Capella, Noteheads, etc.
- According to the goals of MUSICNETWORK: integrating music and multimedia the preferred and more feasible path was selected to be MPEG



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Why MUSICNETWORK and MPEG



- Exploitation of the MULTIMEDIA modeling and Synchronization
- Widespread distribution of MPEG formats, that could bring music notation in all devices and in the homes, music notation for all
- This could lead to
 - A set of new and very interesting applications in the education, cultural heritage exploitation and entertainment, I-TV
 - A relevant enlargement of the market for the related industries
- Specific Symbolic Music Representation model has to be defined with requirements for modeling and integration



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Actions and MPEG



- MPEG already includes: MIDI and SAOL, SASL...for audio and score.
- July 2003. identification o what was missing in the MPEG
- Oct 2003. Why the SMR is relevant for MPEG solutions
- Dec 2003. Which is the missing technology and its requirements
- March 2004. Proposal of the Draft Call for Proposal for missing Technology
- July 2004. Issues of the Call for Proposal
- Jan 2005: Deadline of the Call
- April 2005: assessment and selection of the format
- July 2005: First WD as RM0
- Start work on the standard production
- completing the work in the end of 2006 or begin 2007



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Well known Motivations



- Lack of a common standard in the area of Music notation and Multimedia integration
- The EC has created the MUSICNETWORK among the other activities also to solve this problem: “to make possible new applications and open new markets”
- We have analysed the problems in the last years identifying specific requirements in the area of Multimedia Interactive Music



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Well known Motivations



- Music integrated with multimedia maintaining the interactive aspects of music notation:
 - Interactive music tutorials
 - Multimedia music publication
 - Software for entertainment (sound, text and symbolic information)
 - Play training, performance training
 - Ear training, Compositional and theory training
 - Compositional and theory training
 - Software for music management in libraries (music tools integrating multimedia for navigation and for synchronisation),
 - Piano keyboards with symbolic music representation and audiovisual capabilities
 - Mobile devices with music display capabilities



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Music Notation Applications



- Music Education and courseware construction
 - PC, i-TV, electronic lecterns, tablet PC, PDA..keyboards
 - Music analysis
 - Co-operative work on music notation
 - Virtual composers and orchestras
 - Play training, hear training, etc.
 - Music for impaired, accessible music, Braille, Spoken Music
- Music editing/viewing integrated with audio-visual
 - Electronic keyboard with audio visual
 - Music formatting and transcoding from MN to other visual aspects



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Music Notation Applications



■ Entertainment

- Karaoke: singer support, etc.
 - Synchronizations, audio rendering, etc.

■ Music distribution with DRM

- Music sheet distribution
- Music plus audio visual distribution, distance learning, etc.

■ Multimedia music manipulation in archives, music schools, music information centers, etc.

- Searching technology, annotation in all domains



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Music Education Scenario



the music score

Teacher explanations

Guitar solo: lesson 1 - improvising on major scales

Score browser

Finger positions

Hand position Virtual Reality

Exercise tempo control



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Music Library Scenario



Opera
Video or
Virtual
Reality

Lyrics

The screenshot shows a central interface with several components:

- Video Player:** Displays a scene from an opera with characters in a gallery.
- Lyrics:** A text box on the right containing the Italian lyrics for the scene.
- Annotations:** A panel below the video with 'add', 'remove', and 'long' buttons.
- Music Score:** A musical score is visible at the bottom center.
- Sound Controls:** A mixer and equalizer are located at the bottom right.
- User Annotations:** A box on the left shows a list of user annotations with 'long' and 'short' labels.

end user
annotations

the music score

sound
controls

TRAVIATA

ACT 2— SCENE XIII



Video

Context summary

Violetta and Alfredo are at a party in the gallery of Flora's palace. Alfredo is jealous of Baron Douphol.

Interpreters

| | |
|------------------------------|---------|
| Violetta Valery (Soprano) | who is? |
| Alfredo Germont (Tenore) | who is? |
| Flora Bervoix (Mezzosoprano) | who is? |
| Annina (Soprano) | who is? |

libretto

ALFREDO:
 È tra noi mortal quistione
 S'et cadrà per mano mia
 Un sol colpo vi torria
 Coll'amante il protettore
 V'atterrisce tal sciagura?

score

all Alfredo Violetta

Lyric: Italian Annotate...

W.A. Mozart - eine kleine nachtmusik

Violin I score

Violin I - video

Violin I

Violin II

Viola

Violoncello

Basso

Multimedia Standards: Use case Augmented Web radio (IRCAM)

UNE NUIT DE MUSIQUE RITUELLE LORS D'UN RITE PROPHYLACTIQUE (MAI PUANG) - OCTOBRE 1993 -
"JEUX DE LA DIVINITE" (PANNONGAN PUANG)

Le "premier os de fûte" a pour paire le "second os de fûte". Tous deux forment, selon les Tonjia, une paire (ball) nécessaire à l'efficacité rituelle. À la première écoute, les morceaux diffèrent tant dans la mélodie que dans l'ajournement des voix - le premier étant pur bourdon et le second à l'unisson. Cependant, l'esprit de ces morceaux fondateurs ("os" bulku) est toujours le même : lenteur du tempo, longueur, étrangeté produite par les intervalles de triton, par le frottement à la seconde mineure, par la structure en boucle, réitérant les mêmes cellules, par les trilles instantanés. Ce sont les traits musicaux (lenteur, unisson, absence d'alternance de voix, tessiture grave) qui définissent l'idée de paire mais pas nécessairement l'organisation des voix.

Multimedia Standards: Use case – Signed Listening (Musicology) (IRCAM)



Sehr langsam (♩ = ca. 64) II
mit Dämpfer

rit. [5] *molto agitato*

[10] *rit.*

II. E. 5888 5889

Webern, op.5 n°II : analytical remarks

Prelude Screen1 Screen2 Screen3

contrapuntal phrases. If we continue in this logic, the third section of the piece could be seen as its outcome. In fact, what we named as a third contrapuntal phrase (bar 9) should not really be considered as such. Its character is much less structured in comparison to the group formed by the first two phrases, which are globally symmetrical in relation to the center of the second section. If we decide to consider this center as the heart of the piece, we reinforce the hypothesis now emerging, according to which, the whole of the fourth stanza would be considered as a coda - and not simply the "postscript" we talked about in our first description.

Other elements support this hypothesis: the three-note motif at the end of bar 11 recalls the one that closes the first section of the work [5]. As such, it is understood that in the space of one and a half bars, violin I reiterates all the material of the viola part from the first system. This condensed reminiscence effect, is also a result of the fact that the notes D, D# (or E flat), and E - more exactly the semi-tone intervals they contain - have progressively played a fixative role. This might explain why violin I, from bars 9 to 10, is fixed within the range defined earlier by violin II. In a way, the lyrical climax arrives too late, for the most part, already conditioned by the preceding material [11].

As paradoxical as this may seem at first sight, by trying to move away from a segmental listening towards an appreciation of density, we support the theory of the exhaustion of lyricism. An exhaustion, which characterizes Viennese music of this period, caught in its unfair conflict with post-romanticism.

Click on the score to view the score

**Missing technology:
Multipage
Direct CD sync**

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Benefits to be obtained solving Problems



- creating innovative applications incorporating multimedia integration with musical content
- Creation of new products, exploitation of new markets
 - distribution multimedia music content on media devices, i-TV, PDAs, cellular phones, etc. (interoperability)
 - content and courseware for music education
 - production of music notation and synchronisation with other media
 - managing content in music archives
 - support for the interoperability among the above mentioned different applications
 - musical information for consumers with different accessibility needs
 - Etc...



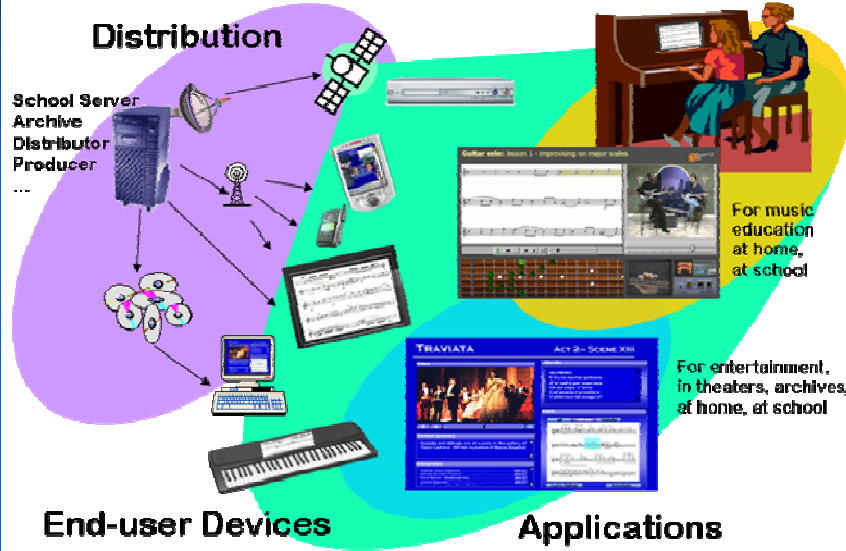
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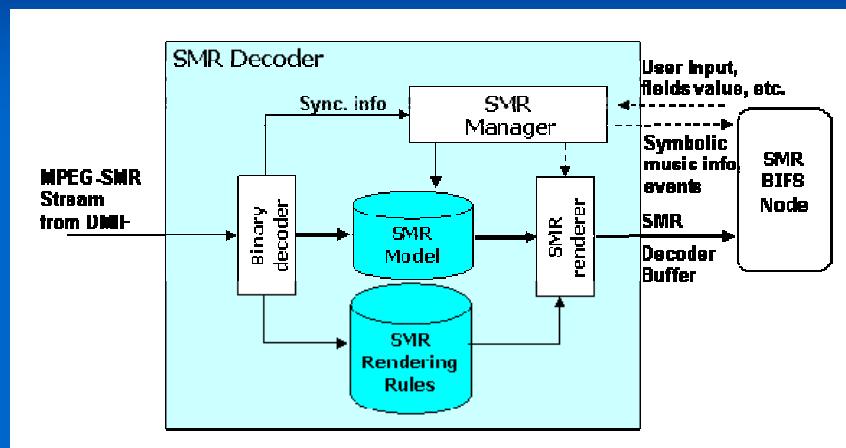


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SMR Scenarios



SMR Decoder into MPEG



Working Draft Main Clauses



- **SMR Bitstream** syntax and semantics of the SMR bitstream.
- **SMR XML Format** syntax and semantics of the SMR format.
- **SMR Synchronisation Info** syntax and semantics of the synchronisation Information between the SMR elements and the other audiovisual elements.
- **SMR Rendering Rules** syntax and semantics of the rendering rules that are applied to the SMR XML format for rendering.
- **Relationship of SMR with other parts of the standard:** relationships of SMR with other parts of the MPEG-4 standard
- **SMR Profiles** contains the normative description of the profiles related to SMR into MPEG-4



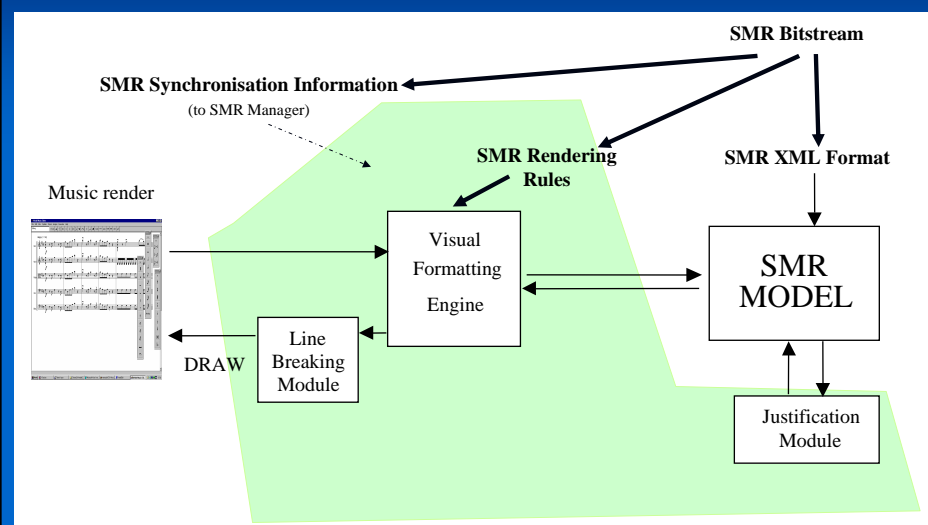
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SMR Rendering (RM)



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CE on Accessible Music



- Accessible Music notation renderers into the SMR RM0 software
- Talking Music and Braille Music formats
- Core Experiment
 - Additions to the SMR RM0 to allow setting parameters to define user requirements in Accessible Music Notation renderers
 - Workplan for integration into SMR RM0
 - Use Case Document
 - Recommendation of additions to SMR RM0



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CE on Korean Music



- Methodology for symbolic music representation of traditional Korean music
- Core Experiment
 - XML listing for Parameter settings based on the Korean Traditional Music requirements
 - SMR rendering rules
 - Reference Software update



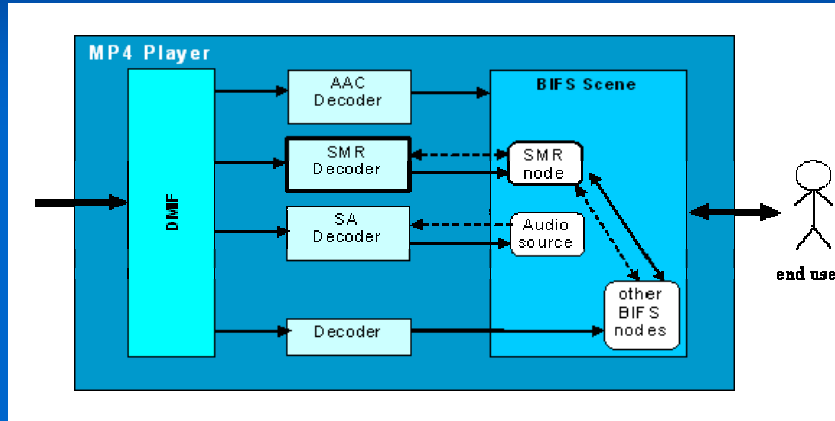
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Integration into MPEG



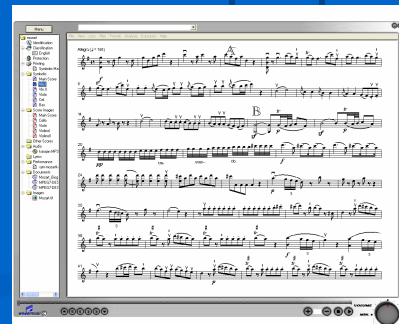
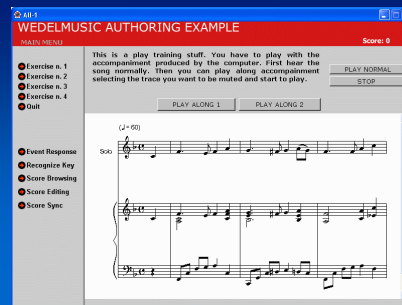
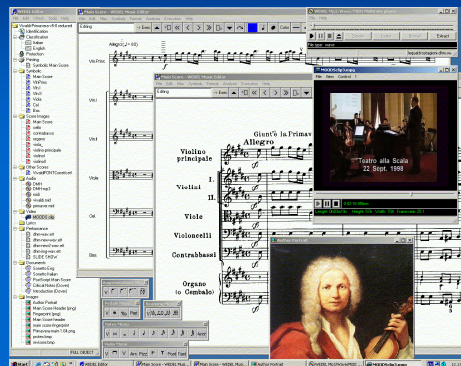
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Original Product



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SMR RMO Main Features



- It is a player, a decoder of SMR
- Dynamic production of Visual rendering from SMR, screen resize, etc.
 - positioning of music symbols
 - justification of music staff (main score and parts)
- Dynamic production of SMR from MIDI
- Dynamic production of Audio rendering in MIDI from SMR
- Dynamic Transposition (user defined parameters for changing rendering tonality and visual rendering, etc..)
- Dynamic editing (user defined parameters and annotations)



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- SMR RMO
 - Player
 - Small editor

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