

**INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
ORGANISATION INTERNATIONALE NORMALIZATION
ISO/IEC JTC1/SC29/WG11
CODING OF MOVING PICTURES AND ASSOCIATED AUDIO**

**ISO/IEC JTC1/SC29/WG11/.....
MPEG 98/.....**

Title: Description Scheme for description of music content
Source: Department of Music, University of Glasgow
Status: Proposal-Discussion
Date: February/March 1999

Description:

This proposal-discussion takes on board discussions held at the AdHoc Evaluation Meeting in Lancaster including Pre-proposals P620 ("Structured time-based event") and P622 ("music event") and the evaluated proposals P155 ("Sonata Forms Description Scheme") and P154/169/163/170 ("Structured and unstructured links") and document M3649 ("Some remarks on Document Structure and Description Schemes").

Due to the need to create a generic method of specifying and describing music content, this document proposes a set of DS and D to provide a general way of describing music content. It is closely based on an existent standard SMDL¹ in order to maximize compatibility in the future.

This set of Description Schemes and its associated set of Descriptors describe a structured time-based entity (or musical note or musical entity or audio entity) in its relation to other internal or external structured time-based entities.

At a very low-level, a Description Scheme named "thread" can take on form (with different Descriptors) to describe a music event down to note level (or further). These Descriptors can take on different forms, and it is possible that additional descriptors with different means of describing a music event exactly, can be added. Proposed in this document are two, one describing the music entity in its abstract form with its four "logical" characteristics: a) duration, b) pitch, c) loudness and d) other characteristics. The second one describes musical events with SMDL syntax. Another descriptor used in this scheme could be a link to a certain section of a structured or unstructured format.

¹ ISO/IEC DIS 10743 Information technology -- Standard Music Description Language (SMDL)
<http://www2.echo.lu/oii/en/audio.html#SMDL>

Annex D: Cover Page for each proposal

Proposal Id: **P620, P622 (number still left from pre-proposal stage)**
Name: **Carola Boehm, Cordy Hall**
Company/Institution: **University of Glasgow, Department of Music**

1) Which item is proposed?

a) Descriptor

b) Description Scheme X

c) Description Definition Language

d) Coding scheme

e) Others (please specify) _____

2) Do you have other proposal(s) related to this one? Please list the proposal Ids.

- P621 ((Pre-Proposal)
- This proposal-discussion takes on board discussions held at the AdHoc Evaluation Meeting in Lancaster including Pre-proposals P620 (structured time-based event) and P622(music event) and the evaluated proposals P155 (Sonata Forms Description Scheme) and P154/169/163/170 (Structured and unstructured links) and document M3649 (Some remarks on Document Structure and Description Schemes).

Music Content Description

Context

This proposal-discussion takes on board discussions held at the AdHoc Evaluation Meeting in Lancaster including pre-proposals P620 (structured time-based event) and P622(music event) and the evaluated proposals P155 (Sonata Forms Description Scheme) and P154/169/163/170 (Structured and unstructured links) and document M3649 (Some remarks on Document Structure and Description Schemes).

Due to the need to create a generic method of specifying and describing music content, this document proposes a set of DS and D to provide a general way of describing music content. It is closely based on an existent standard SMDL² in order to maximize compatibility in the future.

The need for such a low-level description has been noted throughout the past 10 years. Typical applications as finding by humming, similarity and comparison measuring, dynamic music representation on wide area networks, all of these applications require a detailed description of the music event in place. This description can be on a higher level, defining only certain movements or certain parts of a piece of time-based media. Going further down into a more detailed description of the music allows a much richer variety of “access” to the music. Searches across a critical mass of music resources have to be based on such a low-level but efficient description. Any signal-processing means of searching for similarity or comparison measures are unlikely to be as exact, and will not be as time- and resource efficient as searches across a structured description of the music.

Here is a further note on the reason for basing this proposal on SMDL. As the requirements document N2461 mentions:

“It may be pointed out that while MPEG-7 aims to standardise a "Multimedia Content Description Interface", the emphasis of MPEG is on audio-visual content. That is, MPEG-7 does not aim to create description schemes or descriptors for text medium. However, MPEG-7 will consider existing solutions for describing text documents (e.g. SGML, and it's derivations like XML, RDF, etc.) and support them as appropriate with suitable, necessary interfaces between audio-visual-content descriptions and the textual-content descriptions.”³

This proposal follows the framework of SMDL in describing a musical event but offers the flexibility of other thread elements.

SMDL is described as follows:

“SMDL is based on 4 basic domains: the logical domain, the gestural domain, the visual domain and the analytical domain. A musical work is made up of a number of music segments. Each work can be associated with a class of works, and can have information related to its authority and source recorded.

In the logical domain works are presented as individual cantus components,

² ISO/IEC DIS 10743 Information technology -- Standard Music Description Language (SMDL)
<http://www2.echo.lu/oii/en/audio.html#SMDL>

³ International Organisation For Standardisation Organisation Internationale De Normalisation Iso/Iec Jtc1/Sc29/Wg11, Iso/Iec Jtc1/Sc29/Wg11/ N2461, Mpeg-7 Requirements Document V.7

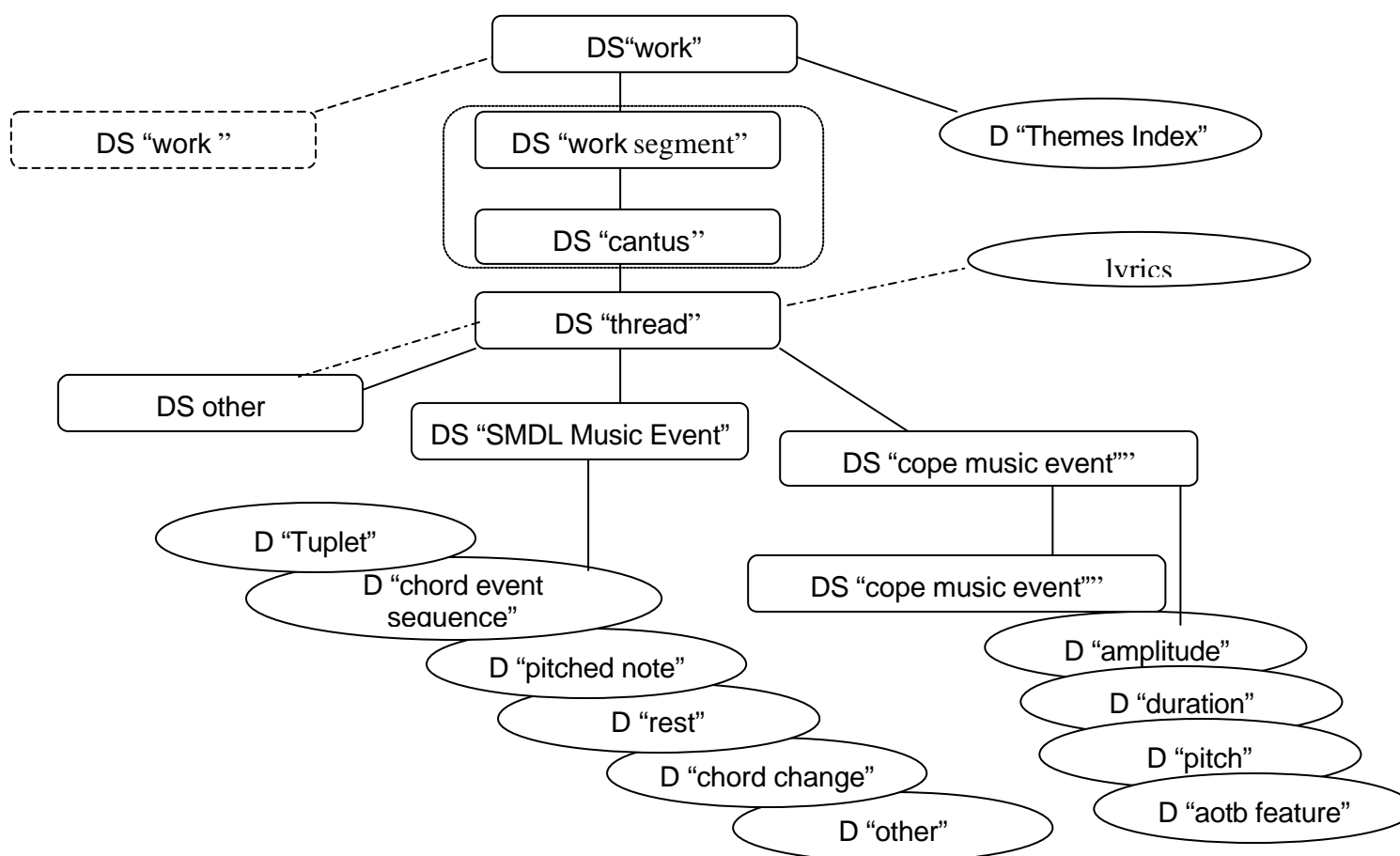
each with its own time line, expressed in virtual time. A cantus can have multiple threads, lyrics, batons for control of timing and wands (sound modification statements) associated with it. Stress and pitch can be controlled and synchronized.

*Music defined in the logical domain can be linked using standard HyTime link constructs to a score in the visual domain, to performance control specifications in the gestural domain, and to individual analysis components in the analytical domain. Themes can be used to link different cantuses.*⁴

This proposal rather concentrates on the basic elements of this structure to describe a structured music content sufficiently for resource discovery and content searching across a massive and a critical mass of data.

Overview of Descriptors and Descriptor Schemes

Following basic structure between Descriptors and Description Schemes is proposed. Some of these have been already proposed elsewhere, some of them might be optional.



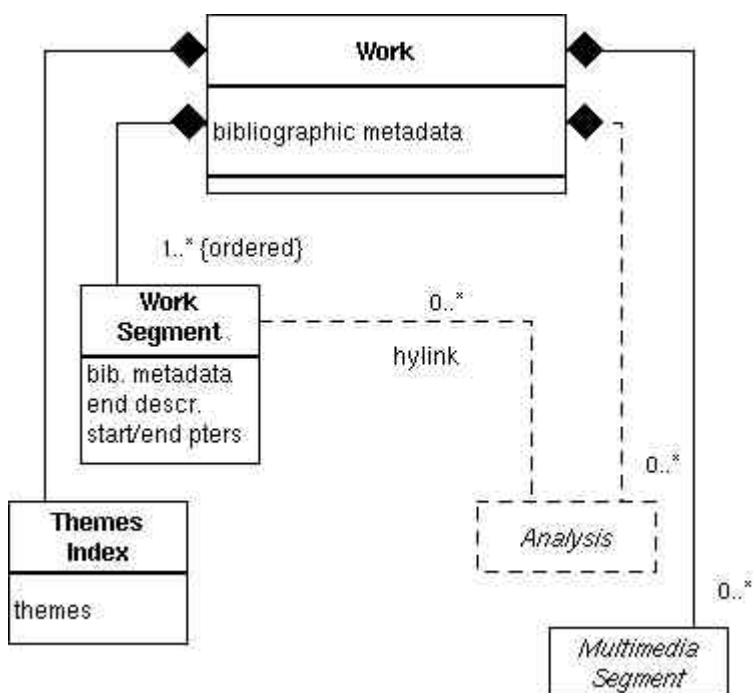
⁴ ISO/IEC DIS 10743 Information technology -- Standard Music Description Language (SMDL)
<http://www2.echo.lu/oii/en/audio.html#SMDL>

Table of Descriptors and Description Schemes:

Description Schemes	Descriptors	notes
<p>smdl: “work”</p> <p><u>attributes:</u></p> <ul style="list-style-type: none"> • bibliographic metadata (DS proposed elsewhere) • <p><u>contains</u></p> <ul style="list-style-type: none"> • smdl: “themes indexes” (DS or D) • smdl: “work segments” (parallel or sequential) • (optional smdl: “analysis scheme”) 	<p>smdl: “themes indexes”</p>	<p>work could be any multimedia segment entity, but here we concentrate on proposing the musical aspects of such a scheme. It could clearly be envisaged to be hooked up to any other already proposed scheme for defining one entity of a media.</p>
<p>work segment</p> <p><u>attribute:</u></p> <ul style="list-style-type: none"> • “bibliographic metadata” (SMDL: classification)(DS proposed elsewhere) • smdl:”end description” • start- and endpoints • <p><u>contains</u></p> <ul style="list-style-type: none"> • smdl:cantus • 	<p>smdl: “end description”</p> <p>start- and endpoints (DS proposed elsewhere)</p>	<p>smdl: “end description” describes what kind of transition exists between two work-segment, such as “3 sec pause” or “no pause”</p>
<p>smdl: “cantus”</p> <p><u>contains</u></p> <ul style="list-style-type: none"> • smdl: “thread” • smdl: “lyric” • 	<p>lyric (DS?)</p>	
<p>smdl: “thread”</p> <p><u>attributes</u></p> <p>smdl:”nominal instrument”</p> <p><u>contains</u></p> <ul style="list-style-type: none"> • SMDL:”music event type” • other music even type (“c-pope music event”) • 	<p>“name” (smdl:”nominal instrument”)</p>	<p>thread is hylinked to Lyric</p>
<p>smdl: “ music event type”</p> <p><u>attributes</u></p> <p>structured/unstructured link</p> <p><u>contains</u></p> <ul style="list-style-type: none"> • triplet • chord event sequence • pitched not • rest • chord change 	<p>“link”</p> <p>smdl: “triplet”</p> <p>smdl: “chord event sequence”</p> <p>smdl: “pitched not”</p> <p>smdl: “rest”</p> <p>smdl: “chord change”</p> <p>smdl: “other smdl event”</p>	<p>link would be a “time-alignment link between representation and realization” such as proposed in P154, P169, P163, P170</p>

<ul style="list-style-type: none"> • other smdl event 		
<p>“c-ope music event type”</p> <p><u>attributes</u> amplitude pitch duration any other time-based feature</p>	<p>“amplitude” “pitch” “duration” “other feature”</p>	<p>Should be very generic All four attributes/descriptors can take on different data types and represent different representations of the same content. I.e. Pitch = 440Hz=a = (p(t)=4t + 3 at t=3sec)⁵</p>

Detailed Description



DS “musical work” or “work”

The structured representation or set of representations of a musical composition. This description scheme might be exchanged by an existent “container” for any MPEG7 item. It can be envisaged to be recursive, i.e. contain an instance of the same class.

In SMDL it is the container for the entire document, and includes the music information and all of the related performances, scores and analyses. We propose to not include the Analysis and Performance Aspects (yet), which are not exactly basic descriptions of one resource. From a

⁵ The “C-ope” music data structure has been developed in the project Comes at the Joannes Gutenberg University in Mainz, which designed an implemented a music system and a central music data structure in smalltalk. It's data structure was similar to the one used in Stephen Travis Pope's "Mode", therefore the name "C-ope". It is a recursive structure with each class (or instance) having the four attributes without specifying a type. This dynamic typing made it possible to have a very simple but generic recursive structure for the smallest entities of music as well as for bigger structures of music. See

Christel Mittelbach, Michel Miller, "Comes, ein arbeitsgestuetzter Rechnerplatz fuer Musiker", Joannes Gutenberg Universitaet, Mainz 1992.

Michael Miller, Entwurf eines objektorientierten Noteneditors. (Design of an object-oriented Note-editor) Diplomarbeit (Thesis) Mainz 1991.

Stephen Travis Pope, The HyperScore Toolkit: A Description and Examples, Parc Place Systems, Plymouth St. Mountain View, California, 1989.

archiving point of view two performances would make it necessary to have two descriptions with different metadata, whereas in SMDL it might be handled as one description. We believe that in a standard such as MPEG7, which will have high archiving usage, every single digitized item will have to have its own metadata, thus one set of metadata per performance.

This descriptions include bibliographic metadata, here represented as an attribute, but could be implemented as a descriptor. This descriptor will have to be defined outside of this proposal.

Also, this DS musical work could be on a top level, including other time-based media segments which are in sequence or parallel to the music work segment.

D “themes index”

Contains a catalog of the themes of the musical work for indexing purposes. These indexes can be manually input or automatically extracted. Extraction methods will have to differ according to media used. Whereas MIDI⁶, NIFF (Notation Interchange File Format)⁷ and other structured music formats might be rather straightforward in extracting thematic indexes, music stored in sound formats will be more difficult and not as process efficient.

It will have to be recorded and apparent to user or top applications whether the indexes have been created manually or automatically. Error estimation and error compensation will be different according to input method.

No extraction methods are proposed here, but as suggested above, using structured music representations such as Midi, Finale’s Enigma, NIFF, Score, DARMS⁸, etc it is merely a programming task. In the signal processing community acceptable solutions and their success rates are already well known.

DS “analysis”

Not proposed here.⁹

DS “multimedia segment”

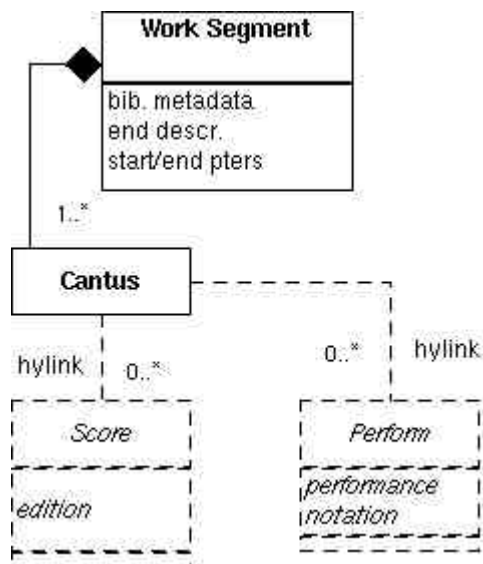
Not proposed here.

⁶ International Midid Association/Midi Manufacturer Association, Midi 1.0 Specification, <http://www.midi.org/specinfo.htm>

⁷ Cindy Grande et alii, Notation Interchange File Format Specifications 6a.3, Grande Software Inc. 1995, <http://esi24.ESI.Umontreal.CA/~belkina/N/>

⁸ For a short but detailed explanation for all these standards, one can refer to EleanorSelfridge-Filed (ed.), Beyond Midi, The Handbook of Muical Codes, MIT Press 1997.

⁹ In the future it may be a SGML/HyTime document with hylinks to the relevant parts of the rest of the musical work representation (e.g. the cantus, score and perform parts).



DS “work segment” (or “music work segment”)

A major section of the work, such as a movement or musical number. The order in which the segments appear is the order in which they are intended to be performed/visually rendered. If sections of a work are separated by a pause or some other significant interruption, or by major key or mood changes, then each should appear in its own segment.

As SMDL does not propose parallel segments, we propose to add parallel as well as sequential ordering. A satisfying solution for some sort of synchronization method (SMPTE, etc) will have to be found outside of the scope of this proposal. Such a method could be used within this Scheme. SMDL specifies only an order, which is a very efficient descriptor, but might not be sufficient for all applications for MPEG7.

The “work segment” also has additional metadata information such as the category of the segment, for example: “movement”, “trio”, “coda”. This, as mentioned above, should be proposed outside of this proposal.

The attribute “end description” specify which type of transition there is from this piece to the next, such as “3 sec pause”, “cut”, etc.

Automatic extraction could be possible for audio if this scheme would rely on other descriptors, such as a descriptor for specifying start and end points (could be HyTime links or any bi-directional links), a descriptor for specifying the kind of transition between two audio segments. Both are outside of this proposal, but are generally needed by MPEG7.

As mentioned above other “performances”, or “scores” or any other representation of this segment could be linked to it via bi-directional links into structured or unstructured documents, as pre-proposed in P154/169/163/170 or annotations as proposed in P200.

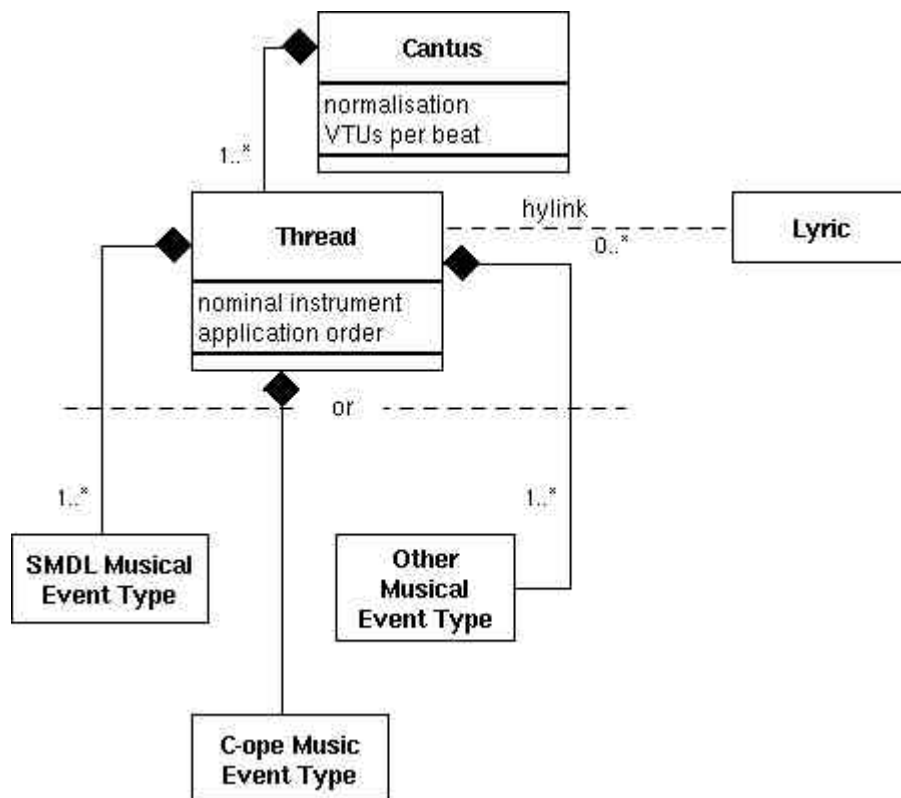
DS “score”

Not proposed here.¹⁰

DS “perform”

Not proposed here.¹¹

¹⁰ Printable or displayable editions which may be linked through hylinks to one or more cantus elements



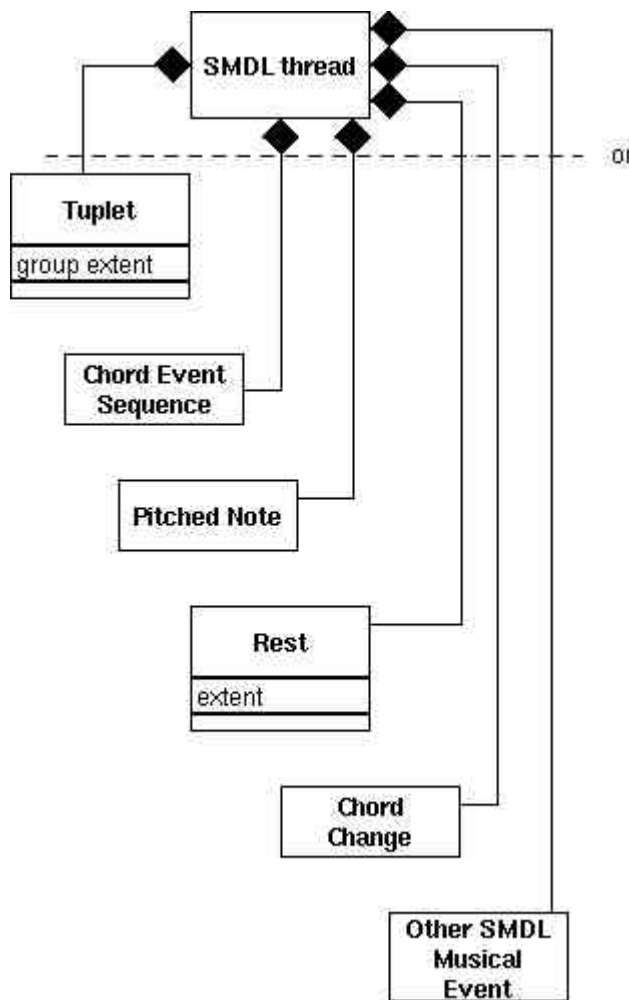
DS “cantus”

The essential abstract music information. It gives the stream of musical events that make up the music as it is played, sung or read. Attributes are an overall time-unit used for the piece: “virtual time units per beat”. This is needed if dealing with a structured music representation. It can be thought of as a metronome setting.

The Cantus has an attribute “normalization” which specifies the application of a set of rules used during the encoding process, ensuring, that a particular representation will result.

If not encoded up to note level, this attribute would not be needed. If the standard will include encoding down to note level, this attribute might have to be included. See the SMDL standard for more detail.

¹¹ Performances which may be linked through hylinks to one or more cantus elements.



DS “thread” (“SMDL Music Event Type”)

The thread is a schedule of musical events. A work for several voices will have a thread per voice. Threads may contain simultaneous or overlapping events as well as sequential events. Threads might also be used to “encapsulate” musical parts or voices.

It is possible to have the threads specified according to different formats or standards. Thus there could be an SMDL thread, here called “SMDL Music Event Type” defining the music structure to a specified level. There could also be the proposed “C-ope Music Event”, as discussed later. This thread shown describes the “SMDL Music Event Type”.

The “Thread” has the attribute “nominal instrument” which specify the instrument such as “violin”. Automatic extraction is reasonably realistic to a certain extent. Manual input should be possible. This could be defined as a descriptor elsewhere.

The attribute “application order” will need to be defined more. It is feasible to take the existing attributes and mechanisms as SMDL/HyTime uses to insure a working solution. It is also realizable to use from this level pointers or links to a SMDL encoded file. Both possibilities have their own advantage as discussed in the introduction. Both should be possible in the long term. The syntax of application order in SMDL is as specified below. Without going into more detail of the syntax of SMDL, the example below should be seen as an example of syntax implementation of such a feature. See SMDL standard for more details.

```
<!-- Thread -->

<!entity % e.music -- musical events and event groups --
    "tuplet | ces | pitched | rest | chordchg | event" >
<!element thread -- schedule of music events and event groups. --
```

```

                - O (%e.music;)*
>
<!attlist thread
    SMDL          NAME          thread
                -- HyTime sched attributes --
axisord          -- Order of axes in schedule. Constraint: GIs of axis
                element types. Omitted GI means all events in
                schedule fully occupy the omitted axis.
                lextype(GIL). --
    CDATA          #FIXED          "" - - Default: axisdefs
                in FCS --
apporder         -- Order of schedule elements is significant to the
                application and must be preserved --
                (order|disorder) order
sorted           -- Representation of schedule elements is sorted by
                order of position on axes of schedule --
                (sorted|unsorted) unsorted

                -- HyTime schdmeas attributes --
basegran         -- Base granule for each axis. lextype(words) --
    CDATA          #FIXED          "" -- Default: SMU for
                each. --
gran2hmu         -- Granule to HMU ratio for each axis. Constraint: 1
                ratio per axis, or 1 for all. lextype(fracs). --
    NUMBERS        #FIXED          "1 1"

                -- HyTime overrun attributes --
overrun          -- Handling of dimension that overruns range --
                (error|wrap|trunc|ignore) error

                -- HyTime pls2gran attributes --
pls2gran         -- Pulse to granule ratio for each axis. Constraint:
                1 ratio per axis, or 1 for all. lextype(fracs) --
    NUMBERS        "1 1"

nominst          -- nominal instrument(s) or other performing
                resource(s) allocated to this thread. --
    CDATA          #IMPLIED          -- Default: not specified. --
>

```

DS “lyric”

Sequence of syllables sung with a thread.

DS: other music event type

A musical event in the stream of events represented by a thread that is from another standard or representation.

A short and very generic mode of describing a single music event could be the “c-ope music event type” with attributes/descriptors being amplitude, pitch, duration, and other feature. Descriptors such as pitch would have to be able to be defined / described as midi pitch, Hz, cents, or a function of time.

Another music event type could be described in a SDIF format. Thus this Descriptor Scheme could be expanded by other existent descriptions of sounds or music entities.

D: tuplet (standardized as in SMDL)

Represents metric subdivisions not implied by the meter (such as triplets in 4/4 time)

D: chord event sequence (standardized as in SMDL)

Association of a semantics with an arbitrary group of (syntactically sequential) musical events. For example, a theme that is repeated several times would appear as a chord event sequence, as would an Alberti bass.

D: pitched note (standardized as in SMDL)

Gives the extent and pitch of a musical note.

D: rest (standardized as in SMDL)

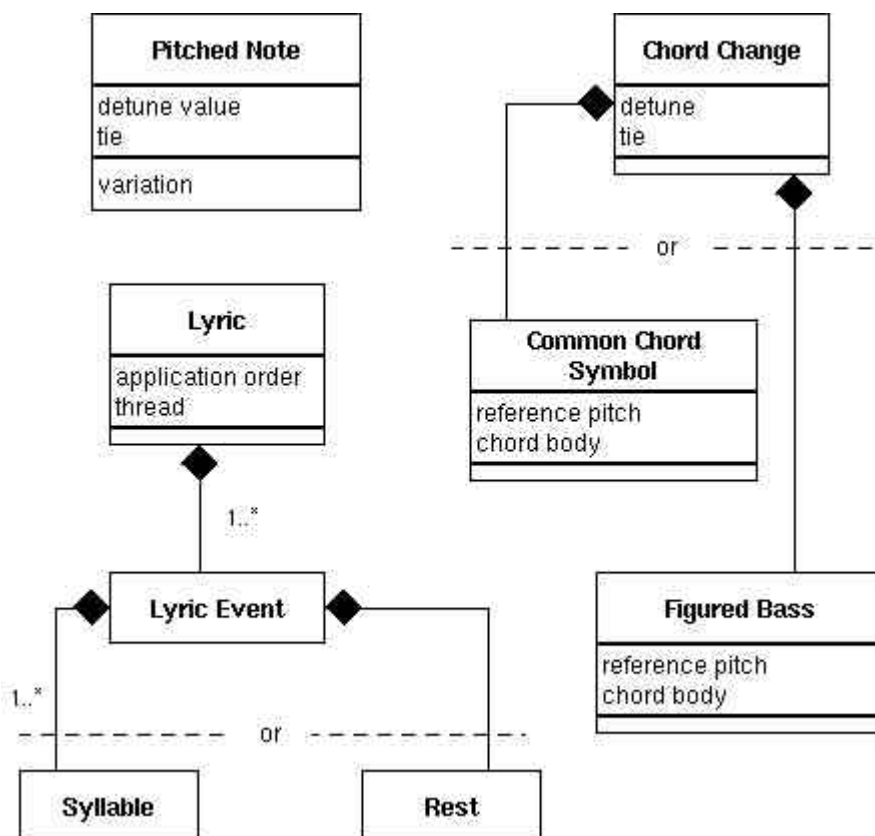
Represents a rest and its extent.

D: Chord change (standardized as in SMDL)

Represents a chord in terms of a specific harmonic representation system (e.g. jazz chord or figured bass). Usually gives a reference pitch, such as the root or bass note, and a set of intervals from that pitch

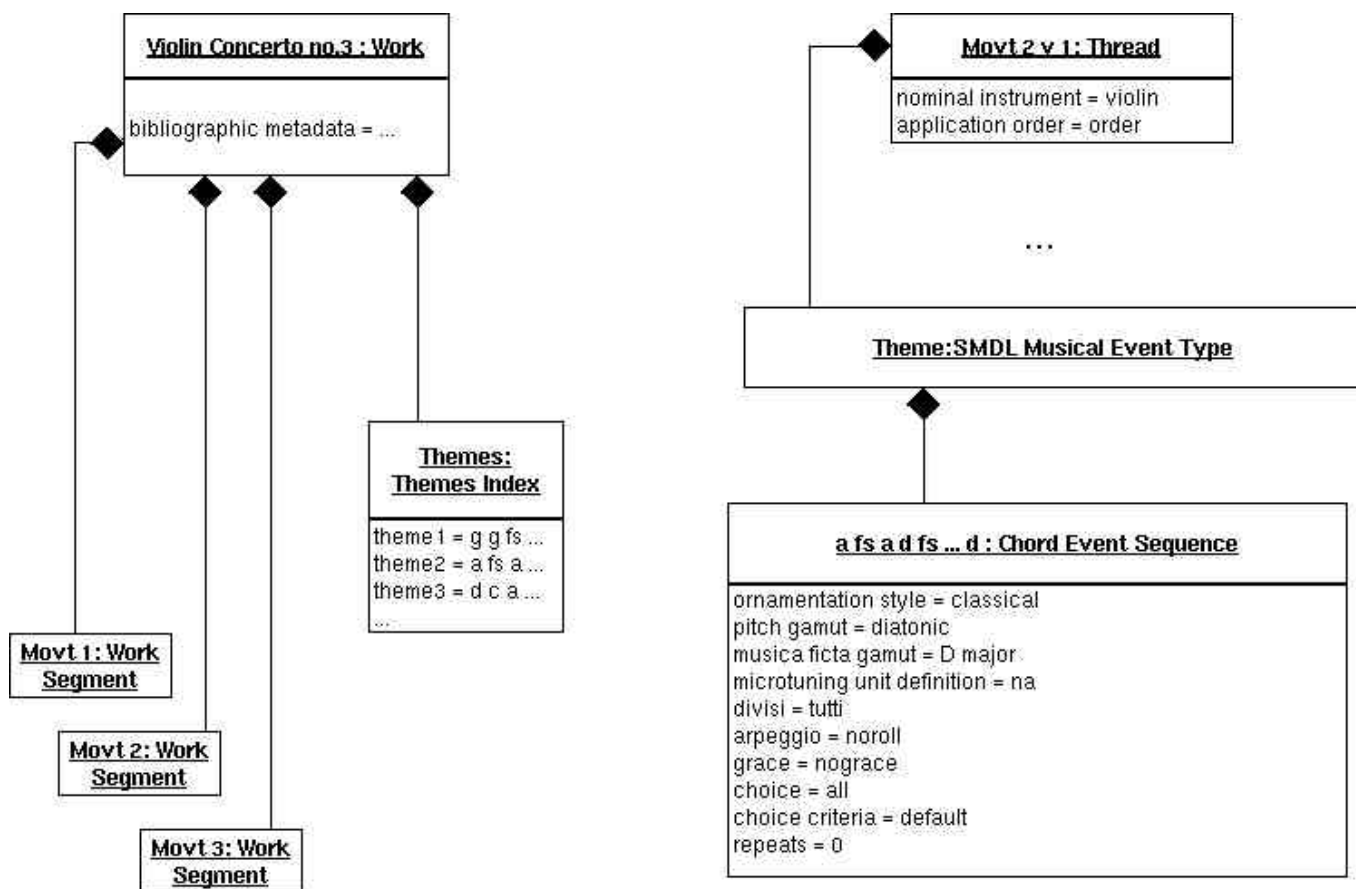
D: other SMDL musical event (standardized as in SMDL)

e.g. multimedia event within score



Examples

As to the fact that fitting examples have already been shown in document M3649 and P155, we will give only one example:



Most of the datatypes have been defined and specified in SMDL but will have to be rethought in terms of which D, DS and DDL will be chosen by MPEG7. As this is just thought to be a discussion document bringing several proposals together under a new and more generic solution, specifying the datatypes will have to be done in collaboration under and with MPEG7.

1. Explain which MPEG-7 requirements in the Requirements document the proposal addresses and how it satisfies them.

Describing music (or any time-based entity) in a structured way, such as this document proposes, makes it possible to have very efficient content searching in place. If one would try to search for certain aspects (melody, chords, texts, etc) in a piece of music formatted as “just” sound, there would have to be very heavy extraction algorithms to find this information. Being able to use the natural structure of music, describing its content structure, will make faster searches and new content search possibilities possible.

2. For Descriptors, please provide the data needed to perform the similarity evaluation, if applicable, as stated in the current document. If the MPEG-7 test set is augmented with other material or a different test set is used, please state why the MPEG-7 test sets were not suitable. Also the data set used must be made available to MPEG on the same conditions as the MPEG-7 Test and Evaluation Material. (See Annex I).

2.1. Typical search / filtering tasks the proposal applies to.

smdl: “themes indexes” – automatic or extracted

Extraction methods differ for different media:

Sound: melody extraction methods could utilize features/descriptors such as proposed in p207 - p221 or be based on existent technology

Image – music recognition systems (MidiScan)

Structured Music Formats – For formats such as Midi, SMDL, NIFF, etc it would be straightforward to extract the melodies.

In a more general and cross-domain definition, this feature could also create or contain a feature for creating “thumbnail” or keyword indexes of video and image.

smdl: “end description” (can be automated or manually input)

Manually input or automatically extracts what kind of transition exists between two work segment, such as “3 sec pause” or “no pause”. Automatic extraction could be straightforward using other features/descriptors.

smdl: “lyric” (could be automated or manually input)

Automatic extraction from a sound would have to rely on speech/sung word recognition algorithms which seems not feasible for the near future. From structured formats such as NIFF, SMDL, score, enigma, it could very well be extracted automatically.

smdl: “nominal instrument”

Automatic extraction might be possible via instrument recognition in sound files. From structured formats such as Midi, SMDL, etc it is straightforward.

smdl: “tuple”, smdl: “chord event sequence”, smdl: “pitched not”, smdl: “rest”, smdl: “chord change”, smdl: “other smdl event”

Automatic extraction might be possible in sound in certain cases and at some point in the future. In structured formats it is already feasible but might not be wished in all cases. Mostly links to a structured data would be used.

For content analytical tasks, such a group of features describing the music context in such a detail would be invaluable.

Also it might be interesting to describe a piece of music to such a depth (maybe manually) in order to synthesize a music format out of it.

2.2. Explanation of the similarity measure used, if any.

Possible and valuable, but not described here.

Annex E: Form to fill out for Descriptors

1. Which media has your descriptor been developed for and/or applied to? (Choose one or more)

(a) Video	(b) Audio XXX	(c) Synthetic video/images
(d) Synthetic Audio XXX	(e) Still Images	(f) Combined Audio-Visual XXX
(g) Cross-Modal	(h) Others (please specify) _____	

2. Which media do you use to extract your descriptor from? (Choose one or more)

(a) Video	(b) Audio XXX	(c) Synthetic video/images
(d) Synthetic Audio XXX	(e) Still Images	(f) Combined Audio-Visual XXX
(g) Cross-Modal	(h) Others (please specify) _____	

3. Describe the feature your descriptor is associated to.

The features of the descriptors are associated to adding to a detailed description of music structure in a music event.

4. Discuss why the above feature is important to MPEG-7.

Descriptors and Description Schemes – General Requirements

1. Types of features:

- Annotation - supported through links defined in other proposals
- N-dimensional Spatio-temporal structure - supported in defining music structure as a time-based entity
- Statistical information - can be easily extracted from features proposed, statistical information such as “Mozart in the average uses more major than minor chords” has to be based on features such as described in this proposal
- Objective features - the proposal is about finding a objective means as possible to describe music generically
- Subjective features - are not supported
- Production features - are not supported
- Composition information - in that it describes the composition as a structured entity
- Concepts – defines musical concepts such as chords, tuplets, music entities, etc

2. Abstraction levels for Multimedia material:

- supported, the description of music content as a hierarchical structure

3. Cross-modality:

- Concentrates on structuring music for resource and content discovery

4. Multiple Descriptions

- The features propose to have a structured content representation enabling different views. These views could be different descriptions depending on which thread (SMDL thread, C-ope thread, other thread) is used.

5. Description Scheme Relationships

- descriptors in different description schemes could be supported. The schemes already rely on Descriptors hopefully proposed elsewhere.

6. Feature priorities - 7. Feature hierarchy

- Higher priority is a general time structure lower priority would be a low-level description of the structured music event. Such a low-level description would encompass all D and DS described in the proposal.

8. Descriptor scalability - 9. Description Schemes with multiple levels of Abstraction

- There are multiple layer of abstraction depending how deep one chooses to describe the musical content, down to not by note level.

10. Description of temporal range

- supported

11. Direct data manipulation

- very much so especially with the use of links into structured audio. With a very detailed level of abstraction a basic music entity can also be synthesized: i.e. manipulation of the description manipulates the data itself

12. Language of text-based descriptions

- not supported, as it is a music language (based on Standard Music Description language)

13. Translations in text descriptions

- not supported, not addressed

Descriptors and Description Schemes – Functional Requirements

1. Content-based retrieval

- supported very efficiently
- searches into content are faster if these DS and D are in place than D and DS which rely on signal processing extraction methods.

2. Similarity-base retrieval

- comparison and similarity measures can be handled over a critical mass of data
- more efficient than D and DS which rely on signal processing extraction methods

3. Associated information

- links to other important information such as bibliographic information and textual transcripts

are employed

4. Note:

- not applicable

5. Streamed and stored descriptions

- feasible.

6. Distributed multimedia databases –

- This proposal does not aim at cross-domain resource discovery but rather distributed resource discovery over a critical mass and the content of music data in different formats. I.e. This proposal rather concentrates on providing a framework for resource and content discovery in music or time-based events. It meets an urgent need of the music user community.

7. Referencing analog data

- supported through defining views of the music structure, the view being an image, a sound or structured formats. Links, as proposed in P154, P169, P163, P170 (with only two types: structured and unstructured) are to be used.

8. Interactive queries

- possible

9. Linking

- uses other proposed features for linking to data

10. Prioritization of Related Information –

- see above

11. Browsing

- enables browsing between different parts of the music event

12. Associate Relations

- supports relations between the component of a description

13. Interactivity support

- not applicable

5. If your descriptor is content-domain-specific (e.g. biomedical images) please answer the following:

5.1. Which domain does your solution support?

- Description of Music or time-based events
- content based navigation and retrieval of music
- efficient resource (content) discovery over a critical mass of music data

5.2. Is there evidence of support from professional organizations for the technology proposed and/or from applicable current domain practices?

There has been a significant need for the last 10 years, especially in the areas of music publishing and now with the web where information retrieval requirements have to handle

intelligently massive and a critical mass of data.

5.3. Is this applicable to other domains? Please list.

No.

6. State up to three MPEG-7 applications

music databases

- searches across music database for finding resources or academic interests such as musicological research

research

- content searches for musicology

dynamic music representation over wide area networks

- such a feature could be used to support dynamic representations of music over WAN's educational applications
- educational applications rely heavily on the above three