An object oriented model for the representation of temporal data in the Integra framework

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ICMC 2009
What is Integra?

- “A European Composition and Performance Environment for Sharing Live Music Technologies”
- An EC financed project led by Birmingham Conservatoire in the UK
- Attempts to address the problems of persistent storage, portability and standardized intercommunication between systems for electronic music.
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For this research the objectives are:

- To complement the (synchronous) Integra module with the ability to store and edit time-based data.
- An abstract definition (and possible implementation) of a DSP process, a documentation item or a relation between modules.
- It should be possible to use the same time data regardless of module implementation.
- It should be possible to extend and alter existing work.
- The work here is a proposal, and work is currently at the development stage.
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Related work (music)

**MIDI**
The (still?) dominant mechanism for time based information.

**SDIF and GDIF**
Spectral and gestural data. May be incorporated in IXD.

**MetriXML**
CLAM’s XML based score file format. Similar to IXD sequences.
Related work (music)

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Related work (general)

**SMIL**
A W3C endorsed multimedia format for synchronizing multimedia.

**RDF**
A language for describing resources (on the web).

**OWL**
Exhaustive (RDF related) language for descriptive ontologies.
Related work (general)

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The Integra framework

Environment A

Environment B
The Integra framework

Environment A

Environment B

libIntegra
The Integra framework

Environment A
player

libIntegra

Environment B
player
The Integra framework

Environment A
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Environment B
player

libIntegra

IXD
The player module

Schedule events

- continuously in Sequences
- statically as in state changes in Presets

Player features

- looped and reverse-looped playback of sequenced data
- random access to sequence data
- non-linear sequences
- relative representation of time (non-absolute)
- non-track based
The player module

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The Event interface

Events

‘events’ scheduled by the player are instances of the Event interface. Its attributes are:

- address
- value
- interpolation

Presets

Presets inherit from the Event class: An event that contains events.

- No time information
- All addresses must be unique
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Player module example

Asynchronous input

Player.1
/Player.1/play 1

Player.3
/Player.3/record 1
/Player.2/synchro 1 1502

Player.2
/Player.2/synchro 11502

Harmonizer.1
/Harmonizer.1/transpose 6

Delay.1
/Delay.1/delay-time 100

Sequence data read from file

OFF
ON

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Storage

The IXD file format

- Already used for module definitions and collections of modules (patches).
- Time based data forms an extension to the existing formats.

Sequence

Sequences of events in time.

Preset

A set of events describing a state.
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Storing Sequences

Re-usability

A Sequence can link in other Sequences, or parts of other Sequences:
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```
<state>
  <value title="mysequence"
    xlinktype="simple"
    href="mysequence.ixd"
    show="embed"
    selector="2" />
</state>
```
Storing Sequences

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Storing Sequences

Sequences

List of timed events. Sequences may trigger other Sequences.

```xml
<sequence id=0>
  <event tick="0" id="1"
    marker="Foo Bar">
    <address class="delay"
      attribute="time"/>
    <value>400</value>
  </event>
  <!-- we deleted event id="2"
  at some point -->
  <event tick="0" id="3"
    marker="">
    <!-- this goes to 'another'
     player -->
    <address class="player"
      attribute="play"/>
    <value>1</value>
  </event>
  <event tick="100" id="4"
    marker="Baz Bam">
    <address class="delay"
      attribute="time"/>
    <value>800</value>
  </event>
</sequence>
```
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</sequence>
Storing Presets

Preset

Presets define events: address/value pairs with no time information

```xml
<preset class="delay" name="delay preset 1">
  <event>
    <address attribute="frequency"/>
    <value>800</value>
  </event>
  <event>
    <address attribute="phase"/>
    <value>0.5</value>
  </event>
</preset>
```
Preset

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<preset class="delay" name="delay preset 1">
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    <value>0.5</value>
  </event>
</preset>

<event tick="100"
  type="preset"
  href="mypreset.ixd"
  id="5"
  marker="Load delay preset 1"
  selector="2">
```

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Presets define events: address/value pairs with no time information

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<event tick="100"
  type="preset"
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```

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Temporal data representation
ICMC 2009
Inheritance

Overriding properties

Existing data may be extended, dynamically or statically.

```
<sequence>
  <name>sawtooth_mod</name>
  <description>Simple linear ramping to modulate the frequency of a sawtooth oscillator</description>
  <tag>ramp</tag>
  <event tick="0" id="1" marker="Section 1">
    <address class="SawTooth" attribute="frequency"/>
    <interpolation>1</interpolation>
    <value>550</value>
  </event>
  <event tick="100" id="2" marker="">
    <address class="SawTooth" attribute="frequency"/>
    <interpolation>1</interpolation>
    <value>800</value>
  </event>
  <event tick="100" id="3" marker="Section 2">
    <address class="SawTooth" attribute="frequency"/>
    <interpolation>0</interpolation>
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</sequence>
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Meta-Data

Tags

- Sequences and Presets may be tagged with semantic information.
- Relations between entities may be created.

Documentation

- Documentation resources may be linked in with Sequence and Preset files.
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Implementación

Integra Environment (beta)
Implementation

Integra Environment (beta)

Temporal data representation
Implementation

Integra Environment (beta)

Temporal data representation
A proposed format for storing and sharing time-based data.

- XML-based drawing on MIDI, RDF and SMIL with the ability to include SDIF and GDIF.
- Extending the IXD Schemas for Module definitions, Collections and Integra documentation.
- Employ semantic richness and sustainability.
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