

A Linking and Interaction Evaluation Test Set for SMIL

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ABSTRACT

The SMIL 2.0 Language profile support several mechanisms for controlling interactivity in a SMIL 2.0 presentation. Unfortunately, the SMIL standard testset does not verify complex interactions of linking/interaction behavior of SMIL players and applications. This paper describes a linking and interaction test suite that was developed as part of the Ambulant SMIL Player project. We begin with a short review of SMIL's linking and interaction facilities, then describe aspects of the test suite that have proven to highlight faults in current SMIL players.

Categories and Subject Descriptors

H.5.4 Hypertext/Hypermedia [Navigation], H.5.1 Multimedia Information Systems [Evaluation].

General Terms

Experimentation, Performance, Verification

Keywords

SMIL, Linking, Test Sets

1. SMIL LINKING AND INTERACTION

The SMIL 2.0 language [1,2] provides rich support for temporal linking and interaction control within a multimedia presentation. These facilities provide a multimedia author with the means to create interactive media presentations without needing to resort to scripting. Unfortunately, SMIL linking and interaction is not well understood by authors or fully implemented by SMIL players.

One of the reasons for the lack of interaction support is the SMIL interaction has complex side effects and timing and synchronization that are not well documented. These side effects are not tested in the SMIL standard testsuite [3]. This work has investigated a test suite that is intuitive (so that human authors can read and understand the nature of the test) yet sufficiently complete to help the implementors of SMIL players verify the linking/interaction behavior of their systems.

This paper presents an overview of a test suite that exercises SMIL's interaction mechanisms. We provide example SMIL fragments that highlight test cases that are not well-implemented by current generation SMIL players. A complete copy of the test suite is available for download [4].

2. LINKING/INTERACTION TEST SUITE

There are three mechanisms that SMIL provides to control linking and interaction behavior: a general linking infrastructure, which

allows anchors to be associated with the temporal behavior of interior nodes in a presentation or an external target; an event mechanism that allows the beginning and end of elements in a presentation to be defined relative to a UI event on an anchor; and the `<excl>` (exclusive) time container, which allows a-temporal timing to be specified within a presentation.

As part of a more general test program, several scenarios have been defined to exercise the following link properties:

- General link-based navigation;
- Selective start/end of elements based on events;
- Start/end of objects based on links;
- Preemptive execution based on priority classes;
- Selective activation based on the `<excl>` semantics; and
- Temporal seeking via links.

This paper highlights various aspects of this test suite that have proven to be problematic for many SMIL players. We summarize general interaction support and explain individual cases below. Section 3 discuss if (and how) the cases are supported by players.

2.1 General Link Navigation

General link-based navigation in SMIL corresponds to coarse and fine-grain navigation of the presentation timeline. The coarse navigation, in which a presentation is seeked to high-level nodes in the timing hierarchy, can take place on whole-node anchors or on anchors defined as temporal areas on media objects. Typical uses cases are references to out-of-scope content or as internal tables of contents (in which the links may change over time).

2.2 Event-Based Start/End

A more problematic form of interaction is illustrated in the Fig. 1. The element `T0` contains a set of temporal containers that test event-based behavior. `T01` displays an image for 5 seconds. If during this period the user clicks anywhere on the image, `T02` is started. If the user clicks on `T02` while it is active, `T04` will start (otherwise not); the whole-node anchor `T03` will also be activated as a consequence of the activation of `T04`.¹

2.3 Preemptive Interaction Using Pausing

Where the previous example was link-based, the element `T10` in contains an `<excl>` that illustrates the use of priority classes to contain preemptive content. `T11` defines pause behavior for its

```
<par id="T0">
  <img id="T01" dur="5s" ... >
    <area id="T01Hit"/>
  </img>
  <img id="T02" dur="3s" begin="T01Hit.activateEvent" ... />
  <a id="T03" href="#LinkPix">
    <img id="T04" dur="5s" begin="T02.endEvent" ... />
  </a>
</par>
```

Figure 1. Event-based activation.

1. In this and other fragments, we only show relevant attributes.

```

<excl id="T10" endsync="T13">
  <priorityClass id="T11" peers="pause">
    <img id="T12" dur="5s" begin="T131.activateEvent;
      T132.activateEvent;T133.activateEvent;
      T134.activateEvent;T135.activateEvent" .../>
    <seq id="T13" dur="5s" begin="0;T12.activateEvent">
      
      
      
      
      
    </seq>
  </priorityClass>
</excl>

```

Figure 2. Pause semantics of `<excl>`.

peers: the content element *T13* starts first because it has an explicit begin time of 0s. If the user clicks on any one of the countdown images in *T13* while it is active, its timeline will be paused by *T12*: an other image will be displayed for 5 seconds, after which *T13* should resume for the remainder of its allocated time. If *T12* is selected, the old state of *T13* is removed, and *T13* starts life a-new. *T10* ends at the conclusion of *T13*.

2.4 Temporal Seeking via Links

Perhaps the most complex linking behavior supported by SMIL is the temporal seeking into a time container. (The behavior can be very complex if combined with events; we show only a simple case here.) Element *T3* contains a collection of six images, each with an anchor. The anchors refer to elements within the timed `<par>` container *T33*. If started normally (or as a result of the link on *T31*), six counters are shown: *T331* counts from 1 to 6; *T332* starts a second later and counts from 2 to 6; *T333* starts 2 seconds after *T331* and counts from 3 to 6. (And so forth.) If the temporal seek works correctly, all of the counter work synchronously when activated based on the index into the parent `<par>`.

3. EVALUATING SMIL PLAYERS

The test suite was applied to three SMIL 2.0 players: the RealPlayer 10 [5], Internet Explorer 6 [6] and the Ambulant SMIL player [7].

In spite of being the Web's most widely distributed SMIL player, IE has no support at all for SMIL temporal linking. As such it failed all temporal linking-related tests. (IE supports non-temporal HTML linking, but it does not support any navigation to elements within time containers.) Event-based activation and use of the `<excl>` with pause and delay semantics worked well for single nested constructs.

The RealPlayer provides support for general linking and for simple temporal seeks. It also supports general `<excl>` processing for non-nested `<excl>` elements. Strangely, the key semantic requirement of an exclusive element that only one of its children be active at any one time was poorly supported. The RealPlayer failed the tests for priority class activation and linking using whole-node activation.

The Ambulant player provides comprehensive support for linking and `<excl>` semantics. The Ambulant player passed all except the pause semantics test for non-continuous media; pause semantics with continuous media worked as specified.

4. CONCLUSIONS AND FUTURE

The use of temporal linking and event-based activation can transform an otherwise conventional media slideshow into an interactive presentation. Unfortunately, the implementation support

```

<seq id="T3">
  <par>
    
      <area href="#T331"/>
    </img>
    ...
    
      <area href="#T336"/>
    </img>
  </par>
  <par id="T33">
    <seq id="T331">
      
      ...
      
    </seq>
    <seq id="T332" begin="1s">
      
      ...
      
    </seq>
    <seq id="T333" begin="2s">
      
      
      
      
    </seq>
    <seq id="T334" begin="3s">
      
      
      
    </seq>
    <seq id="T335" begin="4s">
      
      
    </seq>
    
  </par>
</seq>

```

Figure 3. Temporal Seeking via Linking.

for these core features is limited, which has made content authors weary of linking use. We hope that the development of open test suites can make a positive impact on the availability of these facilities in future SMIL players.

5. ACKNOWLEDGMENTS

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6. REFERENCES

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