TimeMapper using animated SVG in a WMS to visualise moving object data

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http://geoserver.itc.nl/TimeMapper/

ITC – University of Twente,
Faculty of Geo-Information Science and Earth Observation
real-world phenomena are dynamic
real-world phenomena are dynamic

we need tools to explore and see them dynamically
our focus:
our focus:
vector animations
our focus: vector animations on the web
our focus:
vector animations
on the web
generated automatically
from the data
our choice:
our choice:

![SVG icon]
our choice:
Scalable Vector Graphics
SVG: XML / Open Web
SVG: XML / Open Web Open Standard (W3C)
SVG:

XML / Open Web Open Standard (W3C) supported by all major browsers now (IE9!)
SVG:
standard includes SMIL declarative animation
(Opera +, Webkit/FireFox ±)
Prototype:
Prototype:

moving object data
Prototype: moving object data case-study on icebergs movements in Antarctica
Prototype:

moving object data

case-study on icebergs movements in Antarctica
Prototype based on:

ITC  SDI\textsuperscript{light}  OSGEO stack

RIMapperWMS
SDI light ....?
SDI
ILWIS + GeoServer + MapServer + OpenLayers + Java = stack
RIMapperWMS:
RIMapperWMS:
spatial database back-end (postGIS)
spatial and attribute data
Web Mapping Service configuration
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spatial database back-end (postGIS)
spatial and attribute data
Web Mapping Service configuration

server application (Java)
responds to WMS compliant requests
provides output in SVG
workflow:
workflow:

Storing temporal data
Designing SMIL animations
Converting temporal component
Developing animated mapping GUI
**workflow:**

Storing temporal data

<table>
<thead>
<tr>
<th>ID</th>
<th>TIME_ISO</th>
<th>TIME_SECs1970</th>
<th>GEOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>A35B</td>
<td>2009-01-08</td>
<td>3440534400</td>
<td>POINT(-56,-34.2)</td>
</tr>
<tr>
<td>A35B</td>
<td>2009-01-15</td>
<td>3441139200</td>
<td>POINT(-55,-32.3)</td>
</tr>
<tr>
<td>A35B</td>
<td>2009-01-17</td>
<td>3441312000</td>
<td>POINT(-53.7,-35)</td>
</tr>
<tr>
<td>A35B</td>
<td>2009-02-11</td>
<td>3443472000</td>
<td>POINT(-51.7,-31.6)</td>
</tr>
<tr>
<td>A36</td>
<td>2008-12-07</td>
<td>3438892800</td>
<td>POINT(-70.4,-62.3)</td>
</tr>
<tr>
<td>A36</td>
<td>2008-12-20</td>
<td>3437769600</td>
<td>POINT(-73.7,-61.4)</td>
</tr>
</tbody>
</table>
ISO 8601 extended format:

Schema: `ccyy-mm-ddThh:mm:ss.sssZ`


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workflow:

Designing SMIL animations
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Designing SMIL animations

```xml
<circle id="IB_A35B" r="25">
  <animate id="XanimIB_A35B_0"
    attributeName="cx"
    from="-56.4" to="-51.3"
    begin="2.56s"
    dur="1.41s"
    calcMode="discrete"
    repeatCount="none"
    fill="freeze" />

  <animate id="YanimIB_A35B_0"
    attributeName="cy"
    from="-76.6" to="-84.2"
    begin="2.56s"
    dur="1.41s"
    calcMode="discrete"
    repeatCount="none"
    fill="freeze" />

</circle>
```
workflow:

Designing SMIL animation movement

```xml
<circle id="IB_A35B" r="25">
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    dur="1.41s"
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    repeatCount="none"
    fill="freeze" />
</circle>
```
workflow:

Designing SMIL animation timing

```xml
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    begin="2.56s"
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    begin="2.56s"
    dur="1.41s"
    calcMode="discrete"
    repeatCount="none"
    fill="freeze" />
</circle>
```
workflow:

Converting temporal component
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Converting temporal component

OGC


SMIL

begin="2.56s"
dur="1.41s"
ISO 8601 to seconds since epoch

Real-world multi-unit time stamps in ISO 8601 format

1. Convert using algorithm

Real-world time stamps in seconds since 01/01/1900

2. Subtract start-time

Still real-world time extent and stamps in seconds but with start-time = 0

3. Multiply by temporal scale

Display-time time stamps in seconds with start-time = 0

T scale = 2.55*10^{-6}

(T.extent of 136 days in a 30 seconds animation)
• ISO 8601 to seconds since epoch
• subtract start-time
- ISO 8601 to seconds since epoch
- subtract start-time
- multiply by temporal scale

Real-world multi-unit time stamps in ISO 8601 format
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workflow:

Developing animated mapping GUI
Animated mapping GUI

Temporal legends
- Cyclic
- Digital clock
- Time-bar

Interactive functionalities
- User choices
- Functions to control the temporal dimension
  - Play/Pause
  - Time-slider
  - Looping
  - Speed-slider
Demo time!
Acknowledgments:
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David Dailey
Frank Bruder
Questions?

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