An Experiment on Spatial Data Exchange

October 24, 2001

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Content

• Structure and Schedule
• Experiment phase II
• Experiment phase III
• Considerations
• Demonstration
Structure for ISO 19100 series in Japan

ISO/TC211

ISO/TC211 Domestic Committee

Japanese National Standards for Geographic Information (NSGI) Committee with 5 WGs

Japan side
Activity in Committee of National Standards for Geographic Information

- **Development**
  - develop NSGI as conformed to ISO 19100 series
  - (mainly focused on exchange, in current)

- **Support applications**
  - specify methodologies to apply NSGI to practical operations

- **Experiments**
  - on Spatial Data Produces / Exchanges
Schedule of Spatial Data Experiments

**FY 1999**

**Spatial Data Exchange Experiment I**
- Convert existing spatial data to standard specification data sets
- Load standardized data set into existing GIS

**FY 2000**

**Spatial Data Exchange Experiment II**
- Merge multiple standardized data sets in existing GIS
- Exchange update information
- XML documentation for Application Schema

**FY 2001**

**Spatial Data Exchange Experiment III** (will end on March 2002)
- Dynamic recognition of the content of Application Schema
- Implementation of Portrayal Catalog / Specification
Results of

Spatial Data Exchange Experiment II
Dataset and file sizes

(Experiment II)

Impact of large file size:
- Hard to transfer files
- Process time of XML parsing
- Memory shortage in DOM process

Actions to reduce file size:
- Simplify Application Schema
- Assign short tag names
- Use ATTLIST if possible

<table>
<thead>
<tr>
<th>File ID</th>
<th>Original Data</th>
<th>19100 Conformed Data</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>513242</td>
<td>1,176 KB</td>
<td>7,364 KB</td>
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<td>564033</td>
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<td>6,584 KB</td>
<td>5.87</td>
</tr>
</tbody>
</table>

(Original Data are in CSV style.)
An Experiment on Spatial Data Exchange in Japan

Exchanging “Update Data”

Conformed to 19107, 19108, 19109 and 19118

Base Map (XML)

GIS - A

Update operation

Update Data (XML)

GIS - B

Get Update Information

Added

Deleted

Modified

(Experiment II)
Defining “Application Schema Description File”

Instances of any UML class diagrams can be encoded with XML.

MetaClass definitions by UML

Class

Property

Composition

Application Schema by UML

HighwayNode

GM_Point

TP_Node

Instantiation of MetaClasses by XML = Definition of Application Schema by XML

Class name="HighwayNode" tag="HighwayNode" abstract="NO" stereotype="Feature">

(Property name="BoundaryType"
 tag="meshuKyokai" datatype="Boolean"
 multiplicity="1" value="false"/>

 composers="Point" tag="pt"
 targetClass="GM_Point"
 stereotype="geometry" multiplicity="1" />

<Compositional name="Period" tag="pd"
 targetClass="TM_Period"
 stereotype="temporal" multiplicity="0..1" />

Application Schema Description File

General Encoding Rule

<Class_A>

<Data1> …… </Data1>

<Data2> …… </Data2>

</Class_A>
Characteristics of “Application Schema Description File”

( Experiment II )

- All contents of UML class diagrams are described in “Application Schema Description File” as an XML document.

- Contents of “configuration table” for Encoding are also included.

- Both of machine and human readable.

- Independent from commercial UML tools.

- Information of Application Schema can be stored and interchanged.
Overview of on-going

Spatial Data Exchange Experiment III
Highlights

( Experiment III )

- Base Map + Thematic data (Point data) overlay

- Dynamic recognition of Application Schema

- Implementation of Portrayal Catalogs / Specifications
Functional Overview

Conformed to 19107, 19108, 19109 and 19118

Base Map (XML)

Application Schema of Thematic Data (XML)

Thematic Spatial Data (XML)

Portrayal Catalogs and Portrayal Specifications (XML)

Based on 19117

(1) Load Standardized format file of Base Map data.
Application Schema of Base Map is statically defined in GIS-A.

(2) Load Application Schema Description File of thematic data, and recognize new classes and their attributes dynamically.

(3) According to the recognition of Application Schema, load Thematic Data and overlay them on Base Map.

(4) Load Portrayal Catalogs / Portrayal Specifications, and change the way to draw each features.

GIS (6 different systems)
### Schedule and Current Phase

(Experiment III)

<table>
<thead>
<tr>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
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</thead>
<tbody>
<tr>
<td>External Design</td>
<td></td>
<td>Detail Design / Development</td>
<td></td>
<td>Test</td>
<td></td>
<td>Documentation</td>
</tr>
</tbody>
</table>

Now

External Design has been completed.
Considerations
Considerations around Application Schema

- Differences between spatial attribute and thematic attributes.

An alternative:
=> Add stereotypes at the top of attribute statement to identify “spatial” or “thematic”

- Open standard format file for Application Schema descriptions.

(Experiment I ~ III)

Essential spatial Attr. for the feature

No way to distinguish each other.

Thematic spatial Attr. to draw additional data

An alternative:
Considerations around Encoding

- File size problem with XML
- Rule for general UML class diagrams.
- Exchange Configuration table
Demonstrations
Thank you