Kanishk Chaturvedi
10.02.2015

Minutes of Meeting
CityGML 3.0 WP06 Seventh Meeting

Participants

- Thomas H. Kolbe, TU Munich
- Gilles Gesquière, LIRIS
- Steve Smyth, OpenSitePlan
- Tatjana Kutzner, TU Munich
- Kanishk Chaturvedi, TU Munich

Agenda of the meeting

- Further discussion on the draft of the document structure and individual contribution for the paper on the versioning concept.
- Selection of the suitable conference/journal options in which the paper on the versioning concept should be published.
- Presentation by Gilles on an example use case of dynamics within CityGML.
- Presentation by Steve on several specific use cases requiring the support of dynamics within CityGML.
- Discussion on open questions on AAA and INSPIRE.
- Finalization of dates for the next meeting.

Structure of the paper

The document structure was further discussed during the meeting. The suggestions from the members were incorporated and in the section Related Work, the order of the subsections were changed to describe the standards related to semantic information models followed by the tools to support the versioning. The details of the structure are now as follows (Names of the authors of the individual sections are in brackets):

1. Introduction (Thomas/Kanishk)
   1.1. Brief introduction to the versioning
   1.2. Problem statement and motivation
   1.3. General overview of the entire paper
2. Use cases

2.1. Application use cases where the versioning approach may be beneficial
(Steve: use case on factual reconstruction, Gilles: use case for the requirement of versioning in 3D city models, Kanishk: use case for the requirement of versioning in 3D city models)

3. Related work
   3.1. How does the versioning work in following related standards/tools?
      3.1.1.AAA/INSPIRE (Tatjana)
      3.1.2.IFC (Gilles)
      3.1.3.ESRI ArcSDE Geodatabases (Kanishk)
      3.1.4.Oracle Workspace Manager (Kanishk)
      3.1.5.GIT/SVN (Steve)
   3.2. Section on temporality in 3D city models (Gilles/Kanishk)
4. Sketching our work (Methodology) (Kanishk)
   4.1. Requirements for the versioning of CityGML features
   4.2. Selected methodology
   4.3. UML model of the versioning schema in CityGML
   4.4. Versioning of aggregated features
   4.5. Representation of the versions
   4.6. Representation of the version transitions
5. Example scenarios/Proof of concept
   (Steve, Gilles, Kanishk as this chapter is based on the use cases in chapter 2.)
   5.1. How would the versioning benefit specific use cases?
   5.2. Examples with Instance data
6. Conclusion and outlook (Thomas/Kanishk)
7. References

Selection of conference/journal for the paper

- Steve suggested the conference “Conference on Spatial Information Theory XII (COSIT)” (http://www.cosit.info/) for publishing our paper. However, it was discussed for not selecting this conference as this conference focuses more on theoretical aspects; while our versioning approach is practical and rather belongs to applied research.
- It was agreed to prepare and send the paper for publication in the Second International ACM Workshop on Managing and Mining Enriched Geo-Spatial Data 2015 (GeoRich’15) (http://www.dbs.ifi.lmu.de/georich15/).
  - Date of workshop: May 31, 2015
  - Abstract deadline: March 2, 2015
  - Full paper deadline: March 9, 2015
- Kanishk will prepare the initial document structure of the paper and distribute to the authors. After receiving the updated documents from individual authors, Kanishk will compile all the sections to make it the final version of the paper.
- In case the paper is accepted for the workshop, Kanishk will attend the workshop in Melbourne.
- It was also discussed to check if there are ISPRS events for detailed publication on the versioning concept. Kanishk will check and notify the WP6 contributors about any ISPRS event in future.

Other discussion points

Can FME work with our versioning concept and can FME deal with XPath? This should be tested by creating an ADE for the versioning concept and by trying to generate data in FME as well as filtering out data for a specific time period.

Use cases supporting the dynamics within CityGML

Use Case 1 (by Gilles):

- Gilles presented the use case 'Managing dynamic changes in CityGML'. The dynamic attributes can be handled with the help of Tags and Flags. Tags represent the temporal steps at a given point in time or time interval. They always reference a geometry. Flags can be defined for a given tag to describe the behavior or state of the object.
- To support the dynamic attributes, flags can be extended as dynamic flags which can be considered as a container to represent geometry change, attribute modification etc. In this case, the flag can refer to a file or to a link referencing a stream of data. This feature was demonstrated with a use case showing the evolution of temperature during time using textures. The dynamic flag for specific time contains the references to the texture file which can be changed over the period of time.

Discussion:

- This concept allows attributes to be static or dynamic. E.g. it is possible to have static values for 8 weeks, then 2 days changing values, and then static values again.
  → This is an aspect which also has to be supported by us.
  → With our versioning concept this mix is possible, making the first 8 weeks = version 1, the next 2 days = version 2, and the following time interval = version 3.
  → The concept provides good ideas how dynamics can be realized.
- The concept has another interesting characteristic: it separates the storage of the different versions / dynamic states of an object (Flags) from the selection criterion stating at what point in time or also in which situation which state should be active (Tags).
- This approach currently only supports discrete points in time. Periodic changes are not yet supported. Would it be possible to support continuous time ranges and patterns (periodic times or cycles)?

Use case 2 (by Steve):

- Steve presented on the generalization of moving parts with the help of foreground/background dichotomy. The use cases include the operation of an elevator where the building or elevator space is background and the elevator car is foreground. It can be represented using the time animation of relationships between the foreground and background.

Discussion:

- CityGML defines the classes and objects for the relevant topographic objects with respect to their geometrical, topological, semantical and appearance properties. However, the CityGML standard does not define how the function operator works, i.e., it does not define states that cause a change to happen, for example, pushing the elevator button.

- How can we modify the state of the geometry? For example, a window can be opened or closed at a specific point in time. How can the state of the window be set to “opened” and “closed”? In such a case, states can occur multiple times in a day, which is currently not supported in the versioning concept.
- The support of dynamics requires the mapping of values to the time domain which can then be linked by a mapping function. The function of time represents the change in attribute by either using a table or patterns (in case of repetitions or recursive structures). The value can either be related to geometry or attributes, for example, the position of an elevator or heat energy demand values for a building. This leads to the question, how we can determine one value for a specific time. We can use a specific selector to select the correct dynamic instance. Our versioning concept already supports this by means of state objects and a bitemporal model.
- Can we achieve parameterization of the objects? There may be different sources and specialization of parameters, one of them can be time-dependence (there might also be other types of specialization, but our intention is to show in particular how time-parametrization can be achieved). Instead of fixed values, we can supply parameterized functions for the time values.
- Where does the time live? Externally to the model or explicitly within the model?
  → Absolute time is needed, model represents an ensemble of all time values

Follow-up information on the teleconference December 16, 2014

- Tatjana spoke to Clemens Portele regarding open questions on AAA and INSPIRE (cf. minutes of fifth meeting, 16.12.2014):
- Between the AAA versioning schema and the AAA technical schema no connection has been modelled. The AAA versioning schema exists only as a concept, no concrete implementation is available. This is due to the fact that ISO 19109 does not support versioning. According to ISO 19109 each version of a feature is considered as an individual feature, which means, that also features with identical identifiers having additional timestamps are considered by ISO 19109 as separate features. Therefore, the AAA versioning concept is in a strict sense not ISO 19109 compliant. The same is true for INSPIRE, which is why currently only the last published version of spatial objects is supported in INSPIRE but no historic objects.
- The XPath mechanism can be used for referencing different versions of the same feature without any problems. However, there might be performance issues with this approach when processing XML-encoded CityGML files. Hence, it was recommended to test the approach with a very large dataset.

Next steps

- Kanishk will prepare the initial structure of the paper and distribute it to the authors. Each contributor will then start writing his/her sections as defined above and send them to Kanishk before March 2, 2015. Kanishk will then compile all the sections. The goal is to have a first draft of the complete paper by March 2, 2015 which gives enough time to review and prepare the final version of the paper. As per the deadlines, the abstract has to be submitted by March 2, 2015 and the full paper by March 9, 2015 (Deadlines: 11:59pm PST).

- Kanishk will summarize the relevant terminology and list the points to be considered for supporting the dynamic model within CityGML. These points will be discussed in the next meeting.
- Kanishk will prepare a presentation about use cases supporting the dynamics within CityGML.
- Tatjana will prepare a presentation on the OGC Moving Features standard and its relevance for the use case of moving parts presented by Steve.
- Steve will prepare a presentation on the standard WaterML 2.0 (especially about the part which is going to be renamed to TimeSeriesML in the future) and its relevance for our work package.

Next meeting

- The next teleconference will take place on March 19, 2015 (5pm-7pm CET).