Kanishk Chaturvedi
21.05.2015

Minutes of Meeting
CityGML 3.0 WP06 Tenth Meeting

Participants

- Thomas H. Kolbe, TU Munich
- Gilles Gesquière, LIRIS
- Steve Smyth, OpenSitePlan
- Volker Kraut, M.O.S.S.
- Tatjana Kutzner, TU Munich
- Kanishk Chaturvedi, TU Munich

Agenda of the meeting

- Discussion on proposed approach for the submission of paper related to versioning concept.
- Presentation by Kanishk on the modified approach for a dynamic data schema in relation to interpolation and patterns.
- Finalization of dates for the next meeting.

Discussion on the paper related to the versioning concept

- The paper on the versioning concept titled “Managing versions and history within semantically enriched 3D city models” was submitted for publication in the Second International ACM Workshop on Managing and Mining Enriched Geo-Spatial Data 2015 (GeoRich’15). However, the paper was not accepted.
- It was discussed that the paper will be further modified as per the comments provided by the reviewers and will be submitted to 3DGeoInfo 2015 (http://www.geoinfo.utm.my/jointgeoinfo2015/3dgeoinfo.html). The deadline for submission is June 10, 2015 and the maximum page limit for the paper is 10-15 pages. This would allow us to explain our versioning approach in more detail.
- In the new version, more emphasis should be given on
    - Implementation of the version approach or extension in a least invasive way
    - Conflict detection
    - Proper balance between formal description, use cases and proof of concept
- Kanishk will prepare a first draft of the paper and share with the co-authors for review before May 29, 2015.
- Gilles will provide further source of literature in relation to the history or versioning within 3D city models.

Presentation by Kanishk

- Kanishk presented the modified approach of a dynamic schema for supporting dynamic/time-varying attributes within CityGML. The presentation focused on three major research questions:
    - Is it possible to support interpolation within coverages?
    - Is it possible to support patterns within our approach?
    - Is it possible to support spatial components (geometries) within the range set of coverages?
- In relation to the interpolation, two standards were reviewed and discussed during the presentation: ISO 19123 (Schema for coverage geometries and functions) and WaterML 2.0 Timeseries.
- ISO19123 allows defining discrete and continuous coverages, which contain a spatio-temporal domain set. The range of a coverage is a set of feature attribute values. The domain values are mapped to the range values values using a coverage function. The coverage functions within continuous coverages allow defining interpolation methods to derive feature attribute values. However, continuous coverages are still under reconsideration and not supported by GML3.2.1 and GML3.3.
- The standard WaterML2.0 allows defining timeseries as discrete coverages, which means, an instance of such a coverage would be a set of ordered time instances where each time instance is associated with a single value from the attribute space. This association is often represented using time value pairs or a domain range. Interpolation types can be defined ’per point’ within timeseries, allowing the relationship between time instants and the recorded values.
- In the next part, it was presented that the WaterML Timeseries can further be extended to support patterns. By facilitating the start and end points with an increment value, the patterns can consist of a sequence of different timeseries. Further, complex patterns (e.g. separate patterns for energy values for weekdays and weekends) can also be defined.
- The presentation includes a UML diagram for the proposed approach. The model allows defining coverage functions for discrete as well as continuous coverages. Further, according to the WaterML2.0 standard, Timeseries can be realized as discrete coverages allowing mapping of time-value pairs. The patterns can be defined as feature types which can consist of a sequence of different timeseries. The feature type ‘Modifier’ is of type coverage which refer via XPath to a specific property of a CityGML feature which value will be then overridden or replaced by the (dynamic) values specified in the 'Modifier' feature.
- In the end, the presentation includes the description of gml:valueArray which is supported as range types within coverages. Since its value component can be of type gml:AbstractGeometry, it should allow defining geometries or spatial components within the range set of coverages. That would help in providing the support of moving objects or alternative geometries with respect to time.

Discussions:

- Slides 9: Out of the mentioned types of continuous coverages, CD_SegmentedCurveCoverage should be related to our approach. That would allow the support of linear interpolation for a timeseries in a coverage.

- Slide 18: In relation to CityGML, we should not only restrict to the measurement and categorical values, but consider all properties (and property types) to be made dynamic and, thus, having time dependent values.
- Slide 23: In relation to the support of interpolation in coverages and WaterML timeseries, two important questions arise, 'Does the interpolation type only denote that the given value for a time-value pair has been interpolated by the named function?' or 'Should the values for unsampled time points be interpolated using the named function?'. However, in order to provide support of interpolation in our approach, we should currently proceed with the WaterML standard by defining the timeseries as discrete coverages and assume that the interpolation type denotes the interpolation function to be used for the derivation of values at unsampled time points. Another question is: Do our use cases need continuous coverages at all or can we do without them?
- Slide29/30: The patterns only support absolute points in time. However, they should also require the usage/handling of relative points in time and time periods. An anchor point would be needed to anchor the structure to an absolute point in time. Also, it should be possible to express the termination of the patterns (e.g. by determining the length and repetitions of the patterns using a repeater attribute). One hint for a similar approach is Microsoft Outlook Calendar entries for repeated appointments.
- Slide 29: The pattern model should be defined using the 'composition' design pattern. It means a Timeseries can either be an atomic timeseries (having a single type of values) or a complex timeseries (having a sequence of different timeseries).
- Slide 30: The support of gml:AbstractGeometry in the domain set may be omitted in our model as we are considering only the temporal domain sets (1-dimensional domains of time).
- In the mentioned approach, time is the only selector to a specific state. However, the domain might also be a set of discrete states, e.g. the state of a building. We agreed to currently look at time as the only selector and to investigate the concept and relations of 'state' later (maybe even in a later CityGML version).

Next steps

- Kanishk will prepare a first draft of the paper to be submitted to 3DGeoInfo 2015 and share with the co-authors for review before May 29, 2015.
- Kanishk will prepare a presentation for the next meeting in relation to the discussed open questions for patterns and interpolation.

Next meeting

- The next teleconference will take place on June 15, 2015 (5pm-7pm CEST).