Development of IfcRoad in KICT (Korea)

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1. Outline

Most designers are still designing and delivering 2D drawings for civil projects over the world. There are no standardized common exchange format internationally for ensuring data interoperability of road project including bridges and tunnels etc. Currently, Korea and V-Con project only exist. Existing delivering system of overall design data with 2D drawings needs to be changed into BIM environment with IFC format for infrastructures. Besides, international efforts and needs for GIS integration of IfcRoad to apply Infra BIM and for integrating life cycle data of civil facilities into IfcRoad. This IFC development project for road is a small project of "Development of Information Model Standard and Verification Technique for Infra BIM". Now, it is in the middle of third year of 5 year since 2012.

2. Development Concept and Approaches

This project is focusing on the road facilities with earthwork, pavement, drainages (like distribution), and subsidiary facilities. Also, we need to concentrate on delivering 3D model for civil facilities to government after making 3D shop drawings in design phase. The development process has been centering on the IFC schema extension in terms of object shape representation, components (Entities) and basic attributes (Pset). Basically, the IfcRoad is based on the IFC4 (ISO 16739). We extended IfcSpatialElement for civil space, IfcCivilElement for civil facilities and elements, IfcElementComponent for civil components and parts, and IfcCivilElementType for their types.

The spatial extension for IfcRoad includes topographical space for site (original and planned site), structural space for civil structures with road, bridge and tunnel etc., and line reference space for horizontal, vertical and sectioned space in the perspective of management according to the characteristics of civil projects with GIS with node and link for road network and division by station with chainage data.

In order to extend the IfcRoad entities and their attributes, we followed the next 4 steps; classification, categorization 1, categorization 2, and normalization. Through these processes, we configured the standardized 3D cross-section drawings for road segments, which include road shoulder, marginal strip, median strip, carriageway, frontage road, and footpath etc. In road facilities, pavements are critical elements because it is used for all civil facilities with alignment. The pavement has multiple layer with different material configuration. This is represented visually by IfcMaterialLayerSet.

Besides, in terms of alignment model, we follow an IFC schema (IfcAlignment) developed by Prof. Andre Bormann from TUM, DE. Since this alignment model is being developed by InfraRoom, we won't develop our own alignment model and will reflect the final standardized alignment model into the IfcRoad for future. In a IfcRoad converter being developed, an alignment model will be adopted as as-built model prepared by Autodesk Civil3D, not a parametric model.

We also extended the entities for drainage and subsidiary facilities based on IFC4. In case of drainage, new drainage entities for civil projects are added into IfcFlowSegment and IfcDistributionChamberElement. Currently, we are developing an IfcRoad converter and viewer for verifying the IfcRoad schema for Revit for structures and Civil3D for road and earthwork with alignment.

3. Conclusions and Discussions

We extended 121 entities, 43 types with 2 units (defined types), 11 material resources, 476 attributes with 70 Pset for IfcRoad schema. We are now preparing for specifications for IfcRoad schema. Also, we are developing IFC schema for bridge and tunnel based on IFC4. We need to incorporate with all the IFC for infrastructures. Besides, we should consider parametrical modeling based on IFC4 in the IfcRoad schema. Of note, we need to discuss with other countries to collaborate an IFC integration and standardization and bring our IfcRoad schema to an international standard with buildingSMART.