Transforming Spatial Data Between BIM and GIS

Application of Highway Cut and Fill Earthwork Balancing Using 3D BIM and GIS Information

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Today, the BIM and GIS world are operating in different platforms which result in different data formats, scales, representations, and diverse reference systems. But it is apparent that the integration of BIM and GIS can offer substantial benefits to each other as follows:

- Improved design process
- 3D visualization for project participants
- Coordination between different disciplines
- Interference checking
- Automatic quantity take offs
- 4D scheduling
- Improved documentation of design intent
- Potentially used for as-built drawings

The proposed project is intended to provide a thorough review by investigating the technical capabilities between BIM and GIS and measure the different strengths and weaknesses of each approach. Then, the proposed project aims to conduct a series of case studies in order to evaluate the two distinct environments by demonstrating spatial analysis in facilitating the seamless, continuous work process.

While utilizing the BIM technology, the proposed project will base its research on a highway BIM data model to store rich infrastructure information and then on GIS information such as land boundaries, environmentally sensitive regions, and topographic data. In order to retrieve and integrate the two distinct types of data formats, this research will consider different options including the semantic web approach. The concept of the semantic web is applied in this project to provide semantic interoperability between BIM and GIS operations and to demonstrate the feasibility of the combined technology.

The proposed project plans to demonstrate the effectiveness of the integration through highway earthworks. Cut and fill earthwork is one of the most critical processes of a highway construction project. Thus, the proposed project will focus on the process of moving from high areas (cut area) to low areas (fill area) to accomplish an appropriate road grade by integrating spatial data between BIM and GIS. The project will demonstrate how the overall integration can be achieved by demonstrating the following aspects:

- Develop a process of how to convert different spatial data between different BIM and GIS
- Transform spatial data into a precise data model that the user needs in earthwork calculations
- Integrate multiple different data types into a simplified data structure
- Share spatial data with people where, when and how they need it.