Query Answering System for Building Information Modeling using BERT NN Algorithm and NLG

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ABSTRACT

The construction industry is generally regarded as information intensive. Building Information Modeling (BIM) has been developed to provide considerable information support for construction activities. As more data is aggregated in building information models, it is more difficult and time-consuming to extract useful building information for construction project team members with limited BIM experience. In Industry 4.0, deep learning-based conversational Artificial Intelligence (AI) technologies provide more opportunities to support human daily life. Similarly, for smart construction, a conversational AI information retrieval system is considered important to provide building information support. This research aims to develop a conversational intelligent query answering (QA) system for attribute information retrieval from building information models. The methodology of the QA system for BIM was developed based on the Google pre-trained deep learning language neural network (NN) algorithm – Bidirectional Encoder Representations from Transformers (BERT) and natural language generation (NLG) methods. A Python-based prototype program was developed based on the methodology. Building attribute information-related queries were generated to test the accuracy of the developed QA system for BIM. The preliminary results indicate that the developed prototype achieved an 80.0 accuracy score, meaning 80 predictions exactly matched their ground truths, for providing answers to building attribute information-related queries. The developed QA system methodology for BIM was also found to be valid and relatively accurate. The contribution of this research facilitates the development of conversational AI systems that provide convenient information support for onsite and offsite construction personnel, and the developed QA system for BIM can be extended to other information retrieval areas.