

Automated Code Compliance Checking (AC3)

NBIMS Overview

The National Building Information Model Standard™ (NBIMS) is a set of interoperable standards for exchange of facility and infrastructure data through the life-cycle of a project. These data include information related to compliance with codes and standards, which serve to guide the design, construction and continued operation of buildings and facilities. NBIMS is a joint project coordinated by National Institute of Building Sciences (NBIMS) in conjunction with the International Alliance for Interoperability (IAI) and many other Facilities – related associations and software companies.

Business Case

The identification and search of applicable codes, standards and building regulations is primarily done “by hand” today. This takes time and costs money for professionals and firms preparing and completing designs and seeking a building permit as well as for the authority having jurisdiction in checking the submitted documents for compliance. The ability to perform building permitting, plan review, and construction approval and then approve building use with immediately accessible and specifically relevant codes, standards and building regulations can increase productivity, accuracy associated with determining compliance, save money, and significantly reduce the time it takes to begin construction.

Objectives

The objective of this project is to develop and demonstrate an approach and format required for automated code compliance checking (AC3) using a specific subset of the building code related to energy conservation in the short term and all building, fire, mechanical, etc. codes in the longer term. Through the approach created it will be possible to put building regulatory provisions in an interoperable format called SMARTcodes™ that can be applied against a BIM to achieve AC3.

Implementation

AC3 is being accomplished in the U.S. through the leadership of the International Code Council (ICC) with a project team of international experts including AEC3, Digital Alchemy, Battelle Memorial Institute, and ERDC Illinois. ICC is also collaborating with initiatives associated with buildingSMART® to ensure what is being done to automate the building regulatory process through SMARTcodes™ is interoperable with other building related programs supporting buildingSMART®.

Results to Date

- ICC created SMARTcodes™ for portions of the 2006 ICC International Energy Conservation Code (IECC).
- ICC developed software to read IECC SMARTcodes™ and process a rules set that was applied by model checking software to a BIM for the purpose of verifying IECC compliance.
- The application of SMARTcodes™ allowed 3D and 4D viewing of the building design as represented by the BIM and visual and automatic identification of areas in the building that did not comply with the IECC.
- Manual interaction with the 2006 IECC to address specific code compliance or code search questions was completed and the ability to drill down to reference standards, code commentary, evaluation reports, product listing directories and other information specific to a particular code criterion was demonstrated.

Future Work

- Complete a beta test application of the 2006 IECC and after verification of technical accuracy will make the IECC SMARTcodes™ available for AC3.
- Finalize the protocol and software to create SMARTcodes™.
- Create SMARTcodes™ for all the other ICC International Codes and assist federal, state and local agencies to make their amendments and associated building regulatory criteria also available in SMARTcodes™ format.
- Test AC3 for all the ICC codes and federal, state and local building regulations.
- Facilitate the adoption and application of AC3 in conjunction with the maturation and availability of BIM.

Contact Information

- Dave Conover - dconover@iccsafe.org

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