AutoBEM: Automatic Detection and Creation of Individual Building Energy Models for Each Building in an Area of Interest

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Abstract

Buildings in China, India, the United States (US), and United Kingdom (UK) consume 39-45% of each nation's primary energy with fast-growing countries like India projected to use 76% of their primary energy by 2040. In many countries, buildings are – or projected soon to be – the single largest energy-consuming sector in the world. Therefore, building energy efficiency can be one of the fastest, easiest, and most cost-effective paths toward reducing energy use worldwide. Developing sufficiently accurate building energy models enables return on investment calculations for determining the optimal path to an energy efficient built environment.

Development of urban-scale building energy models is becoming increasingly tractable for many applications including citywide energy supply/demand strategies, urban development planning, electrical grid stability, and urban resilience. This seminar has assembled several researchers with capabilities in the field of urban-scale energy models to discuss an overview of the field as well as the data, algorithms, workflow, and practical challenges addressed in their applications involving creation of useful models of individual buildings at the scale of a city, urban, or metropolitan area.

Governments, universities, and industry are all developing significant capabilities for urban-scale building energy modeling…once a virtual city is constructed. To construct the models, most rely on local data sources that work at the scale of a city or county (such as a tax assessor's database) or flyover of the area of interest, but do not use data sources or algorithms that would scale to areas the size of a metropolis, state, or entire country. This presentation will show recent advances in scalable capabilities for automatically creating fully-articulated OpenStudio and EnergyPlus models of individual buildings for any area of interest.

Related Work

1. Muehleisen, Ralph, Crawley, Drury, and Joshua New *(Seminar Chair)* (2017). "Seminar 55 - Urban-Scale Energy Modeling, Part 6." In *Proceedings of the ASHRAE Annual Conference*, Long Beach, CA, June 28, 2017. [ANL] [Bentley]
2. New, Joshua R., Chen, Yixing, Choi, Joon-Ho, and Bass Abushakra *(Seminar Chair)* (2017). "Seminar 28 - Urban-Scale Energy Modeling, Part 5" presenting "Automatic Building Energy Model Creation (AutoBEM)." In *Proceedings of the ASHRAE Annual Conference*, Long Beach, CA, June 26, 2017. [ORNL] [LBNL] [USC]
3. Allen, Melissa, Bobker, Michael, Khan, Haider, Crawley, Drury, and Joshua New *(Seminar Chair)* (2017). "Seminar 55 - Urban-Scale Energy Modeling, Part 4." In *Proceedings of the ASHRAE Winter Conference*, Las Vegas, NV, January 31, 2017. [ORNL] [CUNY] [ICF] [Bentley]
4. Hong, Tianzhen, Muehleisen, Ralph, Long, Nicholas, and Joshua New *(Seminar Chair)* (2017). "Seminar 43 - Urban-Scale Energy Modeling, Part 3." In *Proceedings of the ASHRAE Winter Conference*, Las Vegas, NV, January 31, 2017. [LBNL] [ANL] [NREL]
5. Brown, Jason, Allen, Melissa, Scheer, David, and Joshua New *(Seminar Chair)* (2016). "Seminar 56 - Data Sources toward Urban-Scale Energy Modeling, Part 2." In *Proceedings of the ASHRAE Annual Conference*, St. Louis, MO, June 29, 2016. [GATech] [ORNL] [Autodesk]
6. Cerezo, Carlos, Heo, Yeonsook, and Joshua New *(Seminar Chair)* (2016). "Seminar 39 - Data Sources toward Urban-Scale Energy Modeling, Part 1." In *Proceedings of the ASHRAE Annual Conference*, St. Louis, MO, June 28, 2016. [MIT] [UK]

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Images

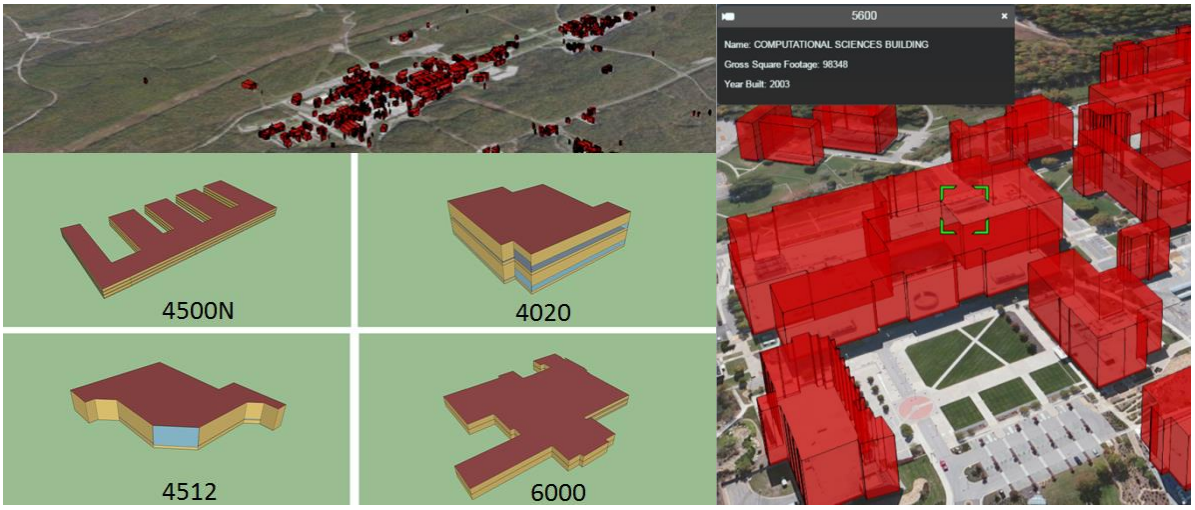

Figure 1. A geographical area is selected and individual building properties (e.g. geometry in red) is extracted (top-left), these are used to create full building energy models for each building using DOE's EnergyPlus (bottom left), and building data (real and simulated) can be explored interactively on the internet via bit.ly/ornl_campus (right).