CHPB-32-2018: Fast Building Energy Simulation Tool for Optimal Design and Control Analysis

Motivation and Problem

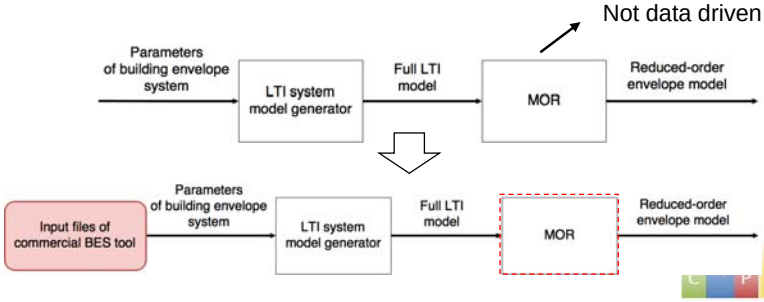
- Current simulation models not fast enough for building design optimization and advanced controls
- Previously developed a methodology for generating reduced order building envelope models
- To make the tool useful for industry, interfacing it to popular commercial building-energy simulation tools is necessary.

Objectives

- Enhance the previously developed model order reduction strategy
- Develop a tool that automatically generates a reduced-order building envelope model from input files of EnergyPlus and TRNSYS for optimal design and control analysis.

Approach:

Not data driven but physics based



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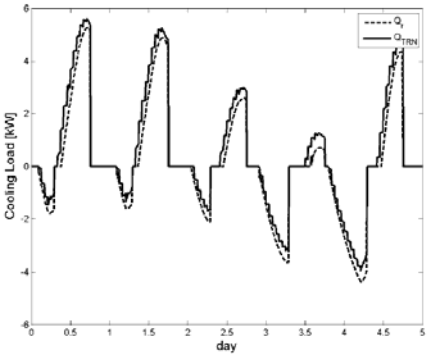
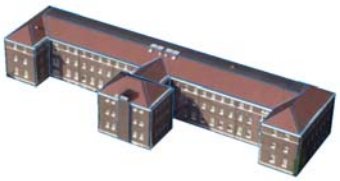
Summary of Previous Results for a 60 zone building

Results comparisons with TRNSYS for a 60 zone building (one-year simulation)



Heating load [kW]		Cooling load [kW]	
MEAN	RMS	MEAN	RMS
0.35	0.65	-0.09	0.32



Computational time comparison (one-year simulation)

Time step [m]	TRNSYS [s]	ROM [s]
10	876.93	8.66
30	482.60	4.70
60	248.52	3.05

100 times faster!

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