

Building Optimization Testing Framework (BOPTEST) for Simulation-Based Benchmarking of Control Strategies in Buildings

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I. Introduction

1. Motivation
 - a. Energy efficiency, load control flexibility
 - b. Rise in MPC, RL, G36, other advanced control development
 - c. Real building test cases are costly and detailed emulator model development requires high expertise
 - d. Lack of objective comparison between controllers, particularly with regards to choosing a baseline that could bias results.
2. Literature
 - a. Example advanced control development and testing
 - b. Simulation-based controller testing, tools, and frameworks
 - c. Common testing features (e.g. building model, kpis, uncertainty)
3. Objective
 - a. Describe requirements
 - b. Describe methods, their motivations, and main components of BOPTEST
 - c. Demonstrate performance with test case and MPC controller

II. Methods

1. Test Case FMUs
 - a. Signal-Exchange / Parser / KPIs json
 - b. Boundary condition data csvs
 - c. Documentation
 - d. Final directory structure
2. KPIs
 - a. Descriptions
 - b. Formulas
3. Run-Time Environment
 - a. API
 - b. Architecture

III. Demonstration

1. Test Case Description
 - a. Building and HVAC design
 - b. Model implementation
 - c. Boundary conditions
 - d. Baseline controller performance
2. MPC Controller Description
 - a. Formulation
 - b. Software implementation
3. Results

- a. KPIs
- b. Timeseries analysis
- c. BOPTEST software performance

IV. Discussion

V. Continued and Future Work

- 1. Test case development
- 2. Service architecture
- 3. Weather forecast uncertainty
- 4. Additional kpis and/or subjective kpis
- 5. Software features and maintenance
- 6. bopetest-gym

VI. Conclusion

Acknowledgements

References