3. *Generation of curve coefficients from ASHRAE 205P data into other existing models*

   This would allow some level of utilization of ASHRAE 205P data before the full integration of the parser in simulation tools as well as testing/comparison of the eventual ASHRAE 205P performance model to the existing performance models in simulation tools.

4. *N-dimensional interpolation utilities*

   A core concept within the current draft of ASHRAE Standard 205P is that performance is characterized as N-dimensional performance maps. The performance of equipment during simulation is determined using interpolation. Interpolation in higher order dimensions can become computationally expensive, and the routines to perform such operations are not readily available in all common programming languages. Lightweight interpolation libraries in various languages can be add to the ASHRAE 205P toolkit to help facilitate the simulation of equipment.

The toolkit can leverage some of the work already completed for the ASHRAE 205P data parser example written in Python. A lightweight, command-line Python application utilizing Pandas (for data management) (AQR Capital Management LLC et al., 2012), SciPy (for interpolation) (SciPy Developers, 2018), and Matplotlib (for plotting) (Hunter, 2007) can be developed very efficiently. If needed, this toolkit can eventually be wrapped in a basic GUI for broader user/manufacturer support.

Much of the capability within the toolkit can be incorporated into C++ routines that can be reused in the various C++ simulation tools (e.g., EnergyPlus, IES-VE, and CSE), or with bindings to other scripting languages.

This toolkit will help facilitate industry adoption of ASHRAE Standard 205P by equipment manufacturers and software vendors alike. Even in the development of the standard, it is very difficult to discuss topics without a common way of visualizing the data. The need for such a toolkit was recognized early in the development of the standard.

CONCLUSIONS

This paper provides an overview of the upcoming ASHRAE Standard 205, and describes an initial implementation of exchanging equipment performance data using FlatBuffers. FlatBuffers is currently a very promising technology and file format for exchanging ASHRAE Standard 205P compliant data.

The standard development process is methodical and sometimes slow. The standard may change between the time this paper is published and when the standard is published. The end result will be the first time the problem of standardized performance data exchange has been solved with participation from all of the stakeholders (manufacturers, software developers, and energy modelers). The outcome from ASHRAE Standard 205P will be more accurate models, more consistent data, and more productive workflows in the context of equipment performance simulation.

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