

Accessing External Data on Local Media and Remote Servers Using a Highly Optimized File Reader Library

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ncDataReader2 [1] is an open-source solution for the efficient interpolating access to external data sets. The library of C-functions can be used with different applications and works well with Modelica. Data sets can be easily accessed as continuous functions using different interpolation and extrapolation methods. The application range covers reading generated or measured data, the integration of simulation results from Modelica or other systems and the validation, parametrization and optimization of models using external data. Data sources may be local files or remote servers. Using the netCDF file format, the DAP network protocol and different optimization approaches the data access can be surprisingly fast, even for large remote files with many variables containing millions of values.

Two different APIs (application programmers interfaces) are available to the Modelica user, accompanied by some wrapper functions and classes written in Modelica.

The most used application today is reading weather data in Modelica simulations of buildings and solar systems. But it is easy to use the library for other purposes and with different software packages.

A server run by the authors provides different data to the research group. This includes weather files generated with METEONORM, the monitoring of a solar plant and the results of different simulations. Using the DAP protocol these data sets can be accessed in simulations like local files using ncDataReader2.

In a research project covering the co-simulation of a solar thermal system the library was used to read the results of a Modelica simulation into the boundary conditions of a CFD simulation with ANSYS CFX. This made it possible to study and adjust the complex CFD model of the thermal storage under realistic conditions, but with reasonable calculation effort. The optimized model was then used in a second step in a real co-simulation of the system.

Another application is the parametrization of a model by the integration of measured data from a real photovoltaic (PV) system located at the UdK into a simulation model of the system. Besides the performance values some environmental conditions of the plant are measured and archived. The *BuildingSystems* library [2] includes a one-diode model of a PV module which contains a constant correction parameter that needs to be adjusted for a real system. A simulation of the model reads the measured environmental conditions with the data reader library. By comparing the calculated and the measured performance the parameter can be adjusted to match the real system under the observed conditions.

References

- [1] ncDataReader2: <http://www.j-raedler.de/projects/ncDataReader2>
- [2] BuildingSystems: <http://www.modelica-buildingsystems.de>