DYNASTEE
NEWSLETTER ISSUE 2019/14

Foreword

As a network for sharing knowledge on the measurement and simulation of building energy performance, DYNASTEE highly values the training of (young) researchers. In this 14th issue of the Newsletter, you will find two articles on the outcomes of the summer schools that have been organized. The DYNASTEE Summer School on Dynamic Methods for Building Energy Assessment took place on 9 – 20 September 2019 in Granada, Spain. The summer school at DTU targeted time series analysis, with a focus on modelling and forecasting in energy systems.

IBPSA-NVL organized two workshops on quality assurance of simulations of buildings and systems, the main findings of which you can find in this newsletter. Also included, is a call to fill in a survey on stakeholder interests regarding the methods that are developed within the IEA EBC Annex 71 project. Finally, an update on the 12th Nordic Symposium on Building Physics, which is to be held in Estonia in June 2020.

Summer School 2019, Granada, Spain: Whole group during their visit to the world famous Alhambra

Twan Rovers, Saxion University of Applied Sciences

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Outcome of the Summer School 2019 in Granada, Spain

By Hans Bloem, Maria-Jose Jimenez

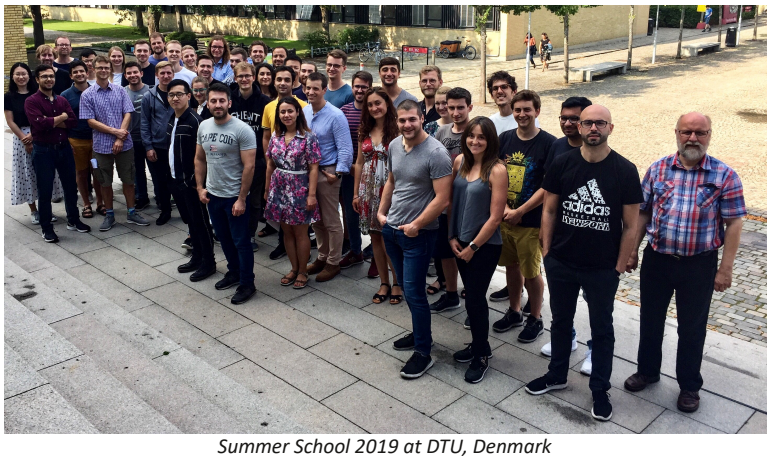
The yearly Summer School, for the first time was spread over a period of two weeks in the student friendly and amazing city, Granada in Andalusia (Spain). September appeared to be a good moment for the intensive course on Dynamic Methods for Building Energy Assessment (DMBEA). Organised as an international doctoral Summer School by the University of Granada, in close collaboration with CIEMAT and DYNASTEE, the course took place on 9 - 20 September 2019. The aim of this Summer School is to train people in performing the analysis of on-site experimental data for the development of a skill that gives confidence in reporting results for building energy performance assessment. Participants, mostly PhD students from all over the world, were trained the application of dynamic analysis techniques. The increased complexity of the analysis steps demonstrates clearly that a proper assessment needs a well-defined approach that offers the application of different analysis techniques, such as discrete or continuous time methods. Beside the fundamental theory on building physics as well as the necessary statistics, roughly half of the time was spent on practical exercises using measured data. The first week was more devoted to building physics and how to judge valuable information from the available data by applying simple plot- and static analysis, like the average and regression methods. In a further step, the discrete time method and LORD tool was introduced and applied to data from a real in-situ measurement of a concrete wall. So far only heat transfer by conduction only was considered.

As in previous years, an event took place to socialize. This year a guided visit to the Nasrid palaces and the Generalife of the world famous Alhambra was organised.

By the end of the first week, new data was presented and the fundamental differences between Output Error and Prediction Error Methods were explained. The data from a Round Robin box experiment, performed at CIEMAT's Plataforma Solar de Almería appeared to be a perfect case for more analysis methods. Also uncertainty and variability due to sensors and solar radiation were reason to give the participants an increased complexity for a proper analysis. The Siviour method as well as Continuous Time Method, CTSM-R were presented for the heat transfer coefficient assessment. All methods were explained side by side, using the same data. Residual evaluation and error analysis have been discussed as well as the importance of producing clear reporting of analysis results (for future clients). The participants have been given a building physical perspective based on physical knowledge of heat transfer combined with advanced statistical techniques that are essential for the success, understanding that the building physicist needs the statistician and vice versa. At the end of the second week the evaluation of the Summer School showed that the participants were very satisfied and would like to stay in contact for further assistance.

A diner was organised with all participants and organisers in the Albayzin area with view of the Alhambra in a fairy tale night time scenery.

Summer School 2019, Granada, Spain: Dinner at Albeyzin area



Summer School 2019 at DTU, Denmark

Outcome of the Summer School 2019 at DTU, Denmark

By Hanne Kokkegård and Peder Bacher

During a week, 44 young researchers got 'hands-on' experience with statistical modelling techniques for smart energy systems and intelligent energy savings.

44 PhD students and postdocs mainly from universities in Europe have spent the last week of August at DTU Compute to learn about smart energy systems and intelligent energy savings.

The summer school was arranged by the two centers CITIES, lead by DTU (including the Interreg supported project Smart Cities Accelerator and researchers from DTU, Section for Dynamical Systems), and FME-ZEN, lead by NTNU in Norway in collaboration with IEA EBC Annexes 67 & 71.

During the summer school named 'Time series analysis – with a focus on modelling and forecasting in energy systems' the participants were introduced to statistical techniques that are particularly useful for data-driven modeling of energy systems with the focus on control and optimization.

Engineering the future

This year was only the second time for the summer school about smart energy systems and Professor Henrik Madsen was very happy.

"These are the PhD students and postdocs to help the world achieve the green transition. These are not people, who are close to retiring. They are the ones who need to be part of this process", he says.

"It is fascinating that there are so many coming from universities and knowledge institutions around Europe, and with backgrounds from universities all over the world, to hear about what we can do and learn about the technologies, we use in SCA, FME-ZEN and CITIES", Henrik Madsen says.

Modelling building thermal dynamics

During the course, the students learned how to identify the thermal dynamics of a building for forecasting and performance identification. This applies both in terms of being able to use the building as thermal energy storage, but also to be able to pinpoint the easiest achievable energy savings - thus where building refurbishment gives the most value.

The summer school alternated between lectures and exercises to get 'hands-on' experience with the technique - for example, to calculate solar energy gain in buildings, and how it affects the building.

This is a technology, that PhD student Christoffer Rasmussen and his colleagues from DTU Compute has developed. Christoffer Rasmussen was also one of the teachers at the summer school:

"Usually, the solar energy gain is said to be dependent on the sun's radiation from the outside, but the usual data driven models assume that the solar gain is proportional to the solar irradiation and constant throughout the day. It is not, as the Earth is turning".

"In our data driven models we have made the solar energy inflow dependent on the sun's position in the sky, such that you can account for, for example, a large window area towards one corner of the Earth and shading trees toward another. The incident angle of the sun rays will also change during the day which affects the amount of irradiation entering the building. All this, and more, are we now capable of estimating only based time series measurements, explains Christoffer Rasmussen".

During the course, participants have learnt how the statistical modelling techniques work fundamentally and how to implement it in grey-box models (combining a partial theoretical structure with data) and in this way model the solar heat gain in buildings.

"At the end of the day, you want a good model that can describe the building dynamics and forecast different scenarios. It can be used, for example, to control the heating system of the building; how does the temperature react if you turn off or turn on the heat? How can you reduce the cost of heating the building if the consumer has variable energy prices, while using more green energy and keeping the consumer happy and warm?" says Christoffer Rasmussen.

IBPSA-NVL – Workshops on Quality Assurance of Simulations of Buildings and Systems

By Christian Struck, Wim Plokker, Dirk Saelens, Friedl Decock

On May 18 and March 19, IBPSA-NVL organized two workshops on the subject of "Quality Assurance of Simulations of Buildings and Systems"; one in Deventer (NL) and one in Brussels (B).

IBPSA Workshops on quality assurance

The aim of the workshops was to explore the challenges that building simulation practitioners face in the interaction with governmental policies and commercial parties, with a specific focus on quality. The identified challenges contribute to the future activities of IBPSA-NVL with regard to offering courses, developing project proposals and organizing future events.

During the workshops, speakers from practice and academia presented their perspective and experience on the subject of quality assurance and related responsibilities in using building performance simulation. (The slides for the workshop on May 18 can be downloaded from (http://www.ibpsa-nvl.org/events/). Whilst the first workshop was focused on the simulation of buildings and systems for design and operation, the follow-up workshop targeted the formalization of the quality assurance. The key outcomes from the first workshop were:

1. Industrial developments towards guaranteeing a minimum performance for integrated building systems leads to increased costs due to the inclusion of safety margins. There is a risk that these additional costs will be high as these are likely to be applied during all steps in the supply chain, starting with the developer and consultants, via the contractor down to component manufacturers.

2. Consultancy firms and designers need continuous education as the ongoing digitalization of the Architecture Engineering and Construction (AEC) sector requires knowledge of capabilities to handle new tools and resources, such as the interaction of buildings with districts, the use of GIS data to feed building information models and the interpretation of in real-time monitored performance data.

3. Due to the diversity of simulation tools applied in practice (ranging from excel spreadsheets, commercial codes up to custom made simulation environments), a quality label to inform clients and authorities should become available.

The discussion during the follow-up workshop focused on the pros and cons of introducing certificates for simulation specialists. The results of the discussion are summarized below.

1. The introduction of certificates for building performance simulation specialists leads to a minimum quality level and is expected to increase the demand for simulations.

2. Normalization and standardization of quality indicators simplifies quality assurance but does not encourage the innovative application of simulation models.

3. There is a development noticeable to integrate simulation as a feature in CAD packages. Whilst the seamless integration improves interoperability, it creates the risk to apply simulation outside the limits of the integrated simulation model.

4. Performance simulations are in many cases an aim, rather than a tool to support design decisions. Many clients lack the knowledge to properly integrate simulation tasks in the development of design concepts. It is advised to provide training sessions to inform potential clients on the potential and limits of building performance simulation.

IBPSA-NVL announces winner of Best Thesis award 2017

During the workshop, the winner of the IBPSA-NVL Best Thesis Award 2017 was announced. Submissions are carefully evaluated by the IBPSA-NVL board members based on set of six predefined criteria. To ensure high quality, the Best Thesis Award is awarded only if the average score of the jury members is higher than the minimum threshold of 80 %.

The 2017 BTA award goes to Wouter Karssies, who is a MSc student from the Eindhoven University of Technology (TUe). The winning thesis is entitled: "Optimization workflow regarding daylighting, energy and glare, for performance assessment of new generation semi-transparent photovoltaic façades" and was submitted and supervised by prof. Hensen. In his work Wouter developed and applied a optimization workflow focusing on daylighting, energy and glare with the aim to assess the performance of an innovative semi-transparent photovoltaic façades.

IBPSA - NVL Workshops, 2019: Presentation by Ron Stet / Coen Energie & Comfort

IBPSA - NVL Workshops, 2019: Lively discussion during the break

Stakeholder survey IEA EBC Annex 71

By Liesje van Gelder

Despite regulation enforcements, monitoring of actual energy performances of buildings reveals in many cases a significant gap with theoretically designed targets. This accentuates the need to develop reliable methods that can be applied on site to assess the actual performance of buildings.

The main goal of the international research project 'IEA EBC Annex 71 Building energy performance assessment based on in-situ measurements' is to (further) develop methods that can be used to characterize and asses the actual energy performance of buildings based on on-site measured data of in-use buildings (https://www.kuleuven.be/bwf/projects/annex71/summary.htm).

Based on on-site measured data (such as smart meter data) of an in-use building, the developed methods would allow to characterize the actual heat loss coefficient of the building. This heat loss coefficient accounts for the transmission heat (gains and) losses through the building fabric and optionally the infiltration losses.

This measured heat loss coefficient could be used to evaluate energy use/saving calculations and to prove the actual energy use/savings, to assess the quality of workmanship, to provide a guarantee of quality to the building owner, to provide an innovative certification label, for compliance checks in EPBD regulation, to quantify the efficiency of costly retrofit operations, to replace the calculated design value in energy performance certification, etc.

Since one of the goals of the research project is to investigate to what extent the developed methodologies can be used in a quality assessment and guarantee framework, we launched a survey to collect the interests and needs of the stakeholders with regard to the methods we develop. If you are interested, you can find the survey at this URL:

https://forms.gle/AztXv1rpDHEvJuyu8

It will only take a few minutes to fill in.

The survey will close on December 15th 2019. If you want to, please leave your e-mail address at the end of the survey so we can send you the final report summarizing the results of the survey and/or project.

12th Nordic Symposium on Building Physics, 14-17 June 2020, in Tallinn, Estonia

The Building Physics conference has been organized in the Nordic countries every third year since 1987. The conference is not limited to cold climate but has grown to attract participants from all over the world. It is the biggest and longest international conference in building physics attracting both scientists and practitioners.

The IEA-EBC Annex 71 project has submitted 6 abstracts to this conference on the topic of *Building energy performance assessment based on in-situ measurements*. The conference organizers have decided that a special session will be devoted to Annex 71 and related papers.

More information about the venue, registration and important dates:

https://nsb2020.org/

The Alexander Nevsky Cathedral in Tallinn, Estonia

Building Simulation 2021 takes place in Brugge

The 17th International Conference on Building Simulation takes place in Bruge, Belgium on 1-3 Sept. 2021. The organization is a collective effort by KU Leuven, Gent University, Boydens Engineering, Daidalos Peutz and IBPSA-NVL, the Dutch – Flanders chapter of the International Building Performance Simulation Association. The focus of the conference will be on “Creating Impact”. This is why the organizing team plans an impact day, with the aim to allow an intensive interaction between research and practice. For more information see:

https://kuleuvencongres.be/bs2021

ABOUT DYNASTEE

DYNASTEE stands for: "DYNamic Analysis, Simulation and Testing applied to the Energy and Environmental performance of buildings". DYNASTEE is a platform for exchange of knowledge and information on the application of tools and methodologies for the assessment of the energy performance of buildings. DYNASTEE functions under the auspices of the INIVE EEIG and it is open to all researchers, industrial developers and designers, involved in these items. The EU energy research projects PASSYS (1985-1992) COMPASS and PASLINK created the initial European network of outdoor test facilities, developed test methods, analysis methodologies and simulation techniques. It resulted eventually into the PASLINK EEIG network (1994). The grouping profiled itself as a scientific community of experts on Testing, Analysis and Modelling. In 1998, PASLINK EEIG started a new project PV-HYBRID-PAS on the overall performance assessment of photovoltaic technologies integrated in the building envelope. The use of the outdoor test facilities in several Member States situated in different climates, together with the available expertise on analysis and simulation techniques, offered the ingredients for more successful projects: IQ-TEST (2001), focussing on quality assurance in testing andanalysis under outdoor test conditions as well as evaluation techniques of collected in-situ data. The expertise of the grouping was also offered to other European projects, such as DAME-BC, ROOFSOL, PRESCRIPT, IMPACT and PV-ROOF. In 2005 the EEIG was converted into an informal network that today is known as DYNASTEE. It is offering a network of excellence and should be considered as an open platform for sharing knowledge with industry, decision makers and researchers. It has been very active in supporting projects such as the IEA-EBC Annex 58 and recently the new project IEA-EBC Annex 71 'Building energy performance assessment based on in-situ measurements'.