Theme C: Agile Design of the Building Envelope for Energy Efficiency and Human Comfort

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Research in recent years has led to the design of various types of high performance building envelope systems intended to reduce the energy costs of a building and provide improved indoor comfort for occupants. In this theme, the following will be performed:

Project 1

Lighting Design Strategies Beyond the Visual: Health, Alertness and Efficiency

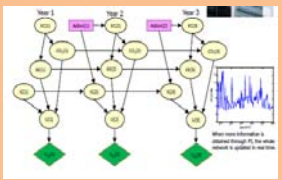
This project will use computational physiological response models in order to assess the long-term circadian effects of lighting over different weather situations: seasonal differences, overcast sky periods, clear sky periods, and intermediate sky periods. A final part to this research will be to study subjective comfort and subjective alertness in the SinBerBEST testbed with actual study participants.

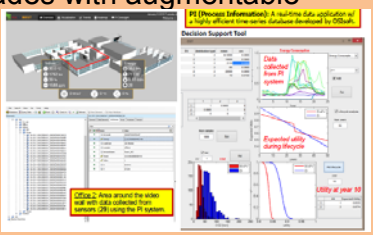
- To develop improved simulation methodologies and to investigate architectural design strategies to use spectrally selective glazing coatings, building surface materials, and specific lamp spectral power distributions in order to improve well-being (alertness) in buildings with a proper design for the circadian cycle; and
- To develop computational tools and methods that are able to integrate materials, cooling systems, human factors engineering and occupant behavior into each stage of the asset lifecycle to determine the optimal design of energy-efficient buildings from a holistic point of view, in terms of health, comfort, safety, and full integration of human-system. Various designs based on the results obtained from SinBerBEST activities will be built and tested under realistic conditions.

Project 2

Experimental and Computational platform for novel façade concept

The sample data will come from the adoption of the SBB testbed facilities. The implemented new techniques for both daylight and sunlight quantification, and circadian and pupillary light reflex effects will be investigated for novel façade solutions. The SBB estbed will allow rapid characterization of the properties of various materials utilized in glass panels, cementitious composite panels, masonry-based systems, and advanced dynamic façades with augmentable components.





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