

LESO **LUNCHTIME*** LECTURES

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EPFL – CE 1 104

Impact of lighting control systems based on “Non-Image-Forming” effects of light on electric lighting energy demand and user’s comfort and performance

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Summary

Lighting has an impact not only on our visual comfort and performance, but also on our behaviour and physiology. It is shown that exposure to light can directly boost alertness, cognitive performance, and improve our mood. These non-visual effects of light are called “Non-Image Forming” (NIF) effects. Considering NIF effects in lighting of working environments such as offices can be very important to improve well-being, performance and productivity of the users. So far, these effects have not been considered in building automation mainly due to their unknown and complicated nature.

The objective of this Master thesis is to introduce and evaluate NIF effect of light in control algorithms used for automatic regulation of the shading and electric lighting in an office environment. A user-centric approach can be adopted thanks to one of the main innovations of this work: a novel HDR vision sensor used for “on-the-fly” assessment of lighting conditions and glare indices. The sensor is integrated in the controller of an office room in the LESO-PB experimental building (Laboratory of Solar Energy and Building Physics) in the Swiss Federal Institute of Technology in Lausanne. A dynamic lighting protocol was chosen based on literature review in order to improve NIF effects of light on office workers (alertness and performance) and with an eye towards energy savings. An advanced control system for shading and lighting was designed to follow the lighting protocol and ensure the visual comfort of the user at the same time. A 12-days field study with 6 young human subjects in the LESO-PB building was carried out in order to test the performance of the controller from an energy saving and occupant’s visual/cognitive perspective. With respect to a reference controller inspired by industry, the advanced control strategy led to considerable energy savings, whereas no remarkable differences were shown for users’ comfort and performance, even though slight improvements were appreciated in some aspects.

About the speaker

Marta has recently obtained her Master degree in energy engineering at the University of Bolzano in Italy. She carried out her thesis project in LESO last semester, with the supervision of Professor Jean-Louis Scartezzini and Ali Motamed. Prior to her master studies, she had obtained her bachelor's degree in Environmental Engineering in Trento, Italy.

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Open to all !

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**Presentations are followed by drinks & snacks, to
give the opportunity to guests and speaker to
further discuss the topic.*

Organized by Dr Nahid Mohajeri, & Barbara Smith

