

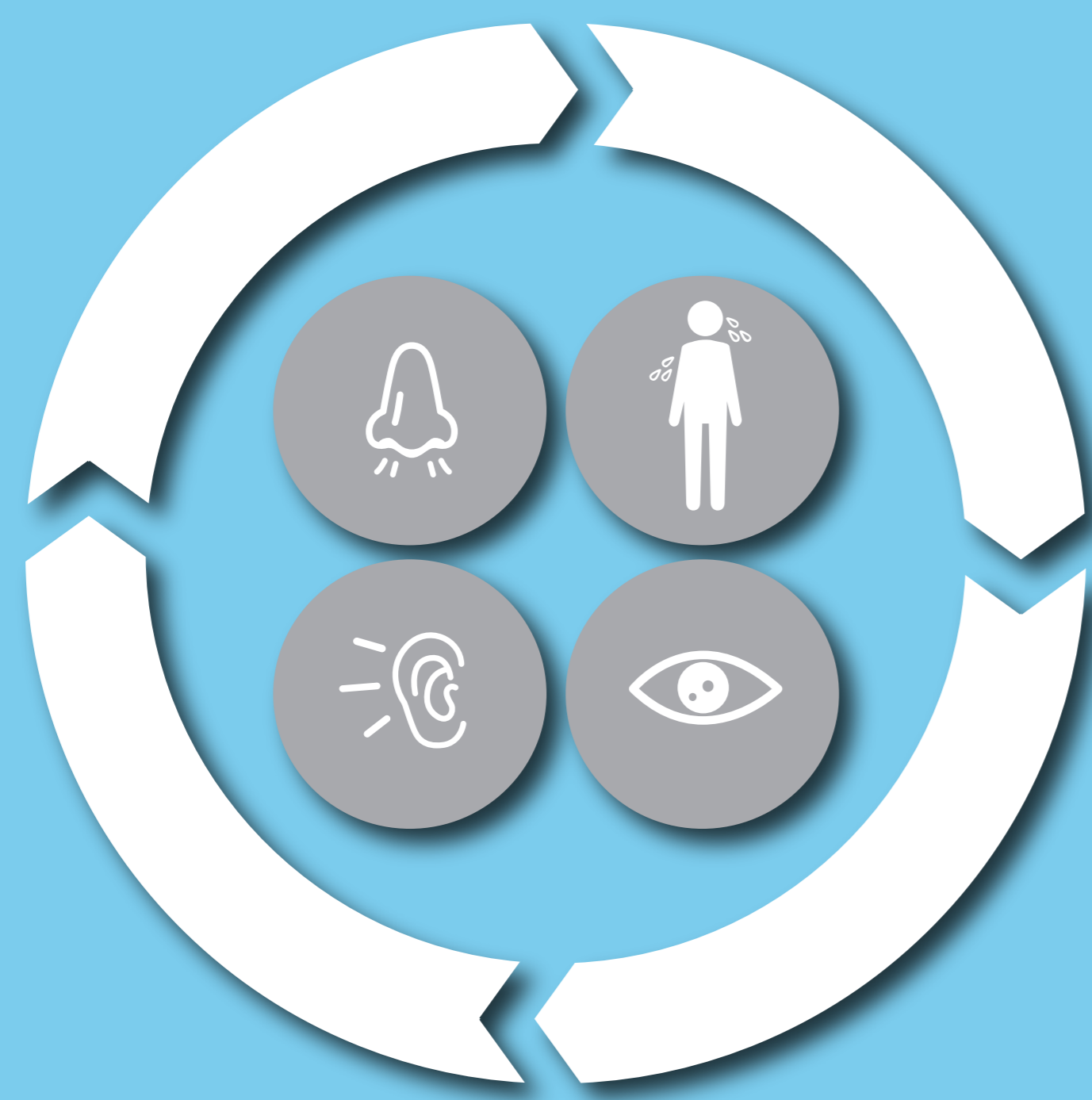
ADAPTIVE VISUAL AND THERMAL COMFORT

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GENERAL BACKGROUND

Increasing efforts are devoted to enhance and optimize the environmental comfort in buildings, as this aspect plays a major role in the affection of health, performance and general well-being of people. Indoor air quality, acoustic ambience, light and thermal conditions have been proved to be fundamental factors for the indoor environmental quality. Engineers must be aware of the effects of the **interactions** between these **factors** on the indoor comfort as people react simultaneously to diverse stimuli belonging to different sensorial fields. Many studies have been conducted on the influence of each component on the overall comfort, but only few studies are available investigating the interaction between different comfort variables of different disciplines.



Our sensory system responds to several environmental factors **simultaneously**: thus, to progress with global comfort knowledge it is necessary to study the **potential interactions of at least two factors** (Laurentin et al., 2000).

"The divergence between the **physical**, measurable world and the **perceptual** world is really an opportunity to use technology to our advantage."

Stephen Selkowitz (2015)

VISUAL COMFORT

THERMAL COMFORT

Combination/
interaction

Perception
(psychological/physiological)

Cause and effect
(physical)

Overall comfort

Specific comfort

Thermal and visual parameters vs. Overall comfort

Thermal parameters vs. Visual comfort

Visual parameters vs. Thermal comfort

Hypotheses

Test room experiments

Statistical analyses

Validation in field studies



EPFL office rooms



Measurement of physical parameters

Comfort questionnaires

Productivity tests

DEMONA
(EPFL test room)

SUMMARY

Study the interaction between visual and thermal comfort parameters

Overall comfort

Productivity

Energy savings

FINAL GOAL: maximize

AIM OF THE RESEARCH

This research focuses on the interaction between **visual and thermal comfort**, looking at the impact of different **perceptible** conditions on the **productivity** of the users and **overall comfort**. In particular, it analyzes the effect of visual variables on the perceived thermal comfort and of thermal variables on the perceived visual comfort, besides the mutual interaction of visual and thermal variables on the overall comfort appraisal. The study is based on fundamental concepts belonging to different branches of knowledge, ranging from engineering to psychology and physiology for the considered purpose. These disciplines come together in search for objective interactions between different comforts by means of experiments in realistic climate chambers and controlled field studies. The results of this study will ultimately foster the development of control systems with the aim to achieve energy savings, increase user satisfaction as well as boost productivity.

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Giorgia joined LIPID as a PhD candidate in the Doctoral Program of Civil and Environmental Engineering (EDCE) in February 2015. In October 2014 she graduated *cum laude* from the Politecnico di Torino with a Master degree in Building Engineering. In December 2014 she graduated with merit from Alta Scuola Politecnica (ASP), the double degree program between Politecnico di Torino and Politecnico di Milano. She was also an exchange student at the Delft University of Technology in The Netherlands during 2013-2014, after which she decided to develop her master thesis at LIPID.