Master Project

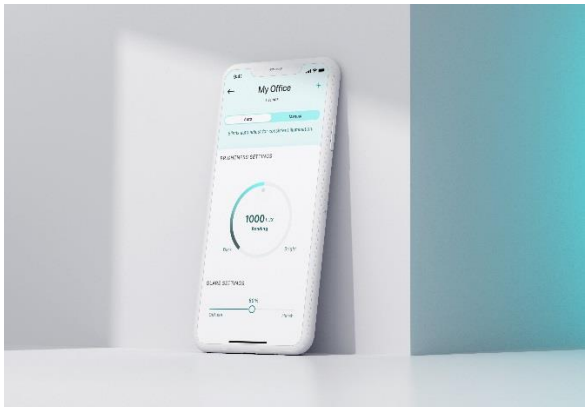
Machine Learning on Users' Interaction Behavior with Smart Blinds

Background

Modern buildings are designed with large windows and glazed facades to allow sufficient daylight penetration with good view outwards; however, excessive solar gains contribute to discomfort glare and overheating issues in office buildings, which lower the productivity of occupants and increase the cooling energy consumption during the summer. Studies have shown that occupants commonly keep blinds closed during daytime and their interaction frequency is low with blinds.

Smart blinds are designed to automatically adjust shading to the optimal position according to different sky conditions, delivering visual comfort daylight in office buildings. They can potentially address the issues of discomfort glare for occupants and reduce the energy demand for cooling during the summer. However, users would have very different sensitivity and preference to daylight. Understanding users' difference and preference from their interaction behavior can improve the comfort level of daylight delivered by smart blinds and achieve user satisfaction.

The target of this project is learn users' manual override behavior with smart blinds and integrate an adaptive control of daylight based on physical lighting simulation, which enhances the climate impact of smart blinds following the direction of Energy Strategy 2050 in Switzerland. The student is expected to develop a Machine Learning algorithm which can adapt to user's behavior to enhance the control of smart blinds. A successful algorithm may be integrated and tested on-site.



Objectives

- Understand the behaviour of smart blinds
- Design and train a Machine Learning algorithm to predict users' override behavior as input to smart blinds
- Integration of the adaptive control and on-site test with the smart blinds
- Write a report

Profile

- Interest in buildings and lighting application
- Experience in Machine Learning approaches
- Experience in programming with Python or Matlab

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