

# AMBIENT LIGHTING DESIGN FOR PERSUASIVE ENVIRONMENTS

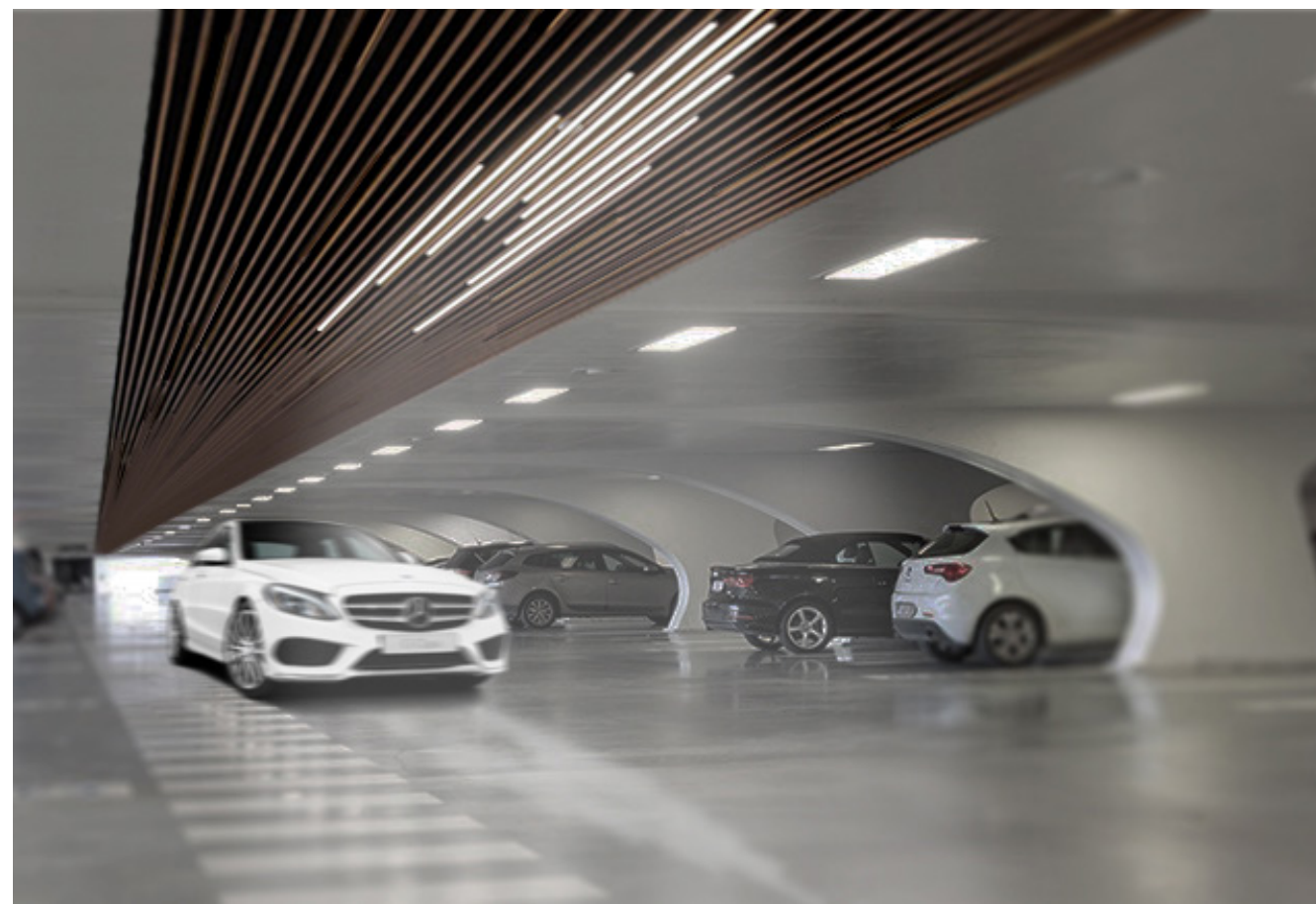


## Flexible Workplaces

Buildings are becoming more and more smart every day, and offices are not excluded from this evolution. Smart offices have a central system which knows your entire work schedule. This data is processed to streamline your experience as much as possible.

For instance, when you enter the parking space, the system assigns you the best possible parking spot to reduce wasted time. By using the overhead luminaires which display directional patterns of increased local intensity which flow towards the desired parking spot, the driver can easily find his/her destination.

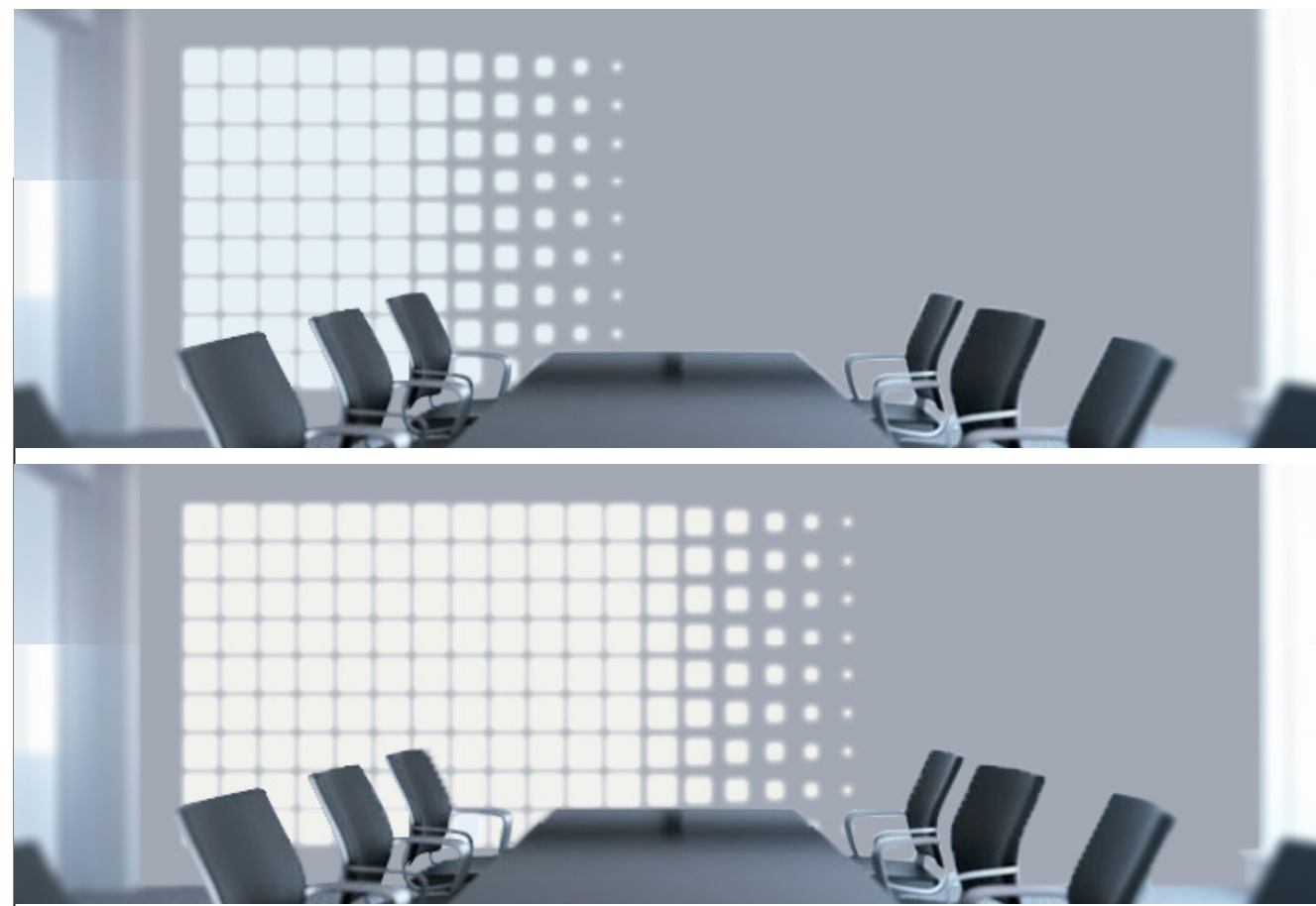
It is commonly known that humans tend to be more comfortable when they have an estimation of how long it takes to reach a destination. The results of the first experiment can be used to convey a sense of progress. In our concept, multiple lanes of luminaires can be used to guide the drivers to their destination. Initially, only the center row is illuminated. As the journey progresses and the car nears its destination, additional lanes turn on, until all lanes are illuminated with a flowing pattern right before the intended parking space is reached. This has other benefits such as increased safety as pedestrians can easily predict the motion of passing traffic. The second experiment has already established that directional cues can be effectively communicated using motion of light patterns.



## Time Management

Time management is another common issue in office environments. We can start to imagine how it would be possible to design a lighting system that can better inform the occupants with information such as: meeting progress, feedback on individual contribution time, and notification of transitions between activities.

We envision a wall-mounted ambient display panel. The panel illuminates the room and creates an ambient effect without distracting the occupants. We concluded that the best visualization to show the meeting's progress is size. As such, the panel should visualize a bar that is filling the entire panel from left to right as the meeting progresses. The color temperature of the light should be low. This is proven to create an activating environment which is beneficial during demanding cognitive tasks. As the meeting progresses, people get tired and lose focus, the panel is filled with this light which has an stimulating effect. A few minutes before the end of the current phase of the meeting, the ambient light solution should notify the occupants of the meeting room that the current phase is nearing completion. This can be seen as an achievement which according to our results, is best visualized using a change in saturation. The light thus turns to a higher color temperature and gradually increase in saturation until the end of the meeting is reached. As low color temperatures create a relaxing environment, the occupants' body becomes prepared for a break or meeting's closure.



As we move towards a world in which the lines between the physical and the digital are increasingly blurred, we see a maturing vision for architecture that actively participates in our lives. The push for ubiquitous networking and device inter-connectivity in buildings is fueling the development of a new wave of smart devices that can collect, process and exchange vast amounts of data. This data can be used to inform and ultimately enhance the experience of the users. The more recent trends in lighting design, has been to use it as a form of ambient light communication to create more lively and dynamic environments based on live data. This project goes beyond that and tries to demonstrate the capabilities and benefits of ambient light communication and its ability to provide useful information and create persuasive environments.

The question is ***can we use this technology in order to enrich the experience of users of public architectural environments with the aid of ambient light communication to inform them of relevant information and entice them to perform desired actions?***

## Health

Health is first and foremost the most important issue within office environments. Rising levels of stress, reduced sleep quality and eye fatigue and strain as well as headaches and discomfort are some of the most common health-related problems that employees experience which can be remedied using proper lighting design. Ambient light could support stress intervention, improving self-awareness of stress and further triggering a behavioral conditioning, such as deep breathing. In the context of an office environment, this idea can be applied in the form of a personal overhead desk lamp that can convey the employee's stress levels and encourages them to take regular breaks to prevent fatigue, headaches and eye-strain. Initially, the light illuminates the first row of LEDs with a low color temperature which enhances productivity and creates a comfortable environment for working. As the time spent behind the desk increases, a second bar of light with a high color temperature starts to grow and become more prevalent. The increasing time is seen as growth, which is best visualized through an increase in size. As the high color temperature results in a relaxing environment, the employee should feel the need to take a break as the size of the bar gets larger. The color temperature of the ambient light itself should raise self-awareness about the amount of time spent behind the desk.



The participants shared a common understanding of certain visualizations. In more general terms, **light visualization can be used to form a very basic language to transfer information.**

It was concluded that **ambient light communications can be used effectively to trigger certain desired behaviors and actions in humans** (specifically, direct the attention and gaze of humans using directional cues).



As a demonstration of how the prior information can be used, office environments were studied. 4 different applications of ambient light communication concepts within were presented which combined its aesthetical value, its ability to convey meaningful information and trigger desired behaviors.

## Communication and Knowledge

Effective communication and knowledge of accurate and relevant information is vital for teams working in organizations. This is more apparent in agile development and management. Team members must interact regularly and often during non-scheduled times because rapid changes occur throughout project completion, and everyone must adapt. Ambient light communication can be used as a tool to facilitate this communication. In teamwork scenarios, tasks are often distributed between all team members. Some individuals may finish their task sooner than others, thus given enough time, the workload tends to become unbalanced. If we think about workload as a quantity which can increase or decrease, changing size can be used as a good visualization to convey it. To this end, an ambient wall-mounted display panel can be placed in the office. The panel will have the names of the team members printed on various locations. At the start of each sprint, the project's tasks are distributed among the members. This can be manifested as a growing/shrinking circle of light around each name tag which provides an up-to-date status of the workload for that particular member. As tasks for individual members are completed and logged in the system, their corresponding circle will reduce in size to indicate that their workload has lightened. This creates an environment where members can easily see the status of the workload of their colleagues and can re-distribute work among themselves in an effective manner.



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