



AALBORG
UNIVERSITY

YEARBOOK

MSC IN LIGHTING DESIGN

CLASS OF 2023



**MAKE
IT REAL**

COMBINING FIELDS OF LIGHTING,
ARCHITECTURE & MEDIA TECHNOLOGY

A LIGHTING DESIGN CONCEPT FOR THE LIGHT FILLED GREEN ROOM

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#dementia #circadian rhythm #lighting

This master thesis investigates how a lighting design concept can positively impact the well-being of elderly people with late-stage dementia in the Light Filled Green Room (LFGR), a space planned for a nursing home in the city of Tune, Denmark. Preliminary research examined dementia, the visual system, and non-visual effects of light. Further research revolved around the WELL Standard, sustainable considerations, a literature review, analysis of the SBI Instructions as well as theoretical knowledge on atmosphere and the benefits of nature. The body of research was used to establish criteria for the lighting design.

Three criteria were developed for the LFGR's lighting design, which include the provision of a circadian lighting system, the use of light to increase fascination of nature and the creation of an atmosphere which facilitates well-being. A case description and daylight analysis were performed to gain an overall understanding of how natural light affects the LFGR. Then, through the Design Thinking process, an initial lighting design concept was proposed.

The initial design proposal underwent a rigorous evaluation against the established criteria, which culminated in the development of a final design proposal that was designed to meet the unique lighting needs of the LFGR. The final design proposal represents the culmination of a comprehensive and thoughtful approach to lighting design, aimed at providing optimal illumination for the well-being of elderly people with late-stage dementia.



Embraced by illuminated nature.



An atmosphere of serenity and safety.

LIGHTING IN HISTORIC MUSEUMS – CREATING THE PERCEPTION OF A DAYLIT SPACE

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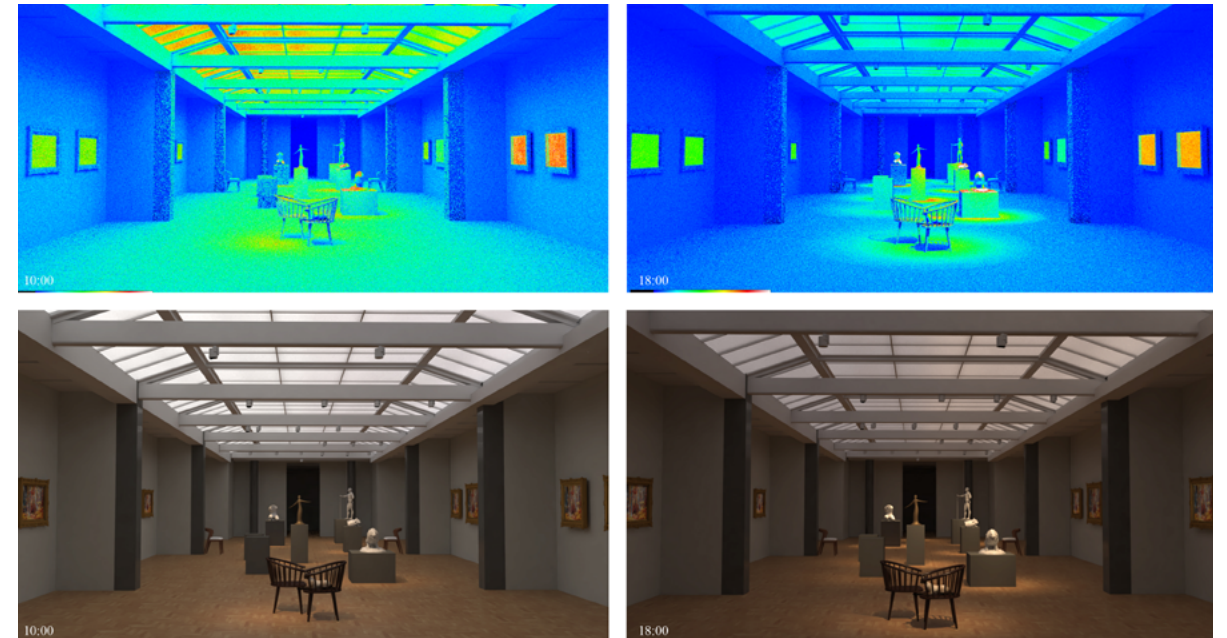
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#daylight #museum lighting #perception

This project focuses on the development of a lighting design solution for exhibition halls in historic museums. Often skylights of historic museums are closed off in order to protect the light-sensitive paintings exhibited inside. The project addresses the dilemma of restoring the daylight experience of exhibition spaces while adhering to lux requirements for art preservation. After data and observation analysis, the decision was made to block out all natural light, providing control and minimising the impact on the architectural structure. The research question aims to answer how illuminating the overhead plane, implementing dynamic lighting, and utilising sensors can re-establish the ambiance of a daylight museum while significantly limiting light exposure for the preservation of artworks. The design was later evaluated based on simulations, digital measurements, and prototype testing. The final design, incorporating electrical indirect and direct light, successfully enhances the perception of a daylight space by utilizing dynamic illumination, colour variations, and directional lighting.



As the “skylight sets” between 18:00- 19:00 the spotlights and frame lights appear more dominant as seen in the more distinct light hierarchies. In terms of perception, this supports the dynamicity of a daylight space where light transitions generate day- and night identities.



Prototype Setup



Prototype phase 2. On six occasions between 18:00-22:00 photos were taken of the transitioning light through the glass. The color was taken from the visualisation. An Atom Matrix, two RGBW led were used to conduct the test.

DECODING LIGHTING: INVESTIGATING THE CORRELATION BETWEEN MELANOPIC RESPONSE AND EMOTIONS USING EEG ANALYSIS

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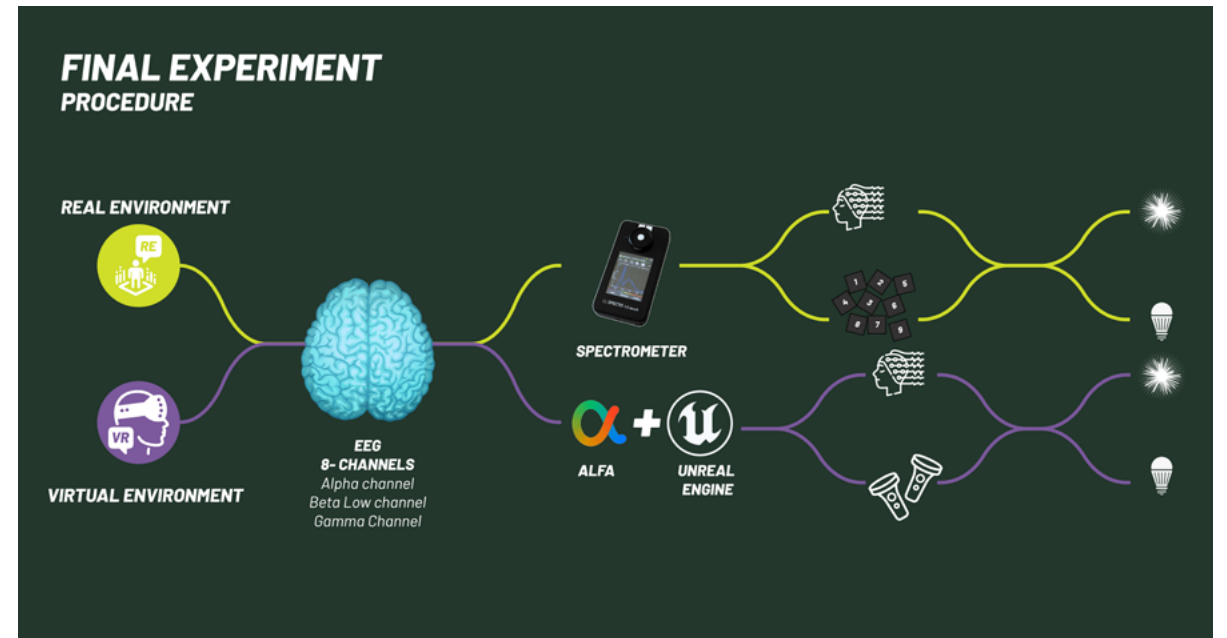
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#EEG #virtual vs real environment #melanopic EDI

This work aims to investigate the correlation of the impact of lighting on circadian rhythm, and the impact of lighting in emotions (arousal and valence) in real and virtual environments by using an electroencephalogram (EEG) test, which is a reliable and cost-effective methodology used to measure brain activity. Using EEG, the emotions of the user can be recognized by analyzing the different brain signal waves generated accordingly. A sample size of 15 participants was recruited for the study in an office space, where participants were exposed to daylight and electrical lighting, and were asked to perform practical activities. To measure the effects of lighting, brain activity was continuously measured with an EEG helmet, and the melanopic equivalent daylight illuminance (EDI) was measured at the eye level, with a spectrometer in the real environment and with ALFA software in the virtual reality. Additionally, a questionnaire using the Self-Assessment Manikin (SAM) approach was provided to participants to assess the subjective levels of valence and arousal, in order to cross check and validate the EEG data. The study design aimed to find the correlations between the melanopic EDI and the increase/decrease in alpha, beta, and gamma brain waves, which are connected to high/low valence and arousal (also cross checked with the questionnaires). Correlations between the melanopic EDI, brain activity, and emotional states, could provide valuable insights for designing environments that promote optimal circadian health and emotional well-being. This work also compares the results between real and virtual environments to validate how VR could be a valuable tool not only to display an upcoming space and light setting but also bring the experience even further closer to reality by mimicking the emotional response.



The graphic represents the fundamental step to setup the experiment, which has been divided in Real and Virtual environment test: both conditions will be evaluated with EEG recording and each was sub-divided in "Experience" with two lighting conditions, daylighting and electrical lighting and "Activity" with the same two lighting condition to be tested.



Adjusting the settings and perspective in the virtual reality to be as similar to the real environment.

TOWARDS TEMPORAL FORMS: AN INVESTIGATION ON COMPOSITIONAL PRACTICES IN LIGHT

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#spatiotemporality #multimedia #soundtheory

This thesis explores compositional parameters for lighting design from the perspective of temporal forms. To do so, musical language serves as an analogy and analytical tool to explore change- and movement-based forms of expressing light in a lighting design practice. To grasp with the complexity of lighting design, the concept of spatiotemporal environments is explored, illustrating how temporalbased parameters should not be necessarily restricted to a single media, but can be understood as a bridge to discuss various interactions and dynamics in space. Discussions on dramaturgy and form can arise by giving attention to temporality, and this thesis looks at how two different compositions can evoke a feeling of engagement. A case study was conducted in Brønshøj Vandtårn to contextualize the findings and demonstrate the role of space.



Light and material explorations at Brønshøj Vandtårn.



Light explorations with LEDs at the Light Lab.

LIGHTING FOR VISUALLY IMPAIRED ELDERLY. FINDING THE PREFERRED LIGHT QUALITIES FOR DINING BASED ON VARIOUS EYE DISEASES.

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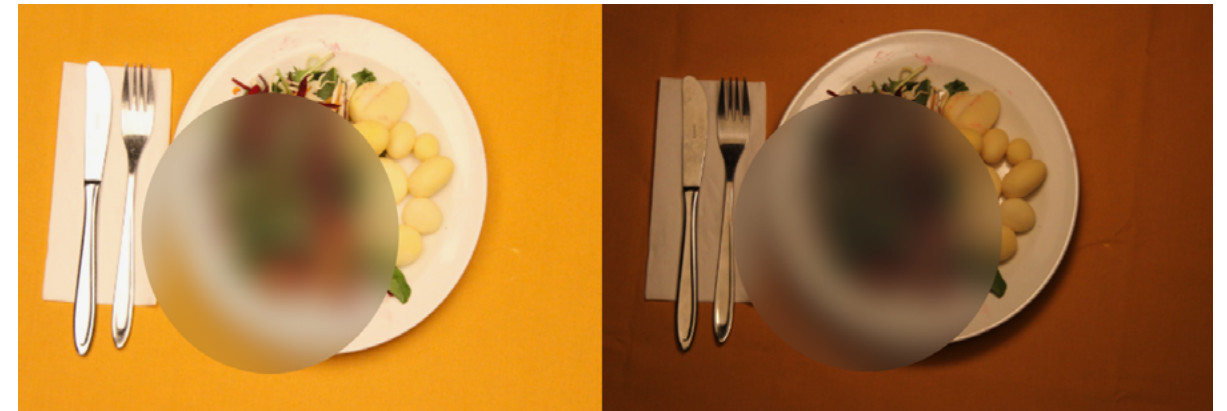
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#visual impairment #lighting qualities #nursing home

This research project focuses on finding the preferred light quality for the visually impaired elderly for dining scenarios. It proposes a new design solution with estimated values for multilayered lightings, such as ambient lighting and task lamps.

The project research was done on-site with elderly partially sighted living in Solgaven adult day care center in Farum, Denmark, and Aalborg University lighting laboratory in Copenhagen. Various methodologies, including the Interview and observation methodology by James Spredley, were used along with the Kevin Houser model and Design Theories to work with the necessary light qualities. Analysis of luminance maps, material analysis, illuminance measurements, and phenomenological and ethnographic observations enabled a better understanding of the needs of the visually impaired. Through the semi-structured interviews and experiments on site done in two seasons from The First Stage occurred from September 2022 until December 2022, and the second from February 2023 until May 2023, the approximate recommended values of light quality were found for AMD, Glaucoma, and Cataract disease. The research showed that those with Glaucoma and Cataracts require two-layer lighting, including table lamps and ambient light while some of the participants specifically only require stronger ambient lighting.

The visually impaired showed a clear need for different tunable lighting with a big focus on the quality of light rather than intensity.



Simulation of AMD disease under two different illuminance levels of ambient light, on the right- 120 lux, on the left - 1000 lux.



Experiment with healthy eye-sighted participants in AAU's Lighting Lab.

THE RIGHTS TO THE CITY. IMPROVING THE INCLUSIVITY OF URBAN PUBLIC PLACES THROUGH LIGHTING DESIGN FOR MARGINALISED COMMUNITIES.

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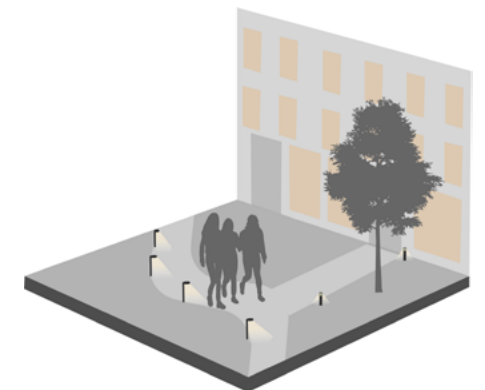
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inclusive lighting #marginalised groups t#mobility

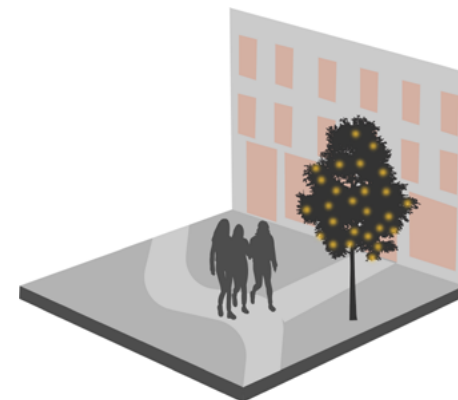
Marginalised groups are experiencing unwanted attention in the public realm worldwide, and gendered fear produces avoidance behaviour in many public urban places. Universal design has been implemented to ensure that everyone has access to the urban areas, but still, this access is restricted for many vulnerable groups. This investigation aims to find relevant lighting design principles for making public urban spaces more inclusive for marginalised groups. A literature review, case studies of three urban places, focus groups, and an experiment in the field with torches were the chosen methods to gain knowledge. First, two focus groups were established, each comprising five members from the LGBT+ population in Oslo between 30-60 years with different social identities. For the first part, they were interviewed about their risk avoidance behaviour in urban places in Oslo. For the second part, a method from visual ethnography was used where the participants used a video camera to record their own experiences without being influenced by the researcher's presence. The findings suggest that the participants are experiencing a need for being less visible, but also the ability to see their surroundings to reveal the presence of others. In addition, the experiment showed how they wanted to use warm lighting and beautify the place by enhancing details. The conclusion suggests various lighting design methods to create inclusive public areas, such as beautifying details and creating legibility with vertically lit surfaces. These six principles could make urban public places more socially inclusive for vulnerable populations. Other urban places should be investigated similarly. The results can be compared and possibly confirmed by using control groups with other non-marginalized groups.



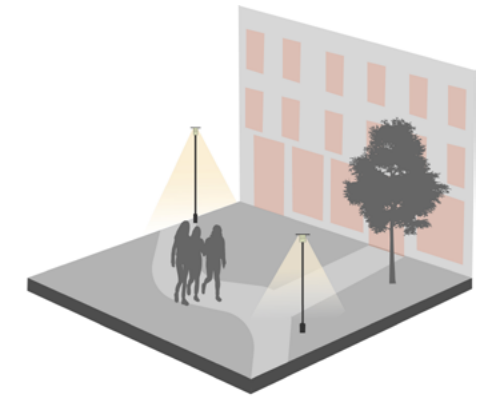
PRINCIPLE 1: LEGIBILITY BY ILLUMINATING VERTICAL SURFACES



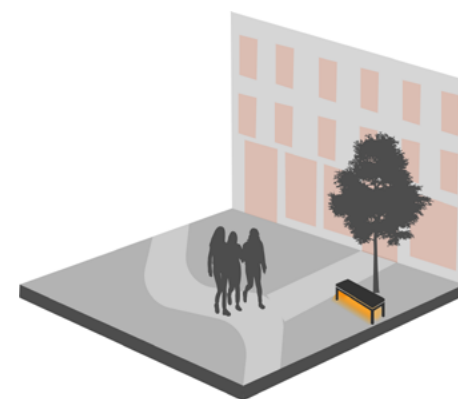
PRINCIPLE 2: WAYFINDING BY LOW HEIGHTS AND HUMAN SCALE



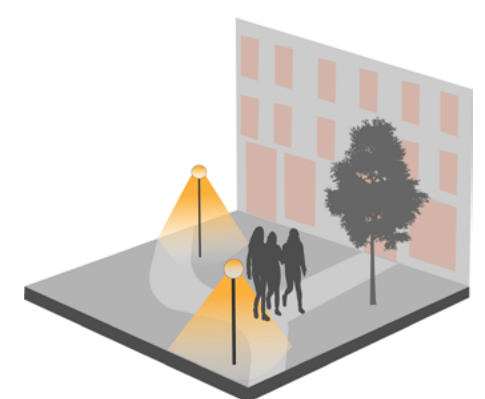
PRINCIPLE 3: BEAUTIFICATION BY ENHANCING DETAILS



PRINCIPLE 4: VISUAL HIERARCHY OF IMPORTANT PLACES



PRINCIPLE 5: INVITING AND WELCOMING BY INDIRECT LIGHTING



PRINCIPLE 6: USING WARM COLOUR CORRELATED TEMPERATURE

THE MUSEUM LIGHTING TOOLKIT

A DECK OF TACTICS FOR WORKING WITH CURATORS AND EXHIBITION DESIGNERS

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#museum lighting #toolkit #lighting techniques

This project presents a comprehensive exploration of lighting quality theories and their application in the realm of museum lighting. It delves into the challenges faced by lighting designers as integral members of a project team and emphasizes the significance of effective communication skills in this professional domain. Through interviews conducted with museum staff and lighting designers, the research sheds light on the collaborative process between these entities and elucidates the expectations that museums have for designers. By examining the interplay between lighting, spatial dynamics, and human perception, the study contributes to a deeper understanding of their convergence within the museum context. Additionally, it identifies specific lighting techniques for exhibition spaces and translates them into quantifiable parameters of lighting quality, encompassing visual appearance, spatial perception, and visual narrative. The study reveals the interconnectedness of these criteria, where changes in one dimension can significantly impact the others. Finally, a toolkit is developed as a means of facilitating communication and collaboration between lighting designers and other professionals involved in the process of setting an exhibition. This toolkit serves as a practical resource to enhance the effectiveness of their partnership.



The Museum Lighting Toolkit, a deck of tactics for working with curators and exhibitions designers.



An engaging experience with a hands-on approach.

AN AFTERIMAGES OF ART, WITH AND THROUGH LIGHT

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#research through exhibition #atmospheres #art

This thesis embodies interconnectedness of seeing, culture, and education, outlining shared interest in developing images and visual experiences that allow human perception to grow beyond form. Through an exploration of visual awareness, human vision, and perception interwoven with light and art, emerges an ephemeral installation on atmospheres and their afterimages - with and through light, that bridges artistic expression with inquiry. Developed lense, the testing procedure, empowers viewers to explore vision, readability of atmospheres, and phenomenon of afterimages. This work lays the groundwork for further exploration, as these topics are also vital for current ways of experiencing art in museums and exhibition spaces that are striving for immersive and captivating visual experiences nowadays.



The installation, driven by the spirit of research through the exhibition, delves into the realm of artistic exploration while simultaneously investigating complex questions.



For data collection, each visitor received paper folder with questionnaire, plan and a pen.

CONGRATULATIONS, LIGHTING DESIGNERS!

2-year master's programme in Lighting Design is the intersection of architecture, lighting and media technology. The students work with physics of light, lighting technologies, digital media, architectural context, human factors and design methods.



Graduates and some of our faculty members.

KEEP IN TOUCH

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