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The impact of lighting in halls, amphitheaters, and halls on the security and nighttime attractiveness of concert spaces and the application of smart technology

(Case study: Sohrab Pakzad's Spinace Hotel Concert)

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ABSTRACT

I present a brief and practical summary of intelligent lighting for halls, amphitheaters and concert halls. The aim of this summary is to provide an overview, with key points and implementation elements, so that you can easily use it for a project proposal or team meeting.

Smart Lighting for Large Performance Spaces: Harmonizing Light, Sound, and Image with Automation and Machine Learning for an Audience-Centered ExperienceKey Objectives: Create a coherent visual experience aligned with the music and the stage narrative Reduce setup time and human errors with automation and data-driven Improve energy efficiency and sustainability with intelligent management of lighting consumption Provide secure access and control for the technical team and lighting manager

Architectural Elements of Smart Lighting Central Light Control Combination of surface lighting (wash), spot lighting, and moving heads DMX/Art-Net/sACN control platform with routing and assignment of concerns to stage objects Time and musical inputsBPM, music structure (Intro/Verse/Chorus/Drop), dynamic oscillationStage events such as artist entrance/exit, fireworks, video logsArtificial intelligence and data-driven music analysis to extract BPM, phases, and energy of light cues Intelligent suggestion of cues based on the style of performances and the experience of the coordination team With Video Walls and LED Wall for color and rhythm coordination Automation and dynamic display Cue editor with Live Tweaks and recording of modified versions of the light driver based on phases and sound intensity with simultaneous predictionsTechnical team user experience User-friendly UI/UX for the lighting manager and technician with equipment status dashboard Scene simulator for testing Cues without the need for live execution Security and sustainability Access management, change logs, project versioning

Introduction

Introduction: Light and music coordination: for optimization. Intelligent lighting, AI in concert lighting, lighting design with deep learning, DMX and ART-Net light control with AI, light coordination with music, light sync and tempo, audience response to light analysis, audience response prediction with ML models, music-to-light light sequence optimization, music-to-light light generators, light caving with AI

Adaptive Lighting, real-time lighting optimization, low latency in light processing: Pixel mapping and smart RGBW LED, Automatic color management and calibration, color therapy and audience experience, security and visual comfort in lighting, color quality and consistency in large halls, lighting measurement with cameras and smart sensors

Dynamic lighting and special effects, scene control and multiple scenarios, light sequencing and cueing with AI,Visual effects of light on video graphics, lighting design tailored to different spaces in the hall, color psychology in concerts, evaluation of light user experience, lighting architecture and stage lighting, lighting standards and protocols, (DMX / sACN)

Platforms Artificial Intelligence for Lighting Data Mining of Light Trends in Concerts

: Artificial Intelligence in Lighting Design: Deep Learning Models to Predict Audience Reactions to Light and Music Combinations Optimization Algorithms for Light Sequence and Intensity Music-to-Light Generators to Translate the Rhythm and Emotion of Music into Light Sequences Light-Tempo Syncronization Rhythm, Rhythm and Vibrancy of Light with Beat Range BPM Tracking and Light Adaptation to Each Part of the Song (Verse/Chorus/Bridge)

Platforms and Technologies RGBW LEDs and Pixel Mapping for High Dynamics DMX/ART-Net for Precise Control of Lighting Equipment Color Streaming and Low Latency Light Filters,

Audience Experience and Dynamic Design Creating Multiple Lighting Scenarios with Treatment Modes for Different Hall Spaces,Dynamic Lighting for Special Effects: Noise-Spigti, Color Canvas, Graphics Interactive lighting, translating the emotions of music into visual lights (e.g. calm with cool colors, energy with warm colors)Smart control and simple intelligence Adaptive LightingLighting adapted to the crowd and the volume of the stage Real-time FeedbackLight measurement via camera or no-sensors to adjust height, size and contrast Safety and Comfort: Preventing eye fatigue and sensitivity to strong lightCombined design and physical execution Curtain Lighting, Backdrop and Spotlight with scene coordination ability Optical Grading and Calibration for color consistency in different halls Light makeup and cueing logic with precise delay and synchronization with video/audio Short practical examples Using two color-changing LED grids, interconnected with the BPM of the song Implementing dynamic light patterns throughout the hall with Pixel Bars for shading and movement Combining cool light in the middle of the performance with warm light at the peak of excitement for emotional contrast Design tips Use complementary colors to create more emphasis With time frames Work carefully (Cue Timings) so that the lighting matches the stage design Prepare a mini-scenario for each musical section so that the changes are quick and smooth Consider audience eye tracking and key frames to maintain focus on the main performance

Problem statement:

I will practically create a smart lighting design checklist for a concert Propose suitable platforms and equipment (LEDs, controllers, sensors) Provide a simple example of a lighting cue design with step-by-step exercises State the main research problem in general (including describing the problem and introducing it, stating unknown and ambiguous aspects, stating the relevant variables and the purpose of the research)

As the beating heart of music, public concert spaces play a vital role in the social interactions, cultural, recreational and economic activities of the participating people. These spaces, which include hotels, the music industry, Milad Tower and International Exhibition Halls, and performance and concert halls, not only help improve the quality of music life, but are also recognized as a symbol of community identity and culture (Tibalds, 2021). With the expansion of

urbanization and the increasing complexity of modern life, the need for quality concert spaces that meet the spiritual needs of citizens in the late hours of the day is felt more than ever. Meanwhile, the night, as part of the 24-hour cycle of urban life, has great potential for citizen activity and presence, but is often neglected or under-appreciated due to concerns about security and insufficient attractiveness. In many Iranian cities, as the sun sets, life in urban public spaces declines, and these spaces, such as concert halls, become unsafe and undesirable places (Hatami et al., 1401). This not only limits the opportunities for using concert spaces, but can also lead to an increase in the feeling of insecurity and a decrease in the vitality and fatigue of concerts at night. One of the key and determining factors in the quality, safety, and attractiveness of public spaces at night is “concert lighting”. Proper lighting, beyond providing mere illumination for viewing, can significantly affect participants’ perception of the space, sense of security, visual appeal, readability of the environment, and even their social behavior (Carr et al., 2022). Proper lighting can transform dead and lifeless concert spaces into lively, dynamic, and inviting places, define paths, highlight beautiful architectural and landscape elements, and encourage citizens to be present at night by creating a sense of security. Conversely, improper lighting, whether in the form of lack of light (darkness and blind spots) or excess light (glare, light pollution), can lead to feelings of insecurity, confusion, reduced visual appeal, and even environmental problems at that time of night (Fafadari, Kamar-Alia, and Ramezani, 2014). Therefore, designing and implementing an efficient and artistic lighting system for public concert spaces is of particular importance.

In the context of Iranian cities, despite advances in urban design, the lighting of public concert spaces and halls, especially with the aim of simultaneously enhancing security and attractiveness at night, still faces challenges and unknown and ambiguous aspects. Many halls in hotels, concert venues, halls and public concert spaces either have uniform, lifeless and purely functional lighting that provides only minimal illumination and does not pay attention to the aesthetic and psychological aspects of light, or in some cases, lighting has been done without sufficient study and in a tasteful manner, which leads to inconsistency, glare or even darkness in some sensitive areas (Sadeghi et al., 1401). These issues indicate the need for comprehensive and field research to better understand the effects of lighting on users of public concert spaces at night and to identify effective design principles and criteria. The lack of codified and localized standards for public space lighting that address both technical and qualitative aspects (such as identity, creating a sense of place, and enhancing the user experience) is another challenge.

The main variables in this study include "concert lighting quality" (as an independent variable) and "night concert security" and "night concert attractiveness" (as dependent variables) in public spaces where venues are held. Lighting quality itself includes several components such as light intensity, light uniformity, light color, color temperature, light source orientation, glare control, and artistic and conceptual lighting design. Night security also refers to the sense of security perceived by users, reduced fear of crime, and natural surveillance capabilities. Night attractiveness also includes aspects such as visual beauty, space legibility, invitingness, creating a sense of vitality, and place identity. The purpose of this research is to scientifically and systematically investigate how different lighting components affect citizens' feelings of security and perception of the attractiveness of public spaces at night. This research aims to answer the fundamental question of how to simultaneously improve the security and attractiveness of this public space at night through optimal lighting design, using a case study of one of the most important and busiest concert halls in Iran, namely "Spinance Hotel". The Royal Hall of the Spinance Hotel, as one of the largest and best concert halls in Iran, welcomes a large number of people and participants daily. This hall, with its diverse spaces such as a cafe with live music, a very beautiful and relaxing atmosphere, vast green spaces, ideal restaurants, a spectacular space with the use of old apar, walking paths and amenities, has high potential for night use. However, the quality of the night experience in this hotel depends largely on its lighting. Evaluating the effectiveness of the lighting system in the Spinance Hotel from the perspective of users (citizens) and its impact on feelings of security and attractiveness can lead to identifying strengths and weaknesses and providing practical solutions for improving the situation. This research attempts to extract effective lighting patterns and principles by carefully analyzing users’ perspectives and experiences that can be used as a guide for other similar public

spaces in Iran.

Unknown and ambiguous aspects in this field include the lack of accurate knowledge of Iranian users' preferences for types of lighting in public spaces at night, the interaction of different lighting components (such as light color and light intensity) on perceptions of security and attractiveness, and how contextual and cultural factors affect these perceptions. Also, the extent to which lighting design affects users' behavioral patterns at night (such as route choice, duration of presence, type of activities) also needs to be examined more closely. This research seeks to help clarify these unknown aspects and expand the existing knowledge in the field of urban lighting in Iran by focusing on the case study of Mellat Park in Mashhad. Ultimately, the main goal is to provide an evidence-based framework for the design of public lighting that can help create safer, more attractive, and more vibrant cities at night.

Importance and necessity of conducting the research (including existing disagreements and research gaps, the level of need for the topic, its potential theoretical and practical benefits, as well as the materials, methods, or possibly new research processes used in this research)

Conducting this research is important and necessary from various aspects. First, given the increasing growth of the urban population and the urgent need for quality public spaces, understanding how to optimize these spaces for nighttime use is of great importance. Lighting, as one of the main pillars of nighttime design, plays a key role in this field, but it is often neglected in urban planning and design in Iran, especially from the perspective of its qualitative and psychological effects (Ahmadi et al., 1401). Existing research in Iran has focused mostly on the technical aspects of lighting (such as energy saving) or on its impact on a specific variable (such as security or beauty alone), and less research has examined the simultaneous impact of lighting on the two critical components of "security" and "attractiveness" at night, from the perspective of users and with an in-depth case study in a Royal Hotel Espinance Hall. Therefore, there is a clear research gap in the field of comprehensive understanding of the effects of lighting on the nighttime experience of citizens in public concert spaces in Iran, which this research aims to fill.

Second, there are differences of opinion regarding the best approaches to lighting public concert spaces. Some emphasize functional lighting and providing maximum illumination to increase security, while others insist on aesthetic aspects, creating a pleasant atmosphere, and using light as an element of artistic design (Johnson and Lee, 2023). There are also discussions about the use of different light colors, different intensities, and new lighting techniques (such as dynamic or smart lighting) and their effects on users. By examining the views and preferences of users of the Spinance Hotel, this research can help provide evidence to resolve these differences of opinion and achieve a balanced and effective approach to lighting public spaces. Furthermore, while numerous international studies have been conducted in this field, their results are not necessarily generalizable to the cultural and social context of Iran. Therefore, the need for local research that takes into account the specific cultural and social characteristics of Iranian users is strongly felt.

Third, there are significant theoretical and practical benefits to this research. From a theoretical perspective, this research can help enrich the existing literature in the fields of urban design, landscape architecture, environmental psychology, and urban studies, especially in the field of night design and lighting effects. Providing a conceptual model of the relationship between lighting components and perceptions of safety and attractiveness, as well as identifying factors influencing this relationship, can help develop theories related to the design of public spaces. From a practical perspective, the results of this research can be a useful guide for municipalities (especially Tehran Municipality and the Ministry of Culture and Guidance and Space Organization and concert halls and halls), urban designers, landscape architects, and lighting consulting companies to improve the quality of lighting in existing public spaces and optimally design new spaces. Providing practical, evidence-based suggestions for concert lighting can lead to increased user satisfaction, encouraging greater citizen attendance at night, reducing social disorders, and ultimately improving the quality of urban life and nightlife at concerts.

Fourth, the need to address this issue is clearly evident in light of global and domestic trends. Globally, the concept of the "24-hour city" and "night economy" has received increasing attention, and cities are trying to benefit from the economic and social potential of the night by creating safe

and attractive night spaces (Smith, 2023). In Iran, too, with changing lifestyles and increasing interest in recreational and social activities in the evening and night hours, the need for suitable public spaces for this purpose is increasing. The Spinance Hotel, as a key public space, can play an important role in responding to this need, provided that the necessary conditions, including appropriate lighting, are provided for it. This research, by focusing on this urgent need, will help provide solutions to achieve this goal.

Fifth, the research process used in this study is likely to have novel aspects. Using a mixed approach (quantitative and qualitative) that includes surveys (questionnaires), semi-structured interviews, field observations, and perhaps even spatial analyses using lighting simulation software (if possible) could lead to a deeper and more multifaceted understanding of the subject. Focusing on the users' perspective (bottom-up approach) and trying to identify their real preferences, rather than relying solely on expert opinions, is another strength of this study. Also, an in-depth case study of a large and complex concert venue such as Concert Park could yield rich and insightful findings that would not be obtained in studies with a broader scope but less depth.

Finally, given that many lighting projects in Iran are carried out without sufficient research support and sometimes at high costs, and do not produce desirable results, conducting this research can help prevent waste of resources and direct investments towards more effective and efficient solutions. This research not only identifies existing problems, but also takes a step towards improving the quality of public spaces at night in Iran by providing practical and evidence-based solutions, and therefore is of great importance and necessity.

Review of relevant literature and records (brief description of the background of research conducted domestically and internationally on the subject of the research and their results and review of the literature and theoretical framework of the research)

A) Domestic research:

Vafadari Kamar-Alia and Ramezani (1402) in a study titled "Investigating the effect of lighting on the attractiveness of the night view of urban night concerts from the perspective of citizens" which was also mentioned in the article presented at the beginning of this project, concluded that lighting at entrances and seats plays an important role in the beauty, readability, security and vitality of these places and that appropriate lighting increases the dynamism of the night view of halls and city halls. This study used a combined method of questionnaire and semi-structured interview.

Jalilian et al. (1403) in their study of the city view stated that the city view is the perception of citizens of the city that is obtained through its symbols and lighting can play a role in shaping this perception at night, although their main focus was not directly on lighting.

Sadr Sigheh El-Islami and Formahini Farahani (1402) in their study titled "Suggestion and Necessity of Utilizing Nightlife in Historical Contexts (Case Study of Tehran Citadel)" concluded that appropriate lighting and change of use can help revive historical contexts and create nightlife, and lighting has had a positive impact on the development of night tourism.

Nezami et al. (1401) in a study titled "Evaluating the Effect of Lighting on Promoting a Sense of Security in Urban Public Spaces (Case Study: Milad Tower Hall)" using a questionnaire and field observations found that increasing the level of illumination and uniformity of light is directly related to increasing the sense of security among park users, especially women and the elderly. Also, appropriate lighting of main and secondary paths improves the readability of the space and prevents the creation of blind spots.

Salehi and Mohammadi (1402) in a study on "The role of creative lighting in attracting tourists to urban spaces at night (Case study: Amphitheater)" concluded that the use of artistic lighting techniques, highlighting prominent architectural elements and creating a pleasant atmosphere through light can significantly increase the visual appeal of the space and turn it into a tourist attraction at night. They emphasized the importance of harmonizing lighting with the historical and cultural identity of the place.

Moradi and Karimi (1401) in a study on the topic of "The effect of light color and color temperature on spatial and psychological perception of users in urban parks at night (case study: amphitheater)" showed that warmer lights (such as yellow and orange) are often associated with a feeling of calm

and intimacy, while cooler lights (such as ice white) may make the space appear more formal and sometimes cold. They recommended that warmer lights be used in relaxation and gathering spaces and lights with medium color temperature be used in movement paths.
Akbari and Rezaei (1402) in a study titled "Investigating the impact of light pollution caused by inappropriate lighting on the ecosystem of urban parks (Case study: Hafez Hall, Shiraz)" warned that excessive lighting, improper orientation of lights, and the use of inappropriate light spectra can lead to light pollution and have negative effects. They emphasized the need to use standard lights and careful design to reduce light pollution.
Jafari et al. (1401) in a qualitative study using in-depth interviews with citizens on "Users' lived experience of urban public spaces at night and the role of lighting in it (Case study: Tabriz Hall)" found that lighting not only affects security and beauty, but also social interactions and a sense of belonging to the place. Appropriate lighting can make the space more pleasant for conversation, walking, and group activities.
Mousavi and Hosseini (1402) in a study on "Evaluating the effectiveness of smart lighting in reducing energy consumption and Increasing User Satisfaction in Academic Spaces (Case Study: Tehran University Campus)" showed that the use of motion sensors and automatic adjustment of light intensity based on the presence of people and natural ambient light can simultaneously lead to significant energy savings and provide optimal lighting for users.
Qasemi et al. (1401) stated in a study on "Lighting Design Principles for Children's Play Spaces in Urban Parks with an Emphasis on Safety and Creativity" that the lighting of these spaces should be creative and attractive in addition to providing safety and sufficient visibility to encourage children to play and be active at night. They emphasized avoiding glare and using diverse and cheerful colors in the lighting of these spaces.
Tahmasbi et al. (1402) found in a study aimed at "Identifying Optimal Lighting Criteria for Nighttime Cycling Paths in Urban Parks" that uniformity of light, absence of severe shadows, clarity of path edges, and use of light markers are among the important criteria for increasing safety and comfort. Cyclists at night.
b) Foreign research:
Kim and Park (2023) in a study titled “Effect of adaptive LED lighting on perception of security and visual comfort in Seoul City Hall” found that LED lighting systems that can adjust the intensity and color temperature of light based on time and user presence significantly increase the feeling of security and visual comfort compared to traditional fixed lighting systems. These systems also help reduce energy consumption.

Chen et al. (2024) in a study on “The role of lighting in promoting nighttime social interactions in public squares in China” showed that lighting design that creates diverse spaces with different lighting levels and atmospheres (such as bright spaces for group activities and dim spaces for private conversations) can help increase the variety and quality of social interactions at night.

In a study in Brazilian cities on “Lighting, fear of crime and women’s use of public spaces at night”, Rodrigues and Silva (2023) concluded that inadequate lighting and the presence of dark spots are one of the main obstacles to women’s presence in public spaces at night. They emphasized that lighting should be designed taking into account the needs and concerns of vulnerable groups in society.

In a study titled “Investigating the Effect of Nature-Based Lighting (Biophilic Lighting) on Reducing Stress and Increasing Attractiveness in Singapore Urban Parks”, Lee and Wang (2024) showed that the use of nature-inspired lighting patterns (such as moonlight, shadow and scene lighting) and combining light with natural elements can help reduce users’ stress and increase the attractiveness and sense of calm in the park environment.
Smith and Jones (2023) in a study of London city halls concluded that the use of dynamic lighting with the ability to change color and intensity significantly increases the visual appeal of spaces for different age groups and helps reduce petty crime, as dynamic and changing spaces are less prone

to antisocial behavior.

In a study on "The impact of light pollution from park lighting on the behavior of migratory birds in North American cities," Davis et al. (2024) found that excessive lighting with an inappropriate light spectrum can disrupt bird migration routes and have negative effects on their populations. They emphasized the need for the use of light shields and longer wavelength lights.

Patel and Kumar (2023) in a study in Indian cities titled “Assessing User Preferences for Nighttime Commercial Walkway Lighting” showed that in addition to adequate lighting for safety, users also care about aesthetic aspects such as highlighting shop windows, creating a vibrant atmosphere, and using colored lights for special events.

O’Connor and Murphy (2024) in a study in Dublin, Ireland titled “Urban Lighting and Sense of Place at Night” found that lighting can help create a stronger sense of place at night by highlighting urban landmarks, creating visual hierarchy, and reinforcing local identity. They emphasized the importance of involving the local community in the lighting design process.

Becker et al. (2023) in a study in Germany on "Integrating urban lighting systems with smart city infrastructure" showed how streetlights can be used as a base for installing various sensors (such as air quality sensors, surveillance cameras, public Wi-Fi), thereby helping to optimize urban management and provide better services to citizens. Abdullah and Hassan (2024) in a study in Kuala Lumpur, Malaysia, on the topic of "The effect of lighting fountains and water elements in Milad Tower on nighttime attractiveness and heat island reduction" concluded that artistic lighting of these elements not only adds to visual beauty, but can also help to moderate the urban heat island effect by encouraging people to be near these spaces at night.

The novelty and innovation aspect of the research

The novelty and innovation aspect of this research can be explained in several areas. First, focusing simultaneously on the two key variables of "security" and "attractiveness" at night in a large and complex public space such as the Espinance Hotel Royal Hall, and examining the mutual impact of lighting on these two, has received less attention in domestic research of this scope and depth. Second, using a comprehensive hybrid approach that includes a detailed analysis of the views and experiences of users (as the main stakeholders) along with expert surveys and field observations will help to provide richer and more practical findings. Third, trying to identify specific lighting components (such as intensity, color, uniformity, design techniques) that have the greatest impact on the perception of security and attractiveness in the cultural context of Iran and in a multi-function concert can lead to the provision of local solutions tailored to domestic needs. Finally, this research will not be limited to simply describing the current situation, but will seek to provide practical and implementable suggestions for improving the lighting system of the Spinance Hotel and, consequently, other similar spaces.

Specific research objectives (including ideal, general, specific and applied objectives)

•Ideal objective: To help create safer, more attractive, more dynamic and more lively urban public spaces at night in Iran.

•General objective: To determine the effect of urban lighting quality on the security and attractiveness of the Spinance Hotel concert at night from the perspective of citizens.

•Specific objectives:

o to determine the effect of different lighting components (intensity, color, uniformity, type of light) on the users' sense of security in the Royal Hall of the Spinance Hotel at night.

o to determine the effect of different lighting components on the users' perception of the visual and physical attractiveness of the Royal Hall of the Spinance Hotel at night.

o to identify the strengths and weaknesses of the current lighting system of the Royal Hall of the Spinance Hotel from the perspective of security and attractiveness at night.

o to determine the relationship between lighting characteristics and behavioral patterns (amount of attendance, type of activities) of users in different spaces of the Royal Hall of the Spinance Hotel at night.

o Identifying the preferences and expectations of users of the Royal Hall of the Spinance Hotel regarding the desired lighting for various concert spaces.

•Practical objectives:
o Providing practical suggestions and solutions to improve the lighting system of the Spinance Hotel concert in order to simultaneously increase security and nighttime attractiveness.
o Developing guiding principles for the lighting design of large halls in Iran with an emphasis on the needs and preferences of users.

If there is an applied objective, the names of the beneficiaries (organizations, industries, or stakeholder groups) should be mentioned (in other words, the location of the case study)
The main beneficiaries of the results of this research are:
1. Concert hall designers and officials: especially the Ministry of Culture and Islamic Guidance, the Deputy of Urban Services, and municipal and architectural regions related to concerts, who can use the results to improve and improve the lighting system of concerts and other halls in the city.
2.Urban designers, landscape architects and lighting engineers: who can benefit from the findings and principles extracted in the design of future lighting projects nationwide.
3. Consulting companies and lighting equipment manufacturers: to better understand market needs and design appropriate products and solutions.
4.Researchers and students in related fields: as a source for future research.
5.Citizens and users of the Royal Hall of the Espinance Hotel and other public spaces: who will ultimately benefit from improving the quality of these spaces at night.
The location of the case study will be the Royal Hall of the Espinance Hotel.

Research Questions
1. Does the quality of different lighting components (intensity, color, uniformity) of Mellat Park Mashhad affect users' sense of security at night? How?
2.Do the lighting design features (such as highlighting elements, creating diverse light spaces) of the Royal Hall of the Spinance Hotel affect its visual and physical appeal at night from the users' perspective? How?
3.What are the strengths and weaknesses of the current lighting system of the Royal Hall of the Spinance Hotel from the perspective of providing security and creating nighttime appeal?
4. Is there a significant relationship between the type of lighting in different spaces of the Spinance Hotel and the behavioral patterns of users (amount of attendance, type of activity) at night?
5. What are the preferences and expectations of users of the Spinance Hotel regarding the desired lighting for different spaces of this park (paths, seating areas, cafe and restaurant and fountain shopping center, green space)?

Research Hypotheses
1.It seems that increasing the level and uniformity of lighting in the main and secondary routes of the Spinance Hotel has a positive and significant relationship with increasing the sense of security at night for users.
2. It seems that using creative and artistic lighting that highlights the landscape and architectural features of the Royal Hall of the Spinance Hotel increases the visual appeal of the park at night from the users' perspective.
3.It seems that the presence of dark spots and inappropriate lighting in some parts of the Spinance Hotel is related to reducing the users' desire to be present and active in those parts at night.
4.It seems that users' preferences for lighting different spaces of the Spinance Hotel (such as active spaces and quiet spaces) are different.
5.It seems that lighting that increases the sense of invitingness and legibility of the space in the Spinance Hotel leads to increased user presence and satisfaction at night.

Definition of technical and specialized terms and terms (conceptually and operationally)

•Concert lighting:

o Conceptual: The art and science of using artificial light (and sometimes natural light in combination with it) to illuminate concert environments at night, with functional (such as visibility and safety), aesthetic (such as enhancing the cityscape), and social (such as encouraging interactions) goals.

o Operational: In this study, all aspects of the lighting system of the Spinance Hotel Royal Hall, including the type and specifications of light sources (lamps, projectors), light intensity (lux), light color temperature (Kelvin), color rendering index (CRI), light uniformity, light direction and distribution, glare control, and lighting design patterns and techniques in different parts of the concert.

•Nighttime security:

o Conceptual: The state in which people in an environment at night feel free from the feeling of darkness and proximity of seats, threat or harm (real or perceived), and can work with peace of mind.

o Operational: In this study, the level of users' sense of safety and comfort in the light, space, environment, and seats in the Royal Hall at night, which is assessed through a questionnaire (measuring the perception of security, psychological, and observations (the amount of people's presence, users' caring behaviors).

•Nighttime attractiveness:

o Conceptual: The level of pleasantness, beauty, attraction, and attractiveness of an urban space at night that makes people want to attend, stay, and experience that space.

o Operational: In this study, users' evaluation of aesthetic aspects (such as the harmony of light and color, the prominence of beautiful elements), the readability and visual clarity of the space, the invitingness, vitality, and dynamism created by lighting in concerts at night, which is measured through a questionnaire and interview.

•Public space:

o Conceptual: Areas in the urban environment that are available for public use without restrictions (or with few restrictions) and provide the possibility of social, cultural interactions, and individual and collective activities.

o Operational: In this study, Specifically, the area of the Espinance Hotel Royal Hall, including walkways, gates, waiting rooms, cafes and restaurants, entrances, and other physical and spatial elements used by participants at night.

Research Method:

A- A complete description of the research method in terms of purpose, type of data and implementation method (including materials, equipment and standards used in the implementation stages of the research separately):

This research is applied in terms of purpose and descriptive-analytical and survey in nature with a mixed approach (quantitative and qualitative). The implementation stages of the research will be as follows:

1.Library and documentary studies: Collecting theoretical foundations and research background in the field of urban lighting, concert halls, security, attractiveness and public spaces through books, scientific articles, documents and plans related to the Royal Hall of the Spinance Hotel.

2.Initial field impressions and preparation of tools: Multiple visits to the Spinance Hotel at different times of the night to initially identify the lighting situation, user behavioral patterns and key spaces. At this stage, a draft questionnaire and interview framework are prepared and their initial validity and reliability are examined. Also, points for quantitative measurement of light parameters (such as light intensity with a lux meter) are determined.

3. Qualitative data collection: Conducting semi-structured interviews with two groups: a) users of the Spinance Hotel (with a variety of ages and genders) to understand in depth their experiences, perceptions and preferences regarding lighting, security and attractiveness. b) Relevant experts and managers (from the municipality, designers) to learn about policies, challenges and expert views.

Participatory and non-participatory observations will also be conducted to record user behaviors and interactions in different spaces of the park at night.
4.Quantitative data collection: Distributing a researcher-made questionnaire (with Likert scale and multiple choice questions) among a representative sample of concert hall users to measure research variables (perception of lighting quality, sense of security, perception of attractiveness). Also, physical parameters of light (such as light intensity) will be measured at selected concert locations using standard equipment (luxmeter).
5. Data Analysis: Qualitative data from interviews and observations will be coded and interpreted using content analysis or thematic analysis. Quantitative data from questionnaires will be analyzed using SPSS software and descriptive (frequency, mean) and inferential statistics (correlation tests, t-test, ANOVA, regression).
6. Integration of results and conclusions: The results from quantitative and qualitative analyses will be compared and integrated to achieve a more comprehensive understanding of the subject and answer the research questions. Finally, conclusions and practical suggestions will be presented based on the findings.

B- Variables under study in the form of a conceptual model and description of how to examine and measure the variables:
Conceptual model: The main independent variable "Mellat Park lighting quality" (with technical dimensions: intensity, uniformity, light color, color temperature, glare control; and design dimensions: aesthetics, legibility, identification) affects the dependent variables "perceived nighttime security" (with dimensions: reduced fear of crime, increased surveillance capability, sense of comfort) and "perceived nighttime attractiveness" (with dimensions: visual beauty, invitingness, liveliness, sense of place). Intervening factors such as individual characteristics of users (age, gender, previous experience) and environmental characteristics (time of night, weather conditions, type of space at the concert) are also considered.
Measurement of variables: Lighting quality is measured through field observations, measurements with a lux meter, and questionnaire questions (users' perception of light quality). Perceived nighttime safety and attractiveness will be measured primarily through standardized or researcher-made questions in the questionnaire and content analysis of interviews.
C – Full description of the method (field, library) and tools (observation and testing, questionnaire, interview, record-keeping, etc.) of data collection:
Data collection is carried out in two main methods: library and field.
•Library method: Includes reviewing scientific articles, books, theses, research reports, documents and plans related to urban lighting, the Royal Hall Hotel, and similar domestic and foreign studies. The main tool in this section is record-keeping from sources and preparing a theoretical framework and research literature.
•Field method:
o Observation: Direct and systematic (with checklist) and indirect observations of the lighting situation, user behavior, strengths and weaknesses of safety and attractiveness in various concert spaces at night.
o Interview: Semi-structured interviews with a predetermined (but flexible) question guide with park users and experts. The interviews will be recorded and then transcribed.
o Questionnaire: A researcher-made questionnaire including closed questions (Likert scale, multiple choice) and possibly a few short open questions, to collect quantitative data from a large sample of users.
o technical measurement: Using a luxmeter to measure the intensity of light in different parts of the park and record other technical lighting specifications.
D - Statistical population, sampling method and sample size (if available and possible):
•Statistical population:
1. All overnight users of the Spinance Royal Hall Hotel (people of different ages) who use the Royal Hall during the research period.
2. Experts and specialists in the fields of urban design, landscape architecture and lighting in the

municipality of hotels and halls and halls and consulting companies.

•Sampling method:

o for the questionnaire (quantitative part): A stratified sampling method appropriate to the different areas of the halls and amphitheaters or convenient sampling will be used at the entrances and high-traffic areas of the halls.

o for interviews (qualitative part): Purposive sampling (for experts) and snowball or maximum diversity purposive sampling (for users) are used until theoretical saturation of the data is reached.

•Sample size:

o for questionnaires: Using the Cochran formula and considering a 95% confidence level and a 5% sampling error, the sample size will be estimated (for example, for an unlimited or very large population, about 384 people).

o for interviews: Usually between 15 and 30 interviews with users and 5 to 10 interviews with experts will be sufficient until theoretical saturation is reached.

E - Data analysis methods and tools:

•Qualitative data (from interviews and observations): will be coded, categorized and analyzed using qualitative content analysis or thematic analysis and with the help of software such as MAXQDA or NVivo (if needed) to extract patterns, themes and key concepts.

•Quantitative data (from questionnaires and technical measurements): This will be done using the latest versions of SPSS software. First, descriptive statistics (frequency tables, percentages, means, standard deviations, graphs) will be calculated to describe the characteristics of the sample and variables. Then, inferential statistical tests appropriate to the type of data and research hypotheses (such as Pearson or Spearman correlation tests, t-test for independent groups, one-way analysis of variance (ANOVA), equivalent nonparametric tests, and multivariate regression analysis) will be used to examine the relationships between variables and test the hypotheses. The results will be evaluated at a significance level of 0.05.

Smart Amphitheater and the Role of Artificial Intelligence in Improving the Audience Experience

The world of modern amphitheaters is changing rapidly. Today's audiences are no longer just looking for a simple performance, but rather expect an immersive, dynamic, and personalized experience. This is where artificial intelligence (AI) comes into play, combining new technologies from smart lighting to interactive seating to create a unique experience for spectators.

Artificial Intelligence and the Evolution of Lighting

Light is one of the most important elements in the design of an amphitheater. The use of lighting systems based on artificial intelligence allows for perfect coordination between light, sound and movement on stage. For example, machine learning algorithms can analyze the rhythm of the performance and adjust the intensity or color of the light in real time. This capability not only helps to increase the quality of the show, but also makes the audience feel like they are in a living and intelligent space.

Interactive seats and personalized experience

Seats are no longer just a place to sit; in smart amphitheaters, seats can be equipped with vibration, heating and haptic feedback systems. Artificial intelligence can change the seat settings based on the genre of the performance or even the momentary reactions of the audience. For example, during an exciting scene, the seat will vibrate slightly to make the audience’s experience more aligned with the story. This feature turns the artistic performance into a multi-sensory experience.

Audience Behavior Analysis with AI

One of the unique capabilities of AI is audience behavior analysis. Smart systems can use cameras and sensors to monitor facial reactions, emotion levels, or even the level of attention of the audience. This data helps venue managers adjust the performance content, lighting, or sound to get the best feedback from the audience. In addition, the collected data can be used to improve future performances.

Business Benefits of Smart Amphitheaters

Investing in smart amphitheaters is not just a technological choice, but also a smart business

decision. The different experience that audiences gain in these venues will increase ticket sales, attract new customers, and keep audiences coming back. The advanced facilities of these venues also provide a suitable environment for holding international events and increasing the reputation of the host brand.

Challenges and the future of this technology

Of course, implementing AI in an amphitheater is not without challenges. High initial costs, the need for strong infrastructure, and human resource training are among the main obstacles. But global trends show that the future of theaters will undoubtedly move towards digitalization and greater personalization. In the meantime, organizations that take action to make their theaters smarter sooner will have a significant competitive advantage over their competitors.

Selection and investment guide

- Needs analysis: Examine the type of performances and the size of the audience.
- Technical infrastructure: Use lighting and sound systems compatible with AI.
- Interactive furniture: Choose smart and comfortable chairs.
- Data management: Use data analysis tools for continuous improvement.
- Collaboration with experts: Entrust the implementation of the project to professional teams.

By following these principles, you can transform your digital amphitheater into a sophisticated and engaging environment for your audience while increasing the business value of your organization.

Lighting for Cinemas, Amphitheaters and Concert Halls

Lighting in conference halls, cinemas, amphitheaters and concert halls should be done in a way that provides the best visual and environmental experience for attendees. This is of great importance considering the needs of the users of these spaces.

The main goal of professional lighting is to ensure that people can see clear and high-quality images when attending lectures or watching performances, while at the same time providing enough light for comfortable entry, placement and exit.

The lighting of these spaces should not only provide appropriate general lighting, but should also use natural and appropriate light as much as possible, so that people's visual experience is not affected by inappropriate lighting.

Another important aspect of lighting is the creation and direction of focused lights and special effects that help to better understand the content and connect more with the performances and shows. To achieve this goal, advanced equipment and various lighting software are used. Types of lighting in cinemas, amphitheaters and concert halls

General lighting

General lighting includes all light sources that are installed to provide general lighting for various spaces in the hall, including the audience seats, corridors and lobby. This type of lighting usually consists of ceiling lights, interior wall lights and hidden lighting, which in addition to lighting, also help to beautify and design the interior of the space.

In general lighting, the use of light sources with sufficient brightness and low energy consumption

is important. Energy-efficient products such as LED lamps are desirable options due to their lower heat generation and reduced energy consumption.

Specialized lighting

Specialized lighting refers to a set of projectors and spotlights that are installed in and around the stage to create lighting effects. These systems usually include projectors such as Spot Light, Flood Light, PAR and Moving Head, each of which has its own specific application

Specialized lighting systems in conference halls, amphitheaters and concert halls are designed to create special lighting effects to draw the audience's attention directly to the stage and performance. These systems are adjusted and managed based on the needs of each performance and type of program.

Lighting during lectures and performances

For lighting in conference halls, during lectures and performances, the hall light is reduced so that the audience's attention is directed towards the stage or screen. In these cases, it is necessary that the corridors and exits are properly lit using special lights such as stair lights and exit lights so that people can move around easily.

•Low light in the space: Cinema halls require minimal light that allows the viewer to focus on the screen. This light is usually emitted indirectly from the walls or ceiling.

•Exit lighting: One of the most important safety points in movie theaters is the lighting of emergency exits. Exit and guide lights should always be visible and well lit.

•Ambient lighting before and after the movie: Before the start and after the end of the movie, the hall light increases slightly so that people can easily go to their seats or leave the hall.

•Stage lighting: One of the most important elements of lighting in an amphitheater is the stage lighting. Spotlights are usually used to highlight actors and objects on the stage. These lights must be carefully adjusted so that the actors are the center of attention.

•Ambient lighting: In some shows, colored and special lights may be used to create a special theatrical atmosphere. These lights help create a sense of atmosphere related to the story.

•Shadow control: One of the important challenges in amphitheater lighting is controlling shadows. The lighting designer must adjust the lighting in such a way that unnecessary shadows do not fall on the stage and the audience's attention is not distracted.

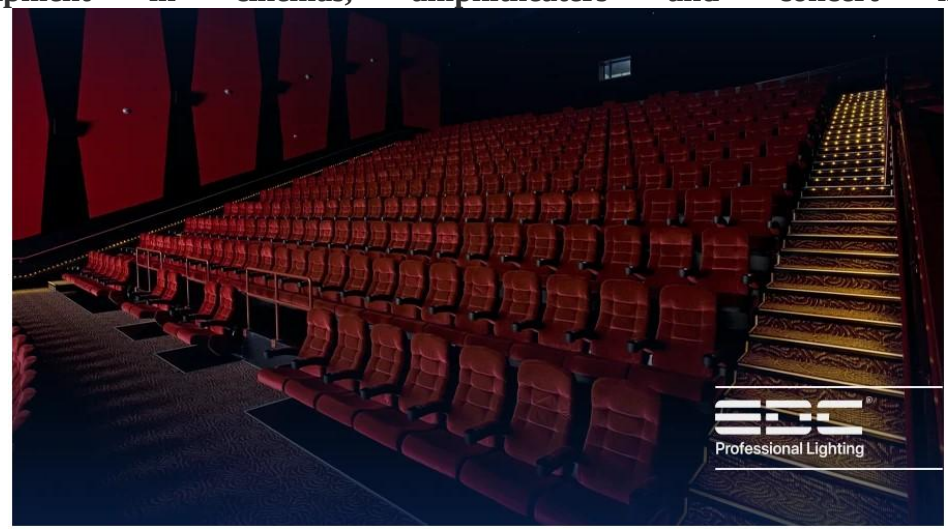
Lighting principles at concerts

•Moving lights: Concerts use moving and intelligent lights that change direction in time with the music. These lights can convey more energy and excitement to the audience.

•Colored lights and effects: The use of colored lights, lasers, and special effects such as fog machines or flashes can add to the visual appeal of the concert. These effects are usually used to match the beat and emotion of the music.

•Lighting for musicians: In addition to moving lights and effects, there should be lights that illuminate the musicians and put them in the center of attention.

Lighting equipment in cinemas, amphitheaters and concert halls



Professional lighting requires the right equipment. Below are some of the common lighting equipment in these spaces:

•LED projectors: These projectors are usually used in large halls due to their high brightness and lower energy consumption.

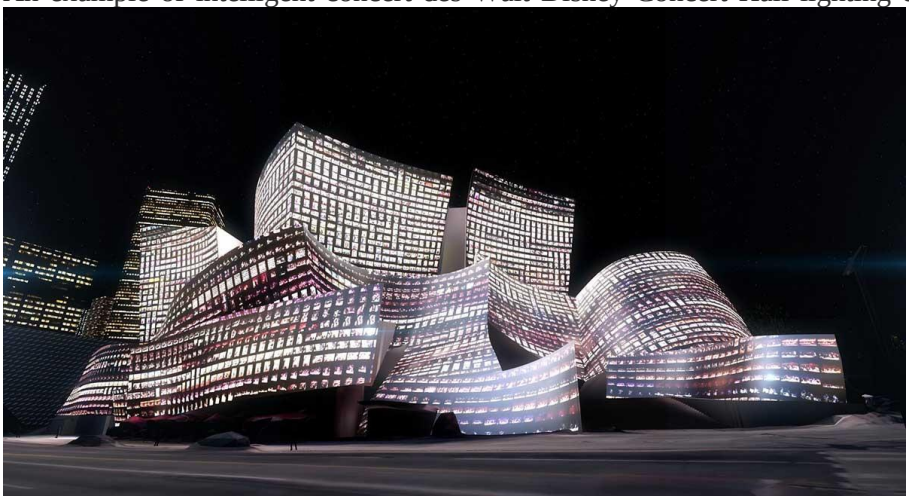
•Spotlights: These lights are used to focus light on a specific part of the stage, such as actors or musicians.

•Intelligent control systems: Modern lighting systems are usually controlled by computer systems that allow for quick changes and synchronization with music or shows.

Buy lighting products for lighting cinemas, amphitheaters and concerts from EDC

To buy suitable lighting products for lighting cinemas, amphitheaters and concerts, the EDC store is one of the best options. Offering modern and high-quality lighting equipment, including projectors, specialized spotlights, and smart lighting systems, this store allows you to create unique visual effects. EDC products, with their low energy consumption, long lifespan, and ability to adjust the light to suit the specific needs of each event, are an ideal option for professional lighting of cultural and artistic spaces.

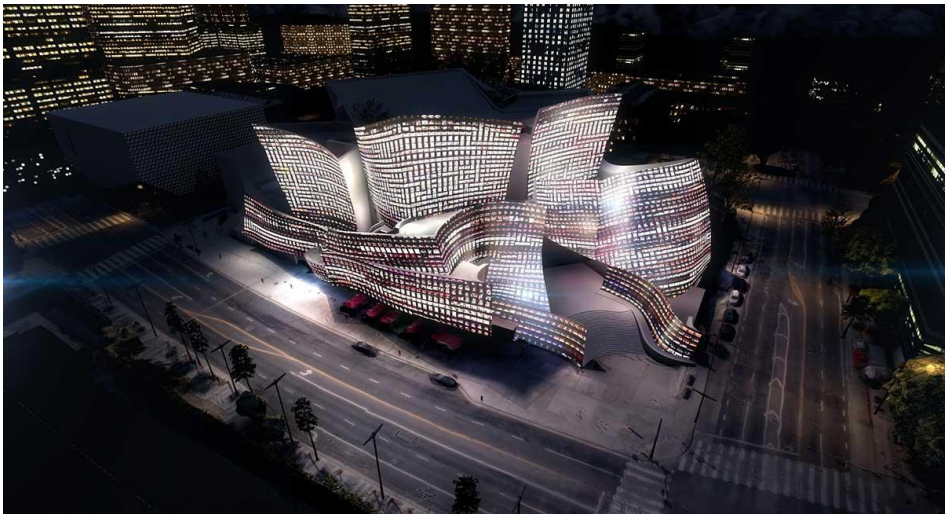
An example of intelligent concert des Walt Disney Concert Hall lighting design with artistic algorithms

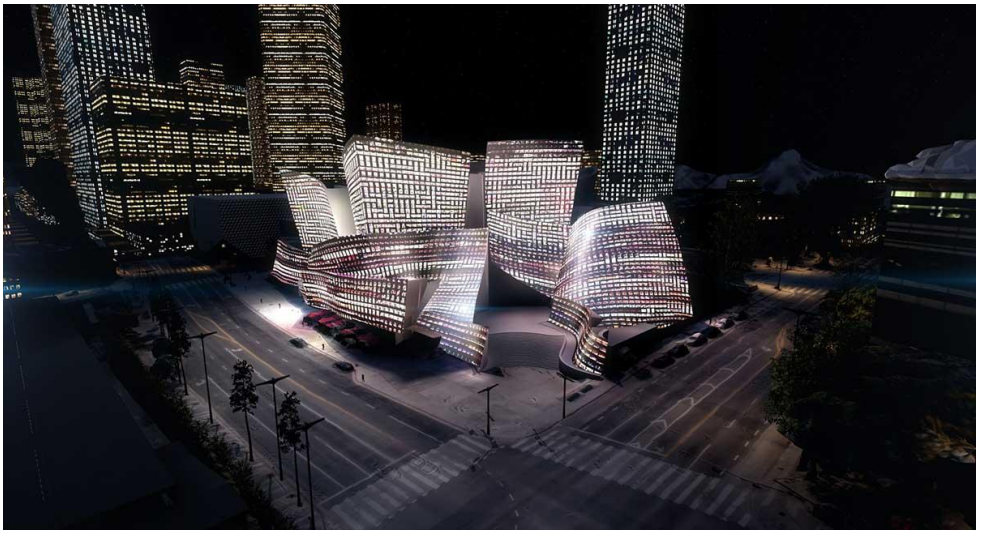


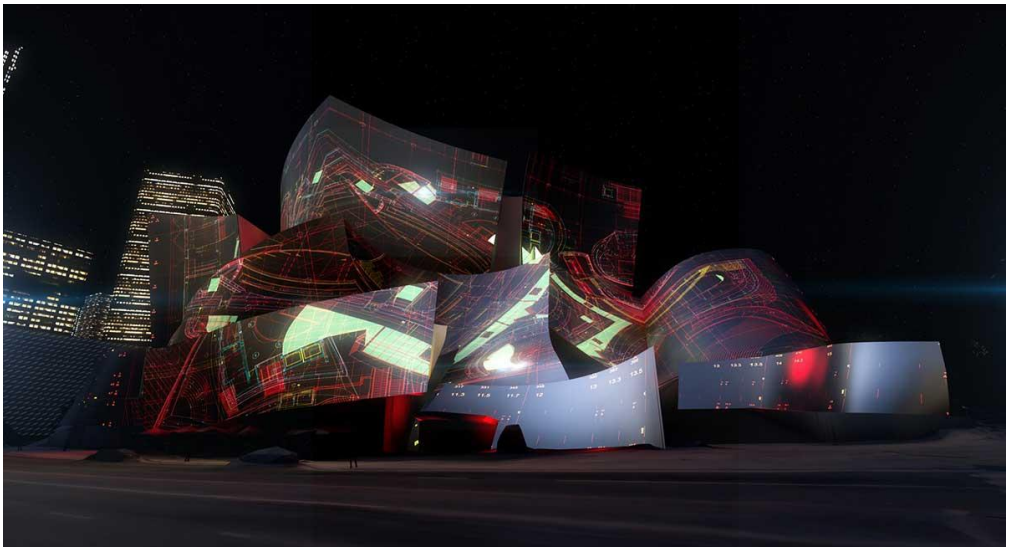
Lighting Design

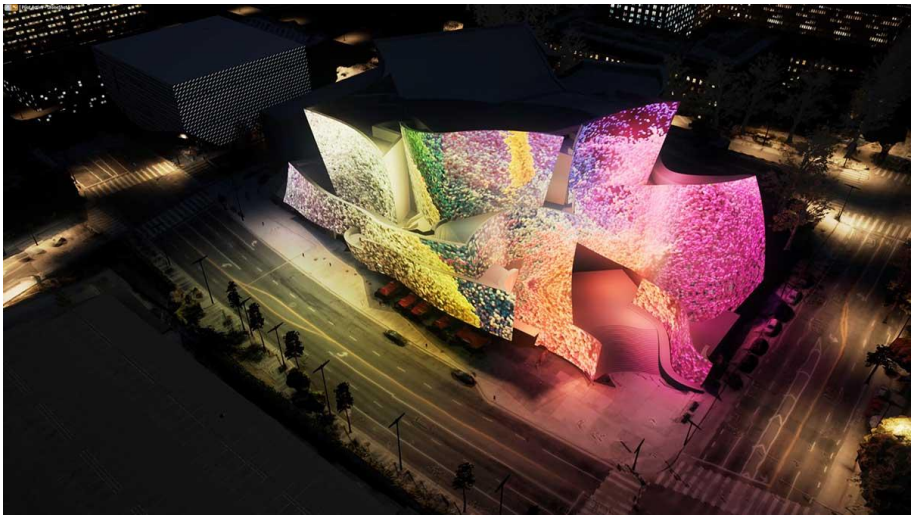
The Walt Disney Concert Hall is intended to celebrate film, art, media and culture annually. The choice of such a design was inspired by the digital changes in the world of cinema and art, and the architects considered the incorporation of holographic lighting as a suitable digital language to express such a concept on the facade of the Walt Disney Concert Hall. For this project, a unique collaboration between Anadolu and Google Art took place, which transformed the entire digital archive of the L.A. Philharmonic Orchestra, with more than 45 terabytes of images, photos, videos and patterns, into millions of holographic dots.

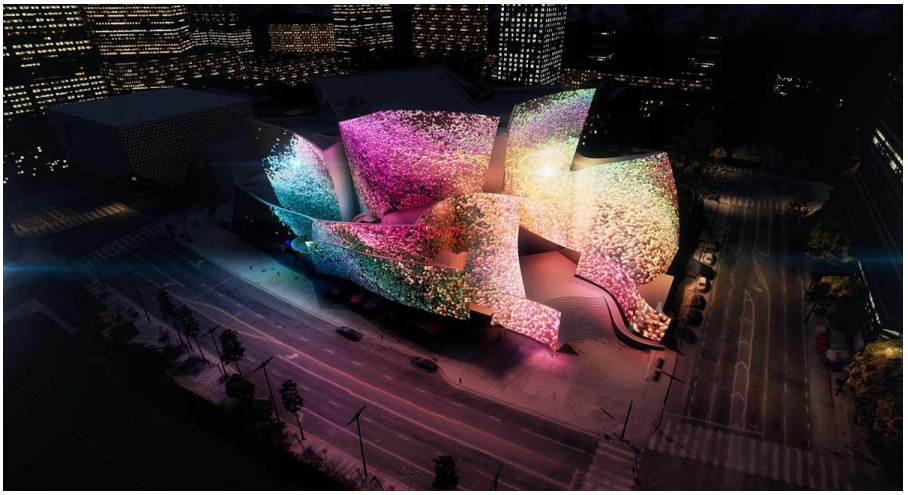
This "information world" is manipulated by digital neural networks and projected as 3D images across the steel geometries of the Walt Disney Concert Hall facade. A fresh idea and a fresh look for the building designed by Frank Gehry. The light show of the projections is combined with the music of three composers named and the dance of the light show is in harmony with the notes of the music. The selection of the songs is done by an automated algorithm by the computer. The project is presented as "exploring and synergizing art, technology, architecture and fundamental memory" and will be on display from September 28 to October 6, 2018.

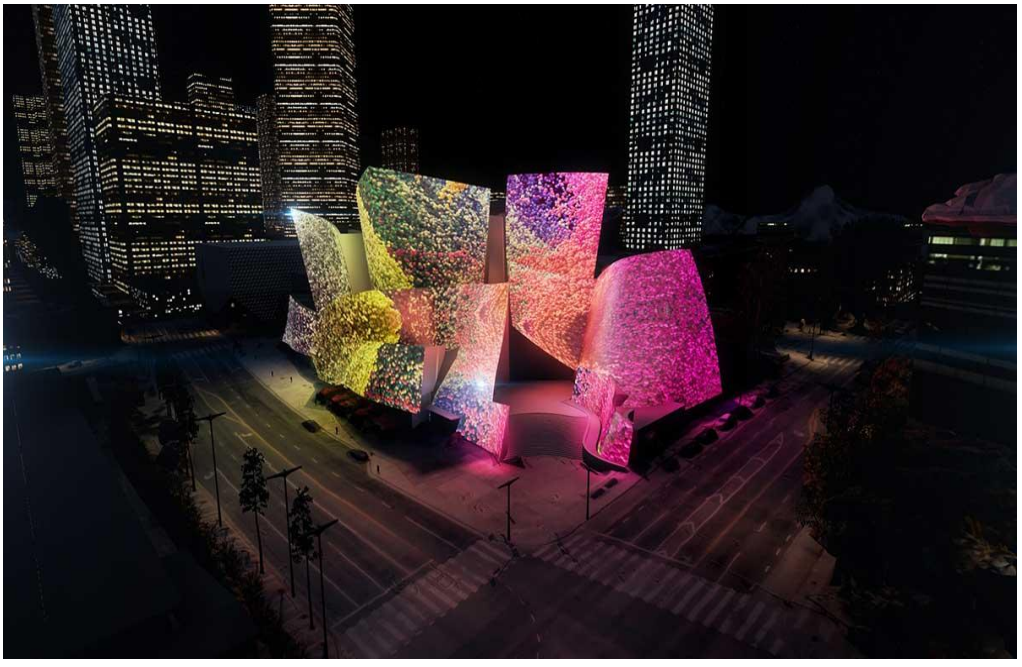












Lighting Design:

The Walt Disney Concert Hall is intended to celebrate film, art, media and culture annually. The choice of such a design was inspired by the digital changes in the world of cinema and art, and the architects considered the incorporation of holographic lighting as a digital language

appropriate to express such a concept on the facade of the Walt Disney Concert Hall. For this project, a unique collaboration was made between Anadol and Google Art, which transformed the entire digital archive of the L.A. Philharmonic Orchestra with more than 45 terabytes of images, photos, videos and patterns into millions of hologram dots.

This "world of information" was manipulated by digital neural networks and projected as 3D images across the steel geometries of the Walt Disney Concert Hall facade. A novel idea and a fresh look for the building designed by Frank Gehry. The light show of the projections is combined with the music of three composers named and the dance of the facade is in harmony with the notes of the music. The selection of songs is done by an automated algorithm by a computer.
The project is presented as an "exploration and synergy between art, technology, architecture and fundamental memory" and will be on display between September 28 and October 6, 2018.
Walt Disney Concert Hall Lighting Design with Artistic Algorithms

Walt Disney Concert Hall Lighting Design
Disney is planning to celebrate film, art, media and culture annually. The choice of such a design was inspired by the digital changes in the world of cinema and art, and the architects considered the incorporation of holographic lighting as a suitable digital language to express such a concept on the facade of the Walt Disney Concert Hall. For this project, a unique collaboration was made between Anadol and Google Art, which transformed the entire digital archive of the L.A. Philharmonic Orchestra with more than 45 terabytes of images, photos, videos and patterns into millions of hologram dots.

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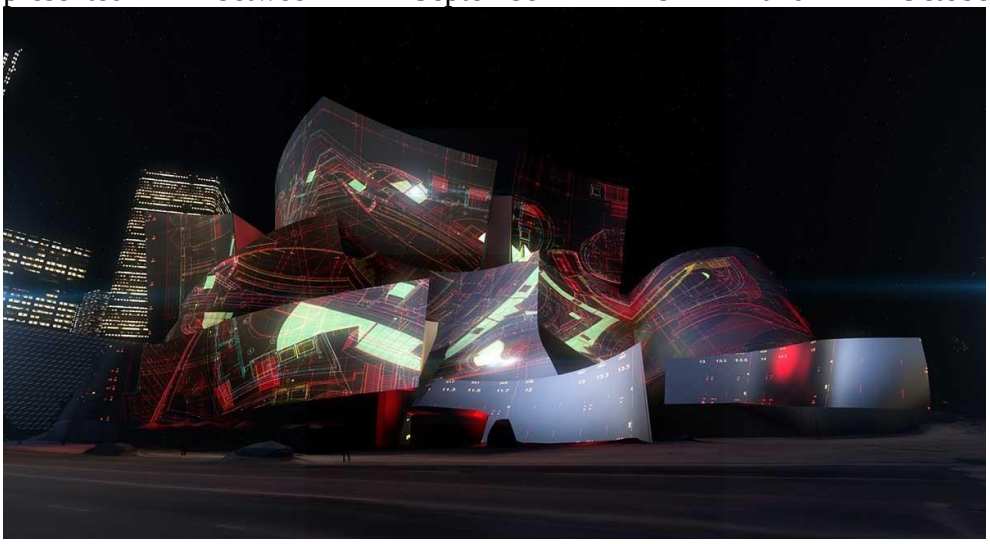
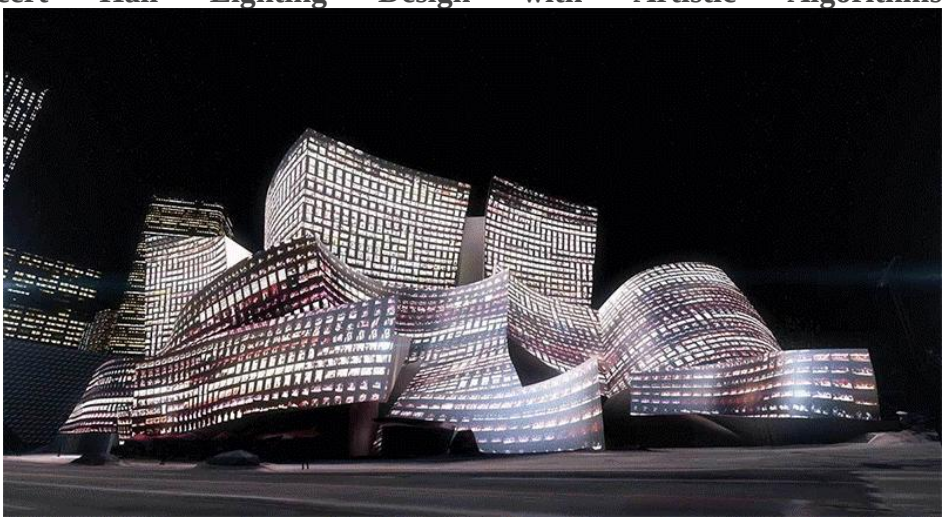


Walt Disney Concert Hall Lighting Design with Artistic Algorithms



The lighting design for the Walt Disney Concert Hall is intended to celebrate the annual celebration of film, art, media, and culture. Inspired by the digital transformation of the world of cinema and art, the architects of the holographic lighting system considered a digital language to be a suitable tool for such a concept throughout the Walt Disney Concert Hall. For this project, a unique collaboration was made between Atadol and Google Art, which transformed the entire digital archive of the L.A. Philharmonic Orchestra, with more than 45 terabytes of images, photographs, videos, and patterns, into millions of holographic dots.

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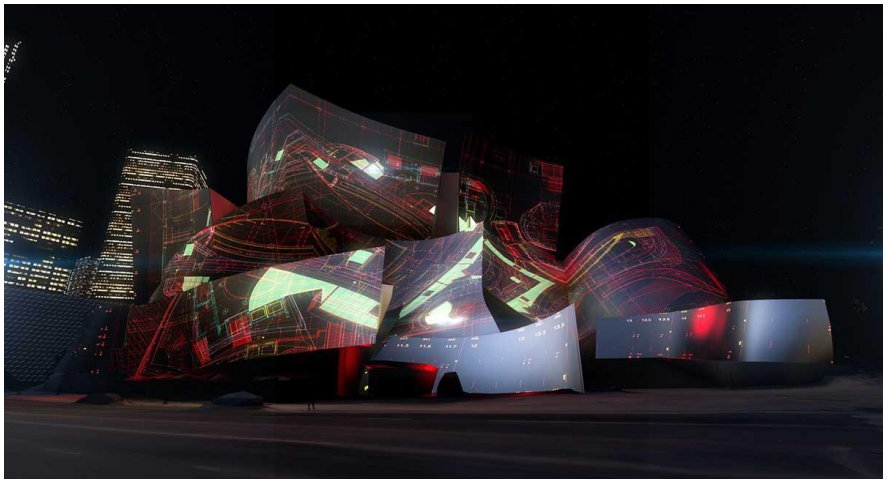

It seems your question is about smart concert lighting, future work and conclusion. Below I will provide a practical framework for concert that can be useful you need lighting projects. If specific details, please let me know so that we can prioritize them. What is smart lighting? The use of intelligent control systems to manage lighting expectations, colors, intensity, movement and synchronization with music and events on stage.

Key components: Music player (DAW), lighting console, control protocols such as DMX, Art-Net, sACN, and sensor/biometric data or smart schedules. Suggested architecture for concerts Control levels: Artistic/technical control: Lighting design team, lighting director, concert technician. Scheduled control: cue list, each cue includes colors, lighting makeup, movement, shadow, intensity and light angle.

Input data: Live or streaming music: BPM, song structure (Verse/Chorus/Break), dramatic sequences. On-stage events: artist entrance/exit, ats, and special lights. Technical Loops: DMX/sACN Diagram for Protocols Light Controller: With Cue Override, LFO/ENV for Parameters Automation: Automatic Execution with AI to Sync with Music or Video

Future Work (Development Solutions): Standardization and Frameworks Defining Cue Naming and Metadata Standard for Each Cue Using Minimum Standards for Compatibility with Different AI and Data-Driven Equipment Music Analysis with Adaptive Models to Extract BPM, Phases, and Intensity for Light Execution Prediction Models to Suggest Cues Based on Concert Style and Performance History Dynamic Scheduling: Creating a Cue Editor with the Ability to “Live Tweak” During Performance and Save It as a New Cue Coordination with Video/LED Wall for Stage Design

Technical Team User Experience

Simple UI/UX for Lighting Manager and Technician Possibility of On-Stage Testing with Simulation

Environment Sound and Lighting Enhancement: Light Layering with Compression and Energy Consumption Assessment Heating/Consumption Management of Lighting Equipment with Smart sensors Security and stability: Cue backup, access management and change log Fast recovery in case of power outages or network errors Proposed implementation process (optimized for new projects) Phase 1: Research and design Analysis of needs, existing equipment, constraints and budget Design of system architecture, standardization of cue naming Phase 2: Basic implementation Setting up a light controller with DMX/Art-Net protocols Creating a bridge between DAW and light (e.g. with MIDI/OSC interfaces) Development of simple AI modules for BPM compatibility Phase 3: Testing and simulation Testing cues on a simulated database Testing the coordination of light with music and video Phase 4: Trial execution and improvement of the concert performance or part of it with the light team Collecting feedback and corrections Phase 5: Continuous optimization Updating AI models, hardware maintenance, and documentation Key results (conclusions): Increased coordination between light, music and video creates a more spectacular and professional experience for the audience Standardized processes and automation can reduce show preparation time and reduce human error. Using music and stage event data in an intelligent way allows for the creation of dynamic cues that are unique to each performance. The ability to report and analyze data from different performances helps the technical team make better decisions to improve lighting. If you are interested, I can: Provide a detailed implementation checklist with step-by-step steps for your project. Create a standard cue template for your concerts (naming, metadata, parameters for each cue). Provide a technical architecture proposal with detailed protocols and tools suitable for your budget.

Please tell me: What is the size and type of your concert? (Live/Pre-recorded) What lighting equipment do you have or plan to use? (DMX/ART-Net, projectors, moving heads, LED walls, etc.) Do you want to use AI to synchronize with the music or is automation and timing of cues enough?

Great! Below I present a collection of upcoming works and development projects for smart concert lighting. This list can be used as a roadmap for the technical team and lighting design.

Standardization and frameworks

Cue naming and standard metadata

Define a clear standard for naming cues (e.g.: Scene_Rhythm_BPM_Verse1_Loud) Metadata for each cue: suggested BPM, timing, dominant color, intensity, light angle, noise/grind

Standard data framework and models Interchangeable formats between software (JSON/XML YAML) Minimum standards for compatibility with different equipment

A library of DAW and light bridges MIDI/OSC modules for communication with DAW (Ableton Live, Logic Pro) and stage production software

2) Artificial intelligence and data-driven automatic music recognition and analysis Deep learning models for extracting BPM, phase (intro/verse/chorus), energy, database of important events

Cue suggestion based on style and performance history A recommender system that suggests appropriate cues for each performance and technical team

Light coordination with video and LED wall Analyze signals from videos and match the color/rhythm of light to the playing images.

3) Dynamic timing and advanced automation Cue editor with Live tweak capability Ability to apply changes to cues during performance and record as a new version

Music phase-based automation

According to BPM, sound intensity measurement, and dynamic light-driven changes AI-powered lighting and scene: Models to detect on-stage movements and adapt lighting to them (e.g., movement of markers, artist entrance/exit)

User experience and stage control

User-friendly UI/UX for lighting manager and technician: Clear dashboard to display cues, equipment status, and safety alerts Scene and cue simulator (Simulation) A test environment to test cues without having to be on stage Secure access and control Access level management, change logs, project versioning, and recovery_ERROR Improved efficiency and energy consumption Light layering and consumption optimization Models to evaluate the energy consumption of each cue and suggest more energy-efficient alternatives Thermal management and equipment life Monitoring of lighting heating

and predicting maintenance needs
Security and stability Fast backup and recovery Secure storage of cues and scene settings with fast recovery Continuous technical tests Protocol integrity checklists (DMX/sACN/Art-Net), network security, and connection stability Control Operation in unsafe or heterogeneous environments Support for power outage scenarios, sudden changes in music or events Development and implementation process Concept and research phase Gathering needs, reviewing existing equipment, analyzing budget and constraints Basic implementation phase: Connecting DAW to light with MIDI/OSC interfaces Implementing light field protocols (DMX/Art-Net/sACN) Testing and simulation phase: Testing cues in simulation environment and before live performance Trial run and feedback phase: Limited run with light and video team for validation Continuous optimization phase: Updating AI models, maintaining hardware, and documenting success evaluation criteria Better coordination of light, music and video in performances Reducing show preparation time and reducing human errors Enabling dynamic and experience-based lighting for the audience Ability to report and analyze data from different performances for continuous improvement.

References:

1. Ahmadi, S., et al. (1401). Challenges of lighting public spaces in Iranian cities. Quarterly Journal of Urban Studies, 10(3), 45-62.
2. Akbari, M., and Rezaei, A. (1402). Investigating the impact of light pollution caused by inappropriate lighting on the ecosystem of urban parks (case study: several parks in Shiraz). Journal of Environmental Sciences and Technologies, 24(1), 112-128.
3. Jafari, N., et al. (1401). Lived experience of users of urban public spaces at night and the role of lighting in it (case study: Shahriar Pedestrian Walkway, Tabriz). Journal of Fine Arts - Architecture and Urban Planning, 27(3), 88-101.
4. Jalilian, N., Hajigholam Sarizadi, A., and Mirei, M. (1403). An analysis of the factors and components of the landscape of Islamic cities with emphasis on the old bazaar. Quarterly Journal of Sustainable Urban and Regional Development Studies, 5(2), 66-90.
5. Hatami, P., et al. (1401). The decline of nightlife in public spaces of central Iranian cities: causes and consequences. Research on the geography of urban planning, 9(4), 780-799.
6. Sadr Sigheh-e-Islami, S., and Farmahini Farahani, R. (1402). Proposal and necessity of applying nightlife in historical contexts (case study of the Tehran Citadel). Iranian Restoration and Architecture, 13(36), 55-66.
7. Sadeghi, R., et al. (1401). Qualitative evaluation of urban lighting projects in Iran: a case study of metropolises. Modern Urban Management, 6(22), 33-50.
8. Salehi, F., and Mohammadi, J. (1402). The role of creative lighting in attracting tourists to urban spaces at night (case study: Khajou Bridge, Isfahan). Urban Tourism Quarterly, 9(1), 1-18.
9. Tahmasebi, Z., et al. (1402). Identifying optimal lighting criteria for bicycle paths at night in urban parks. Journal of Transportation Engineering, 14(2), 201-215.
10. Ghasemi, Sh., et al. (1401). Principles of lighting design for children's play spaces in urban parks with an emphasis on safety and creativity. Sustainable Architecture and Urban Planning Studies, 3(2), 44-59.
11. Moradi, Kh., and Karimi, L. (1401). The effect of light color and color temperature on spatial and psychological perception of users in urban parks at night (case study: Saei Park, Tehran). Environmental Psychology, 7(2), 78-93.
12. Mousavi, S.A., & Hosseini, M. (1402). Evaluating the effectiveness of smart lighting in reducing energy consumption and increasing user satisfaction in academic spaces (case study: Tehran University Campus). Energy and Building, 11(4), 30-45.
13. Nezami, K., et al. (1401). Evaluating the effect of lighting on enhancing the sense of security in urban public spaces (case study: Laleh Park, Tehran). Quarterly Journal of Law Enforcement and Social Security, 15(1), 120-138.
14. Vafadari-Kamaraliya, D., & Ramezani, A. (1402/2025). Investigating the effect of lighting on the attractiveness of the night view of urban parks from the perspective of citizens. Quarterly Journal of Sustainable Urban and Regional Development Studies, 6(1), 140-158.

15. Abdullah, F., & Hassan, M. (2024). The impact of lighting water features in urban parks on nocturnal attractiveness and heat island mitigation in Kuala Lumpur, Malaysia. Journal of Urban Ecology, 10(1), ujae005.
16. Baker, L., et al. (2023). Integrating urban lighting systems with smart city infrastructure in Germany. Smart Cities, 6(3), 1245-1260.
17. Carr, S., et al. (2022). Public Space (2nd ed.). Cambridge University Press.
18. Chen, X., et al. (2024). The role of lighting in promoting nocturnal social interactions in Chinese public squares. Environment and Behavior, 56(2), 210-235.
19. Davis, R., et al. (2024). Impact of park lighting on migratory bird behavior in North American cities. Ornithological Applications, 126(1), duad050.
20. Johnson, M., & Lee, S. (2023). Balancing functional and aesthetic lighting in public spaces: A review. Lighting Research & Technology, 55(4), 345-360.
21. Kim, J., & Park, H. (2023). The effect of adaptive LED lighting on perceived safety and visual comfort in Seoul's urban parks. Sustainability, 15(6), 5021.
22. Lee, K., & Wang, Y. (2024). Exploring the impact of biophilic lighting on stress reduction and attractiveness in Singaporean urban parks. Journal of Environmental Psychology, 93, 102188.
23. Masullo, M., Cioffi, F., Li, J., Maffei, L., Ciampi, G., Sibilio, S., & Scorpio, M. (2023). Urban Park Lighting Quality Perception: An Immersive Virtual Reality Experiment. Sustainability, 15(3), 2069.
24. O'Connor, P., & Murphy, E. (2024). Urban lighting and the creation of a sense of place at night in Dublin. Urban Design International, 29(1), 45-58.
25. Patel, R., & Kumar, A. (2023). User preferences for lighting in nocturnal commercial pedestrian streets in Indian cities. Journal of Asian Architecture and Building Engineering, 22(5), 2340-2355.
26. Rodriguez, A., & Silva, B. (2023). Lighting, fear of crime, and women's use of public spaces at night in Brazilian cities. Gender, Place & Culture, 30(7), 985-1003.
27. Smith, J. (2023). The 24-Hour City: Revitalizing Urban Life. Routledge.
28. Smith, T., & Jones, K. (2023). Dynamic lighting in London's urban parks: Enhancing visual appeal and reducing petty crime. Journal of Urbanism, 16(2), 180-199.
29. Thibaud, J. P. (2021). The Sonic Attunement of Urban Ambiences. MIT Press.
30. Vafadari Komarolya, D. and Ramezani, A. (2025). Investigating the effect of lighting on the attractiveness of the night landscape of urban parks from the perspective of citizens. Journal of Sustainable Urban & Regional Development Studies (JSURDS), 6(1), 140-158.
31. Bolitzer, B., & Netusil, N. (2000). The impact of open spaces on property values in Portland, Oregon. Journal of Environmental Management, 59(3), 185-193.
32. Chiesura, A. (2004). The role of urban parks for the sustainable city. Landscape and Urban Planning, 68(1), 129-138.
33. Lin, Z., Jiao, W., Liu, H., Long, T., Liu, Y., Wei, Sh., He, G., Portnov, B., Trop, T., Liu, M., Li, X., & Wen, Ch. (2023). Modelling the Public Perception of Urban Public Space Lighting Based on SDGSAT-1 Glimmer Imagery: A Case Study in Beijing, China. Sustainable Cities and Society, 88, 104272.
34. Kefale, A., Fetene, A., & Desta, H. (2023). Users' preferences and perceptions towards urban green spaces in rapidly urbanized cities: The case of Debre Berhan and Debre Markos, Ethiopia. Heliyon, 9(4), e15262.
35. Yigitcanlar, T., Kamruzzaman, M., Teimouri, R., Degirmenci, K., & Aghnaei Alanjagh, F. (2020). Association between park visits and mental health in a developing country context: The case of Tabriz, Iran. Landscape and Urban Planning, 199, 103805.
36. Boyce, P. R. (2014). Human factors in lighting (3rd ed.). CRC Press.
37. Fotios, S. (2021). Lighting for pedestrians: A review of the literature. Lighting Research & Technology, 53(3), 203-231.
38. Painter, K. (1996). The influence of street lighting on crime and fear of crime. Security Journal, 7(3), 161-169.
39. Shafer, C. S., Lee, B. K., & Turner, S. (2000). A tale of three greenway trails: User perceptions related to quality of life. Landscape and Urban Planning, 49(3-4), 163-178.

Van der Ryn, S., & Cowan, S. (1996). Ecological Design. Island Press.

40. Ahmadi, S., et al. (1401). Challenges of lighting public spaces in Iranian cities. Quarterly Journal of Urban Studies, 10(3), 45-62.

41. Akbari, M., and Rezaei, A. (2010). Investigating the impact of light pollution caused by inappropriate lighting on the ecosystem of urban parks and halls (case study: several parks in Shiraz). Journal of Environmental Sciences and Technologies, 24(1), 112-128.
42. Jafari, N., et al. (2010). Lived experience of users of urban public spaces at night and the role of lighting in it (case study: Shahriar Tabriz sidewalk). Journal of Fine Arts - Architecture and Urban Planning, 27(3), 88-101.
43. Jalilian, N., Hajigholam Sarizadi, A., and Mirei, M. (2010). An analysis of factors and components of the landscape of Islamic cities with emphasis on the old bazaar. Quarterly Journal of Sustainable Urban and Regional Development Studies, 5(2), 66-90.
44. Hatami, P., et al. (1401). The decline of nightlife in public spaces of central Iranian cities: causes and consequences. Research on the Geography of Urban Planning, 9(4), 780-799.
45. Sadr-Saghe-Eslami, S., and Farmahini-Farahani, R. (1402). Proposal and necessity of applying nightlife in historical contexts (case study: Tehran Citadel). Iranian Restoration and Architecture, 13(36), 55-66.
46. Sadeghi, R., et al. (1401). Qualitative evaluation of urban lighting projects in Iran: a case study of metropolises. Modern Urban Management, 6(22), 33-50.
47. Salehi, F., and Mohammadi, J. (1402). The role of creative lighting in attracting tourists to urban spaces at night (case study: Khajo Bridge, Isfahan). Urban Tourism Quarterly, 9(1), 1-18.
48. Tahmasebi, Z., et al. (1402). Identifying optimal lighting criteria for bicycle paths at night in urban parks. Journal of Transportation Engineering, 14(2), 201-215.
49. Ghasemi, Sh., et al. (1401). Principles of lighting design for children's play spaces in urban parks with emphasis on safety and creativity. Studies in Sustainable Architecture and Urban Planning, 3(2), 44-59.
50. Moradi, Kh., and Karimi, L. (1401). The effect of light color and color temperature on spatial and psychological perception of users in urban parks at night (case study: Saei Park, Tehran). Environmental Psychology, 7(2), 78-93.
51. Mousavi, S.A., and Hosseini, M. (1402). Evaluating the effectiveness of smart lighting in reducing energy consumption and increasing user satisfaction in academic spaces (case study: Tehran University Campus). Energy and Building, 11(4), 30-45.
52. Nezami, K., et al. (1401). Evaluating the effect of lighting on enhancing the sense of security in urban public spaces (case study: Laleh Park, Tehran). Quarterly Journal of Law Enforcement and Social Security, 15(1), 120-138.
53. Vafadari Kamar-Alia, D., and Ramezani, A. (1402/2025). Investigating the effect of lighting on the attractiveness of the night view of urban parks from the perspective of citizens. Quarterly Journal of Sustainable Urban and Regional Development Studies, 6(1), 140-158.Abdullah, F., & Hassan, M. (2024). The impact of lighting water features in urban parks on nocturnal attractiveness and heat island mitigation in Kuala Lumpur, Malaysia. Journal of Urban Ecology, 10(1), ujae005.
54. Baker, L., et al. (2023). Integrating urban lighting systems with smart city infrastructure in Germany. Smart Cities, 6(3), 1245-1260.
55. Carr, S., et al. (2022). Public Space (2nd ed.). Cambridge University Press.
56. Chen, X., et al. (2024). The role of lighting in promoting nocturnal social interactions in Chinese public squares. Environment and Behavior, 56(2), 210-235.
57. Davis, R., et al. (2024). Impact of park lighting on migratory bird behavior in North American cities. Ornithological Applications, 126(1), duad050.
58. Johnson, M., & Lee, S. (2023). Balancing functional and aesthetic lighting in public spaces: A review. Lighting Research & Technology, 55(4), 345-360.
59. Kim, J., & Park, H. (2023). The effect of adaptive LED lighting on perceived safety and visual comfort in Seoul's urban parks. Sustainability, 15(6), 5021.
60. Lee, K., & Wang, Y. (2024). Exploring the impact of biophilic lighting on stress reduction and attractiveness in Singaporean urban parks. Journal of Environmental Psychology, 93, 102188.
61. Masullo, M., Cioffi, F., Li, J., Maffei, L., Ciampi, G., Sibilio, S., & Scorpio, M. (2023). Urban Park Lighting Quality Perception: An Immersive Virtual Reality Experiment. Sustainability, 15(3), 2069.
62. O'Connor, P., & Murphy, E. (2024). Urban lighting and the creation of a sense of place at night in Dublin. Urban Design International, 29(1), 45-58.
63. Patel, R., & Kumar, A. (2023). User preferences for lighting in nocturnal commercial pedestrian streets in Indian cities. Journal of Asian Architecture and Building Engineering, 22(5), 2340-2355.

64. Rodriguez, A., & Silva, B. (2023). Lighting, fear of crime, and women's use of public spaces at night in Brazilian cities. Gender, Place & Culture, 30(7), 985-1003.
65. Smith, J. (2023). The 24-Hour City: Revitalizing Urban Life. Routledge.
66. Smith, T., & Jones, K. (2023). Dynamic lighting in London's urban parks: Enhancing visual appeal and reducing petty crime. Journal of Urbanism, 16(2), 180-199.
67. Thibaud, J. P. (2021). The Sonic Attunement of Urban Ambiences. MIT Press.
68. Vafadari Komarolya, D. and Ramezani, A. (2025). Investigating the effect of lighting on the attractiveness of the night landscape of urban parks from the perspective of citizens. Journal of Sustainable Urban & Regional Development Studies (JSURDS), 6(1), 140-158.
69. Bolitzer, B., & Netusil, N. (2000). The impact of open spaces on property values in Portland, Oregon. Journal of Environmental Management, 59(3), 185-193.
70. Chiesura, A. (2004). The role of urban parks for the sustainable city. Landscape and Urban Planning, 68(1), 129-138.
71. Lin, Z., Jiao, W., Liu, H., Long, T., Liu, Y., Wei, Sh., He, G., Portnov, B., Trop, T., Liu, M., Li, X., & Wen, Ch. (2023). Modelling the Public Perception of Urban Public Space Lighting Based on SDGSAT-1 Glimmer Imagery: A Case Study in Beijing, China. Sustainable Cities and Society, 88, 104272.
72. Kefale, A., Fetene, A., & Desta, H. (2023). Users' preferences and perceptions towards urban green spaces in rapidly urbanized cities: The case of Debre Berhan and Debre Markos, Ethiopia. Heliyon, 9(4), e15262.
73. Yigitcanlar, T., Kamruzzaman, M., Teimouri, R., Degirmenci, K., & Aghnaei Alanjagh, F. (2020). Association between park visits and mental health in a developing country context: The case of Tabriz, Iran. Landscape and Urban Planning, 199, 103805.
74. Boyce, P. R. (2014). Human factors in lighting (3rd ed.). CRC Press.
75. Fotios, S. (2021). Lighting for pedestrians: A review of the literature. Lighting Research & Technology, 53(3), 203-231.
76. Painter, K. (1996). The influence of street lighting on crime and fear of crime. Security Journal, 7(3), 161-169.
77. Shafer, C. S., Lee, B. K., & Turner, S. (2000). A tale of three greenway trails: User perceptions related to quality of life. Landscape and Urban Planning, 49(3-4), 163-178.
78. Van der Ryn, S., & Cowan, S. (1996). Ecological Design. Island Press.