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# Exploring Environmental Design: Utilising Nature's Elements to Create Interactive Artistic Sculptures for Jeddah's Coastal Regions

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***Abstract***

*The objective of this study is to analyse the artistic characteristics of prominent interactive artistic sculptures, "in light of environmental design." It aims to uncover the aesthetic and philosophical dimensions of these interactive artistic sculptures, as well as to investigate the process of drawing inspiration from nature, specifically the seagull element, to showcase the aesthetics of sculptures in Jeddah. Additionally, the study aims to explore the possibility of utilising elements from nature to shape interactive and functional sculptures in Jeddah, employing three-dimensional graphic design software, namely 3D MAX. It also examines the application that combines and considers the relationship between sculptures and the environmental design of the site, while meeting the needs of the community within a visual artistic framework. The study further aims to stimulate various modes of perception and audience reception, thereby enhancing their capabilities, "in light of environmental design.*

***Keywords:*** *Exploring Environmental Utilising Nature's Elements, Interactive Artistic Sculptures.*

## Introduction

The modern era has witnessed significant leaps and technological advancements in the digital realm. These advancements have brought forth innovative software and technologies that have greatly influenced and elevated the artistic and aesthetic values. They have facilitated the dissemination of visual messages tailored to diverse target age groups, shifting artistic designs from traditional to digital forms.

When Plato introduced his materialistic theory in the visual arts within the framework of his philosophy of beauty, he described it as a reconfiguration of natural visuals through works characterised by imitation and emulation. This provided modern art with the keys to expression through continuous experimentation in thought and application. It compelled artists to search for laws governing the construction of artistic works while blurring the boundaries between artistic classifications.

The representation of nature serves as a vital source of inspiration for designers in the design process. Designers have introduced modern approaches in thinking, formulation, and shaping, including the paradigm of "parametric thinking." This principle marks the entry into a new phase of design, forming the foundation of parametric design through formal characteristics that reflect the outcomes of utilising such design principles. It assists designers in dealing with complex forms and obtaining design solutions inspired by nature, following its structural system and

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description. For instance, drawing inspiration from the seagull as a coastal natural element to create three-dimensional sculptures with functional and utilitarian aspects.

Parametric design is an innovative technique within computer-aided design software, utilising modern digital digitisation sequences such as Maya, Grace Hopper, Rhino, and 3D MAX. It involves incorporating parameters specific to the intended design, employing repetitive design units and introducing design systems with complexity and structural density in dynamic formats. This approach aims to achieve the concept and contemporaneity of the era, making parametric design a foundational methodology based on a digital computational system that relies on the concept of information. It involves incorporating various parameters specific to the design and shaping of objects, known as "design modelling" or "standardised design" (Hassan, Basma Nabil Ahmed, 2018).

Parametric design supports soft, flowing, and non-solid organic shapes, moving away from repetitiveness. It involves flexible lines that flow and form surfaces and levels of soft masses. Environmental design represents one of the established fields within the visual arts, based on understanding the relationship between society's culture and its environment. It encompasses the activities of designers who shape and mould their surroundings, rearranging and beautifying the environment. It involves reconstructing and reshaping the elements surrounding individuals and comprising the environment (Samah, 1994, p. 16). Environmental design can also encompass various specialised areas such as historic preservation and lighting design on a broader scale. Furthermore, the term has expanded to encompass environmental issues and sustainability.

A presentation of solutions and conceptualisations for environmental problems and their preservation is provided, aligning with the needs and purposes of individuals and service delivery, to contribute to environmental conservation and enhance its quality in cities, thereby fostering a sense of urban citizens' connection to the environment. "Environmental design" comes into play to address certain issues that may affect public squares, areas, and building facades by adding aesthetic touches that fulfil the desires of the masses in their admiration for environmental art, revitalising heritage, and reconciling with environmental problems caused by the forces of nature.

The goal of environmental design, through its expressive messages, is to change the visual taste of the audience, achieve satisfaction, happiness, and positive interaction, as well as alter their habits and behaviours by conveying an artistic and educational message that carries an intellectual character within a visual artistic framework. This stimulates the reception and reception methods of the audience and develops their abilities.

Hence, the importance of environmental design lies in shaping spaces that enhance the natural, social, cultural, and material environment of specific areas. The environmental movement has made the concept clearer. Environmental design can also refer to the arts and applied sciences that deal with shaping the human-designed environment. Interaction, on the other hand, is a form and template based on the idea of preparation and composition, with the aim of removing the boundaries between the recipient and the artistic object and merging them to create interaction between them. The recipient has the freedom to intervene, select media, modify content, movement, and navigation locations, leading to changes in interactive outputs based on the

desires and reactions of the audience. This is achieved through processing the surrounding environmental criteria when developing plans, policies, or products, to shape spaces that enhance the natural, social, cultural, and material environment of specific areas (Miller, Fredric, Vancome, Agnes, & McBrewster, John, 2009).

**The Problem Statement**

In the search for modern formulations and methodological approaches that represent nature as a motivator and a source of inspiration for designers, the research focused on deriving inspiration from and analysing the seagull as one of nature's elements. It served as a basis for creating interactive sculptures in Jeddah. The significance of the seagull lies in its constant and abundant presence in the marine environment, surrounding and interacting with visitors to those areas, marine environments, and large parks. This is achieved through various dynamic positions and flight patterns that are enhanced by the seagull's distinctive form, white colour, and wing span. Its presence attracts the connection between elements and components of the coastal environment (audience, birds, sea, and aesthetic sculptures) in an interactive and cohesive system of interconnected parts.

The seagull, being a member of the seabird family, tends to be present near oceans, inland bodies of water, marine and coastal environments, wetlands, agricultural fields, urban areas, and suburbs. It exhibits various forms, shapes, structures, and species around the world.

Therefore, the researcher drew inspiration from the seagull as a natural element of marine and coastal environments to create interactive sculptures along the Jeddah Corniche. There are several considerations for this choice, including the fact that the seagull is a prominent and active part of that area, densely present near bodies of water and in close proximity to people. It also carries multiple symbolic meanings across different civilisations and cultures. Additionally, the seagull possesses diverse tactile values, varied forms, proportions, and dynamic rhythmic characteristics in its structure.

The research necessitates exploring methodologies and analytical approaches to harness parametric design in analysing complex forms inspired by the seagull. The aim is to design functional and interactive sculptures that align with the spatial, geographical, and cultural context of Jeddah's coastal areas, within the framework of environmental design. Within this context, parametric design serves as a significant design approach for understanding certain structural formations and analysing the underlying engineering principles. It allows designers to move beyond traditional forms and instead focus on shaping and crafting form based on physical models and computational methods in the creative process.

**The problem of the study can be defined by the following questions**

To derive inspiration from the seagull as a natural element for shaping interactive artistic sculptures in the coastal areas of Jeddah, within the framework of environmental design, the following questions arise:
What are the artistic characteristics of prominent interactive artistic sculptures in light of environmental design?

What are the aesthetic and philosophical dimensions of interactive artistic sculptures?
What are the stages of creating interactive artistic sculptures using the 3D MAX software to highlight the aesthetics of Jeddah's sculptures?
Is it possible to draw inspiration from the seagull as a natural element and a source of inspiration to shape interactive and functional sculptures in Jeddah using the 3D MAX software, while considering the integration between the sculptures and the environmental design of the site?
Can the design combine the creation of interactive artistic sculptures that encompass artistic aesthetics within the framework of environmental design?

These questions explore the artistic, aesthetic, and functional aspects of incorporating the seagull's inspiration into the design of interactive sculptures in Jeddah's coastal areas, taking into account the principles of environmental design. The use of 3D MAX software can assist in visualising and implementing the design concepts, ensuring a harmonious blend between artistic expression and the environmental context.

**The objectives of the study are as follows.**

Analysing the artistic features of prominent interactive artistic sculptures within the framework of environmental design.
Uncovering the aesthetic and philosophical dimensions of interactive artistic sculptures.
Exploring the stages of deriving inspiration from the seagull as a natural element to shape interactive artistic sculptures using the 3D MAX software, in order to highlight the aesthetics of sculptures in Jeddah.
Investigating the possibility of drawing inspiration from the seagull as a natural element and a source of inspiration to shape interactive and functional sculptures in Jeddah using the 3D MAX software, in an application that integrates and considers both the sculptures and the environmental design of the site.
Presenting models of interactive artistic sculpture designs that encompass artistic aesthetics within the framework of environmental design, capable of meeting the community's needs.

These points delve into the analysis of artistic features, aesthetic dimensions, and the practical application of using the seagull as a source of inspiration for interactive artistic sculptures in Jeddah. The utilisation of 3D MAX software enables the visualisation and realisation of the design concepts, ensuring that the sculptures not only possess artistic beauty but also fulfil the requirements of the community within the context of environmental design.

**The Importance of the Study**

**Theoretical Significance**
Analysing the aesthetic and philosophical dimensions of functional interactive artistic sculptures.
Understanding the methodology and philosophy of environmental design through the inspiration of natural elements, with a focus on analysing the seagull as a source of inspiration.
Introducing new artistic visions in the field of digital arts using the 3D MAX software.

Strengthening the relationship between augmented reality technology and one of the art forms of the twentieth century.

Expanding the scope of Arab research related to the formation of interactive artistic sculptures and the inspiration of natural elements within the framework of environmental design.

These points highlight the analysis of aesthetic and philosophical aspects of functional interactive artistic sculptures, explore the methodology and philosophy of environmental design through the inspiration of nature and the seagull, discuss the use of 3D MAX software in creating new artistic visions, emphasise the connection between augmented reality technology and art, and call for the expansion of Arab research in the field of interactive artistic sculptures and the integration of nature within the context of environmental design.

**The Practical Significance**

Harnessing emerging technologies such as the 3D MAX graphics design software as a technique to add artistic formations to interactive and functional artistic sculptures inspired by the seagull.

The research contributes to envisioning contemporary interactive and functional artistic sculptures that are connected to Saudi Arabian culture.

Creating a contemporary vision for utilising the 3D MAX graphics design software technique and the philosophy of environmental design to impart artistic and aesthetic values to sculptures in Jeddah, as a major tourist city in the Kingdom.

The study's findings aid in designing contemporary interactive and functional artistic sculptures inspired by the seagull, supporting the goals of the Kingdom's vision to achieve a quality of life through the visual arts.

Producing utilitarian, interactive, and aesthetic artworks that meet the needs of individuals in society, using contemporary artistic methods and visions inspired by natural elements, specifically analysing the seagull as a source of inspiration.

These points emphasise the utilisation of 3D MAX software as a modern design tool, the connection between contemporary artistic sculptures and Saudi Arabian culture, the integration of environmental design philosophy, and the production of interactive and aesthetic artworks inspired by nature, specifically the seagull. The study aims to contribute to the enhancement of visual arts and the fulfilment of societal needs.

**Study Limitations**

**Objective Limitations**

Drawing inspiration from elements of nature and analysing the seagull as one of these elements, as a source of inspiration. Interactive artistic sculptures, functional sculptures, environmental design, and conducting designs for interactive and functional artistic sculptures that contribute to enriching the spatial site.

**Temporal Limitations**

Academic year 2024

**Spatial Limitations**

**Study Terminology**

**Inspiration**

The term "inspiration" in the Arabic language is derived from the root (L-H-M), which means "inspiration." In the context of "the ocean," inspiration comes as a source that settles in the mind, heart, intellect, and emotions, either directly or indirectly (Khalifa, 2022)

In terms of terminology, inspiration is the emergence of ideas, visions, and the projection of these visions and arguments as a product of internal and external influences. It involves shaping and dressing them appropriately by infusing them with imagination, emotions, and passion for the designer. It is the derivation that arises from forms and elements, either directly or indirectly, as a science that seeks to solve design problems through the analysis of elements and components of nature (Al-Khalewi & Al-Jawhara Salem, 2019).

**Artistic Sculptures**

Artistic sculptures are characterised by artistic and aesthetic aspects, designed by artists and designers within a geographical and spatial environment. They are found in public squares, cultural and public spaces, with the purpose of beautifying those locations. The designer draws inspiration from heritage and nature, in line with spatiality and the relationship between the sculpture, time, and place.

Operationally, they are defined as a collection of entities and artistic forms consisting of materials and techniques. They come in contemporary diverse sizes that enhance the idea and are suitable for the era, age stages, target audiences, and specific functions of these sculptures (Caves, R. W., 2004). The researcher designed them to be present in the coastal city of Jeddah, along the Mediterranean Sea, by creating interactive artistic designs that stand out for their functionality and utility. Visitors and users interact with them to appreciate their artistic value and benefit from them functionally and practically.

**Interactivity**

The term "interactivity" is derived from the Latin term "interactivus," which includes two parts: "inter," meaning between, and "activus," meaning action. Thus, interactivity represents "the property or function created by humans in their design of things and interactive virtual environments, incorporating a range of characteristics such as the ability to sense and dynamically respond to physical movement, signals related to human physical and psychological desires, or changes in geographic location" (Dalal Yousrallah, 2014).

The researcher refers to interactive sculptures as those sculptures that serve functional and practical purposes and play roles for the passing audience. These sculptures are used for relaxation, amusement, waiting, entertainment, happiness, sports and recreational activities, acquiring information and data through Bluetooth capabilities, charging personal devices, sports activities, children engaging in recreational activities, and taking photos alongside them.

**Environmental Design**

Environmental design encompasses the creation of aesthetically pleasing and functional designs that contribute to providing solutions for environmental issues. It employs specific desires and needs to elevate the environment artistically and aesthetically. Environmental design refers to the arts and applied sciences that deal with the environment created by the artist. It includes various specialised fields such as historic preservation, lighting design, and industrial design, and focuses on environmental issues, sustainability, and aesthetic values. Its aim is to shape spaces that enhance the natural, social, cultural, and material environment of specific areas.

One of the modern trends in the field of design practices is the recognition of environmental design as an international necessity. Communities are concerned with achieving standards and requirements that align with environmental preservation and the harmonisation of economy and aesthetics. The role of the designer becomes more significant when their design thinking is presented in harmony with the elements of the environmental system, without detachment from the surroundings, to achieve interactive responsiveness (Aiain Guiheux, 2007).

**Parametric Design**

The concept of parametric design stems from the principles of finding and shaping form through experimentation and exploration, employing computer programs and artificial intelligence. It differs from previous traditional and sequential technical methods of idea design. Parametric design is a design approach that diverges from conventional methods and interacts with the idea.

Designers can interact with the idea and its technological media, turning the design process into a problem-solving activity by manipulating specific variables. Through the variations of these variables proposed by the designer, alternatives, options, and solutions emerge based on performance, construction, user needs, aesthetic requirements, and their integration (Mohamed, Osama Yousf; Eslam Magdy; Ahmed Yehia; 2019).

**Theoretical Framework of the Study**

**First Axis: Inspiration and Utilisation of Natural Elements**

**(**Methodology and Mechanism of Designers' Inspiration from Nature's Elements)

Inspiration represents the human activity upon which designers rely to utilise and employ elements and components of nature within their design texts and the design of functional and utilitarian products. This is achieved through specific conditions that arise from innovative modernity that tackles problem-solving through an exploratory search that investigates and delves into the shaping relationships of structures, deriving meanings and connotations.

Therefore, the process of "inspiration" requires a combination of intuition and imagination to deliver innovative solutions and introduce novel ideas. This conscious effort is associated with inspiration towards restoring and contemplating the origin, through the interaction of emotions and feelings with it, with the aim of designing and shaping with a specific mindset, considering it as a source and wellspring of inspiration. Thus, the natural form becomes a stimulus for design

thinking and imagination, evoking emotions and reactions, enhancing emotional responsiveness between humans and nature, to perceive an integrated structure that realises the idea.

This inspiration is achieved through multiple approaches that originate from internal processes built upon the mental capabilities and knowledge of the designer, as well as their biological and physiological abilities. It also arises from external processes that stem from the designer's relationship, interaction, and analysis of nature, to formulate diverse visual designs and their structural and aesthetic organisations. This is accomplished through observation, monitoring, analysis, and interpretation of natural phenomena, employing all the senses of the designer and their ability to imagine.

In three-dimensional formulations, it relies on (design, material, colour), as well as content clarity, colour vitality, and creative design thinking, creating colour excitement, suspense, and visual fascination, in accordance with flexible and agile mathematical patterns and laws. To derive inspiration from that and incorporate it into the mind and imagination, exporting innovative design solutions characterised by privacy, contemporaneity, and national identity.

The visual exploration of natural components and their inspiration in creating artistic representations comes in a distinctive and innovative manner that provides aesthetic pleasure, functionality, and user desires. The analytical abstraction of natural components, moving away from appearance and reaching the essence, is achieved through organised laws and relationships that contribute to solving user problems and align with the evolving intellectual, social, and industrial nature of the era.

**The seagull as a visual signifier**

Taxonomically, the seagull belongs to the family of seabirds known as "gulls" or "seagulls," which encompasses a wide range of aquatic and marine birds. These birds are characterised by their ability to fly with their long, pointed wings over seas and other bodies of water.

Seagulls are commonly found near oceans and inland bodies of water. They are distinguished by their medium-sized bodies and long wings, with the size of a seagull ranging from 30 to 70 centimetres. Seagulls are part of a lineage of seabirds that consists of around forty species, all of which prefer coastal areas during the winter season. Some specialists differentiate between different species of seagulls based on the colour of their beak or legs. Typically, male seagulls are slightly larger than females and have larger beaks.

Seagull feathers exhibit a variety of colours, including white, grey, black, and a spectrum of other colours. Seagulls possess long wings, a thick and powerful hooked beak, and long legs equipped with strong toes and claws that aid in hunting, stability, and perching. They have robust bodies, tails with sharp angles and rounded tips, and are known for their graceful aerial movements.

**Types of seagulls**

There are numerous species of seagulls worldwide, and the following are some examples:
Ivory Gull: This species inhabits the polar regions, particularly the Arctic. It is distinguished by its white plumage and the size and length of its wings.

Great Black-backed Gull: Found along the northern coasts of the Atlantic Ocean, this species stands out due to its large size and distinctive appearance. It can reach a length of about 75 centimetres, with a wingspan of 1.5 meters.
Heermann's Gull: This species is found near the coast of California, close to the shores of the Pacific Ocean. It is characterised by unique colour and texture features, such as its warm grey colouration.
Ring-billed Gull: Inhabiting North America, particularly the inland parts of the continent, this species displays a slender body shape with extended wings and legs.
These are just a few examples of the diverse seagull species that exist globally. Each species has its own unique characteristics, habitats, and behaviours, contributing to the rich biodiversity of seagulls worldwide.

**The Seagull in Literature and Visual Arts**

The seagull leapt into the imagination of poets and writers, occupying a significant place in literature. It appeared through its distinctive presence in literary expressions, representing a source of inspiration for authors, poets, and their writings. It serves as a means to express imaginative feelings and ideas, inspiring writers and readers to liberate themselves, transcend limitations, and achieve their dreams. The seagull, as depicted in poetry, is a symbol of freedom, independence, departure, and liberation. It is diagnosed within poems and verses as it soars freely in the sky, breaking free from constraints.

Additionally, the seagull symbol and its indicative connotations of spirituality have been employed in poetry. It is embodied in its soaring movements towards the sky, launching with strength and speed towards the distant horizon, reflecting and emanating the spirit of exploration, liberation, and surpassing imposed restrictions. In addition to poetry and novels, the seagull has been drawn upon in critical articles, short stories, and plays, aiming to touch upon specific meanings and purposes such as departure, independence, freedom, adventure, and spirituality.

Seagulls have also been portrayed by artists and designers in visual arts and drawings. They have been depicted in various artistic works using diverse styles and techniques, occupying a vital and active position in the realm of visual arts and illustrations. Seagulls have become a visual stimulus and a common subject for artists and painters, employing various artistic techniques and styles. Artworks have taken on a poetic and dreamlike form, weaving mythical worlds through mystery, expression, and spiritual atmospheres. These works are contemplative, inspired by the compositions of nature, serving as modernist presentations that signify the distinctive presence of the artist and the visionary designer who strives to unveil unique, rhythmic, and colourful worlds.

Creative expressions of the artist and designer emerge from a romantic and emotional perspective, as a result of contemplating and analysing the elements and components of nature and the seagull. They export abstract contemplative works inspired by the compositions of nature, presenting artistic expressions with a modernist style that signifies the distinctive presence of dreamlike, rhythmic, and colourful worlds. These worlds, with their formations, allure the imagination, allowing viewers to embark on an emotional and introspective journey within blocks, spaces, lines, and expressive colour rhythms that support the mythical atmosphere.

Through dynamic and active formations, the artworks celebrate the dynamics of expression and the mythical aspect of the scene.

In addition to the depiction of seagulls in artworks and sculptures, they have also been seen in artistic creations such as glasswork, textiles, handmade crafts, and artisanal pieces. These media reflect the beauty of the seagull's feathers, with their diverse colours and tactile value. The seagull has been crafted while soaring in the sky, standing upright on rocks, or in motion alongside coastal marine environments. Elements of design such as point, line, space, shadow, light, texture, and colour have been utilised, along with design principles of unity, rhythm, balance, proportion, and harmony. These elements and principles highlight the beauty of the seagull and give the artwork a realistic and vibrant dimension.

**Symbolic Meanings of the Seagull:**

The seagull's multiple forms, diverse appearances, variations in size, and the richness of white and grey shades, along with its tactile values, possess various symbolic meanings, including:
It is a symbol of freedom, as interpreted by many civilisations.
It symbolises marine life and the connection between humans and the sea.
It represents wisdom, cleverness, fairness, and restoring rights.
With its distinctive form and exceptional flying abilities, as well as its graceful movements in the air, the seagull symbolises strength.
It signifies freedom, taking off without boundaries or restrictions, soaring high in the sky adorned with delicate white clouds, embodying swiftness and boundless freedom.
It carries symbolic meanings of cleverness, advocating for the oppressed, wisdom, insight, and knowledge.
It represents never-ending new beginnings or renewal in life, emphasising that opportunities never cease, no matter how difficult the journey becomes.
In some cultures, seagulls are associated with spirituality and myths.
In fishing and maritime cultures, the appearance of seagulls in coastal areas is considered a sign of abundant fish and food resources. Fishermen track the movement of seagulls to locate fishing spots and fish presence.
It symbolises freedom and challenge by soaring smoothly and effortlessly in the sky, reflecting the tranquillity of its flight journey, liberated from earthly constraints and defying the gravitational pull and weight.
It represents overcoming difficulties, breaking free from surrounding constraints, determination, and resilience to surpass obstacles.
Symbolises reaching goals and searching for meaning and significance in life, as seagulls embark on their flight in the sky, seeking to soar into vast and expansive horizons.
Symbolises contemplation, spirituality, Sufism, and sensibility.
Embodies inner peace, communication, and harmony with the forces of nature.

**Second Axis: Environmental Design and Interactive Art Objects** (The Environmental Responsibility of Design)

Design is defined as the organised planning of a specific object, conceptualised by the designer to manifest ideas that fulfil functional and aesthetic purposes through interconnected and coherent components, employing formal relationships. This extends to the design of art objects that are enveloped with true-to-scale dimensions and surfaces characterised by protrusions, height, and depth, stimulating the viewer's gaze as they navigate through these terrains, evoking emotions and sensations.

According to a forward-looking perspective and the principles of sustainable development, designers work not in isolation within their own environment, but through collaboration and collective thinking in proposing multifaceted interactive artistic design solutions. This partnership brings together designers, artists, engineers, and others to present proposals for interactive artistic design concepts that incorporate multiple media.

The designer operates within a systemic framework that influences and is influenced by the participants involved, while not neglecting the necessary functions that should be present in such types of designs. This includes the selection of materials and media capable of conveying and enhancing ideas, whether renewable or non-renewable materials. Additionally, design encompasses the choice of manufacturing processes, whereby the term ecologically conscious design (Ecodesign) replaces the term design, signifying the incorporation of environmental considerations into product design methods and the necessary industrial processes for their production.

Ecodesign aims to develop environmentally compatible products and industrial processes without compromising considerations of product performance, price, and quality (Yen, Lishan Xue and Ching Chiuan, 2007).

Regarding the reasons behind the emergence of environmental design, Norbert Schulz stated that it involves the creation of human habitats by respecting the spirit of the site through improving the quality of life, psychological and physical well-being, preserving the ecological system, utilising natural resources, and prioritising local material culture. Consequently, environmental design becomes a form of design that mitigates negative impacts on the environment by integrating them into everyday life processes.

Environmental design is an integrated field of design that aims to preserve and safeguard the environment. It helps to bridge the fragmented efforts in green architecture, sustainable agriculture, environmental engineering, ecological restoration, and other related fields.

**The relationship between interactive art sculptures and the environment**

The relationship between interactive art sculptures and the environment is characterised by the contemporary designer's formulation of artistic sculptures in harmony with the spatial and geographic nature. This is done based on their function and the scientific artistic data through modern innovations. For instance, the designer may shape the surfaces and blocks of the sculptures using the same architectural materials present in the surrounding environment. They may also create geometric forms through variations in elevations and depressions, employing colour and texture treatments that emphasise the interplay of light and shadow on the elements of the sculpture and its vocabulary.

On the other hand, environmental design is an approach used in planning environmentally intelligent, sustainable, and beneficial products and industrial processes for human health and the environment. It is employed to address the environmental standards surrounding plans, programs, products, policies, and more, with the aim of achieving a natural, social, cultural, and material green environment within the boundaries of the area in question (Salah al-Din, Muhammad, Ayatollah, 2012). Environmental design encompasses various fields such as arts, applied sciences, architectural engineering, interior design, industrial product design, and others.

Within the overall design of the art piece and its relationship with the environment, there are several visual variables, such as the interplay of light and shadow created by light projections. This results in extended shadows and subtle gradients over the surfaces of the art sculptures. The actual space within the art sculptures, between surfaces, hollowed levels, and surface treatments, contributes to a diverse range of shadow lengths on the bodies of the sculptures. Shadows become an added element that enhances the aesthetic and expressive aspects of the sculpture design, while also amplifying the visual impact when viewing the art sculptures. This further supports the attractiveness of the concept and increases the vibrancy of the contemporary and modern ideas conveyed through the art sculptures.

**Ecological design of the natural and physical environment**

Environmental design is considered one of the established fields of visual arts that is built upon understanding the relationship between the culture of a society and its environment. It is a type of designer's activity where they shape and form their surroundings by rearranging and beautifying the environment. It involves reconstructing and reshaping the elements surrounding individuals and constituting their environment. Environmental design can also encompass various specialised fields such as historic preservation (Human & Hind, 2015) and lighting design. The term has expanded to include environmental issues and sustainability.

Presenting solutions and visions for environmental problems and preservation aligns with the needs and purposes of individuals, aiming to contribute to the field of environmental conservation and improve its quality in cities. This contributes to the urban citizen's sense of belonging to the environment. Environmental design aims to address some of the issues that may affect public squares, public areas, and building facades by adding aesthetic touches that fulfil the desires of the public to embrace environmental art. It also seeks to revitalise heritage and reconcile with environmental problems caused by natural forces.

The ecological design aims, through its expressive messages, to alter the visual taste of the audience, achieve satisfaction, happiness, and positive interaction, as well as change their habits and behaviours by delivering an artistic, educational, and aesthetic message that carries an intellectual character within a visual artistic framework. This stimulates the ways in which the audience receives and perceives the messages, while fostering their developmental capabilities.

Hence, the significance of ecological design lies in shaping spaces that enhance the natural, social, cultural, and material environments of specific areas. The environmental movement has made the concept more explicit. Ecological design can also refer to the arts and applied sciences that deal with creating the human-designed environment.

By applying ecological design principles in projects and urban areas, the quality of life can be improved, and sustainable and aesthetically pleasing environments can be created. This is achieved by considering environmental, social, and cultural factors in the design process and engaging with the natural landscape and surrounding community. Consequently, ecological design can carry a strong message that promotes balance and positive interaction between humans and their environment.

**Interaction and real environment data surrounding:**

Contrary to the advancements in multimedia technology, the linguistic, auditory, visual, and kinetic aspects of artistic sculptures have undergone significant transformations that align with the aspirations of the designer and the needs and desires of the audience. Technology has provided visual arts with a new state and radical changes, altering the form of artistic sculptures, transforming their mediums and dimensions, and influencing their presence. It has also impacted the methods of performance, composition, and material handling, ultimately erasing the dividing line and boundaries between art and life. Artistic sculptures have become capsules that encapsulate the human experience, expanding the artist's artistic concepts into broader horizons and shaping their emotions towards a society characterised by transformation, technological progress, and effectiveness. It is the era of machinery, robotics, and mass production.

These possibilities have fueled the designer's imagination to establish spatial sculptures that encompass various elements such as spaces, volumes, colours, details, voids, movement paths, and the audience's exploration. This is achieved through the integration of the sensory environment and the real environmental data surrounding it.

Through design partnerships with chemists, scientists, engineers, software specialists, control media experts, environmental specialists, material scientists, social specialists, and others, and by bridging the gap between science, technology, and art, interactive sculptures have been introduced that rely on interactive engagement among individuals, architectural spaces, physical objects, and internal movement within those elements and volumes.

These interactive sculptures encompass a variety of spaces that allow the audience to interact with them. Sometimes, certain parts can be manually manipulated, forming pathways and movement routes inside. These sculptures are designed to define entry and exit paths, seating areas, waiting spaces, comfort zones, amusement, entertainment, play, sports, digital data loading, and more.

**Functional and utilitarian approaches and applications in interactive models**

Considering the significant role played by interactive sculptures, which have functional and utilitarian roles alongside their artistic and aesthetic aspects, the researcher has incorporated his sculptures into the applied dimension through various ideas and propositions that enhance interaction. These ideas deviate from the conventional norms associated with sculptures and introduce numerous functions that benefit the audience. This transformation aims to shift the audience from being passive recipients to becoming active and central elements within the interactive system.

Here are some approaches and applications highlighting the functional and utilitarian aspects of interactive sculptures:
Embedding electronic chips in a number of artistic sculptures as a means of interacting with pedestrians through Bluetooth and infrared technology. These chips can receive various data, files, multimedia, and different advertising materials from individuals (Obaid, Saad, Hind, 2010).
Incorporating unconventional ideas into artistic sculptures with the aim of entertaining and providing amusement, playfulness, and leisure activities for the audience. This creates a joyful atmosphere and offers opportunities for individuals to take pictures with these sculptures.
Adding swings and utilising them during waiting times to provide entertainment, break the monotony, and alleviate boredom.
Equipping some functional interactive artistic sculptures with highly sensitive devices that detect the movement of pedestrians at a distance. These sensitive devices attract their attention to interact with the advertising content conveyed through body movements (Carpo, Mario, 2013).
Integrating sports equipment and fitness devices into sculptures to promote healthy habits, encourage physical exercise, and attract people towards beneficial health practices.
Equipping interactive sculptures with devices that monitor the movement of pedestrians in close proximity. These sensitive devices attract their attention to interact with the formations and beneficial functions of the sculptures.
Incorporating sounds and musical tones into a number of sculptures to engage the audience visually and audibly, reinforcing the concept of interaction and functionality.
Adding chairs and tables that the audience can use for sitting, whether for comfort, waiting, or contemplation.

**The Third Axis: Barometry and the Innovation of Interactive Artistic Sculptures**

**(**Insightful Vision and Experimental Thinking)

Artistic vision is connected to human thinking and perception, through which individuals acquire knowledge and experiences by interacting with the environment and the surrounding society. Artistic vision represents the "methods and means of perceiving the artist's surrounding world in their own concept, the analytical observation of natural components, the pivotal points in the system of construction or composition, and the perceptible relationships through the specific system of form and formation laws." Therefore, the practice of artistic vision is an insightful process that intertwines the artist's talent, innovative abilities, perceptiveness, and emotional engagement (Abdul Karim & Ahmed, 2020).

The sources of artistic vision encompass several aspects, including: the inspiring and instructive nature, the national and global artistic heritage, and experimentation as a modern source with technological and cognitive advancements.

Experimentation has occupied a prominent position in the field of visual arts due to its association with the philosophy of this era. Contemporary artists have embraced the research approach to comprehend new artistic concepts that enhance awareness of the logic of artistic formation. Experimentation, as one of the sources of artistic vision, combines the continuity of innovative

thinking, which achieves novel concepts in the exploration of artistic values. It serves as a form of renewing thinking and proposing solutions towards understanding the relationships that form a specific experience in behaviour. It fosters conscious artistic vision, precise observation of phenomenon variables, and the formulation of solutions with the aim of revealing new meanings and training in the creation of formulations through perceiving the fundamental relationships of form. This process allows for the acquisition of fluency and flexibility in reconciling contradictions (Abdul Karim & Ahmed, 2020).

Experimentation has assumed a prominent and significant position within the realm of visual arts due to its association with the philosophy of this era. Contemporary artists have embraced a research methodology to apprehend new sculptural concepts that cultivate an awareness of artistic formation logic. Experimentation, as one of the sources of artistic vision, amalgamates the continuity of innovative thinking, which engenders novel concepts in the exploration of artistic values. It embodies a form of renewed thinking and the proposition of solutions aimed at recognising the relationships that constitute a specific behavioural experience. It fosters conscious artistic vision, meticulous observation of phenomenon variables, and the formulation of expressions and solutions with the purpose of unveiling novel manifestations and their connotations. It entails training in devising formulations through the perception of fundamental shape relationships and acquiring fluency and flexibility in composing amidst contradictions.

The definition of parametric design can be summarised as follows: all design elements and components are interdependent and interconnected parametrically, where the impact on one element affects the entire system, both directly and indirectly. This definition includes the notion of elastic influence as it establishes a paradigm shift in understanding the fundamental elements and components of design. Parametric design introduces complex models and concepts within the principles of differentiation and interconnection, contrasting with the classical sequential approach to design.

In addition to facilitating design processes, execution, shaping, and manufacturing through the utilisation of repetitive units or prototypes, parametric design offers flexible solutions to design problems within imaginative spaces. Design flexibility is manifested in the creation of blocks, shapes, and volumes generated from vocabulary and elements that evoke a sense of radical kinetic vitality and balance, amalgamating the harmony of the overall fabric (Mohamed, Osama Youssef, 2019). Alongside flexibility and fluidity, parametric design achieves artistic, aesthetic, and expressive values. The solutions and treatments in parametric design align with the desired function, purpose, and requirements, while achieving diversity with harmony and rhythm through the use of units. This comprehensive application adheres to design standards, with the possibility of adding a fourth dimension to depict the coherence between different project elements to achieve a unified composition. It allows for global and partial modifications to the design, followed by automatic application to the entire design.

Parametric design has evolved as a design approach rooted in computational thinking, aligning with advanced computer systems, genetic algorithms, and robotic manufacturing. The function of parametric design is to propose formulations and three-dimensional configurations with intricate density and complex structures, incorporating multi-layered levels while maintaining unity and coherence. It encompasses organic flowing curves, undulations, bends, and folds

through organisational gradient calculation.

**Structural characteristics in parametric design**

Parametric design is characterised by several features, including the ability to shape and create designs for objects through specialised software such as Maya, Grace Hopper, Rhino, and 3D Max. It enables the export of complex structural systems with their intricate configurations, following established structural systems based on form structures, and employing these concepts in the design of contemporary artistic objects.

Parametric designs specialise in fluidity, dynamic motion, ease of exchange, coordination, assembly, and disassembly operations. They offer a diverse range of materials and design mediums, formulations, shapes, and infinite systems by simulating nature through vital repetitive units, such as wood, plastics, glass, paper, fabric, rubber, and others (Mentegazzi & Edoardo, 2014). Moreover, parametric design allows for the diversity of tactile values, surface properties, and the natural and industrial external appearance, both smooth and rough, through the senses of sight and touch. It also enables the application of dynamic variations and color values, enriching parametric design to enhance the conceptual idea of objects and the modernity of the designer's imaginative creation based on the composition and blending of material and color, where every interconnected part emanates vibrant vitality.

Parametric design allows for modifications to any part of the design by dealing with its complex structure and studying the relationships between the fundamental aspects of construction, including materials, media, manufacturing techniques, and the structural characteristics employed in the design process. It also incorporates the sustainability aspect through reuse and recycling, as integrated design, where each element is part of something larger, enhancing the effectiveness of sustainable design.

**Parametric Design and Natural Formation**

Parametric design draws inspiration from the formations and algorithms of design construction, resembling the patterns and design structures found in nature, as well as the natural growth and generation processes of building elements and cells. The formulation of design elements follows specific patterns derived from and belonging to nature. Examples include architectural formations and rhythmic repetitions with geometric and mathematical patterns, such as crystals, coral reefs, bee cells, and the generation of structural elements in flowers, fruits, and repetitive patterns, such as regular, alternating, reflective, spiral, and radial patterns in living organisms.

Through simulated graphic techniques that mimic the growth and formation processes of natural elements, while maintaining aesthetic and functional aspects through diverse sizes, levels, and specific textures, parametric design is a contemporary approach in the field of two-dimensional and three-dimensional designs. It emerged with the digital system and its various application programs, aiming to innovate according to a digital mathematical system based on the concept of information. It incorporates parameters specific to the intended design object, such as length, width, height, weight, and material of each element, with the goal of forming a database that can be relied upon in decision-making (design modelling) or (standardised design), as shown in Figure 1.

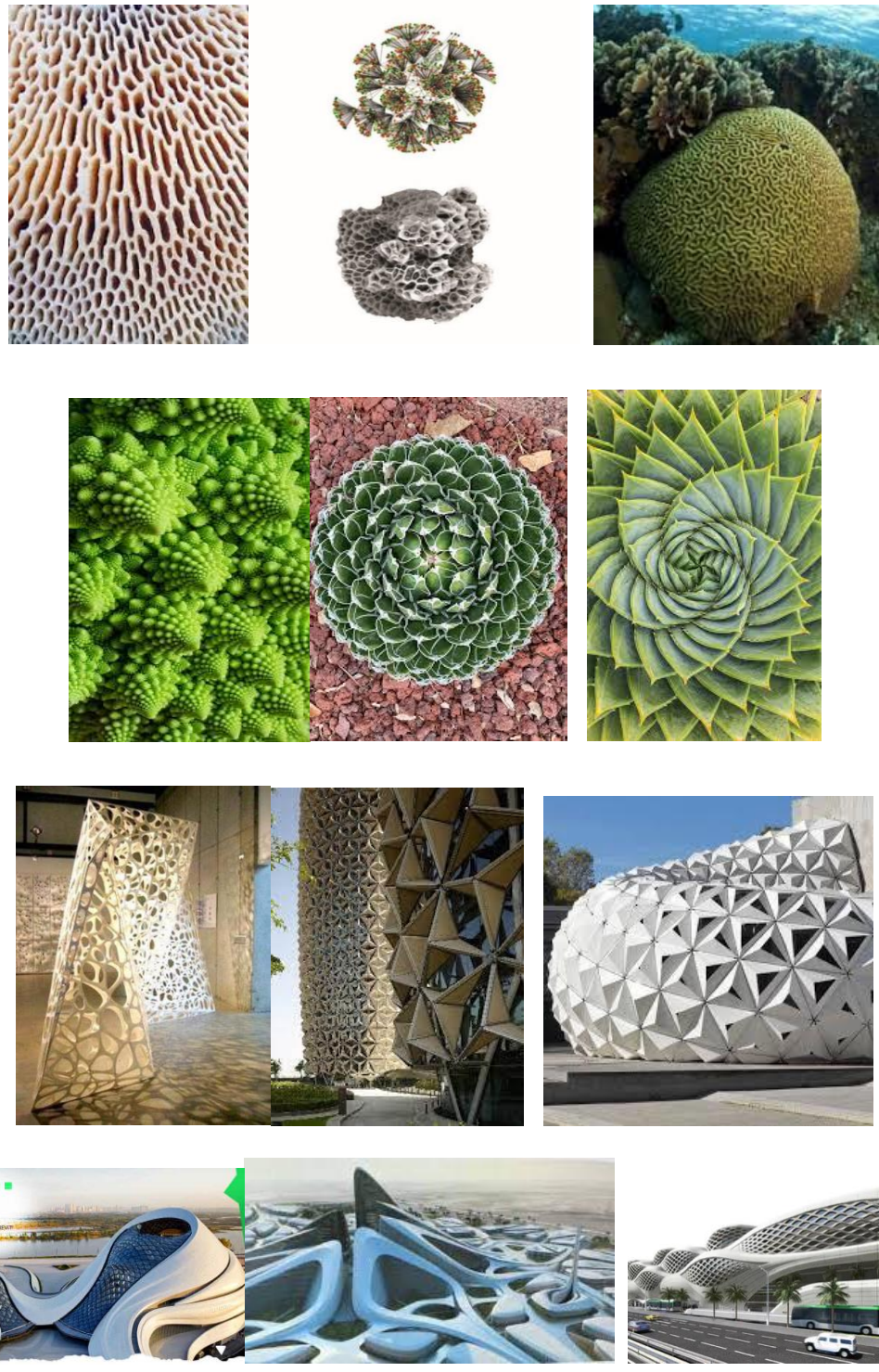


Figure (1) Geometric formulations and rhythmic repetitions derived from nature with a

mathematical and logical pattern. Represents parametric graphic techniques that simulate the growth and formation processes of natural elements while maintaining aesthetic and functional aspects.

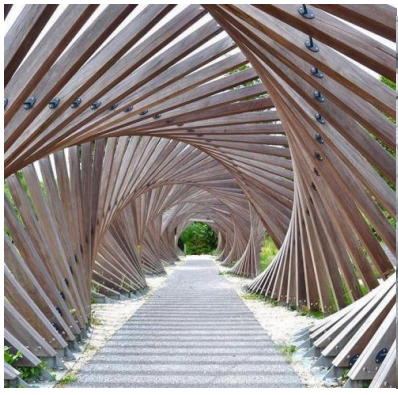
**Parametric design formats and mathematical algorithmic sequences**

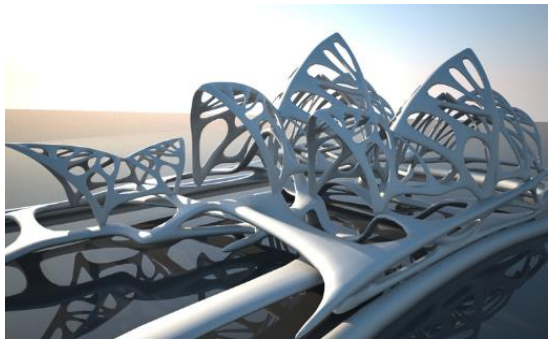
Parametric design refers to the borrowing of details and measurements from nature and their precise representation through established scientific theories and mathematical equations. Parametric design has become a modern system that relies on inputting predetermined information for the intended object through technology and computers, utilising innovative methodologies that blend "sculpture and architecture." It is closely associated with numerical sequences, mathematical patterns, and algorithms, which involve a series of mathematical, logical, and sequential steps necessary to solve a specific design problem.

Artistic propositions through parametric design are characterised by dynamic and fluid lines, moving away from explicit geometric shapes. They allow for a deeper understanding of complex systems and unrealistic design methods, as well as the integration of repetitive patterned units. This enables designers to easily and effortlessly choose shapes.

Patrick Schumacher, in his book "The Auto Poems of Architecture," emphasises that the foundation of parametric design lies in transforming elements into logarithmic parameters that can be utilised in shaping and forming processes. It involves considering the relationship between objects and their geographic surroundings, neighbouring buildings, and urban planning. Parametric design moves away from classical geometric models (such as spheres, pyramids, cubes, and cylinders) traditionally used in artistic sculptures. Instead, it focuses on formative relationships where surfaces and levels exhibit flexibility, extension, unevenness, and rigidity. These elements interact with the environment through differentiated, interactive responses, dynamic volumes, and organic characteristics that possess flexibility, unity, diversity, and coherence among all parts of the work.

This approach provides a degree of freedom, experimentation, research, and imaginative design possibilities. The design element is characterised by diversity, achieved through variations, substitutions, and correspondences formulated using a specific mathematical approach and methodology. The parametric design differentiates its elements through dynamic and equal variations in shape, guided by specific design criteria. It emphasises lively repetition that generates movement and diversity, while elements come together through formative relationships and design exchanges. It highlights the relationship between design elements, harmony, and coherence with the overall context, establishing a contemporary visual language that easily connects with the audience. It moves away from monotonous mechanical repetition and rigid forms lacking complexity and differentiation, which leads to a lack of order, as shown in Figure 2.





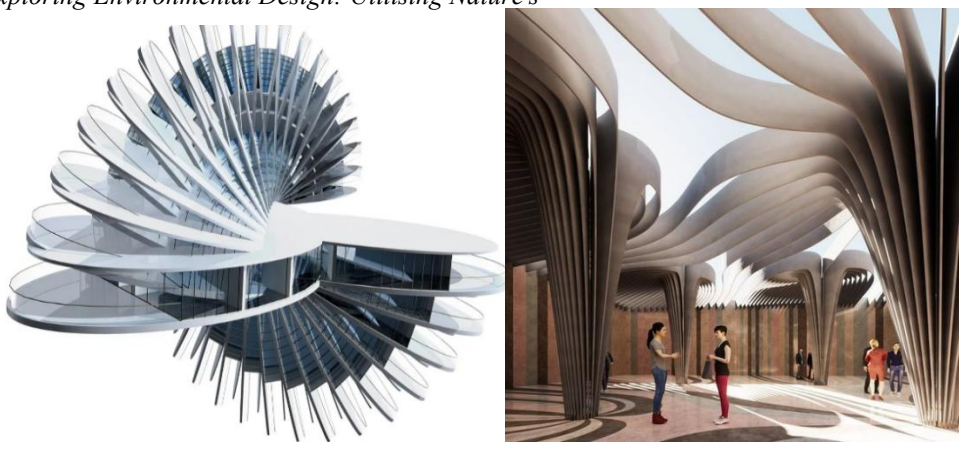


Figure 2 represents artistic propositions through parametric design, incorporating flowing lines, numerical sequences, mathematical patterns, and algorithms.

**Parametric Design and Spatial Formation of Interactive Sculptures**

The term "parametric design" has diverse meanings, including boundary design, design modelling, architectural design, standard design, or variable design. It is a modern tool that aids designers in handling complex sculptures and intricate architectural systems. The term "parametric" emerged from mathematics, algorithmic equations, engineering principles, and mathematically inspired concepts derived from nature.

To transform the elements in parametric design from discrete solid entities to connected organic softness, each interrelated component elevates its proportion, ratio, and golden sections to enhance the aesthetics and diversity of parametric elements. This supports the transformative transition from traditional fixed engineering media and materials to dynamic and responsive geometric ideals, such as spline slices, blob bubbles, NURBS mesh points, and particle dynamics. These forms are sensitive, interconnected, and interactive, generating organic shapes within dynamic fields.

Thus, parametric design represents a core of continuous innovation in research, signifying a new paradigm in academic and applied domains. Parametrism embodies a contemporary approach that seeks suitable measures across various fields, ranging from architecture and interior design to artistic sculptures. It draws inspiration from natural elements, such as the analysis of seagulls as part of nature, to shape interactive artistic sculptures for Jeddah's coastal city, within the framework of environmental design. These sculptures strive to be both interactive and functional, employing the 3D modelling software "3D MAX" to combine and harmonise the sculptural and environmental aspects of the site. The aim is to present models of interactive artistic sculptures that encompass artistic beauty while considering the principles of environmental design, capable of meeting the community's needs.

**Practical Proposals**

In search of modern formulations and methodological approaches, where nature serves as a stimulus and a source of inspiration for designers, the research has focused on drawing inspiration from natural elements and studying their systems and descriptions. For instance, seagulls have been explored as a source for designing functional and interactive sculptures that align with the spatial, geographical, and cultural nature of Jeddah's coastal regions, within the framework of environmental design. In this context, parametric design represents an important design approach for understanding certain structural formations and analysing the underlying engineering principles. It enables designers to move beyond conventional forms and instead formulate and shape designs based on physical models and computational methods in the creative process.

Through analysing the artistic features of prominent interactive artworks, within the context of environmental design, the dimensions of aesthetic and philosophical aspects of interactive artworks are revealed. This analysis aims to explore the possibility of drawing inspiration from natural elements to shape sculptures in Jeddah, making them interactive and functional. The 3D modelling software, 3D MAX, is utilised to combine and integrate sculptures with the environmental design of the site. The researcher envisions contemporary interactive functional artworks that are linked to Saudi culture, employing contemporary artistic techniques and insights inspired by elements of nature.

In this regard, the researcher presents a collection of three-dimensional physical proposals, which have been designed based on an analysis of the seagull. The seagull is considered as a living entity, serving as an intermediary that undergoes transformation and abstraction while incorporating design thinking into symbolic, metaphysical, and realistic structural formulations. This is achieved through organic and structural geometries, employing sharp angular lines and soft transitions to maintain unity and coherence among the components. As a result of the researcher's experimental exploration, these proposals are materialised using 3D MAX software, showcasing the research concept and objectives through various materials, colour gradients, and sizes that align with the form, function, and context.

Whereas these three-dimensional sculptures combine authenticity and contemporaneity, their distinguishing feature lies in their relationship with the site and history. Therefore, it is of utmost importance that these designs are artistic works in themselves, departing from tradition and stereotypical approaches, while keeping pace with the new technological language of the era. They should provide enjoyment for users while fulfilling functional and aesthetic purposes.

Below, the researcher presents a number of proposals that can be realised as interactive three-dimensional artistic sculptures for Jeddah's coastal city, within the framework of environmental design. These proposals draw inspiration from the form of the seagull, deriving their formations from a specific source. They are the result of studying and analysing the elements and components of coastal nature, such as the seagull, to illustrate the research concept and objectives.

**Research Methodology**

**The research employs both the descriptive-experimental Method**

**Research Community**: The research community in this study includes a collection of functional and utilitarian three-dimensional sculptures inspired by the seagull as one of the elements of coastal nature. These sculptures undergo transformation and abstraction to align with the spatial nature and culture of the community.

**Constructing a questionnaire** form to measure, evaluate, and arbitrate the proposed solutions as design interventions for the research problem. The questionnaire was presented to a number of experts in the field to gather their opinions and guidance.

The questionnaire included the following axes:
How can the elements of nature, particularly the analysis of the seagull as one of these elements, be used as a source of inspiration to shape interactive artistic sculptures for the coastal areas of Jeddah, in the context of environmental design?
What are the aesthetic and philosophical dimensions of interactive artistic sculptures in the context of environmental design?
What are the stages of creating interactive artistic sculptures using the 3D MAX software to highlight the aesthetics of Jeddah's sculptures?
What is the potential for drawing inspiration from natural elements to shape interactive and functional sculptures for Jeddah using the 3D MAX software, in an application that combines and considers the sculptures and the environmental design of the site?
Each dimension consists of a set of comprehensive phrases for describing and evaluating that dimension thoroughly.

<table>
<tr><td colspan="7">Questionnaire Form</td><td>Axes</td></tr>
<tr><td colspan="7"></td><td rowspan="6">First axis</td></tr>
<tr><td rowspan="3">Quality Factor</td><td colspan="3">Percentage</td><td colspan="3">Number</td></tr>
<tr><td colspan="6">• How can elements of nature, such as the seagull as a coastal natural element, be used as a source of inspiration to create interactive artistic sculptures for coastal areas of Jeddah "in light of environmental design"?</td></tr>
<tr><td>Disagree</td><td>Neutral</td><td>Agree</td><td>Disagree</td><td>Neutral</td><td>Agree</td></tr>
<tr><td>%93</td><td>0</td><td>%20</td><td>%80</td><td>0</td><td>2</td><td>8</td></tr>
<tr><td colspan="7"></td></tr>
</table>

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| %95 | • What are the aesthetic and philosophical dimensions of interactive artistic sculptures "in light of environmental design"? | | | | | | **The second axis** |
| | 0 | %10 | %90 | 0 | 1 | 9 | |
| %93 | • What are the stages of creating interactive artistic sculptures using the program "3D Max" to highlight the aesthetics of sculptures in the city of Jeddah? | | | | | | **The third axis** |
| | 0 | %20 | %80 | 0 | 2 | 8 | |
| %100 | What is the possibility of drawing inspiration from elements of nature and analyzing the seagull as one of these elements, as a source of inspiration, to create sculptures in the city of Jeddah and make them interactive and functional sculptures through the program "3D MAX," in an application that combines and considers the interaction between sculptures and the environmental design of the site? | | | | | | **The fourth axis** |
| | 0 | 0 | %100 | 0 | 0 | 10 | |

Sample of questionnaire results and reviewers' opinions in the dimensions

Concepts for interactive artistic sculptures for the coastal city of Jeddah in the context of environmental design may include:

**Conceptualizations of Interactive Artistic Sculptures for Jeddah's Coastal City in the Context of Environmental Design.**

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| The morphological characteristics of the seagull bird |

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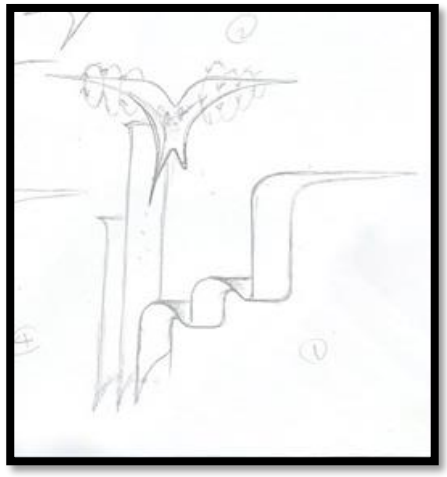
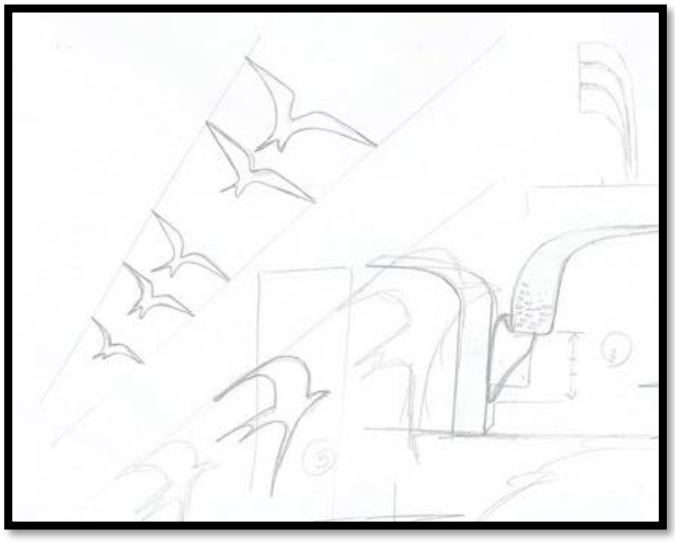
**Examples of Morphological Structures of the Seagull that the researcher utilized as an experimental starting point for designing and shaping aesthetically pleasing and functionally beneficial sculptures.**

| **Proposed Three-Dimensional Artistic Sculpture** | **Artistic and Aesthetic Values of the Scupture in the Context of Environmental Design** |
|---|---|
|  | A collection of preparatory studies and sketches exploring modern formulations and methodological approaches, where nature is considered a primary stimulus and a source of inspiration for the designer. The study is focused on drawing inspiration from natural elements and observing their patterns.<br><br>And to present a vision of interactive functional contemporary art models |

| Proposed Three-Dimensional Artistic Sculpture | Artistic and Aesthetic Values of the Scupture in the Context of Environmental Design |
|---|---|
|  | related to Saudi culture, with contemporary artistic styles and visions inspired by elements of nature, such as the seagull. The researcher designed proposed models as three-dimensional physical sculptures. |
|  | |

<table>
<tr><th colspan="2">Proposed Three-Dimensional Artistic Sculpture</th><th>Artistic and Aesthetic Values of the Scupture in the Context of Environmental Design</th></tr>
<tr><td colspan="2"></td><td rowspan="3">Toward drawing inspiration from elements of nature like the seagull, and following systems and structures as a source for designing interactive functional sculptures that align with the spatial, geographical, and cultural nature of the coastal regions of Jeddah, in the context of environmental design. The design, from a parametric perspective, represents one of the important design inputs for understanding some structural forms.<br><br>To explore the potential of drawing inspiration from natural elements to shape sculptures of the city of Jeddah and make them interactive functional models using the 3D MAX program, in an application that combines and</td></tr>
<tr><td>  </td><td>  </td></tr>
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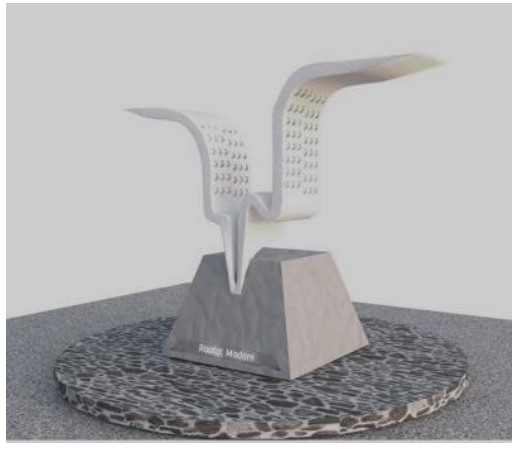
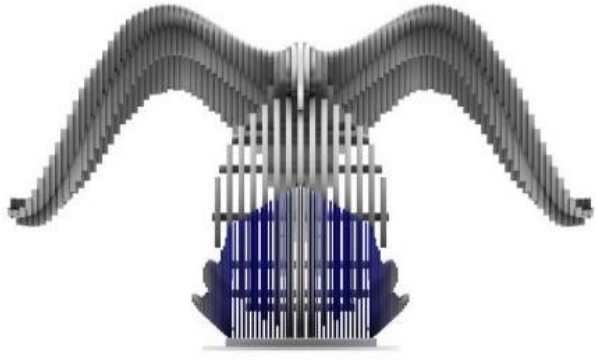
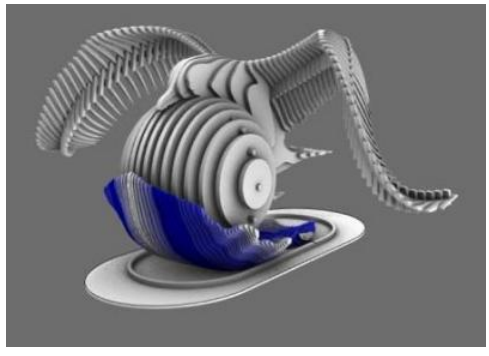
| Proposed Three-Dimensional Artistic Sculpture | Artistic and Aesthetic Values of the Scupture in the Context of Environmental Design |
|---|---|
|  | considers the relationship between the sculptures and the environmental design of the site. This involves creating a vision of interactive functional contemporary art models related to Saudi culture, with contemporary artistic styles and visions inspired by elements of nature.<br><br>These three-dimensional sculptures combine authenticity and modernity, distinguishing themselves in their relationship with the site and history. Therefore, it is crucial for these designs to be artistic works in their own right, diverging from traditional and stereotypical forms, and keeping pace with the new technological language of the era to provide enjoyment for the user along with functional and aesthetic value. |
| | Design a collection of modern and diverse aesthetic art sculptures inspired by Seljuk art artifacts, in a contemporary context using Adobe Photoshop. The sculptures |

| **Proposed Three-Dimensional Artistic Sculpture** | **Artistic and Aesthetic Values of the Scupture in the Context of Environmental Design** |
|---|---|
|  | feature forms of blacksmiths and birds in various poses and contrasting colors, crafted from materials suited for their function such as metal, bronze, polyester, employing supportive colors for these sculptures. |
|  | The researcher proposes a three-dimensional sculpture through an analysis of the seagull bird. The designer takes the seagull as a living organism, a medium that is transformed and abstracted in line with design thinking into symbolic, metaphysical, and realistic structural formulations through organic and structural geometries. The design employs sharp angular lines and soft transitions in each coherent interconnected unit. |

| **Proposed Three-Dimensional Artistic Sculpture** | **Artistic and Aesthetic Values of the Scupture in the Context of Environmental Design** |
|---|---|
| | As a result of a personal experiment, the researcher executed this concept using "3D Max" software to align with form, function, and space. The sculpture incorporates various technological techniques such as Bluetooth connections, electrical charging, and individualization. It is equipped with interactive screens that engage certain young age groups for play. |
|  | The artistic and functional interactive sculpture for the coastal city of Jeddah, inspired by the seagull bird, embodies a modern aesthetic while considering environmental design principles. Drawing from a specific source, the sculpture's form is derived from a study and analysis of elements and components of coastal nature to illustrate the research concept and goals. |

| **Proposed Three-Dimensional Artistic Sculpture** | **Artistic and Aesthetic Values of the Scupture in the Context of Environmental Design** |
|---|---|
| | |
|  | Comprising a series of regular circular slices symbolizing the agile rotating movements of the seagull, the sculpture exudes vitality and evokes an atmosphere of activity in the space. |

| **Proposed Three-Dimensional Artistic Sculpture** | **Artistic and Aesthetic Values of the Scupture in the Context of Environmental Design** |
|---|---|
|  | Here is a structured outline of the design proposal for an innovative and aesthetic sculpture inspired by the seagull bird, utilizing the 3D Max software for a contemporary three-dimensional representation:<br><br>1. **Inspiration**: Seagull bird as the muse for the sculpture design.<br><br>2. **Software**: Utilization of 3D Max for the creation of the sculpture.<br><br>3. **Variety and Contrast**: Creation of the sculpture in various poses and with contrasting colors to enhance visual appeal.<br><br>4. **Materials**: Selection of materials such as metal, bronze, polyester, stainless steel, and iron to align with the functionality of the sculpture.<br><br>5. **Color Scheme**: Employing supportive colors to enhance the aesthetic appeal of the sculpture. |

| **Proposed Three-Dimensional Artistic Sculpture** | **Artistic and Aesthetic Values of the Scupture in the Context of Environmental Design** |
|---|---|
| | 6. **Technological Features**:<br>o Bluetooth connectivity for interactive capabilities.<br>o Electrical charging mechanisms for practicality.<br>o Individualization features for customization.<br>o Incorporation of interactive screens to engage younger age groups for play.<br><br>By integrating these elements into the design, the sculpture aims to embody innovation, functionality, and interactive engagement, drawing inspiration from the graceful and dynamic nature of the seagull bird. |

**A collection of interactive artistic sculptures and the proposed designs that the researcher has created as three-dimensional models in a 'self-exploratory' experience**

## Results and Recommendations

### Study Results

There is a possibility to analyse the artistic features of prominent interactive artistic sculptures "in the context of environmental design".

Discovering the aesthetic and philosophical dimensions of interactive artistic sculptures.

Identifying the potential for drawing inspiration from elements of nature to shape sculptures for Jeddah city and make them interactive and functional, in an application that combines and considers both the sculptures and the environmental design of the site.

Presenting models of interactive artistic sculptures that embody artistic beauty, in the context of environmental design, capable of meeting the needs of the community.

Strengthening the relationship between augmented reality technology and one of the arts of the twentieth century, and Syriac art.

Expanding the scope of Arab research related to the formation of interactive artistic sculptures in the context of environmental design."

Encourage the exploration of parametric design as a modern approach in enriching the fields of visual arts and product design, focusing on its characteristics and inputs.

Expand the scope of studies and research to explore the utilisation of natural elements and their incorporation into interactive and functional designs with contemporary perspectives.

Based on the findings, the following recommendations are proposed:

Further research should be conducted to explore innovative ways of integrating interactive artistic sculptures within the environmental design of public spaces, taking into consideration the cultural and historical context of the location.

Collaboration between artists, designers, and technologists should be encouraged to push the boundaries of creativity and incorporate cutting-edge technologies in the development of interactive artistic sculptures.

Public awareness and engagement programs should be implemented to educate and involve the community in appreciating and interacting with the sculptures, fostering a sense of ownership and pride.

Continuous evaluation and monitoring of the sculptures' functionality, maintenance, and durability should be carried out to ensure their long-term sustainability and preservation.

Funding and support should be provided to commission and install more interactive artistic sculptures in prominent public areas, enriching the cultural landscape of the city and attracting tourists.

### The Practical Importance

Utilising innovative technologies such as the 3D graphic design software "3D MAX" as a technique to add artistic formations to functional interactive artistic sculptures.

Developing a vision for contemporary interactive and functional artistic sculptures that are connected to Saudi culture.

Creating a contemporary vision for leveraging 3D graphic design software "3D MAX" as a technique and the philosophy of environmental design, to impart artistic and aesthetic values to sculptures in Jeddah, as a major tourist city in the Kingdom.

Designing contemporary, interactive, and functional artistic sculptures that support the goals of the Kingdom's vision in achieving a high quality of life through the visual arts.

Producing utilitarian, interactive, and aesthetic artistic works that contribute to fulfilling the needs of individuals in society, using contemporary artistic methods and visions inspired by elements of nature.

**Study Recommendations**

Intensify the analytical and design study of the vocabulary and elements of nature and harness them in creating and innovating designs for interactive artistic sculptures in the coastal areas of Jeddah. These designs should embody artistic, aesthetic, and functional values that cater to diverse segments of society.

Expand the scope of studies and research towards employing elements of nature and utilising them in creating interactive and functional designs with contemporary perspectives.

Encourage further studies that focus on the characteristics and inputs of parametric design as progressive propositions that enrich the fields of visual arts and product design.

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