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DOI <https://doi.org/10.24919/2308-4863/82-2-14>**Jingjing MU,***orcid.org/0009-0004-9879-8336**Postgraduate at the Department of Multimedia Design
Kyiv National University of Technologies and Design
(Kyiv, Ukraine) 792629339@qq.com***Olena VASYLIEVA,***orcid.org/0000-0002-9275-0591**Candidate of Technical Sciences,
Head of the Department of Multimedia Design
Kyiv National University of Technologies and Design
(Kyiv, Ukraine) vasileva.os@kmutd.edu.ua*

ORIGAMI ART IN MODERN LAMPS DESIGN THINKING

The article explores the innovative use of traditional origami techniques in modern design of lamps, emphasizing their aesthetic and functional potential. It delves into the geometric, structural, and compositional characteristics of origami, revealing its ability to harmonize artistic expression with practicality in the creation of lighting fixtures and lamps. By analyzing the fundamental folding principles of origami, the study demonstrates how intricate three-dimensional forms can be achieved using diverse materials, ensuring flexibility and adaptability.

Special attention is given to the aesthetic values brought by origami techniques in design of lamps. These methods encourage designers to experiment with shapes, textures, and proportions, leading to the creation of unique and visually striking lamps. The study also highlights the balance origami-inspired designs offer between compactness, functionality, and artistic expressiveness. Lighting fixtures crafted using these techniques not only serve their primary purpose but also enhance the ambiance of spaces with their distinctive visual appeal.

The potential for material applications, including paper, textiles, plastics, and metals, is explored in detail, showcasing the versatility of origami in integrating traditional and modern elements. Moreover, the article examines the future possibilities of incorporating origami into smart home systems, such as adaptive lighting, remote control features, and other cutting-edge innovations. This integration aligns with contemporary demands for both sustainability and technological advancement.

The findings underscore the relevance of origami-based designs in optimizing the interaction between functional and decorative elements in lighting solutions. This approach ensures that the resulting designs are compact, practical, and visually captivating. Furthermore, the article discusses how the principles of origami can be expanded beyond lighting to influence architecture, interior design, and eco-friendly technologies.

This research sets a solid foundation for further investigations into the potential applications of origami in the design industry. By bridging traditional art forms with modern needs, origami continues to inspire innovative approaches in creating functional and aesthetically pleasing products.

Key words: origami art, lamp, design, design thinking.

Цзінцзін МУ,*orcid.org/0009-0004-9879-8336**аспірант кафедри мультимедійного дизайну
Київського національного університету технологій та дизайну
(Київ, Україна) 792629339@qq.com***Олена ВАСИЛЬЄВА,***orcid.org/0000-0002-9275-0591**кандидат технічних наук,
завідувач кафедри мультимедійного дизайну
Київського національного університету технологій та дизайну
(Київ, Україна) vasileva.os@kmutd.edu.ua*

МИСТЕЦТВО ОРИГАМІ В ДИЗАЙНЕРСЬКИХ КОНЦЕПЦІЯХ СУЧАСНИХ СВІТИЛЬНИКІВ

Стаття присвячена дослідженню особливостей використання традиційних технік оригамі в сучасному дизайні освітлювальних приладів. Проведено глибокий аналіз характеристик мистецтва оригамі та його потен-

ціалу для створення інноваційних рішень у дизайні освітлювальних приладів і світильників, що поєднують естетику й функціональність. Основна увага приділяється дослідженню геометричних, структурних і композиційних особливостей оригамі, які сприяють реалізації естетичних і практичних цілей у дизайні світильників. Розглянуто основні принципи та техніки складання оригамі, застосування яких дозволяє створювати складні тривимірні форми, які забезпечують динамічність і гнучкість у використанні різноманітних матеріалів. Приділено увагу питанням естетики в дизайні освітлювальних приладів з використанням технік оригамі. Дослідження демонструє, що сучасні дизайнерські підходи, засновані на принципах оригамі, сприяють експериментам із формами, текстурами та пропорціями, що дозволяє створювати світильники з унікальними характеристиками. Результати дослідження показали, що світильники, створені з використанням технік оригамі, здатні оптимізувати взаємодію між функціональними та декоративними властивостями. Вони дозволяють досягти ідеального балансу між компактністю та функціональністю конструкції, її зручністю та виразністю.

У статті проаналізовано можливості застосування матеріалів таких як папір, текстиль, пластик та металу. Окремо розглянуто перспективи інтеграції оригамі в концепції розумного будинку, що включає адаптивне освітлення, дистанційне керування та інші інноваційні рішення.

Отримані результати можуть бути використані як основа для подальших досліджень і розробок у сфері дизайну освітлювальних приладів, а також у суміжних галузях, таких як архітектура, дизайн інтер'єру та екологічні технології.

Ключові слова: мистецтво оригамі, освітлювальні прилади, світильники, дизайнерські концепції.

Purpose of this work is to identify the features of incorporating traditional origami techniques into contemporary lamp design. Through in-depth study of the characteristics of origami art and the needs of lamp design, it can bring more innovation and artistry to modern lamp design and expand the possibilities of lamp design.

Methodology. The research methodology of this article includes a literature review, analytical investigation, interpretation, and systematization of the obtained results. Visual materials were researched using the visual-analytical method and the method of formal analysis.

Scientific novelty. The scientific novelty of the obtained results lies in the systematization of information on the use of origami techniques in the design of contemporary lamp design.

Practical significance. Origami art has rich creative potential and unique artistic charm in modern lamp design. The lamp design shaped by origami art can give the lamps more artistry and beauty, and create unique light and shadow effects and visual experience for the interior space. In practical application, it not only requires designers to have professional technical and creative ability, but also needs to make comprehensive consideration in material selection, production process and practicality.

Introduction. The art of origami is also known as "craft origami" and "origami design". The word "fold" originally means to break, break or bend; "paper" refers to the thin sheet made of plant fibres, which is a common material used for writing, printing, packaging and so on. Origami is the art of paper folding in a two-dimensional plane through the valley folding method, peak folding method, pinch folding method and other folding methods to create a three-dimensional papercraft form of paper folding art, in traditional culture, it was

initially mainly used in rituals and religious activities, for example: the production of Yuanbao, official hats and so on, along with the popularity of papermaking, paper has gradually become a cheap product, the content of the art of origami is also more enriched, and a large number of living origami works began to appear (Hao, Y. Y., & Zhang, J. X.), such as: paper cranes, paper boats, paper kites, etc. Origami art is a form of artistic expression produced by people in their labour and cultural life.

Today, this ancient traditional art is utilized in the development of the design of modern products such as clothing, fabrics, tapestries, furniture, lamps, etc. The main goal of this article is to explore the ways of incorporating origami techniques in contemporary lamp design.

Analysis of previous research. Many writers have explored the integration of traditional artistic techniques, particularly those of origami, into modern design. The research mainly focuses on the design form of origami art, the design aesthetics and composition law and the structure of reorganisation and innovation, and the application of origami morphological elements in modern product design. Hao Y.Y. and Zhang J.X. used origami art as an entry point to explain the characteristics of the shape, light and shadow, and material of the lamp design shaped by origami art (Hao, Y. Y., & Zhang, J. X.).

Zhu L. study focuses on the application of origami art in communication design, origami as a symbolic element of traditional art is widely used in home design, clothing and textile design, architectural design and other design fields, which can effectively enrich the form of the design and enhance the cultural connotation of the work (Zhu L.).

Yue S. focuses on the innovative use of origami art in furniture design from the four aspects of natural

beauty, simplicity, technology and humanity, aiming at enriching the form of artistic design, improving the quality of design, enhancing the cultural heritage of products, and allowing people to appreciate the charm of origami art (Xiao H., Liu C.Y.).

In order to explore the way paper art is applied in modern lamp design, the article firstly summarises the advantages of paper art in modern lamp design by collecting, reading, analysing and collating relevant academic materials and typical cases. Secondly, the four artistic means of paper cutting, paper folding, paper sculpture and papier-mâché are studied in depth, and their application ideas in modern lamp design are analysed (Xiao H., Liu C.Y.).

Xie N. and Zhang Z.Y. introduced the development history and status quo of origami, analysed the design aesthetics embedded in the art of origami, and combined with the specific cases of modern design to analyse the point of fit between the combination of origami and modern design, as well as the inspiration of the art of origami to modern design (Xie N., Zhang Z.Y.).

Wen G.N. modern origami art in product design deconstructive thinking training in the application of research, to explore the composition of origami works of law and reorganisation of the process of innovative structure and form as a deconstructive and reconstructive thinking strategy thinking projection.

Wu Yuses the four characteristics of origami art, namely fun, experience, structure, space, and culture, to further stimulate the creative experience of cultural and creative paper product design, and to allow the traditional art of origami to be further inherited and spread through the application of cultural and creative paper product design.

Xiu J.X adhering to the traditional origami art and culture as a precursor, from the perspective of morphology, texture and emotional resonance, through the application of origami form elements in product modelling design research, aims to explore a design path suitable for Chinese traditional cultural characteristics (Xiu J.X.).

Origami art itself has a sense of visual beauty. Formal beauty is summed up by human beings in long-term art practice, this paper takes the law of formal beauty as a guide, discusses and analyses the formal beauty in origami art, and reinterprets the formal beauty of origami (Shi X.X.).

Problem statement. The purpose of this work is to investigate the peculiarities of utilizing origami techniques in the design of lamps. The author focuses on techniques specifically employed in lamp design, their structure, and visual characteristics. The methodological foundation of the research involves a

comprehensive approach, combining analytical methodology with structural-systemic analysis of relevant sources. It is anticipated that the research results will reveal key features of contemporary lamps design based on traditional origami techniques.

Results of the research and its discussion. Contemporary product design, especially lamp design, often draws inspiration from traditional arts. Understanding the structure and peculiarities of origami art provides the opportunity for its effective use in modern design. Researching literary sources and analyzing various works revealed that origami can be considered from the perspectives of morphological beauty and structural beauty. Let's delve into these aspects more thoroughly.

In origami, morphological beauty is associated with the appearance, form, and structure of intricate figures created from paper. In this context, origami is determined not only by the technique of folding, but also by the aesthetics expressed through clear lines, harmonious proportions and the ability of figures to convey emotions or represent the characteristics of an object.

Origami is the art of folding paper into different shapes by turning, folding, stacking, pulling and other technique, creating three-dimensional paper art forms on two-dimensional paper surfaces (Wang H.). Origami is rich in modeling and varied, and through the reconstruction and deformation of origami base shapes and folding base shapes, it is possible to create exquisite and accurate specific shapes and modeling structures with both mechanical properties. In other words, origami is an artistic creation that transforms two-dimensional into three-dimensional and static into dynamic, with many advantages such as strong creativity, high degree of freedom, rich emotional semantics, and clear spatial hierarchy (Zhu Z.J., Qin Y., Mu X.J.). Origami art uses different categories, colors, and physical properties of paper materials as the carrier for folding and processing, and the materials themselves have unique aesthetic values. For example, coated paper is glossy and strong; lightweight paper is textured and opaque; aluminum foil lined paper is gorgeous and easy to preserve. What is most special is that the consumption of paper does not necessarily mean the wear and tear of the product, but may also bring new artistic forms and functions. Origami art has a unique stylistic aesthetic, completing the transformation from two-dimensional to three-dimensional by means of folding, stacking, cutting and inserting (Chen X.Y., Zhu N.). Origami works have both concave and convex surfaces, straight lines and curves in parallel, with multi-dimensional and multi-level visual changes such as bright and shadow

intertwining, the use of repetitive composition, gradient composition and other techniques, the fusion of change and unity, contrast and harmony, rhythm and rhyme, and fully embodies the law of beauty of the form, so origami elements have been widely used in the design of lamps and lanterns, home design, apparel design, graphic design, cultural and creative products, and other design fields. Therefore, origami elements are widely used in lighting design, home design, clothing design, graphic design, cultural and creative product design and other design fields.

Origami structure has two distinctive features: first, regularity. The art of origami is rich in shape and artistic beauty, giving people a superficial impression of sensual design. But in fact, modern origami is also known as "the art of science, the science of art". Origami is a kind of rational design; each crease is repeatedly calculated and contains mathematical philosophy (Y J.D., Huang M.). Therefore, the art of origami has a strong regularity (Fig.1, a-b), and can design origami works that combine aesthetics and science. Second, versatility. Origami art creation methods and forms of expression are varied, with endless possibilities and changes. Mountain folding and valley folding are the two most basic folding methods in the art of origami, and they also form the basis of complex origami modeling. Mountain folds and valley folds have undulating and staggered forms, and as decorative elements, they have strong light and shadow effects, and as structural elements, they can play the role of supporting forces. The basic origami forms such as mountain fold, valley fold, V-shaped fold, parallel fold, etc., can be combined through interspersing and layering, and can be freely changed into endless product forms. In addition to the versatility of the design, there is also the versatility of the way it is used. Products designed with the art of origami usually retain the characteristics of folding and easy deformation in the way of use, allowing users to fold and combine them freely, which is very interesting.

There are also two forms of lamps modelling design using origami art, one is the overall shape of the lamps is a complete unit (Fig.2,a), in general, this lamps modelling is simpler, strong sense of geometry, to create an atmosphere that is more simple and generous, elegant and calm. The length of the staggered folding line can not only enhance the physical properties of the lamp modelling, but also has a visual extension of the force and undulation jumping sense of movement and static contrast shows not only lively, relaxed and rational, elegant design language, rich in the sense of design hierarchy, the overall shape of the concave and convex (Li N., Yang J.); the other is made up of a number of basic units of the lamp modelling (Fig.2,b), the modelling of this kind of lamps and lanterns is usually more complex structure, flexible splicing and combining methods, This kind of lamp shape is usually more complicated in structure, flexible in splicing and combination, changeable in form and interesting in nature. Using origami techniques to shape the lamp modelling design is divided into two kinds of rules and irregular, regular lamp modelling (Fig.2,c) is mostly symmetrical form, the overall modelling sense of order is strong, not only simple and clear but also elegant and gentle, rich in a sense of harmony and unity and a sense of space, which can bring out the atmosphere of peace and tranquility. Irregular lamp modelling design (Fig.2,d) breaks the existing lamps and lanterns of the inherent style, can meet the pursuit of personalised user needs. The sparse and dense folding line has movement in the static, the perfect combination of movement and static makes the lamps visually have a sense of rhythmic movement, either tense and urgent, or quiet and soft, breaks the monotonous and constrained silhouette, and the overall style of the novel and chic, the folding interest is also stronger (Xie X.Q.). Using origami dry folding technique to shape the lamp design (Fig.2,e) folding line rigid, sharp, clear and hard structure, clear corners. Folding lines dispersed

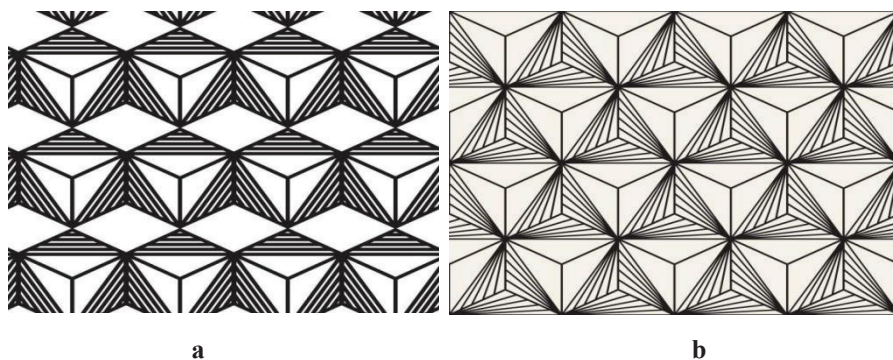


Fig. 1. Regularity of origami structures

and assembled around a certain visual centre form a variety of points, lines and surfaces, which breaks through the fixed structure and expression of the lamp design, making the lamp shape concave and convex, presenting a simple and sharp geometric sense of aesthetics. In addition, the lampshade can be easily pressed into a flat plate by using the folding techniques such as folding, circular folding and three-dimensional folding in the art of origami, which takes up little space for storage and facilitates packaging and transportation; the lampshade shaped by using the wet-folding technique of origami is shown in (Fig.2,f): the series of lamps of the brand of ISDANFO have a more rounded shape, which is both simple and novel, and the flowing and soft folding lines add a sense of concave and convexity to the lampshade. The folding line adds to the artistic infectivity of the lamps and lanterns, which easily inspires users to have an easy, comfortable and pleasant emotional experience, and enhances the cultural connotation and heritage of the lamps and lanterns.

Light and shadow characteristics of lamp design shaped by origami art Origami is a kind of understanding of space, which can be applied to the design of lamps to increase the artistic qualities of light and shadow. Folding methods such as internal and external folding, pleating, pinch folding, rabbit ear folding and other folding methods (Fig.2,g) make the light reflected or refracted, forming a hazy and fuzzy boundary of the light, and shaping a soft form of the lamps. Light and shadow with the folding line

of the ups and downs and twists and turns, orderly shuttle, clutch and blocking, the formation of light and dark visual effects, the original bland light and shadow was given a unique flavour and charm, active outline of the monotonous and constrained, to bring the user a sense of emotional rhythm. In addition, the light direction of the lamps and lanterns, projection angle and material texture and other factors also make the light, shadow changes more colourful, the formation of dreamy, quiet or elegant and other different light and shadow effects. Light colour design needs to be based on the use of lamps and lanterns of the environment and emotional tone, and combined with a variety of colours to bring the user a different psychological experience to add, highlighting the spatial sense of the lamps and lanterns, the pursuit of the perfect fusion of light and shadow and space, to enhance the beauty of the lamps, to give the user different moods and recollections.

Origami is mainly embodied in geometry and art, is the combination of art and mathematical logic, reflects the beauty of science. Origami art shaped lamps and lanterns design modelling characteristics and light and shadow characteristics, both reflect the origami art of form beauty and structural beauty. For example, the lamps of ISDANFO brand are rounded and smooth, elegant and delicate, which are in fact borrowed from the wet-folding method of origami art. Wet folding method shaped lamps and lanterns works more sinuous arcs, works of beautiful shape and rich sense of flow, both simple and novel,

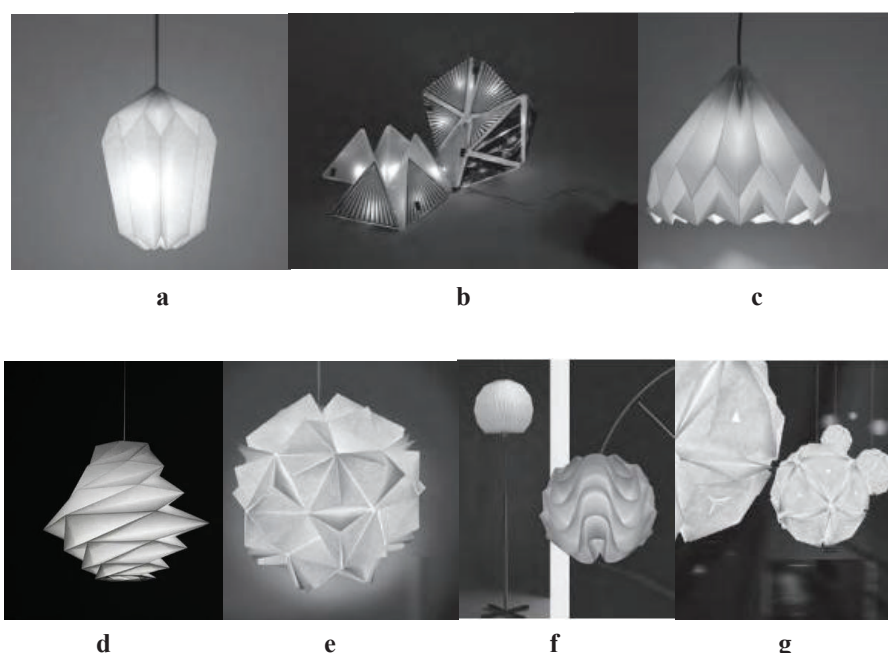


Fig. 2. The application of origami art in modern lighting design

giving users a gentle, soothing, relaxing emotional experience. Reference to origami shaped lamps pay more attention to the understanding of space and the modelling of the refinement and generalisation, modelling is often used to repeat the composition of the law, the design of the lamp modelling more rhythmic, a sense of order, a sense of space and the light and shadow effect is obvious. For example, Umut Yamac, a British designer, was inspired by a small bird perched on a tree branch, and used sharp folding lines to summarise the bird's three-dimensional shape. Traditional origami techniques collide with modern geometric aesthetics to create an artistic spark. The light and darkness between the folded surfaces are richly varied, and the interplay of light distinguishes the relationship between the surfaces, portraying the three-dimensionality of the lamps.

Conclusions. Origami art is characterised by folding paper to create unique shapes and structures, and designers can draw on the modelling characteristics

of origami art to create creative and artistic lighting forms. The structure of origami art is compact and stable, designers need to ensure the functionality of the lamps on the basis of clever folding, design. give full play to the structural beauty of origami art. As an emerging design form, the development trend and future research direction of origami lamps deserve attention. Firstly, designers can further explore the combination of origami art with other materials and technologies, such as ceramics, glass, metal, etc., in order to create more diversified and complex forms of lamps. Secondly, designers can study the combination of origami art with the function and intelligence of lamps, such as the light-control adjustment of origami lamps and sound-control switches, etc., to improve the convenience and user experience of lamps. In addition, designers can make use of computer-aided design technology to optimise the form and structure of lamps and lanterns, so as to further improve the innovation and practicability of origami lamps.

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