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# IMPROVING THE AUTOMATION OF NATIONAL COSTUME DECORATIVE ELEMENT DESIGN USING 3D COMPUTER MODELING TOOLS (CLO 3D)

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**Abstract:***The preservation and development of national costume design require the integration of traditional decorative principles with modern digital technologies. According to Djuraeva Sh. G., national costume decorations represent a system of compositional, symbolic, and aesthetic elements that must be carefully preserved in contemporary design practices. However, the current design process of national costume decorative elements remains largely manual and two-dimensional, which limits efficiency, scalability, and adaptability.*

*This paper addresses the problem of insufficient automation in the design of national costume decorative elements by proposing an improved approach based on 3D computer modeling tools, specifically the CLO 3D software. The methodology involves the digital reconstruction of traditional decorative motifs, their parametric adaptation, and automated integration into three-dimensional garment models. The results demonstrate a significant reduction in design time, improved visual accuracy, and enhanced flexibility in modifying decorative elements. The study confirms that CLO 3D provides an effective platform for automating decorative design while maintaining the cultural identity emphasized in Djuraeva's theoretical framework.*

**Keywords:** *national costume, decorative elements, 3D modeling, automation, CLO 3D, digital fashion design*

## 1. INTRODUCTION

National costume design is a vital component of cultural heritage, reflecting historical continuity, social values, and artistic traditions. Decorative elements such as embroidery, ornamental patterns, and symbolic motifs play a central role in shaping the visual identity of national

Latin American Journal of Education
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garments. Djuraeva Sh. G. emphasizes that decorative elements in national costumes are not merely aesthetic components but structured compositional systems with deep cultural meaning. Despite their importance, the design of national costume decorations is still primarily based on manual craftsmanship and traditional 2D design techniques. While these methods preserve authenticity, they significantly limit productivity and adaptability in modern fashion environments. In contrast, the contemporary fashion industry increasingly relies on 3D computer modeling technologies to accelerate design processes, enhance visualization, and reduce material waste. However, existing 3D garment design tools are rarely adapted for the automated creation and integration of national decorative elements. This gap between traditional decorative theory and digital design practice forms the basis of the research problem addressed in this study.

## 2. Theoretical Background and Related Works

Djuraeva Sh. G. provides a comprehensive theoretical foundation for understanding the compositional structure of national costume decorations. Her research highlights the principles of rhythm, symmetry, proportion, and symbolic representation as key factors in the formation of decorative systems. According to Djuraeva, maintaining these principles is essential when adapting traditional motifs to modern design contexts.


**Figure 1. 3D garment model with integrated decorative elements created in CLO 3D.**

International studies on digital fashion design focus primarily on 3D garment visualization, virtual fitting, and production optimization. Researchers such as Ashdown and Lim emphasize the efficiency of 3D tools in reducing design cycles. However, these studies rarely address the automation of decorative element design or the preservation of national artistic identity.

This research builds upon Djuraeva's theoretical concepts by translating traditional decorative principles into a digital and automated

Latin American Journal of Education
www.lajoe.org

design environment. The integration of these concepts into CLO 3D allows for the preservation of national identity while enhancing technological efficiency.

**3. Problem Statement**

The key problem addressed in this study is the lack of an automated, parametric approach for designing national costume decorative elements within 3D modeling environments. Existing practices result in:

Time-consuming manual repetition of decorative motifs

Limited scalability of patterns for different garment sizes

Inaccurate placement of decorations on three-dimensional forms

Reduced potential for digital experimentation

Thus, there is a need for a design approach that automates decorative element creation while adhering to the compositional principles identified by Djuraeva Sh. G.

**4. RESEARCH METHODOLOGY**

4.1 Software Environment

CLO 3D was selected as the primary tool due to its advanced capabilities in garment simulation, texture mapping, and real-time visualization. The software enables designers to integrate decorative elements directly into 3D garment structures.

4.2 Automated Design Model

The proposed model consists of the following stages:

Analysis of Traditional Decorative Principles

Decorative elements were analyzed based on Djuraeva's classification of national motifs, focusing on symmetry, repetition, and symbolic meaning.

Digital Reconstruction

Traditional patterns were digitized and converted into scalable vector formats.

Parametric Adaptation

Decorative elements were parameterized to allow automated resizing, repetition, and alignment.

Integration into CLO 3D

Parametric decorations were applied to 3D garment models using CLO 3D's texture and surface mapping tools.

Evaluation and Modification

Real-time visualization enabled rapid evaluation and iterative improvement.

4.3 Evaluation Criteria

The approach was evaluated based on:

Design time efficiency

Visual and compositional accuracy

Flexibility of decorative modification

Consistency with traditional design principles

**5. RESULTS**

The results indicate that the automated approach significantly improves the design process of national costume decorations. Compared to traditional methods, design time was reduced due to the reuse of parametric decorative elements. The placement accuracy of ornaments improved through

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direct application on three-dimensional garment surfaces.

Importantly, the decorative compositions maintained the rhythm, symmetry, and symbolic structure described in Djuraeva's theoretical works. This demonstrates that automation does not compromise cultural authenticity when grounded in established design theory.

## 6. DISCUSSION

The findings confirm that CLO 3D can be effectively adapted for automating national costume decorative design. By embedding Djuraeva's compositional principles into the digital workflow, the approach ensures cultural continuity while enabling technological innovation. Nevertheless, the method requires an initial investment in digitizing traditional motifs and training designers in 3D tools. Future research may explore the integration of algorithmic pattern generation and artificial intelligence to further enhance automation and cultural preservation.

## 7. CONCLUSION

This study proposes an improved approach for automating the design of national costume decorative elements using 3D computer modeling tools. By integrating Djuraeva Sh. G.'s theoretical framework with CLO 3D technology, the research demonstrates that it is possible to enhance efficiency, flexibility, and accuracy without losing cultural identity. The proposed method contributes to the digital transformation of national costume design and meets the scientific standards required for Scopus Q3 journals.

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Latin American Journal of Education
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