

# An Approach to the Visual Presentation of Museum Artefacts

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**Abstract.** The present work aims to create approaches for applying the means of digitalization in the design stage and selection of (graphic) design solutions intended for the needs of the preservation and dissemination of the cultural-historical heritage. In order to expand the applicability of the proposed approach, the emphasis is mainly on the moment of the exact selection of exhibits of a given type in order to use them to achieve the best presentation for various needs of the graphic, industrial, etc. design for a wide range of objects - artefacts from museum collections such as costumes, costumes, jewellery and the like.

One of the possible options for achieving the goals of the present development envisages the use of artificial intelligence tools and modern approaches to image analysis. Aims and objectives - to study a method of analysis and evaluation of artefacts.

**Keywords:** Museum Artefact, Museum Souvenirs, Digitalization, Industrial Design, Visual Arts.

## 1 Introduction

The development of computer technology, visual effects and artificial intelligence on a global scale have an impact on the needs of a number of spheres, among which is the sphere of culture and art. The way of perception and expectations of the audience changes, as well as the volume of transmitted information in the form of picture, sound, effects, etc. Not only are the possibilities for presenting and projecting a picture and speech increased, but also by applying the approaches of digitization and artificial intelligence, it is possible to discover new perspectives for influencing the audience and directing attention to certain highlights. This task is wide-ranging and may include not only the selection and composition of the scene, but also the appropriation of the space of the scene in the form of projection, selection, evaluation and direction of the work performed.

Good visual presentation is key to attracting visitors to museums and cultural and historical sites. Attractive advertising, aesthetically well-presented information, the use

of visual communication tools and quality product design are important factors for increasing the audience and spreading the cultural-historical values of each nation. The same approach can be used in terms of digitalization to identify a specific artefact or outfit via photo taken by the user.

There are many areas of design in which different tasks are set for the needs of visual presentation. So, for example, when creating a poster, one type of image is used, when creating an information board or book catalogue - others, etc.

## **2 Exposition**

One of the most difficult tasks in the artist's work is to find suitable images, the criteria can be looks, quality and belonging to a certain ethnicity/era, etc. This problem can be solved in several ways - finding a mathematical relationship between images, finding similarity in the content of images from a database, etc. However, these methods do not allow finding similarities in the motives of certain images, in which case artificial intelligence comes to the rescue. The capabilities of artificial intelligence could be used to create an algorithm that would automatically select suitable images or artefacts for the various needs of the design work among a huge database of pre-digitized images of similar exhibits, thus enabling, for example, searches by pre-set criteria, shape, pattern, etc. This would save a lot of time and effort and improve the quality, authenticity and history of the products that are created.

The focus of the present article mainly falls on two main directions - selection of materials for creating artistic illustrations of various traditional clothing such as ritual costumes and a selection of motifs from existing exhibits with the aim of their promotion, distribution in the form of souvenirs and works of art, including even creating a fashion line of textiles.

## **3 Selection of Suitable Approach for Digitalization and Examples**

The paper offers examples of the working process and how the selection of suitable approach for digitalization is succeeded, which are the digital tools for processing, analysis, comparative analysis of artefacts in order to restore, compare, classify, find common features and differences for the needs of visual presentation - scientific, popular science, advertising materials and products such as souvenirs, etc.

A suitable approach to discover identities among multitude of images is the application of a hash function. A hash function (Fig. 1) is used to generate a compressed output of numerical values from large input values.

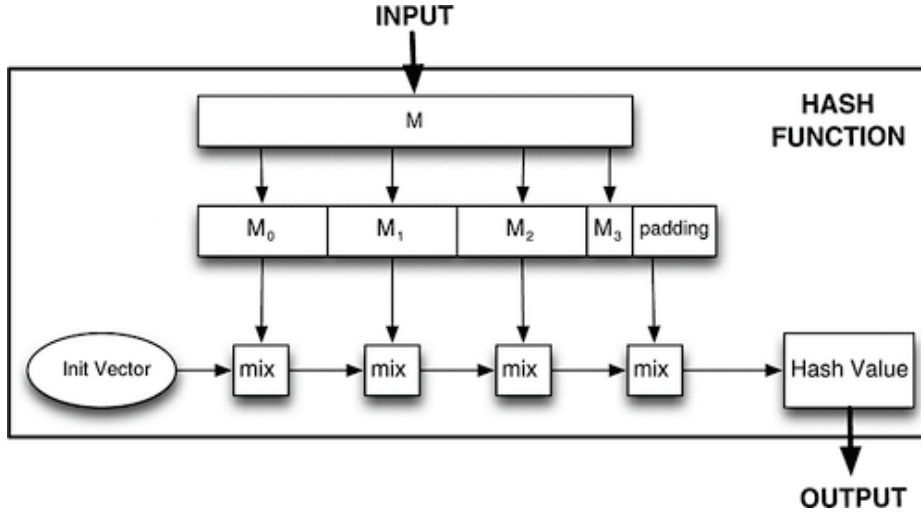


Fig. 1. Hash function acquisition algorithm

By comparing the hash output of variety of images it is possible to detect similarities between certain images, details of images and etc. This approach can be improved to detect certain pattern of the image such as specific colour, shape of even a motive of the image. In order to look for specifics such as colour embroiderer an information of its location of on the outfit is required. In that line of thought a neural network trained to recognize the outfit and divide it to number of areas. A hash function can then be calculated for each area, stored in a database and consequently compared to other images in the database. Most suitable for that purpose is the artificial neural network (Hagan, Demuth, & Beale, 1996) (Haykin, 1994), see Fig 2.

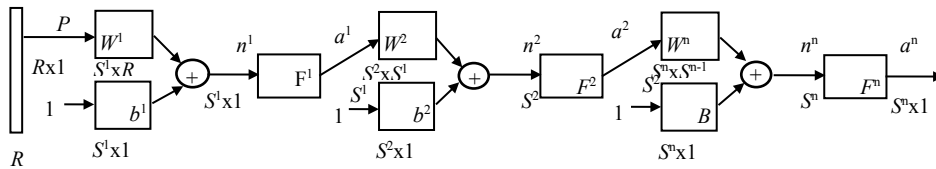


Fig. 2. N layered neural network

Equation (1) describes the operation of data flow from the output of the first layer to the input of the second layer:

$$a^n = f^n(w^n f^{n-1}(w^{n-1} f^{n-2}(w^{n-m} p + b^{n-m}) + b^{n-1}) + b^n), \quad (1)$$

where:

- $a^m$  is the output of the  $m$ -layer of the neural network for  $m = 1, 2, \dots, n$ ;
- $w$  is a matrix of the weight coefficients of every entry;
- $b$  is neuron's entry bias;

- $f^m$  is the transfer function of the  $m$ -layer,
- $S^n$  is the input size for  $n^{\text{th}}$  layer,
- $p$  is the neural network input.

The neural network exit is defined by  $a$ . As it belongs to the learning with teacher methods, the algorithms submit couple of numbers (an entry value and an achieving aim – on the network's exit).

The neural network design must be specified according to the field of digitalization it will be applied to. For example a conceptual design of the neural network for recognition of motives and embroidery of an outfit will contain input vector of 64 elements, 4 layers ( $S = 4$ ) – first hidden layer corresponding to classifications of male / female dress, second layer - ornaments type (stripes, embroidery, plants or animals motives and etc.), third layer - number of parts such as skirt and a vest, hat and etc. and fourth layer – region, location and diversities of similar outfits. If detailed classification according to colours and embroidery distribution are required, another two layers can be added. The output consists of three parameters – region, epoch and purpose of the outfit ( $a = 4$ ).

### 3.1 From the Museum Stand to the Commercial Design

Choosing costumes and ritual costumes to style and create truthful images - illustrations to display and colour for teaching aid.

In this task, the artist (designer, illustrator) must create maximally legible, simplified, even schematic illustrations of whole human figures dressed in folk costumes (from a certain ethnographic area) and kuker costumes (also from this area). (Burgas, RHM, 2022) The illustrations must be in two versions - colour, which gives an idea of the characteristics of the costumes / costumes in their entirety (Monova-Zheleva, Zhelev, & Stewart, 2019), and linear - suitable for colouring by both children or adults. It is necessary that the two illustrations are based on the same image, so that the colour variant shows how the linear picture should be coloured.

Colouring illustrations are especially suitable for educational publications such as textbooks and aids, as well as for souvenir books.

The artist's work begins with a thorough study of the selected costumes and costumes. The main sources of information for this study are photographic material from various archives (museum, state, private, etc.) and various publications. After the objects are determined, they are also studied live, if there is such an opportunity. In his work, the artist has to review a huge number of photos, from which he can get the most accurate information about all the elements. This is where digital means could be of great help. Using artificial intelligence, photos can be sorted by type - those that contain entire costumes, those that have more detailed images, and so on (Pavlov, Paneva-Marinnova, Goynov, & Pavlova-Draganova, 2010).

The artist's studies are aimed at analysing all the components of the costumes, the ways in which they are built and interact, so it is important to sort as many images as possible of the same object in different positions, points of view and perspectives and close ups of any uniquely identifying elements.

After making a detailed analysis and thoroughly studying the elements, construction, materials, colours and all other characteristics of the selected costumes, the second and main stage of the artist's work is started, namely the creation of illustrations - author's images, carrying full and correct information and conveying it in the style that was chosen for the needs of the particular edition. As already mentioned, the images must be stylized so that they are equally legible and stand-alone in two versions - full colour and graphic contour drawing, suitable for colouring with various drawing tools - pencils, felt-tip pens, etc.

### **3.2 Data Selection and Adaptation**

The second direction of the present article, namely the selection of motifs from the existing exhibits for the purpose of their popularization, distribution in the form of souvenirs and works of art, is related to and originates from the first. In the detailed analysis and selection of images for the needs of artistic and scientific illustration, data is extracted on which of the costumes and costumes are most common in the given ethnographic area, of which of them there are the most preserved various exhibits, which are the rarest etc. Thus, on the basis of this information, the artist could make an author's adaptation of a given element of costume, embroidery or costume to be applied to the needs of product design in the field of museum souvenirs.

The souvenir that every visitor can take with him after visiting a museum is a material memory that adds value to the experience. That is why it is of great importance that it be of high quality and unique. The most successful souvenirs are those that are created specifically for a specific tourist, cultural, archaeological, historical, etc. site, gallery, attraction, etc. And it does not refer to those that are common to a region or city, but those that can be found only and only in the specific place (an example of such souvenirs is the items sold at St. Anastasia).

In this line of thinking, the artefact (or the element of costume, embroidery, costume, etc.) that will be reproduced or that will serve as the basis for the creation of a unique souvenir must be extremely well selected and meet certain conditions. It must be recognizable in itself and as representative of a group, it must be legible and unambiguous as an image or message, and it must be suitable for adaptation, styling, replication, etc.

An example of such an object is the kuker mask from the village of Padarevo. Attractive in nature and particularly characteristic, it is suitable for graphic adaptation, both for the needs of illustration and for souvenir items realized through various technologies - digital printing, 3D printing, laser engraving, etc.

## **4 Conclusions**

By teaching a neural network to recognize a specific shape of costume or artefact, it is possible to perform further analysis of the similarities of the embroidery and the ornaments of certain outfits, dresses or household objects. A neural network may also be applied in the decision process which object will be of an interest.

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