



Translating Color: Sonification as a Method of Sensory Substitution within the Museum

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ABSTRACT

This research will examine the problem of the fruition of the chromatic element, dominant in contemporary art, by people with visual impairments or blindness (VIB). The process of Sonification (i.e., a technique for communicating information that employs sound to describe data) will be applied in order to translate the color dynamism of the artwork into sounds, taking into account the inner rhythm of the painting. The outcome of the research will be the creation of assistive technologies that can make artworks fully accessible by ensuring a simultaneous overview through word-sound-touch juxtaposition, with the aim of offering a total multimodal and multisensory experience of the artwork.

CCS CONCEPTS

• **Human-centered computing** → **Accessibility systems and tools**; • **Social and professional topics** → **People with disabilities**.

KEYWORDS

visual impairment, sonification, multimodality, inclusive communication, assistive technologies

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1 INTRODUCTION

Since time immemorial, art in history has had the function of reading the trends and social changes of the time. Nowadays, enhancing artistic and cultural heritage is about conveying meaningful experiences that can be addressed to any kind of visitor, making it accessible to all. In the museum field, accessibility can be defined

by the degree of ease or difficulty with which any individual can access the physical space and content; in fact, the museum institution has shifted over the years from being an elitist and exclusive environment to considering the need for a more open-minded public ready to express its opinion. At the same time, attention to the needs of different groups and individuals in society has grown, not only in terms of disability but also in terms of age (children, young people, the elderly), social level, and culture. All this has led to a reflection on the issue of accessibility of artistic heritage; all visitors, independently of the existence of any disability and according to their knowledge and experience, must be able to enjoy the artistic product. The practice of Audiodescription (AD), which is part of the broader context of the Accessible Intersemiotic Translation, demonstrates a wide range of applications and therefore an essential resource, thanks to the possibility of verbalizing everything that is visual and, eventually, being translated into various languages. Certainly, to convey the expressive nature of an artwork, verbal description is essential but not enough. Elements such as shapes and colors cannot only be explained but need to reach perception through other methods, particularly in the case of non-figurative works (e.g., by Pollock) or works with low figurative density (e.g., by Kandinsky).

2 THEORETICAL FRAMEWORK

Translating artistic discourse, encoded in a language that is sometimes cryptic for the audience, means making its contents accessible to different kinds of receptors. The work of art may be more or less figurative and present specific compositional techniques and methods that depend primarily on the historical period and context during which it was made [6]. In the case of abstract paintings, the plastic level, i.e., the organization of lines, colors, and spaces, often does not allow us to recognize figures from the real world. In this case, any effort to “objectively” describe the image would greatly limit the reception of the work. Attempts to analyze non-figurative arts as a language with its dignity have led visual semiotics scholars to consider the individual painting as a system of oppositions of forms and colors containing the rules to produce meaning [1].

The figure of the translator fits into this context as a mediator between the creator and the recipient of the message, simultaneously playing the role of a user of the work and producer of meanings, operating intersemiotically. Obviously, the transmission of the color experience presents concrete issues; those who have lost their sight

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during the course of life can recover, through memories, the concept of light/shadow and color, whether vivid or just through sensations. In the case of congenital blindness, the situation proves more complicated. So, what should we rely on when translating such works? We must take into account some important factors such as the symbolic meaning of colors, the artist's intentions, and the kind of context and receptors they are destined to. Colors have the effect of evoking feelings, emotions, and moods in us; but these associations are not the result of contemporary investigations, the connection between colors and psychic life has ancient origins. We can consider this system of chromatism and forms as the rhythm of the artwork, understood as musicality, which is an intrinsic property of non-figurative art [1, 5]. Each painting has a certain rhythm that is marked by oppositions, which our visual system is very good at capturing. The proposed solution is to translate intersemiotically this inner language of the artwork through vicarious sound associations that can be connected to the sensations that a particular color can arouse.

3 METHODOLOGY

First, we will analyze how the loss of vision leads to a massive functional reorganization of the brain thanks to neuroplasticity [4], which is strictly dependent on the age at which blindness occurs. Studies on the human mirror system would support the basic idea of the project because they show that the perception of sound activates in our brain the same responses provided by the visual stimulus [3]. This research will accompany the semiotic study of the artwork and will help us identify the best strategies to be used by the translator when conveying the central aspects of the paintings, namely form and content, and the artist's communicative intentions. The form, the element of greater perceptual density, can be conveyed by means of tactile information, which is particularly effective in capturing volume and geometry, but when it comes to the content more attention must be paid. As an active reader of the work, the translator may choose to highlight certain aspects that he/she will consider fundamental to its employment, so it will be necessary to collect enough documentation from critics and art experts. We will then move on to analyze the sound-color relationship and the various theories that associate their wavy nature and expressive charge. All this will accompany the tactile and descriptive experience of the visually impaired person. Again, it will be necessary to enlist the support of music and technology experts, who will be involved in the creation of tactile/sound aids. These aspects will be applied to a Reception Study [2] and tested both on groups of normally sighted people and people with different visual impairments. Impressions and judgments will then be collected in order to assess whether the presence of music can be a valuable support to the fruition of the work of art with the aim of reinforcing common means of accessibility.

4 OUTCOMES

The outcome of the research will be the creation of assistive technologies that will accompany both the AD and the tactile exploration of the artwork in such a way as to complete the artistic experience of the VIB visitors. Some of the proposed solutions would be:

- (1) The composition of an ad-hoc soundtrack based on the most relevant colors, lines, signs, and geometric shapes of the painting that can be downloaded thanks to a QR code or IOS/Android app. The music will follow the variation of the color intensity (which will result in an increase or decrease in the intensity and/or speed of sound), as well as the dynamism of lines and geometric shapes. The track is played during the AD of the painting and can be listened simultaneously with tactile exploration.
- (2) The creation of a thermographic relief print that can be placed on a screen (a tablet, for example). The screen will project the image of the artwork so as to coincide with the relief print. As the fingers explore the print, the device will emit some sounds corresponding to the color being touched. The transition from one color to another can be gradual if the colors fade, or it can be sharp if the colors are clearly divided.
- (3) The creation of a 3D-printed audio-tactile reproduction of the artwork. The reproduction would contain some interactive touchpoints that can be activated and emit a sound when the finger passes over them.

5 OBJECTIVES

The final goal of the research is to demonstrate that the sonification of colors can be a viable solution to the lack of conceptual completion of the artistic experience within the museum context. By working simultaneously on tactile and sound associations, juxtaposed with verbal AD, the visitor has the opportunity to experience a global overview of the artwork and receive a stimulus for reflection, growth, and consequently integration. All of this will ensure a double benefit: for the VIB audience, who will have the chance to enjoy the content with ease, and for the rest of the visitors, who will be able to appreciate additional services and think more deeply about the feelings generated by art.

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