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ART PICTURE FROM MUSEUMS, COLLECTIONS AND TEMPORARY EXHIBITIONS OF CROSSLINKING IN NEAR INFRARED SPEKTRUM

UMJETNIČKE SLIKE IZ MUZEJA, ZBIRKI I PRIVREMENIH IZLOŽBI U BLISKOM INFRACRVENOM PODRUČJU

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Abstract

This paper presents the state of art in the visible (V) and near infrared spectrum (NIR). The images reveal naked eye invisible images in the lower layers of pictures that point to the authenticity of the artwork, In the infrared and visual spectrum 1436 art images were recorded at the same time in museums, collections and temporary exhibitions in Zagreb. 36 mapped coats, prints and shots were found. In the visual and NIR area, photographing of images provides protection against forgery of art images, loss of data due to changes that occur with time and future possible damage. The double-sided shooting process extends the image analysis and emphasizes the importance of capturing in close infrared spectrum of all the images from the museum and gallery collections and during the process of conservation and restoration of the artwork.

Keywords: *infrared recording, shift / repentance, copying layers, transcripts, protection against forgery of art images.*

Sažetak

U radu je prikazano stanje umjetničkih slika u vidljivom (V) i bliskom infracrvenom spektru (NIR). Na slikama su otkriveni golim okom nevidljivi podaci u donjim slojevima slika koji upućuju na autentičnost likovnog djela. U infracrvenom i vizualnom spektru istovremeno je snimljeno 1436 umjetničkih slika u muzejima, zbirkama i privremenim izložbama u Zagrebu. Otkrivena su 36 preslikana sloja, preslika i pomaci/pentimenti. U vizualnom i NIR području fotografiranje slika osigurava zaštitu od krivotvorina umjetničkih slika, od gubitka podataka zbog promjena što nastaju s vremenom i budućih mogućih oštećenja. Dvostrukim postupkom snimanja proširuje se analiza slike i naglašava se važnost snimanja u bliskom infracrvenom spektru svih slika iz fundusa muzeja i galerija te tijekom procesa konzerviranja i restauriranja umjetnina.

Ključne riječi: *infracrveno snimanje, pomak/ pentimento, preslikani slojevi, preslici, zaštita od krivotvorina umjetničkih slika.*

1. Introduction

1. Uvod

The term “IR reflectography” is used in the recording of artworks in the field of conservation and restoration. It is a nondestructive optical technique used for analyzing artworks in order to discover specific details hidden from the human eye under the visible surface of the painted layer. The near-infrared spectrum belongs to the range between 750 and 1400 nm. Within this near-infrared spectrum, I analyzed the area at 1000 nm. Point Z at this precise wavelength was defined [1]. Scientists and experts in the conservation and restoration field use different methods to study hidden layers in paintings. Thanks to this research in art, it has been known since the 1930s that many painters throughout history overpainted their artworks [2]. In many paintings, infrared imaging can “see” through layers of paint [3]. We are gaining more and more insight into the lower layers of paintings thanks to the perfecting of IR technology.

If we wish to be studious in our reading and interpretation of artworks, it is not enough to observe them with the naked eye. Infrared reflectography has been very good in penetrating through thinner layers in the near-infrared spectrum. This is an important method in discovering forgeries and solving some issues in attributing works to authors. X-ray photography (RTG) is the standard method for observing layers of the painting in cases when the layer of paint is too thick for IR reflectography. I recorded 1436 paintings from seven Zagreb museums, three collections, ten temporary exhibitions and five private collections in the infrared and visible spectra for my doctoral dissertation *Images in the Infrared Spectrum: Postponing the Visible* [4]. Paintings on different supports from the permanent collections of seven museums were photographed in the visible and near-infrared spectrum at 1000 nm. The museums are: the Modern Gallery, the Zagreb City Museum, the Museum of Contemporary Art Zagreb, the Mimara Museum, the Museum of Arts and Crafts, the Croatian Museum of Naïve Art and the Strossmayer Gallery of Old Masters of the Croatian Academy of Sciences and Arts. Paintings from three collections were also photographed: the Anka Gvozdanović Collection, the Dr. Ivan Ribar and Cata Dujšin-Ribar Memorial Collection and the Collection and Flat of the Architect Viktor Kovačić. Paintings from ten temporary exhibitions in the following museums and galleries were photographed: the Modern Gallery, the Zagreb City Museum, the Museum of Contemporary Art Zagreb, the Strossmayer Gallery of Old Masters of the Croatian Academy of Sciences and Arts, the Klovićevi dvori Gallery, the Croatian Association of Visual Artists and the Art Pavilion in Zagreb. Paintings from five private collections in Zagreb were also photographed [4].

The specific information shown by infrared photographs cannot be seen in the visible spectrum. Thanks to NIR images, new information about the lower layers of paintings has been obtained.

2. Reasons for recording images in the NIR area

2. Razlozi snimanja slika u NIR području

Paintings were photographed both in the visible and in the NIR region in order to create a database of image states in two regions of the spectrum. NIR images reveal hidden information, which helps to protect the artwork from forgery [5]. The second reason is to identify possible conservation and restoration work on the paintings and to discover paintings with interesting findings in the lower layer. The third reason is the fact that photographing the paintings in both spectra means documenting their current state, which can help conservators and restorers to restore the paintings to their original state in case of changes caused by time or various types of damage. In most museums in Croatia and in the Croatian Conservation Institute as the central national institution for the conservation and restoration of artworks and other cultural heritage, recording paintings in the infrared (NIR) region is not mandatory for all paintings, but rather mostly for selected paintings of greater historical or artistic value [6].

3. The results of recording paintings with RGB camera

3. Rezultati snimanja umjetničkih slika ZRGB kamerom

A ZRGB camera that records in the visible and near-infrared spectra at the Z value was used [7]. Calibration was done through equation with the forensic scanner Projektina at 1000 nm [8]. All the paintings have different information in the visible and infrared regions. I recorded them using two adjusted digital cameras: Casio EXILIM Zoom EX-Z150, 8.1 MP and Canon EOS 350D/Digital Rebel XT, 8.0 MP. Both cameras were adjusted for near-infrared recording at 1000 nm. Physical quantities were determined as the quantity Z of the Casio EXILIM Zoom EX-Z150 camera. This camera can be used during the day because it filters the quantity Z from the Sun's spectrum. Paintings in the museums' permanent collections were recorded in the visible spectrum with two digital cameras: Canon EOS 400D, 10.1 MP and Olympus FE-360, 8.0 MP.

The paintings were recorded simultaneously in both spectra (V and NIR) in the same conditions. I surveyed 1830 and recorded 1426 paintings in the near-IR region in Zagreb. Since all the paintings were simultaneously recorded in the visible light and the near-infrared region, two images were recorded and processed for every painting, giving a total of 2852 recorded and 3660 surveyed photographs of paintings.

New information about the paintings was obtained thanks to recording in both spectra. I discovered seven paintings with shifts/pentimenti, 29 paintings with overpainted layers and overpaint and 29 paintings with visible work stages: underpainting and underdrawing in the NIR spectrum.

Of the surveyed paintings belonging to the period between the 6th and 20th century, housed in museums and on temporary exhibitions, it was discovered that five paintings have a visible shift or pentimento in the near-IR region. These are *Vera* by Vladimir Becić, 1926; *Odalisque* by Milivoj Uzelac, 1934, Modern Gallery; *Dido and Aeneas* by Guido Reni, beginning of the 17th century, Museum of Arts and Crafts; *Antun Bedeković Komorski* by an unknown author, c. 1750, Zagreb City Museum; *Symbolist Self-portrait* by Nasta Rojc, 1914, from the exhibition "A Critical Retrospective" held in the Art Pavilion in 2014.

Overpainting was detected in seven paintings: *Dido and Aeneas* by Guido Reni, beginning of the 17th century; *Blue Fairy Tale* by Nives Kavurić Kurtović, 1993, Museum of Arts and Crafts; *Vukovar Panorama* by Oskar Herman, mid-20th century, Strossmayer Gallery; *Portrait of Marija Radočaj-Pintar* by Vjekoslav Karas, mid-19th century; *Sai Baba* (?) by Cata Dujšin-Ribar, 1982, Dr. Ivan Ribar and Cata Dujšin-Ribar Memorial Collection; *Majka Božja Remetska* by an unknown author from 1717, exhibition "On Shaky Foundations – Archaeology and 725 Years of the Sanctuary in Remete" in the Zagreb City Museum; *In Boka Kotorska – Tivat* by Nasta Rojc, c. 1927, exhibition "A Critical Retrospective" in the Art Pavilion in Zagreb [4].

Picture 1 V

Picture 1 Z

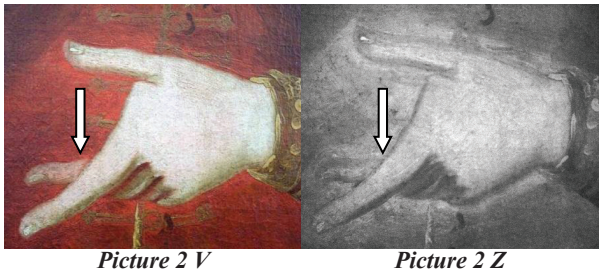
Figure 1 V i Z *Unknown author, Antun Bedeković Komorski, circa 1750, picture in V and Z spectrum at 1000 nm*

Slika 1 V i Z *Nepoznati autor, Antun Bedeković Komorski, oko 1750., slika u V i Z spektru na 1000 nm*

3.1. Shift / pent-up from the Zagreb Museum of the Unknown Author

3.1. Pomak/pentimento na slici iz Muzeja grada Zagreba nepoznatog autora

The painting in semi-figure by an unknown author depicts Antun Bedeković Komorski (Figure 1), who was the city notary (the most important city official) in the mid-18th century.



Picture 2 V ***Picture 2 Z***

Figure 2 V i Z *Detail of the picture in the V and Z area where the visible shift is invisible to the naked eye*

Slika 2 V i Z *Detalj slike u V i Z području na kojoj je vidljiv pomak koji je nevidljiv golim okom*

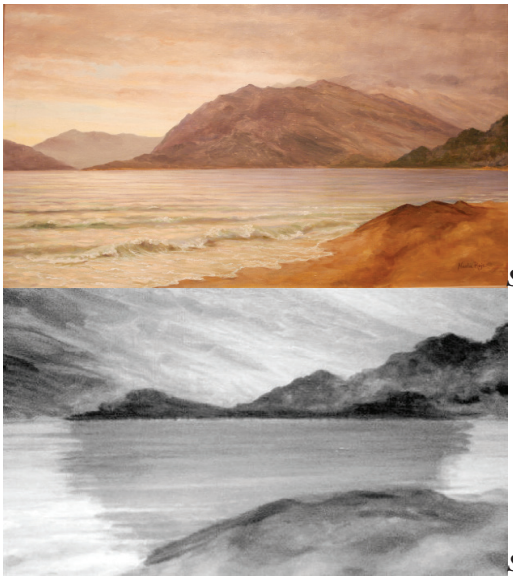
A shift/pentimento was discovered on the left hand thanks to the NIR image. The contour line is not visible in the shift area in the Z region, which confirms that the original position of the fingers was overpainted by the artist himself. He changed his mind during painting and changed the position of the hand and fingers by a few centimeters.
It can be concluded that the author first made a drawing, and then applied color. That the artist later performed additional work on this part of the painting is shown by visible edges on the finger and by shadows between fingers which stand out.

Slika 3 V

Slika 3 Z

Figure 3 V i Z *Nasta Rojc, In Boka Kotorska - Tivat, circa 1927, picture in the V and Z area at 1000 nm showing the copy*

Slika 3 V i Z *Nasta Rojc, U Boki kotorskoj – Tivat, oko 1927., slika u V i Z području na 1000 nm koji pokazuje preslik*



Slika 4 V

Slika 4 Z

Figure 4 V i Z *Detail of a picture with a visible copy in the V and Z area at 1000 nm*

Slika 4 V i Z *Detalj slike na kojoj je vidljiv preslik, u V i Z području na 1000 nm*

Slika 5 V

Slika 5 Z

Figure 5 V i Z *A detail of a signature showing the copy in V and Z area at 1000 nm*

Slika 5 V i Z *Detalj potpisa na kojem je vidljiv preslik, u V i Z području na 1000 nm*

3.2. Visible Stage of Image Work In Boka Kotorska - Tivat painted by Naste Rojc

3.2. Vidljive faze rada na slici U Boki kotorskoj – Tivat Naste Rojc

The careless overpaint on the sea surface in the right-hand part of the painting is extremely visible in the Z image of the painting *In Boka Kotorska – Tivat* by Nasta Rojc (Figure 3).

It is possible that the author herself overpainted this part using different colors. She might not have liked the too strong shadow on the sea reflection, so the difference in color is visible under NIR light. It is also possible that it is a restoration retouch [4].

4. Conclusion

4. Zaključak

In this work I wanted to examine the information about the layers of paintings invisible to the naked eye and how visible these changes are when viewed with a ZRGB camera at 1000 nm. In the entire research, I discovered interesting information in 36 paintings. The goal was to find and confirm that paintings with overpainting, shifts/pentimenti, underpainting, visible stages of work, underdrawing, retouches and other changes in the invisible lower layer are exhibited in permanent collections of museums [4]. Some paintings concealed interesting information about the way they were created, the stages of the author's work and the construction of the painting. The discovery of a shift/pentimento in the painting *Antun Bedeković Komorski* by an unknown author from the Zagreb City Museum was presented in the article. The second image shows the restoration retouch or overpainting by Nasta Rojc in the painting *In Boka Kotorska – Tivat.* Whether it is a retouch or overpainting will be determined by further analyses of the painting. Photographs in two spectral regions, V and NIR, ensured the protection of paintings from forgeries and the changes occurring with time. Some information in paintings invisible in the visible spectrum was confirmed by previous recordings, but in most paintings, shifts/pentimenti, overpainted layers and overpainting were discovered for the first time, and this belongs in the area of discovery.

Recordings in both spectra are permanently stored in the doctoral dissertation, and the results of the dissertation were submitted to all institutions and private collections I worked with. This ensures that the discovered information is preserved for future interpretations by art historians, conservators, restorers and other experts [4].

In the event that a certain artwork's authenticity comes into question in the future, this research has stored all of them in the database of recorded paintings and so protected them from forgery.

5. REFERENCE

5. *REFERENCES*

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Dijana Nazor - biograpgy can be found in the Polytechnic & Design Vol. 2, No. 2, 2014.

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