

# Embodied Iconography: A Case Study on Methods for Retrieving Musical Context in Capoeira Images

Luiz Naveda  
Loque Arcanjo

Universidade do Estado de Minas Gerais (UEMG)

## Abstract

This article explores an interdisciplinary approach that integrates historiography, musicology, iconography, and motion computing to investigate the interactions between music, the body, and visual representation. It introduces the concept of “embodied iconography”, which seeks to interpret historical images not merely as visual documents but as traces of the bodily and musical dynamics of the contexts in which they were created. Through the analysis of bodily postures in 19th-century iconographic representations related to capoeira and their comparison with contemporary motion recordings, the study reveals how the bodies depicted in the images can reflect complex musical and choreographic practices, exposing the distortions of colonial discourse. By linking historical and technological data, the study emphasizes the importance of embodiment studies in reconstructing cultural contexts and contributes to the decolonization of historiographical and musicological studies, offering new perspectives on Afro-Brazilian cultural practices.

**Keywords:** body; iconography; African diaspora; human movement; capoeira.

## Introduction

*There is an old Yoruba proverb that says,  
'Exu killed a bird yesterday  
with a stone he only threw today.'*

This is how the rapper Emicida begins the introductory narrative of the documentary titled *AmaRelo: é tudo prá ontem*<sup>1</sup>. In *AmaRelo*, the works of painter Johann Moritz Rugendas (1802-1858) cited amidst the rapper’s critical narratives are visual references reinterpreted to reflect on the history of anti-racist struggles. In the same documentary, the paintings *Burial of a Black Man*

---

<sup>1</sup> The album *AmaRelo* is the third studio work by rapper Emicida. It was released in October 2019 and was recognized by the Associação Paulista de Críticos de Arte (APCA) as one of the 25 best Brazilian albums of the second half of 2019. The album’s launch show, held on November 27 at the Municipal Theater of São Paulo—which later gave rise to the documentary released by Netflix the following year—was also celebrated by the same association with the award for Best Show of the Year.

*in Bahia* and *Feast of Our Lady of the Rosary, Patroness of Blacks* (Rugendas, 1998) are revisited by Emicida and used as references for his interpretation of the presence of African culture in Brazil. In contrast to Rugendas' Eurocentric perspective, Emicida sees in these images different possibilities for interpretation, and by valuing the Afro-Brazilian musical practices identified in his iconographic reading, the rapper's critical gaze demonstrates how documents, when read against the grain and reinterpreted through a lens of sophisticated temporal, visual, and sonic articulation characteristic of the Afro-diasporic matrix present in rap, can bring information about the cultural diversity that resists and persists today. In the documentary, this articulation between image and sound is then traversed by the temporality proposed by the verses of the song *Sujeito de sorte* from the album *Alucinação* by Antônio Carlos Belchior, released in 1976. Under Rugendas' images, Emicida's speech, referring to the political movements associated with anti-racism between the 1960s and 1970s, revisits the historicities of organizations and collectivities that represented and continue to represent Afro-diasporic resistances throughout history.

The relationship established between yesterday and today in the construction of the documentary subverts the temporal logic proposed by Eurocentrism, which is based on a univocal notion of the "time of progress," thus demonstrating an original articulation between future/past. It is a particular way of engaging different fields of experiences and horizons of expectations amidst specific historicities and in a context of crisis in the modern regime of historicity (Hartog, 2013). The Yoruba proverb at the beginning of this text carries a temporal perspective that can be interpreted as a metaphor for temporality and a possibility of reading that is at once historiographic, musicological, and iconographic. It is precisely this reading that forms the axis of the proposal in this work: the search for choreographic and musical patterns in bodies represented in the past using technologies and culturally situated bodies in the present.

## **Documents, Colonialism, Images, and Bodies**

Starting in the 19th century, with the transfer of the Portuguese Court, the founding of the Imperial Academy of Fine Arts in 1808, and the arrival of the "French Artistic Mission"<sup>2</sup> in 1816, the Portuguese State began to invest in patronage, financing artists who created visual representations of "important events," social practices, culture, and the "picturesque" everyday life of Brazil. It was from 1808, with the arrival of the Portuguese Court in Brazil, that "foreign curiosity – long repressed – finally had the opportunity to know and recognize the 'famous nature of Brazil and its natives'" (Schwarcz, 2008, p. 155).

---

<sup>2</sup> The missionary character implicit in the idea of an artistic "mission" was discussed by Lilia K. M. Schwarcz, who highlighted the mythical nature of the event. Through documentary, contextual, and historiographic analysis of the topic, the historian underscores the conditions of these artists within the crisis of Napoleonic politics—conditions that demystify the heroism and grandeur surrounding the memory of these artists' arrival in Brazil (See Schwarcz, 2008).

In 1815, Brazil was elevated to the category of United Kingdom, thus taking a central place in the Portuguese Empire. In this same context, the “French Artistic Mission” arrived in Brazil in 1816, guided by the model of the French Academy of Arts, which trained artists with the objective of glorifying the monarchy. Like their predecessors in Europe, through neoclassical and academic art, these artists’ production was based on the production and reproduction of rituals, monuments, and symbols as a way of commemorating the achievements of the monarchy. These adherents of Napoleon’s expansionist policy found fertile ground in Brazil and were well-received by the Portuguese court, eager to create an imaginary consistent with the project of “civilizing” the new seat of the Portuguese Empire (Schwarcz, 2008, p. 155).

Among this production from the “picturesque”<sup>3</sup> perspective, the watercolors of Jean Baptiste Debret, for example, marked a new way of “portraying” the colony by depicting the practices, ways of life, habits, the “exuberant” nature, the animals, the urban universe, among other themes. His works present “royalty elevated through allegories and parallels with classical antiquity, and the slaves... almost Greek with their perfect bodies and always with muscles on display” (Schwarcz, 2008, p. 157), which were elaborated in a way to reinforce stereotypes, simplifying and reductionist versions about Africans and Afro-Brazilians, and even today are used to naturalize generalized views about the presence of Africans in Brazil during the colonial period. “Documenting meant elevating and conferring civilization on this colony lost in the Atlantic.” For this reason, “he [Debret] instilled in his paintings his own values, as well as his vision and interpretation about the colony and what he understood to be its good prospects” (Schwarcz, 2008, p. 157).

In the same “missionary” perspective filtered by the “picturesque” as Eurocentric references, the painter Johann Moritz Rugendas established himself in Brazil in two contexts: in 1821, five years after Debret’s arrival with the scientific “mission” led by Georg Heinrich von Langsdorff (1774-1852), in which he worked as a draftsman, and later in 1845, when he was already established as an artist. Alongside the works of Jean-Baptiste Debret (1768-1848), Rugendas’ works are among the most widespread of those produced by travelers in the first half of the 19th century. The publications *Voyage pittoresque dans le Brésil* (1835) by Rugendas and *Voyage Pittoresque et Historique au Brésil* (1835-1839) by Debret adapted to European taste and achieved emblematic success in Europe. It can be said that these painters were the most active artists responsible for disseminating images of Brazil in Europe at that time.

The works that comprise the corpus of this study are two images that reproduce the paintings *War Dance or Playing Capoeira* - Johann Moritz Rugendas (1835) and *Negros*

---

<sup>3</sup> Throughout the 19th century, the term “picturesque” evolved into a commonly used formula in the titles of works produced by artists/travelers who explored the Americas and the Orient. Thus, the picturesque, which initially served an aesthetic purpose, became conflated with curious and relatively exotic themes from a European perspective in the “picturesque travels” albums (Costa; Diener, 2013, p.173).

*combatendo* - Augustus Earle (1821-1824). The latter was an English painter, draftsman, and traveler, trained at the Royal Academy in London, where he received his artistic education and identified with the English school initiated in the 18th century, characterized by adherence to the grand academic pictorial genres such as portraiture and history painting.

After participating with historical and military-themed works in some group exhibitions in London between 1806 and 1815, in which he was awarded, in 1819, he traveled to the United States and arrived in Brazil in 1820 at the age of 26 for a two-month stay in Rio de Janeiro. He settled in Brazil between 1821 and 1824. His last visit to Rio de Janeiro occurred in 1832. During ten years, Earle visited, in addition to Brazil, Chile, Peru, India, and other places. His name is regularly associated with Captain Fitzroy's expedition aboard the HMS Beagle, which had Charles Darwin as a naturalist (Gonzaga 2014).

Unlike other well-documented European artists who worked in 19th-century Brazil, such as Debret and Rugendas, who quickly disseminated their works, Earle did not succeed in publishing an illustrated volume containing his Brazilian images, probably due to his premature death in 1832. [...] It is also relevant to note that Earle grew up under the tutelage of the English Academy, which at that time followed a different path from the French school, adding journalistic qualities to the classical tradition, as exemplified by the works of John Singleton Copley and Benjamin West (Gonzaga 2014, p. 122).

As will be demonstrated in the following section, in recent years, musicology has incorporated a series of contributions from epistemological transformations in history, philosophy, and anthropology through a network of postmodernity approaches such as structuralism, postcolonial and decolonial studies, and the development of comparative studies of cultures through ethnography (Beard; Gloag, 2005; Leman, 2010; Parncutt, 2012). An important part of these advances is realized through transdisciplinary studies that contrasted documents from the colonizer's gaze on the musical practices of Africans and their descendants in Brazil with ethnographic reports from remaining groups and practices today.

The critical study of iconographic sources, when compared with information present in remaining groups of African origin, allows for the emergence of new perspectives on the African musical presence in Brazil (Galante 2015, p. 40). However, the available iconographic sources – synonymous with documents, texts, and documents produced by institutions – represent distorted records of cultural practices distanced from the colony, organized by principles of a system of maintaining colonial and bureaucratic power. Still, these images circulate in various media, including textbooks, which rarely propose a potentially revealing iconographic reading. This problem demands another deconstructive and revealing reading of elements valuable to historiographic research, for example, those related to material culture and the cultural history of enslaved or freed Africans in Brazil. This demand opens a field for methodologies that remove part of the layer of colonial filters, offer other interpretations, and reveal new clues for

interpretation. Could images produced from bodies in African cultural practices represent less distorted records of culture and these individuals? Would it be possible to trace a mapping of these bodies that returns their context to the original sequences of movements and music?

### **The Iconography of the Body as a Visual Embodied Trace**

Musical iconography is typically defined as a field of study of a “set of visual sources that relate to music in some way, whether musical or related to music” (Sotuyo Blanco; Da Silva Filho, 2014, p. 55), but these boundaries can be broader than just the image:

Concerning the ontological boundaries applicable to this object of study, such documentary sources can be ornamental, decorative, and/or illustrative in two or three dimensions, fixed, movable, or even in apparent motion (as in the case of film documents composed of sequences of frames), regardless of their medium/support, manufacturing process, and/or exposure/viewing method (and they may not even be visible to the naked eye, as in the case of watermarks). Such sources may also serve certain needs arising from eventual socio-cultural uses and/or functions, through which, paraphrasing Alan Merriam’s traditional definition (Merriam, 1964, p. 209-227), they communicate values and/or ideas, maintain or challenge traditions, and thus activate various types of social and/or cultural mechanisms (Sotuyo Blanco; Da Silva Filho, 2014, p. 55).

The iconographic-musical studies proposed in this citation implicitly reference the work and conceptual construction of Erwin Panofsky (1892-1968). This theorist was part of the group of “iconologists” based in Hamburg, whose training was associated with classical studies articulated interdisciplinarily with literature, history, and philosophy. Among these scholars were Friz Saxl (1890-1948), Aby Warburg (1866-1929), Edgar Wind (1900-1971), and Ernst Cassirer (1874-1945). Panofsky’s perspective involves adapting a German tradition of text interpretation (hermeneutics) to the interpretation of images, proposing that, as part of a given culture, images cannot be understood without an understanding of the culture itself.

Despite the advances, this methodological proposal was criticized by historians such as Gombrich (1972) and Burke (2004). Both emphasize the limitations of this analytical methodology, particularly noting that the image would possess an ultimate meaning derived from the “universal spirit” of an era, the *Zeitgeist*. In the search for “one” meaning, the objectives of Panofskyan iconography would be indifferent, if not hostile, to a social history of art, neglecting the question: meaning for whom? And when?

The assertion that the sources for iconographic-musical study “can be ornamental, decorative, and/or illustrative in two or three dimensions, fixed, movable, or in motion” suggests the need to broaden this conception of “movement” beyond the cinematic example. Images have the ability to endure, revealing their historical, mnemonic, unconscious dimension. In this sense, form should not be captured as a rigid structure in time but always in motion. Style is

not an applied code. Style emerges as a structure of experience, as an emotion traced by the unconscious, by culture (Didi-Huberman, 2015).

It is in this sense that Didi-Huberman's (2015) proposal advances. For him, from the perspective of an anthropology of the image, the goal is "in short, to attempt a critical archaeology of art history capable of displacing the Panofskyan postulate of 'art history'" (Didi-Huberman, 2015, p. 18). It is then to question in art history the object "history," the very historicity. For this, a semiology that is not iconological in the "scientific" sense proposed by Panofsky, nor positivist (representation as a mirror of things), nor even structuralist (representation as a system of signs), is necessary. The recognition of the valuable need for anachronism seems to be an internal demand of the very objects—the images—as a place of historiographical reflection. "Anachronism would thus be, in a first approximation, a temporal mode of expressing the exuberance, complexity, overdetermination of images" (Didi-Huberman, 2015, p. 22).

The appropriations and uses of visual representations of African and Afro-descendant musical practices seem to reproduce a naturalization of the imagined or idealized gaze by European visual culture within the context of colonizing policy. This gaze, grounded in textual records of colonial bureaucracy or interpreted iconography, is still present in social imagination today. It is likely that these images and texts have filled and continue to fill the imagination of generations, as they are embedded in various textbooks (ALVES, 2020) and are frequently revisited in narratives about Brazil's past without deep discussion or revisions of interpretation regarding colonial models of image production.

The iconography produced during this period was used as a research source by Brazilian musical historiography, sometimes treating the transfer of the Court not only as a milestone in the construction of "a" national identity but mainly as a temporal divider characterized by the effective arrival of "civilization" to the New World and the supposed elements responsible for the construction of musical taste and aesthetics. Similarly, the idea of the "genesis" of national musicality is often naturalized, for which Afro-diasporic musicalities would have "contributed" to the constitution of "Brazilian (national) music" (see Arcanjo; Maximiano, 2021 for a discussion on the idea of genesis). This naturalization is presented superficially according to a colonial imagination of a general "African musicality" that does not, for example, discuss the evidence of an Afro-diasporic musical knowledge embodied and grounded in the corporality of musical and choreographic practices.

Kofi Agawu (1995), in elaborating an inventory of musicology between the 19th and 20th centuries, highlighted the reductionist perspectives that treat African musicalities in a generalist way. The author points out the recurrence of a predominantly simplistic and superficial notion that the rhythmic structure present in African music would be its distinguishing element. This version became commonplace in musicology, crystallizing in Western literature and even in various more recent ethnomusicological perspectives (Agawu, 1995, p. 380).

Mapaya and Mugovhani (2020) emphasize that most African musical genres are formed by song-dance. “Singing is usually accompanied by music, and the presence of music usually suggests dance.” In this way, “a song can be vocalized or played on a melodic instrument while the dance is of the body” (Mapaya; Mugovhani, 2020, p. 60). Thus, “recognizing that indigenous African music exists primarily in performance is half the battle won. [...] We note how the philosophy of musical performance incorporates costumes and accessories, enhancing the different aspects of performance such as dance and singing” (Mapaya; Mugovhani, 2020, p. 60).

Although many aspects of the cultural misinterpretation pointed out by Agawu exist, the problem seems to arise from the very reduction of the nuances of African (and its diaspora) musics to a purely sonic phenomenon. From this perspective, if the African musical phenomenon is often accompanied by movement and dance, body movement can carry evidence of musical relationships. If the relationship between dance and music is consistently present in ethnographic reports (Mapaya; Mugovhani, 2020; Nzewi, 2020), the visuality, plasticity, and configuration of the visual document of these relationships can, by extension, also carry evidence of musical relationships. This hypothesis creates the potential to explore the representations present in body images as a musical document, taking the body represented in the image to an instance where the experience of the body in performance—past, present, and future—is an essential component of the structure of the iconographic experience (Didi-Huberman, 2015), or an experience of “embodied iconography.”

The new methodologies that study the recovery of this body in performance as a trace of the experience of an Afro-diasporic body form a new field of exploration and methodological expansion where this proposal is situated. By taking the body as support and meaning, this methodological exploration would conform to the ontological principles of the African musical matrix itself because it returns to the body a descriptive, documentary, historiographical, and musical instance that permeates the original epistemologies, as Nzewi (2020) reflects:

Theorizing before experiencing existing knowledge harms the mind. The African educational philosophy is that the most effective way to acquire lasting knowledge in the body and mind is through practical experience. Through consistent practical engagement, certain parts of the body automatically become eloquent in reproducing sound-choreographic expressions (Nzewi, 2020, p. 120).

### **Case Study: The “Inventory for Registration and Safeguarding of Capoeira as Cultural Heritage of Brazil”**

Although the focus of this work is not to discuss the broader context of Capoeira in Brazilian society, we take as a case study the images present in the *“Inventory for Registration and Safeguarding of Capoeira as Cultural Heritage of Brazil”* (Brasil, 2007, p. 13) conducted

between 2006 and 2007. Despite its role in safeguarding and documenting a notably embodied knowledge, the presence of few images and the near exclusivity of written or verbal knowledge representation reflects recurring issues for registration documents and inventories focused on intangible heritage (see an analysis of this problem in Ferreira, 2021). The literature seems not to question whether orality or written documentation can adequately represent the embodied knowledge in culture. Even the literature on Capoeira does not seem to question how the embodied knowledge of the knowledge holders (*capoeiristas*, masters, students) is represented and recorded.

However, some approaches to the problem of knowledge representation in Capoeira form a body of critical thought that directly discusses the relationships between music and body movement. Larraín (2005), for example, describes the details of the relationships between rhythmic models through the notation in scores with choreographic records of body movement. Mason (2013) specifically addresses the iconography of Capoeira with hypotheses about body movement based on images, although he presents exogenous and somewhat incoherent constructions about the origins of Capoeira. Braga (2017) explored in detail the formation of the imagery of Capoeira and safeguarding elements that begin in 17th-century images and extend to the iconographic imagery of contemporary Capoeira masters. This iconographic imagery has also received significant contributions from visual artists, such as in the book *Capoeira Angola* by Mestre Pastinha (Pastinha 1964), which presents a document filled with photos and images, or the work of the artist Carybé for the collection *Recôncavo* (CARYBÉ 1955), where the artist translates elements of Capoeira into a publication with 25 illustrations.

Next, we will describe new methods and their application in the case study of recovering this body represented in images using two images widely discussed in this literature. This proposal does not directly address what characterizes Capoeira as a manifestation from a musical, choreographic, or ethnographic point of view, but rather a new methodological window that allows us to explore images of bodies represented in iconography in their relationship with the latent temporality and musicality in bodies in movement in the present. Details of methods, instruments, and results of this proposal are described in the following sections.

## Methodology

The methodology of this work involves the use of annotation methods on digital images to extract postures/poses. These postures—referred to here as key postures—are represented in images produced in the past but allow for comparison with postures in performances recorded in the present. The main concept is to use the structure of a human body represented in the image as a channel to reconstruct hypotheses about the relationships between bodies, dance, and music in the past. This concept is operated by computational technologies for



recovering, processing, and mining data in images and movement data that help explore hypotheses proposed about musical iconography.

The procedures used for processing the images involve three phases: (1) Recovery of body postures in three dimensions, (2) Capturing postures in movement recordings, and (3) Musicological/choreological analysis of the similarities between key postures and movement sequences. The results are presented and discussed within a broad approach to the latent possibilities of the musical iconography in question.

## 1) RECOVERY OF BODY STRUCTURE

The images used in this study are from the *“Inventory for Registration and Safeguarding of Capoeira as Cultural Heritage of Brazil”* (Brasil, 2007, p. 13) conducted between 2006 and 2007. Two images that reproduce the paintings *War Dance or Playing Capoeira* by Johann Moritz Rugendas (1835) and *Negros combatendo* by Augustus Earle (1821-1824) were chosen. These images, presented in Figure 1, are not discussed or referenced in depth in the text of the inventory, with sporadic references to the presence of musical instruments in Rugendas’ work<sup>4</sup>. In this study, a key posture of bodies represented in each of the images was selected for annotation and recovery.

The annotation or recovery of the body was carried out using specific software (Naveda, 2022), which consists of a 3D digital annotation environment programmed specifically for the manual annotation of postures in images. This manual process is computer-assisted but is based on the annotator’s ability to make visual inferences about the positioning of joints in the body overlaid on an image (see Figure 1B). These joints are manipulated by the user in a 3D environment until a posture composition is reached that best defines a posture hypothesis for the image based on the annotator’s visual inference ability. The annotation is then exported in JSON (JavaScript Object Notation) format, which records all data on the positioning of the body in three dimensions. The images and the body annotation screen using the Pose software and the posture graph represented as joints in the Matlab software are shown in Figure 1 and other results.

## 2) CAPTURING POSTURES IN MOVEMENT RECORDINGS

The key postures extracted from the illustration images were compared with the postures present in each frame of Capoeira movement recordings collected in 2010. The movement capture data of Capoeira practices were taken from a movement capture database from 2010

---

<sup>4</sup> The discussion about the presence of the atabaque is only expanded on page 84 of the dossier, even though the figures were inserted on page 13 of the document “[...] as demonstrated in one of Rugendas’s engravings, made in the 19th century, one of the rare early records of the existence of capoeira in Brazil. In the fantastic scene depicted by Rugendas, only one instrument—the atabaque—stands out in a manifestation that shows traces of capoeira movement” (BRASIL, p. 84).

at Ghent University by one of the authors of this work. The performance was carried out by a professional Capoeira teacher who was instructed to perform demonstrations and verbally state the title of the various Capoeira sequences. The performance was recorded on video, filmed in a diagonal position (see Figure 2), and the teacher was compensated for the activity. The teacher was asked to name each change of movement sequence out loud. The performance was annotated in video using the Elan software (Wittenburg et al., 2006). The periods of each movement verbalized by the teacher are described in Figure 3. The movement capture (or simply “mocap,” short for motion capture) was carried out using the Optitrack capture system. The system consists of a set of optical motion capture devices based on passive markers composed of 12 cameras that recorded the performance at 100 frames per second. The synchronized file with visual markers, the performance video, and the data were exported in C3D format.

### MUSICAL STRUCTURE PRESENT IN THE RECORDING OF A CAPOEIRA PERFORMANCE

Each position in the capoeira performance can be related to the musical structure of the accompaniment chosen by the capoeira instructor. During the recording, the instructor brought recordings of capoeira accompaniment music. A track identified as “Toque de Santa Maria” accompanied the performance (3 repetitions). The track consists of a recording with a berimbau, which plays phrases that alternate between four beats in a low tessitura and four beats in a high tessitura. The beats and phrases were annotated and are shown in Figure 3. The recording had a total duration of 202 seconds, producing 20,212 frames of motion capture.

### 3) MUSICOLOGICAL/CHOREOLOGICAL ANALYSIS

Both the key posture recovery data and the movement data (mocap) were processed using Matlab software. The conversion of postures was performed using accessory functions of the Pose package for Matlab (Naveda, 2022), while the import and processing of movement data were carried out using the Mocap Toolbox package for Matlab (Toiviainen; Burger, 2011). The mocap data and the key postures were captured to represent the same 19 body joints: head, neck, left shoulder, right shoulder, left elbow, right elbow, left wrist, right wrist, left hand, right hand, pelvis (root), left hip, right hip, left knee, right knee, left heel, right heel, left foot, and right foot.

The search for similarity between the key postures and the postures present in a movement recording was performed using Procrustes analysis (Goodall, 1991). This algorithm compares and adapts sets of points referenced in three-dimensional Euclidean space (x, y, z), resulting in a similarity value between 0 and 1 (where 1 indicates that the two sets of body points are completely similar and 0 completely dissimilar) without limitations of inversion (e.g.,

the geometry of the body may be laterally reflected) or scale (e.g., the comparison is performed regardless of differences in body size). Of the 19 body joint representation points in the mocap, only five points considered relevant for similarity processing were used: head, right and left hands, right and left feet. This processing generated time-distributed similarity data that indicate the level of similarity between the body in the key posture of the iconography and all the postures present in the frames of the movement recording. From these time data curves, we extracted the similarity peaks that indicate which postures in the movement recording most resemble the key posture annotated in the image. The Results section presents the visualization of these postures and similarity levels, and their location in the recorded Capoeira performance substantiates the discussion presented.

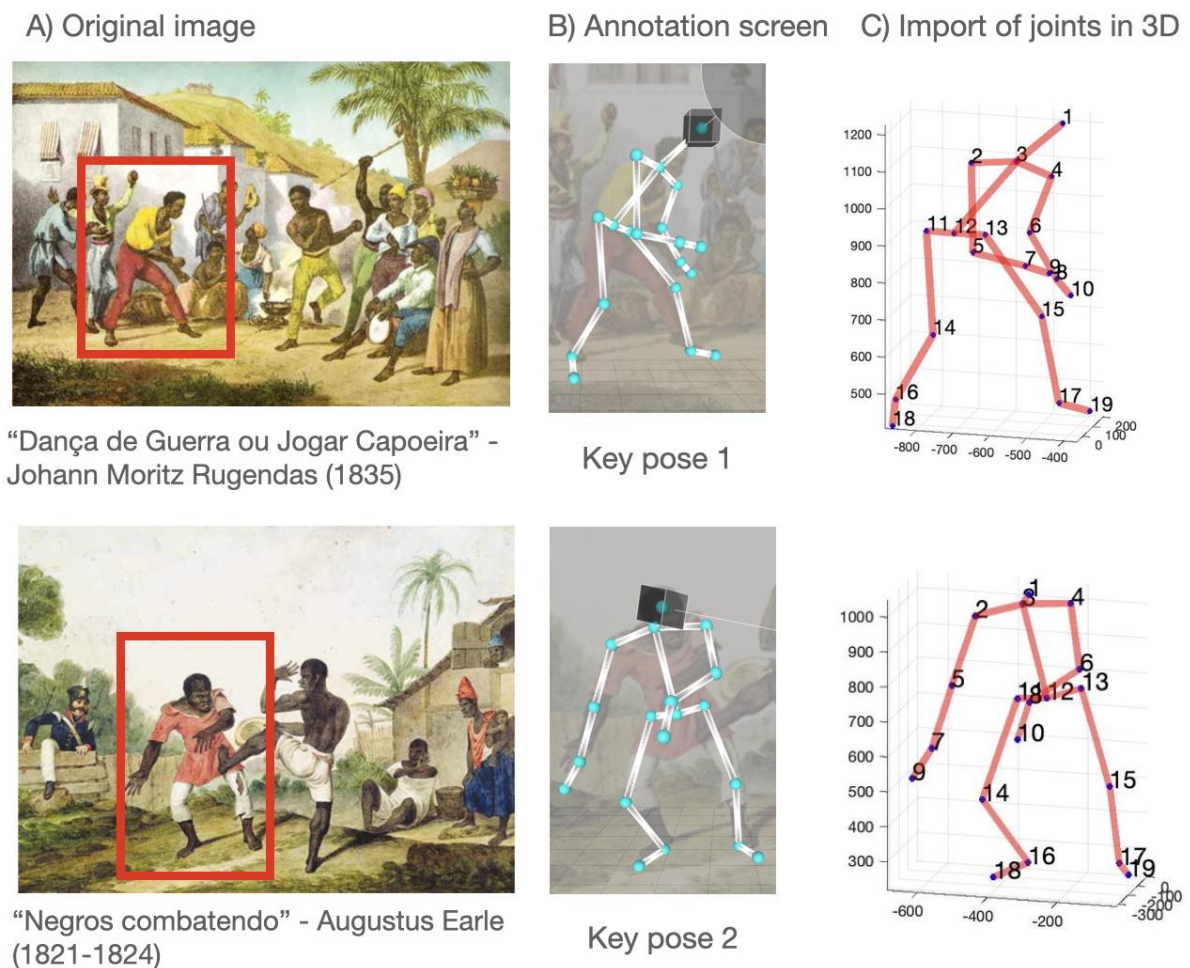


Figure 1 – A) Images of the paintings “Dança de Guerra ou Jogar Capoeira - Johann Moritz Rugendas (1835) and “Fighting Blacks” - Augustus Earle (1821-1824); B) annotation screen of the Pose software with postures 1 and 2 annotated in a 3D environment; and C) key postures resulting from the annotations imported into the Matlab software.

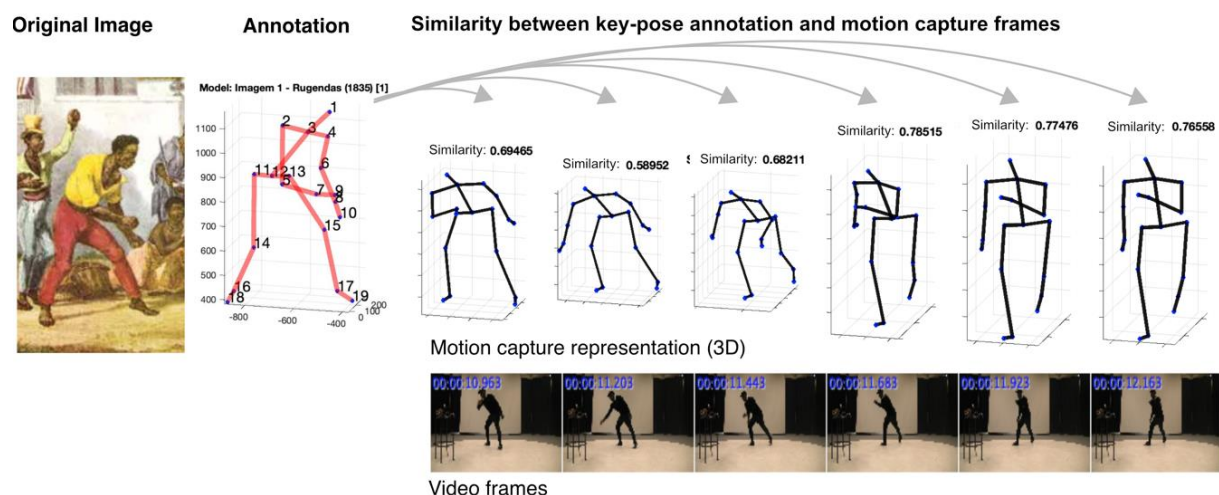


Figure 2: Example of the similarity comparison process between the annotated key posture and a sequence of 6 frames extracted from the mocap recording. Above each skeleton is the similarity value assigned by the Procrustes analysis algorithm.

## Results

Figure 3 presents the similarity results between key posture 1 from Johann Moritz Rugendas' *War Dance or Playing Capoeira* and the postures present in the frames of the Capoeira performance recording. The graphs below the similarity graph show the movement and musical structures annotated in the movement recording. The similarity peaks (triangles) are indicated on the curves. The five most relevant similarity peaks are marked with numbers. The arrows show the relationship between the similarity peaks and the annotations of the musical and choreographic structure extracted from the recording.

Although the average similarity of the entire sequence is 0.71 (or 71%), there are many peaks with high similarity (above 0.9) in addition to the five most important peaks indicated in Figure 3. This suggests that the figure represented by Rugendas may be a "key frame" or reference frame of a scene of a practice similar to Capoeira that Rugendas witnessed in the past. In other words, instead of considering this visual document as a "photograph" frozen in a specific instant of the event, the key posture appears similar to several segments of the recording, like an image, a subjective internalized pattern of a scene. This posture may have been brought to representation by Rugendas from a subjective perception or by a systematic study of recurring poses, by attention brought by musical structures, or by a random choice.

Table 1 provides more details on the characteristics found in the movement and the music by pointing out the sections where the 10 most similar postures are found in the recording. In this table, we see that these postures are predominantly found in the *ginga* sequence, which is the standard movement sequence of Capoeira (Brasil, 2007, p. 72). There is also a recurrence of similarity at moments when the musical phrase is in a low tessitura.

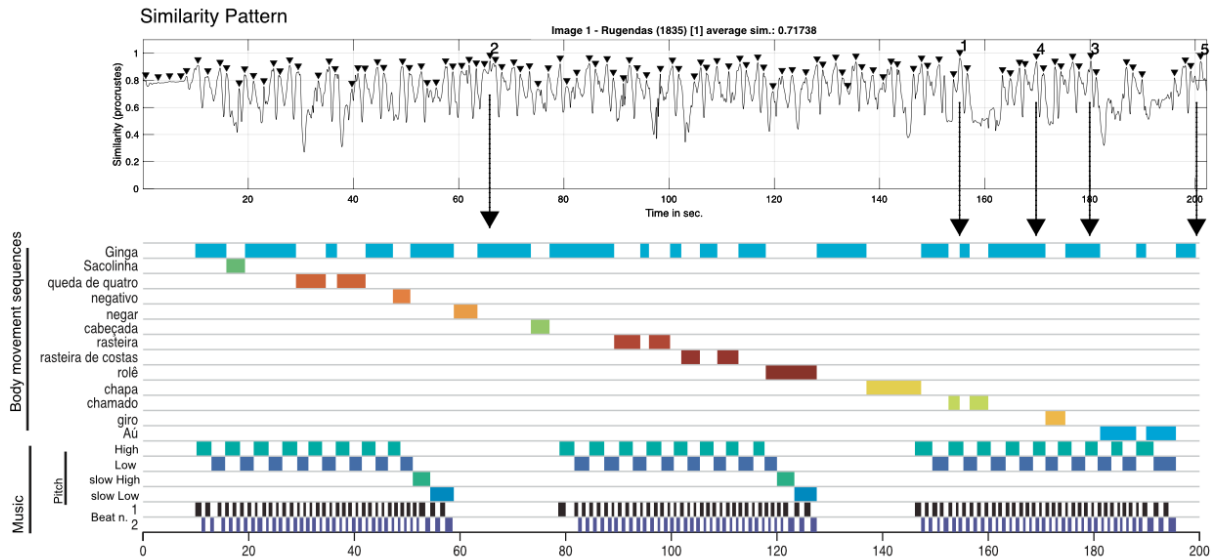


Figure 3 – Similarity patterns (Procrustes) between posture 1 (Figure *War Dance or Playing Capoeira* - Johann Moritz Rugendas) and the movement recording. The numbers indicate the 7 most significant peaks. The bands represent the “steps” or movement sequences of Capoeira and the structure of the music in the performance.

Table 1: Table of the 10 most similar postures to key posture 1, showing the temporal position (in seconds), similarity, sequence, time, and musical phrase.

Order	Position (s)	Similarity	Sequence	Beat	Phrase Pitch
1	155,26	0,96	ginga	1	High
2	65,95	0,94	ginga	N/A	N/A
3	180,16	0,94	ginga	2	Low
4	169,83	0,94	ginga	1	Low
5	201,02	0,94	N/A	N/A	N/A
6	135,5	0,94	ginga	N/A	N/A
7	176,7	0,94	ginga	2	High
8	116,84	0,93	ginga	1	Low
9	131,67	0,93	ginga	N/A	N/A
10	84,84	0,93	ginga	1	Low

Figure 4 presents a visual comparison of the five postures most similar to the body representation found in Rugendas’ work. If we visually interpret the static posture in the image and the proximity of objects and people to the protagonist (see Figure 1), the scene seems to indicate a positioning without movement of the individual, without space for lateral displacement (left), which is closer to a defensive attitude of a stationary body. However, if we interpret it as a dynamic key frame in a sequence likely belonging to the *ginga* movements,

the figure recovers more complex characteristics. The similarity peaks are distributed across several moments of the performance, whether as a *ginga* pattern, as preparation, or as an exit from other structured Capoeira movements. The similarity with the postures in the *ginga* sequence raises the hypothesis that the key posture is potentially more dynamic. It should be questioned whether factors external to the scene (documentation, illustration, or cultural priorities) shift the representation to a subjectively subordinate defensive configuration, altering the capacity for constructing other hypotheses.

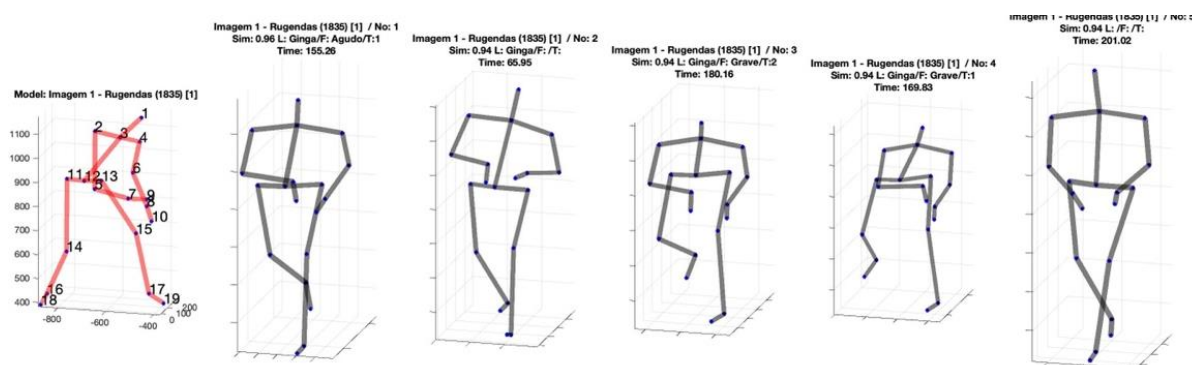


Figure 4 – Key posture 1 extracted from the image “Dança de Guerra ou Jogar Capoeira” - Johann Moritz Rugendas (1835) and the 5 most similar postures found in the movement recording. Each posture contains information about the similarity level (Sim), the phase (L) of the Capoeira performance, the musical phrase (F), and the time.

Another issue concerns the variability of the similar postures found, the variability of the movement configurations present in the Capoeira performance, and the variability of hypotheses for the key posture shown in Figure 4. The variability in human movement and music is related to the adaptability of systems and signals healthy, complex biological systems capable of sophisticated operations with the environment (Chaffin; Lemieux; Chen, 2007; Stergiou 2019). We can imagine that this movement variability presented a considerable challenge to Rugendas and other illustrators’ visual representation capabilities. This variability may have imposed a series of ambiguities, uncertainties, and disturbances on the model of representation and subjectivation of the European culture’s body (especially the representation of a Black body for the time). A possible attempt to simplify this complex cognitive landscape by the illustrator may have been to select the postures related to repetitive musical structures or structures where the painter perceived regularity. This problem demonstrates the need to deepen historiographic hypotheses by constructing multimodal scenarios that reproduce cognitive conditions minimally consistent with the events, such as the presence of music, dance, songs, and objects.

The visual information present in the hypotheses of static postures can be explored through the movement context in time, as presented in Figure 5. This figure shows the

moments before (-0.5 and -0.25 s) and after (+0.25 and +0.5 s) of 3 postures similar to key posture 1. The recurrence and diversity of preparation and consequence possibilities are shown in the sequences of postures observed as continuous in time. In the first and third rows, we observe that the Capoeirista passes through the key posture in a traditional movement of *ginga* in Capoeira. Even though this movement is referenced and repeated as *ginga*, there is variability in its performance that incorporates the needs for adaptation, ambiguity, and rhythm of a martial dance (which cannot be predictable to the point of being anticipated by an opponent). In the second row, the Capoeirista reaches the key posture through a completely different movement, highlighted by the exit of crossed arms and the gradual return to the *ginga* movement.

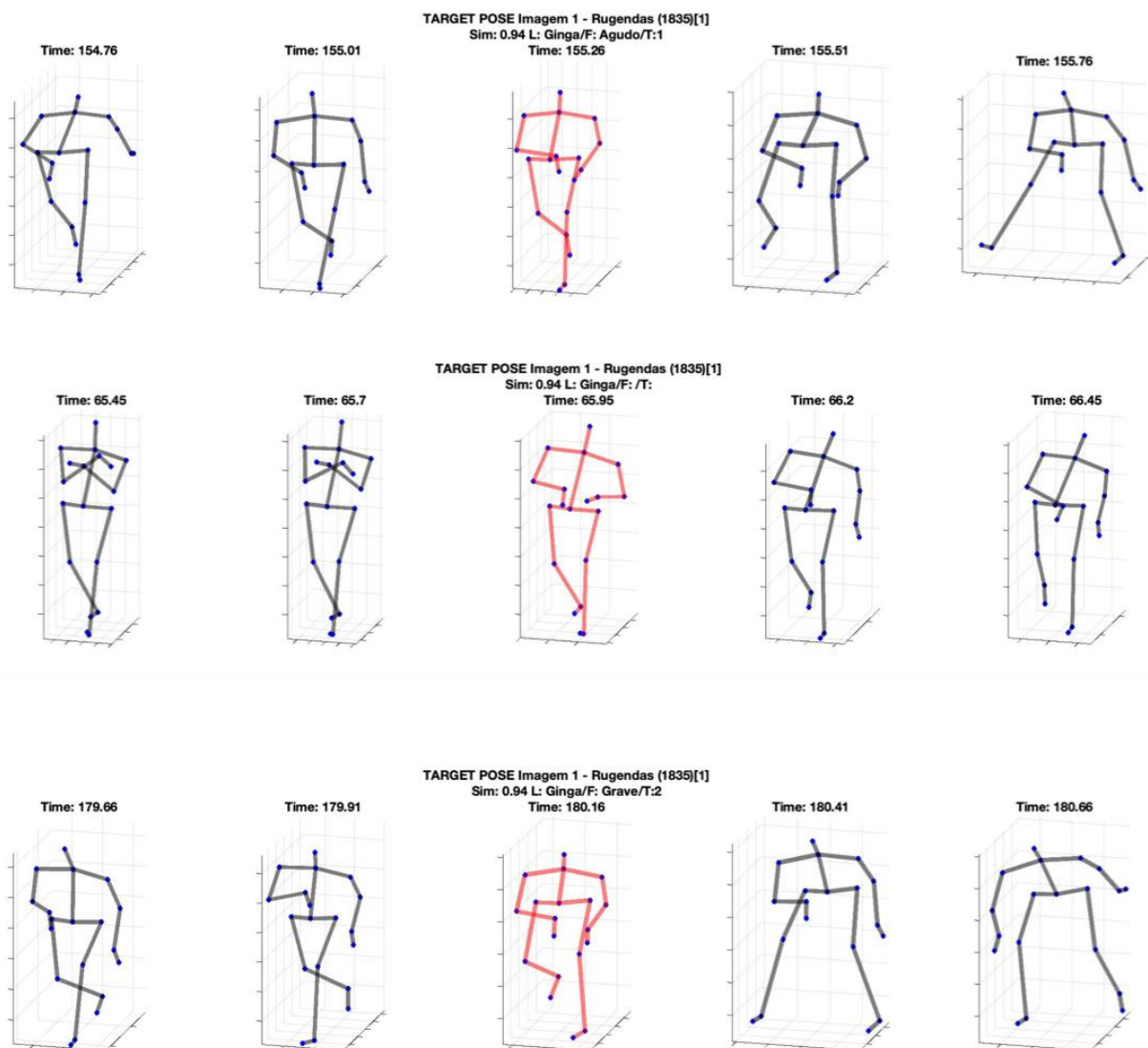


Figure 5 – Temporal context of the 3 most similar postures found in posture 1 of “Dança de Guerra ou Jogar Capoeira” - Johann Moritz Rugendas (1835). The context presents the most similar posture (in red in the center), two frames before (-0.25 and -0.5 seconds), and two frames after (0.25 and 0.5 seconds).

Figure 6, complemented by Table 2, presents the similarity patterns between key posture 2 (annotated from the image *Negros combatendo* by Augustus Earle) and the Capoeira movement recording. The image on the canvas (see Figure 1) shows a complex, asymmetrical posture (hands) and imbalance (trunk) of the protagonist on the left of the canvas in opposition to the attack of the other protagonist on the right. Musical instruments or musical actions are not represented. Earle's choice of this reference frame for representation does not seem to be related to the manifestation or practice of Capoeira itself but to the martial nature of the fight that the scene and the title suggest. The aggressive postures emphasize the idea of combat and are potentially linked to the practice of Capoeira as “first iconographic references,” as indicated in the *Inventory for Registration and Safeguarding of Capoeira as Cultural Heritage of Brazil* (BRASIL 2007, p. 13). This example represents a distinct representation context from Rugendas, as the literature demonstrates that Earle's training and function as an illustrator were focused on a documentary and journalistic perspective.

The similarity peaks and patterns indicated in Figure 6 and Table 2 show the levels of relationship between key posture 2 and the sequence of postures found in the same Capoeira recording used earlier. While the average similarity remained around 0.7 for the entire sequence, the similarity peaks reached 0.91 as indicated in Table 2. However, relationships with other movement sequences besides the standard sequence—*ginga*—appear to be significant. Similarities with *rasteira*, *rolê*, *cabeçada*, and *giro* sequences indicate that the posture is closer to a set of more aggressive and martial movements. On the one hand, this reinforces the hypothesis of recovering a fight scene drawn from a choice of key posture where the protagonist is in an offensive action. Nevertheless, despite the documentary and journalistic nature, these patterns still transmit elements of Afro-diasporic culture and similarities with the Capoeira game. This denotes the permeability capacity that Capoeira's resistance technology imposes on colonial representation methods. In other words, it is possible that the multimodality, specificity of body movements, and African legacy used the colonial representation channels to represent important ancestral reference elements for the culture.

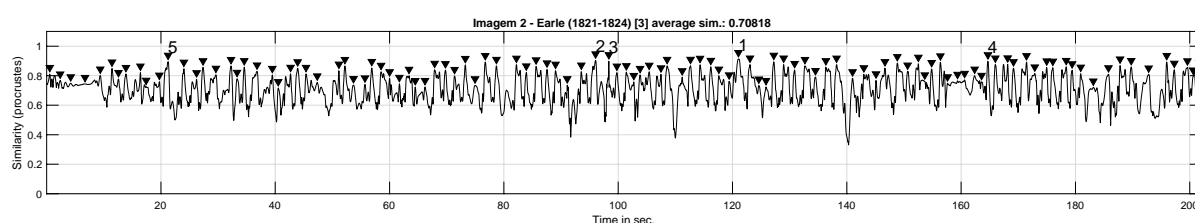


Figure 6 – Similarity patterns (Procrustes) between key posture 2 (Figure *Negros combatendo* - Augustus Earle) and the movement recording. The numbers indicate the 5 most significant peaks. The bands represent the “steps” and the structure of the music in the performance.



Table 2: Table of the 10 most similar postures to key posture 2, showing the temporal position (in seconds), similarity, sequence, time, and musical phrase.

Order	Position (s)	Similarity	Sequence	Beat	Phrase Pitch
1	121,04	0,91	rolê	2	Grave lento
2	96,05	0,90	rasteira	2	Grave
3	98,37	0,90	rasteira	1	Agudo
4	164,69	0,90	ginga	1	Grave
5	21,26	0,89	ginga	1	Grave
6	127,23	0,89	rolê	2	Agudo lento
7	195,97	0,89	ginga	N/A	N/A
8	76,75	0,89	cabeçada	N/A	Entrada
9	171,44	0,89	giro	2	Agudo
10	156,37	0,89	ginga	2	Agudo

The table of the most similar postures presented in Figure 7 highlights the latent geometric forms between the key posture and the sequence, but without showing a completely similar posture. Particularly in postures 1 and 3 (position 121.04 s and 96.37 s), the Procrustes analysis algorithm’s ability does not differentiate lateral reflections between the body joints, allowing for the observation of similarity between postures even when the laterality is inverted. There is no clear tendency of a relationship between movement and music in the table, which could also indicate the opportunistic nature of the aggressive function that martial strikes should have. In this case, predictability would be avoided so that the opponent cannot anticipate the defense.

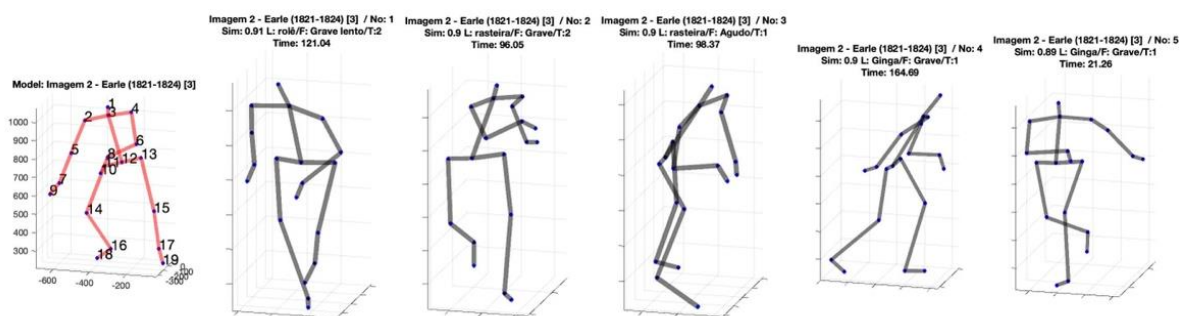


Figure 7 – Posture 2 extracted from the image *Negros combatendo* - Augustus Earle (1821-1824) and the 5 most similar postures found in the movement recording. Each posture contains information about the similarity level (Sim), the phase (L) of the Capoeira performance, the musical phrase (F), and the time (T).

The relationship between metric and predictability is relevant both from the perspective of understanding Capoeira as a resistance and cultural representation strategy, and from the perspective of recovering these events from the cognition and perception of illustrators. Key postures that produce repetitive (metric) similarity peaks with the movement recording may indicate the illustrator's focus on representing the coordination of movement and music (choreography). Key postures not anchored in repeated similarity peaks may indicate non-musical movements or postures. These observations can highlight elements of musical iconography or the interference of music in the documentation process, even if this iconography does not contemplate figurative musical elements (instruments or musical actions). Just as overlapping layers of sketches, contours, and superimposed (abandoned) layers of paint impact the final painting, recovering the conditions of musical iconography may seek submerged or impregnated layers of the canvas from the bodies or movement traces in the similarity with the movement sequences.

The martial characteristics can be observed in the temporal context sequences present in Figure 8, and in the imbalance and asymmetry of the body denoted by the hands and attempts at subsequent balance. The imbalance of the key posture is compensated by the leg's displacement amplitude, most likely in preparation for a strike. In this sense, the key posture seems to incorporate a tension of preparation for a response (in reaction to the other fighter), which must have been planned by the illustrator. Even so, the conditions of the relationship between the posture and the Capoeira sequence remain given the similarity levels resulting from the comparison.

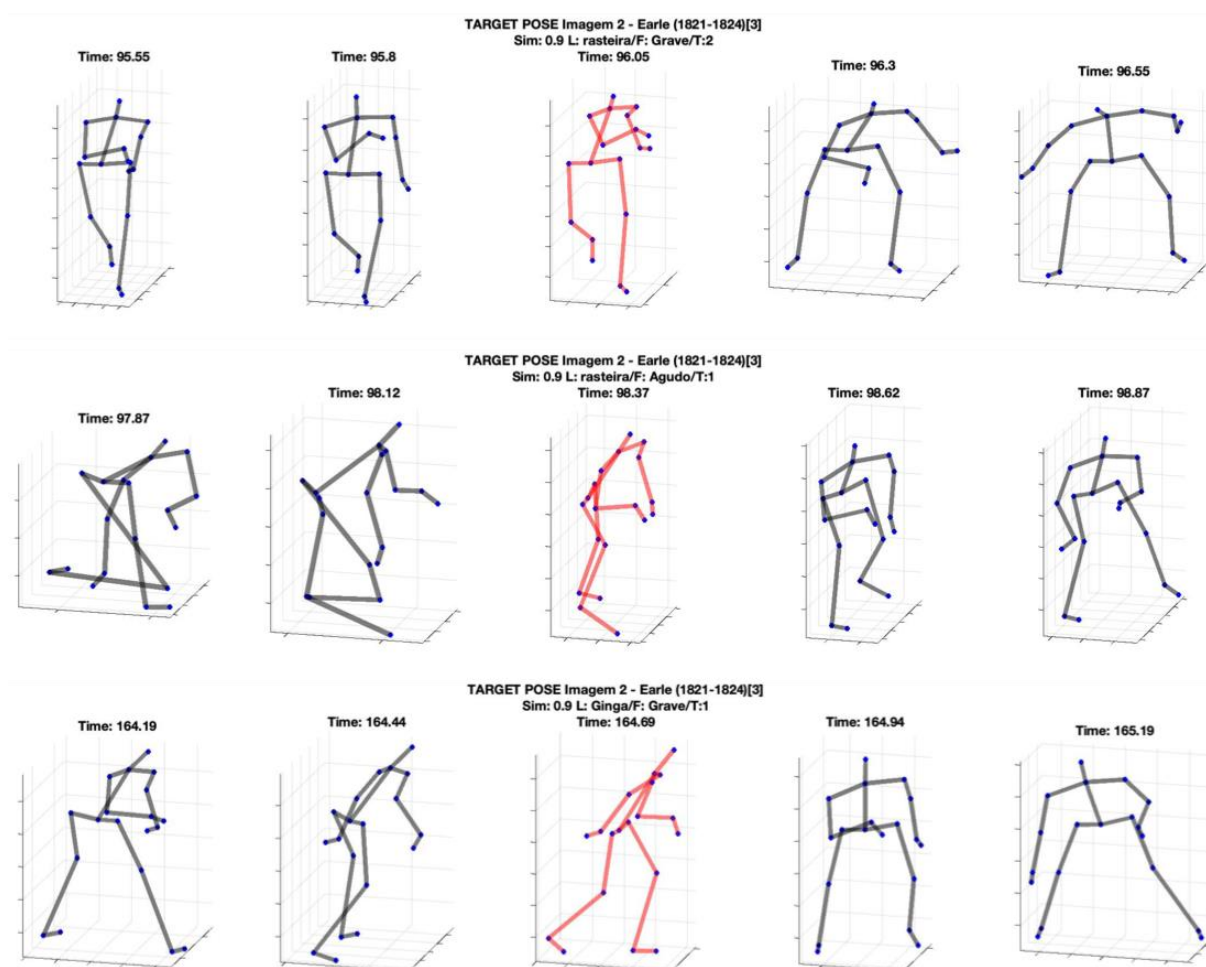


Figure 8 – Temporal context of the 3 most similar postures found in the key posture of the image “*Negros combatendo*” - Augustus Earle (1821-1824). The context presents the most similar posture (in red in the center), two frames before (-0.25 and -0.5 seconds), and two frames after (0.25 and 0.5 seconds). The distortions in the representation of the second row are due to data capture loss in the movement recording at the moment.

The idea of a musical reconstruction of the original musical context that uses the body information present in the iconography is fascinating, though highly speculative (if not fictional) in this study. No evidence of systematically linked metric or musical structures was found in the posture and movement data studied here, but new hypotheses and forms of relationships between iconography and music were raised from this data. The observations regarding the musical and metric structure of the music present in the movement recording enrich the methodological possibilities of an embodied iconography in relation to musical and choreographic gestures. However, the methodological path presented here represents only one possible exploration among others of this methodological framework, which can

incorporate both advances from the computational perspective and other experimental, empirical paths, or structured databases.

## Discussion

The proposal presented here introduces an original methodology where we not only read the images “against the grain,” as proposed by Walter Benjamin, but also recover epistemological operation channels encoded in the image and through the key of the body in the image, establishing a field of study and interpretation that we define as “embodied iconography.” Benjamin, when reflecting on Paul Klee’s work *Angelus Novus* in his 1940 article *On the Concept of History* (Benjamin, 2021), expands and unfolds the image rather than merely describing or domesticating it into a brief history. This is a way to go “beyond the narrow limits of a purely formalist ‘reading,’” considering, as Warburg did, “the singular artwork as a complex and active reaction [...] to the surrounding historical events” (Ginzburg, 1990, p. 62). The images produced by travelers are generated as a reaction to the estrangement between bodies of foreign cultures which, despite being tainted by a colonial lens, are used as a channel or technology of African epistemologies to bring these “knowledge-bodies” into the present.

The reinterpretation of Rugendas’ work articulated through Capoeira movement frames developed in this work allows for the identification of these elements based on evidence of the presence of African bodies as protagonists of the scene described as a documentary support, as a document, and as meaning. Moreover, these protagonists perform a type of culture designed to pass through various filters and antagonistic cultural hierarchies and deliver traces of the acculturated body’s experience in its figurative, musical, and historical dimensions. The relationship between musicological texts associated with the African perspective of musicology enables us to explore hypotheses about musical contexts brought by the choreographic possibilities of Rugendas’ image, partially stripped of the conditions of event representation and colonial views. This is achieved through objective contextualization and interpretation through the lens of Afro-diasporic practices and not merely by the uncritical acceptance of the painter’s Westernized text. The musical performance associated with clothing and accessories, dance, and song observed in the literature becomes a fundamental exercise in seeking other interpretations of the images and the imagination constructed by interpretations offered by musicology.

This case study demonstrates a methodological proposal that leverages the subjectivity of cultural archaeology hypotheses combined with the objectivity of computational methods to point to an experience of similar bodies in the present, based on bodies represented in the past. It is not a naive and simplistic conception of finding the key posture of a painting in present-day performances. In its complexity, this proposal presents procedures for quantifying

and qualifying levels of similarity between posture configurations, enriched and related through metrics and categories of human experience: chronological time, figurative space, Euclidean space, subjective space, cultural elements, musical structure, historical accounts, among others. Like processual archaeology (Wichers, 2016), this concatenation of methods across different disciplines exhibits a transdisciplinary structure with broad application possibilities in other collections of images and movement. Furthermore, this set of methods is dedicated to a form of “embodied iconography” as it reflects an attempt at interpretation through the visually represented body compared to the body in its movement experience. In its conceptual frameworks, the embodied iconography of Afro-diasporic practices gathers transcultural theoretical assumptions: it applies and operates African concepts such as *sankofa* (“go back and get what was left behind”<sup>5</sup>) through objective or computational scientific processes, uses hypothetical-deductive models of natural sciences, searches for patterns in data, and considers evidence of a past experience that, while scientifically unreachable, remains significant.

The methodology explored here still allows for a series of developments, ranging from the improvement of algorithms and capture technologies to the testing of concepts and viability. The use of annotation and data capture technologies for bodies in images or movement capture can be enriched with applications in other databases. The methodology is also perfectly expandable to recover not only musical experiences but any type of experience related to movement over time that can be represented in data, annotations, or even questionnaires. The exploration of latent subjectivity in comparisons between movement data can be expanded, configuring a conceptual and abstract dialogue about exchanges of subjective gesture and sound patterns, technically operated by computers and conceptually woven by transdisciplinary reflections engaged in historiography, music science, art science, and musicology.

## Acknowledgments

This research was supported by research projects funded by the agencies CNPq (National Council for Scientific and Technological Development, projects 420106/2021-9 and 310450/2019-5) and FAPEMIG (Minas Gerais State Research Support Foundation, project APQ-02909-22).

---

<sup>5</sup> “One of the ideograms from the Adinkra set of the Akan people, *sankofa* means: ‘it is never too late to go back and retrieve what was left behind.’ It symbolizes the wisdom of returning to the past as a way to improve the present and build the future.” (Oliveira, 2016, p. 15)

## References

- AGAWU, K. The Invention of “African Rhythm”. *Journal of the American Musicological Society*, v. 48, n. 3, p. 380-395, 1995.
- ALVES, P. M. M. *O imaginário escravista em algumas imagens da obra de Debret: possibilidades de leitura*. 2020. Dissertação (Mestrado em Antropologia Social) – Universidade Federal de Santa Catarina, Florianópolis, 2020.
- ARCANJO, L.; MAXIMIANO, J. A invenção da brasilidade musical: racialização dos aspectos iconográficos da música brasileira. *In: CONGRESSO BRASILEIRO DE ICONOGRAFIA MUSICAL*, 6., 2021, Salvador. *Anais [...]*. Campinas: Unicamp, 2021. p. 578-597.
- BEARD, D.; GLOAG, K. *Musicology: the key concepts*. London: Routledge, 2005.
- BENJAMIN, W. *Sobre o conceito de História: edição crítica*. Tradução: Márcio Seligmann-Silva. São Paulo: Alameda Casa Editorial, 2021.
- BRAGA, G. G. *A capoeira da roda, da ginga no registro e da mandinga na salvaguarda*. 2017. Tese (Doutorado em Antropologia Social) – Faculdade de Filosofia, Letras e Ciências Humanas, Universidade de São Paulo, São Paulo, 2017.
- BRASIL. *Inventário para Registro e Salvaguarda da Capoeira como Patrimônio Cultural do Brasil*. Brasília: IPHAN, 2007.
- BURKE, P. *Testemunha ocular: história e imagem*. Bauru: EDUSC, 2004.
- CARYBÉ. *O Jogo da Capoeira: 24 desenhos*. Coleção Recôncavo n. 30. Salvador: Livraria Progresso Editora, 1955.
- CHAFFIN, R.; LEMIEUX, A. F.; CHEN, C. “It is Different Each Time I Play”: Variability in Highly Prepared Musical Performance. *Music Perception*, v. 24, n. 5, p. 455-472, 1 jun. 2007.
- COSTA, Thiago; DIENER, Pablo. O Brasil Pitoresco de Debret. *Polifonia*, Cuiabá, v. 20, n. 28, p. 172-188, jul./dez., p.173, 2013.
- DIDI-HUBERMAN, G. *Diante do tempo: história da arte e anacronismo das imagens*. Belo Horizonte: Editora UFMG, 2015.
- FERREIRA, M. F. *Dança, caboclo, cada qual em seu lugar! Estudo sobre os movimentos corporais e a patrimonialização da Dança dos Caboclinhos – Peçanha/MG*. Orientador: Luiz Naveda. 2021. Dissertação (Mestrado) – Universidade do Estado de Minas Gerais, Belo Horizonte, 2021.
- GALANTE, R. B. F. *Da cupópia da cuíca: a diáspora dos tambores centro-africanos de fricção e a formação das musicalidades do Atlântico Negro (Sécs. XIX e XX)*. 2015. Tese (Doutorado) – Universidade de São Paulo, São Paulo, 2015.
- GINZBURG, C. *Mitos, emblemas, sinais: morfologia e história*. São Paulo: Companhia das Letras, 1990.
- GOMBRICH, E. H. Aims and limits of iconology. *In: GOMBRICH, E. H. Symbolic images: Studies in the Art of the Renaissance*. London: Phaidon, 1972. p. 1-25.
- GONZAGA, G. G. Augustus Earle: pintor viajante – cenas de gênero e paisagens brasileiras. *In: COLÓQUIO DO COMITÊ BRASILEIRO DE HISTÓRIA DA ARTE*, XXXIV, 2014, Uberlândia. *Anais [...]*. Uberlândia: Universidade Federal de Uberlândia, 2014. p. 121–136.
- GOODALL, C. Procrustes methods in the statistical analysis of shape. *Journal of the Royal Statistical Society, Series B (Methodological)*, v. 53, n. 2, p. 285–339, 1991.
- HARTOG, F. *Regimes de historicidade: presentismo e experiências do tempo*. Belo Horizonte: Autêntica, 2013.
- LARRAÍN, N. R. S. *Capoeira Angola: música e dança*. 2005. Dissertação (Mestrado) – Universidade Federal da Bahia, Salvador, 2005.

- LEMAN, M. Music Research at the crossroads of innovation. *In: PENA, D. (ed.). Themes in transdisciplinary research*. Belo Horizonte: IEAT-UFMG, 2010.
- MAPAYA, M. G.; MUGOVHANI, N. G. Musicologia comum Africana: uma epistemologia musical de perspectiva Africana. *Claves*, v. 9, n. 14, p. 79-98, 2020.
- MASON, P. H. Intracultural and Intercultural Dynamics of Capoeira Training in Brazil. *Global Ethnographic*, v. 1, p. 1-8, 2013.
- NAVEDA, L. *Pose: A software for annotation of tridimensional body postures in bidimensional images*. Belo Horizonte: Universidade do Estado de Minas Gerais, 2022. Disponível em: <https://corpuslab.info/pose>.
- NZEWI, M.; FREIRE, K; GRAEFF, M. Por uma musicologia “verdadeiramente” africana-brasileira: entrevista com Meki Nzewi. *Claves*, v. 9, n. 14, p. 116-135, 2020.
- OLIVEIRA, A. S. de. *Sankofa: a circulação dos provérbios africanos: oralidade, escrita, imagens e imaginários*. 2016. Dissertação (Mestrado em Comunicação) – Brasília: Faculdade de Comunicação, Universidade de Brasília, 2016.
- PARNCUTT, R. Musicologia Sistemática: a história e o futuro do ensino acadêmico musical no ocidente. *Em Pauta*, v. 20, n. 34/35, p. 145-185, 2012.
- PASTINHA, V. F. *Capoeira Angola*. Salvador: Fundação Cultural do Estado da Bahia, 1964.
- RUGENDAS, J. M. *Viagem pitoresca através do Brasil*. Belo Horizonte: Itatiaia, 1998.
- SCHWARCZ, L. *O sol do Brasil: Nicolas Antoine Taunay e as desventuras artísticas dos artistas franceses na corte de D. João*. São Paulo: Companhia das Letras, 2008.
- SOTUYO BLANCO, P.; DA SILVA FILHO, W. M. Tema y variaciones en la iconografía musical mariana: del estudio de caso a la integración informacional iconográfica iberoamericana. *Cuadernos de Iconografía Musical*, v. 1, n. 1, 2014.
- STERGIOU, N. Variability in Life Can Facilitate Learning to Live Together. *In: KELSO, J. A. Scott (ed.). Learning To Live Together: Promoting Social Harmony*. Cham: Springer, 2018. p. 65–69.
- TOIVAINEN, P.; BURGER, B. *MoCap Toolbox Manual*. Jyväskylä, Finland: University of Jyväskylä, 2011.
- WICHERS, C. M. Sociomuseologia e arqueologia pós-processual: conexões no contexto brasileiro contemporâneo. *Cadernos de Sociomuseologia*, v. 51, n. 7, 2016.
- WITTENBURG, P. et al. ELAN : a professional framework for multimodality research. *In: 5TH INTERNATIONAL CONFERENCE ON LANGUAGE RESOURCES AND EVALUATION (LREC 2006)*. 2006. Disponível em: [https://pure.mpg.de/pubman/faces/ViewItemOverviewPage.jsp?itemId=item\\_60436](https://pure.mpg.de/pubman/faces/ViewItemOverviewPage.jsp?itemId=item_60436). Acesso em: 20 fev. 2019