Article

Using AI-Assisted Image Analysis Techniques to Examine Hollywood Movie Murals: A Zone of Intensive Mural Experience (ZIME) Perspective

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Abstract: The concept of the Zone of Intensive Mural Experience (ZIME) refers to an intensive experience people could feel when they are exposed to visual communication artefacts such as murals. Previous research adopted a cultural ecological approach to examine whether murals showed dynamics between murals, local, and national histories in generating the audience's experiences. Few have explored whether these subjective analyses can be validated in a more objective manner through machine-generated narratives. Our study employed AI-assisted image analysis techniques to examine murals as an important visual communication element in Hollywood movies that could evoke audience's ZIME. We selected a total of 13 mural scenes from three representative Hollywood movies: "Sister Act", "Artificial Intelligence", and "Blood In, Blood Out" that included mural images representing different cultural and ethnic backgrounds in the movies. We text-mined these AI-generated analytical narratives from image analysis prompts to identify extracted keywords, key phrases, and topics to support our proposition. Discussions and implications were provided.

Keywords: artificial intelligence (AI); mural; image analysis; text mining; visual communication; Zone of Intensive Mural Experience (ZIME)

1. Introduction

As a cultural heritage artefact connected with architectural structures, murals refer to "a painting on a wall, ceiling, bridge, or other permanent substrates" (Wang & Wu, 2023, para 1). Although the history of murals can be traced as far as Borneo's cave painting 52,000–40,000 before present (Wang & Wu, 2023), Arreola (1984) attributed the rapid diffusion of murals in the United States to the government sponsorship during the Great Depression in the 1920s, in which "wall paintings, sponsored by the Federal Arts Program of the WPA, were executed in public buildings across the land" (Marling cited in Arreola, 1984, p. 409). Arreola (1984) summarized from past researchers that murals have become noteworthy "on exterior walls of buildings and thus are part of an evolving pattern of street art" (p. 409). Nawaz (2024) observed that, as a public art form, murals "could celebrate local traditions, honor historical figures, or possibly create a beautiful page in cultural histories. They help give a feeling of ownership and pride in taking art closer to the people who live in the city" (n.p.).

Although diverse ethnic and cultural groups may perceive murals differently, Arreola (1984) concluded that the close relationships between Mexican Americans and the popularity of murals distinctively presented in urban landscapes resided in this ethnic group (for example, Hispanic communities in the East Los Angeles area). Similarly, murals in the Mission District in San Francisco, "reflect the identification and power of a local community through images of the Latino culture, activism, and history" (Nawaz, 2024, n.p.). As paintings in public

space, Cockcroft and Barnet-Sanchez (1990) further explained the use of murals as a form of identity and culture, particularly among Hispanic Americans. Rosen and Fisher (2001) chronicled the preservation of the historical Chicano Park in California to protect its murals. Similarly, Ford and Griffin (1981) concluded that murals are a platform for political and social expressions, as well as an art form to enrich the local landscape.

As a form of public art easily accessible and available to the general public, murals have become an important intercultural tool to communicate and promote important human values in multicultural contexts (Ceprag, 2024). Murals invite different methods of participation to create a sense of belonging (Nawaz, 2024). Ceprag (2024) confirmed Nawaz's (2024) proposition through her interpretive analysis of what murals mean, and she concluded that "[t]he murals were seen as catalysts for community engagement, encouraging collaboration between diverse ethnic groups and promoting a sense of belonging" (p. 249). Researchers have found that murals, as an agency of community identity, often display distinctive characteristics of the local culture of residents in the neighborhood (Davies, 2001). Davies (2001) once observed, "local muralists often use murals to articulate their aspirations and identities with the communities" (p. 155).

2. Literature Review

2.1. Murals as an Intercultural Visual Communication Platform

In the U.S., murals have emerged as a new non-verbal communication form of "artistic expressions" (Ceprag, 2024, p. 250) tied closely to a distinctive ethnic and cultural group of Hispanic Americans. In Canada, Mexico, and the U.S., America is known to be rich in murals (Wang & Wu, 2023). Murals could be used to communicate the "deep-rooted history" as a form of social commentary and storytelling by people of various cultures in a created space for dialogue (Cuevas, 2025, n.p.). Ceprag (2024) reasoned that murals can be considered "as a system of signs, a language encoding a specific informational content, a bundle of meanings, which it transmits" (p. 250). Murals are strongly influenced by political and ideological contexts in which painters are situated (Bizzell & Herzberg, 2001). Unlike previous mural studies that examined murals in public space as a stand-alone art form connected with architecture (Arreola, 1984; Cockcroft & Barnet-Sanchez, 1990), our study investigated murals situated in several Hollywood movies, which are also considered an important intercultural visual communication artefact. The study of murals in Hollywood movies is particularly meaningful because both visual communication artefacts are intercultural in nature and have been used for intercultural communication. Similar to murals, movie scholar Kellner (1993) argued that the political and ideological nature of movies is in the processes of production, creation, and interpretation. As a result, the analysis of murals in movies should be investigated by examining the intercultural context in which movies are produced. Combs (1993) argued that "we have to be able to say that movies expressed something of political meaning for a particular time and place, and for at least some people who lived then. We must also remember that movies are also vehicles of learning for those involved in making them, especially those creative talents who attempt to infuse meanings into movies" (p. 5).

Although the investigation of murals or movies has been extensive among both communication (Boone, 2002; Gonzalez, 1982; Gonzalves, 1998) and film scholars (Baugh, 2003; Blakesley, 2004; Cawelti, 1993; Combs, 1993; Costanzo, 1992), extant literature has yet to explore the intensive experience of murals as felt by contemporary audiences. Additionally, the combination of murals (a historical "visual cultural heritage" [Wang & Wu, 2023, n.p.]) in movies (a relatively new visual communication tool since the 1890s) offers a unique experience for movie-goers. Murals in Hollywood movies have represented an integration of two visual communication tools into a hybrid popular contemporary artefact (i.e., movie murals or murals-in-movies). As a result, the hybridity of these two visual communication artefacts presents an interesting research avenue that is worth further exploration. Studies have also confirmed that, generally speaking, visual images tend to generate more emotional responses while print/textual messages tend to bring out more rational responses (Chaudhuri & Buck, 1995).

Therefore, the study of murals embedded in Hollywood movies has allowed scholars to examine what the audience may experience with their full immersion in a 2-h or 90-min movie. Movies can be considered an important intercultural communication medium (or platform) (Futeng, 2024). To be more specific, audiences with various cultural and ethnic backgrounds are exposed to a great amount of intercultural information when they watch a movie (Futeng, 2024). Murals in Hollywood movies require scholars to reconsider the functions of visual objects in the intensive experiential process with murals. Furthermore, the audience's interpretations of the movie murals will be affected by the contents of the movies in which the murals are situated. In other words, contrasting with interior and exterior murals outside a building in public space, movie viewers' responses to the murals situated within Hollywood movies will be influenced by the contents and genres of the movies. Our study attempts to study murals in Hollywood movies as an intercultural communication artefact.

2.2. Hollywood Movies as the Zone of Intensive Mural Experience (ZIME)

A repetitive theme among mural studies is the term "placemaking", defined as "a sense of place" in the physical landscape to "connect spaces to create a deeper, emotionally felt bond between people and their environment. When the aspect of art is included in the fabric of the neighborhood or city, it boosts a sense of belonging and pride" (Nawaz, 2024, n.p.). Embedding murals in a Hollywood movie could create similar placemaking effects to empower movie-goers to make sense of what the murals mean in the context of movies.

To examine how murals in Hollywood movies may be experienced as ZIME, we borrowed from Mary Louise Pratt's (1991) seminal concept of "contact zone", which Green (2003) defined as "a space in which people geographically and historically separated come into contact with each other and establish ongoing relations" (n.p.). As a virtual place to enable and facilitate intercultural interexchange, we argued that Hollywood movies can be considered as an intercultural contact zone in which different "cultures meet, clash, and grapple with each other, often in contexts of highly asymmetrical relations of power, such as colonialism, slavery, or their aftermaths as they are lived out in many parts of the world today" (Pratt, 1991, p.34). Conceptualizing movies as a contact zone allows scholars to examine the intercultural discourses and practices (i.e., movie director, scriptwriter, or the cast) and their influence on audiences with different cultural, ideological, political, and social backgrounds. Our extension of Pratt's contact zone theory to study non-textual discourses is justified and supported by other scholars (such as Yongku Cha) who used the same theory to examine propaganda films in colonial Korea and Nazi Germany (Kim, 2024).

To capture the intersection of murals and movies in creating a new art form, we proposed the theoretical framework, The Zone of Intensive Mural Experience (ZIME), to better study the employment of Hollywood movies as a place to enable movie-goers to experience murals in an immersive movie environment. Based on the above discussions, we proposed the following questions from past contact zone literature (Pratt, 1991) to guide our research:

RQ1: Does the mural in the Hollywood movie demonstrate an asymmetrical power relationship in the intercultural change?

RQ2: Does the mural in the Hollywood movie demonstrate cross-cultural interactions between people and cultures?

RQ3: Does the mural in the Hollywood movie demonstrate identity negotiations and struggles among people and cultures?

RQ4: Does the mural in the Hollywood movie demonstrate that marginalized and minority cultures try to find their own agency, instead of succumbing to the dominant cultures?

RQ5: Does the mural in the Hollywood movie support a new form of expression?

RQ6: Does the mural in the Hollywood movie reduce miscomprehension and misrepresentation among peoples and cultures?

3. Research Method

3.1. Method Selection

Visual communication, such as photojournalistic images, has been a popular research topic to examine readers' emotional responses elicited by reading image representations (Feng et al., 2021, cited in Alpuim & Ehrenberg, 2023). In recent years, employing computational image analysis has attracted the attention of mural scholars when they developed deep learning, diffusion models, and Generative Adversarial Networks (GANs) to detect and preserve murals (Shen et al., 2025). In terms of artwork analysis, AI tools such as Art Analyzer could provide thorough analysis about the style, technique, and authentication, as well as emotional and sentiment analysis (Farmer, 2025).

Our study employed a ChatGPT (GPT-4V)-assisted image analysis technique, supplemented by a text mining technique (QDA Miners and WordStat 8.0), to examine the ZIME experience in Hollywood movies. The AI-assisted image analysis could "interpret and extract meaningful information from digital images automatically" (Timothy, 2025, n.p.). Using machine learning algorithms, we were able to understand visual data and interpret an image by extracting "[w]hat things are present?" (i.e., "objective detection"), "[w]hat are they doing?" (i.e., "action recognition"), "[w]here is this taking place?" (i.e., "scene understanding"), and "[h]ow do objects relate to each other?" (i.e., "visual relationships") (Timothy, 2025, n.p.).

GPT-4 with vision (i.e., GPT-4V) is an innovative OpenAI function that enables users "to instruct GPT-4 to analyze image inputs provided by the user" (OpenAI, 2023, n.p.). It employs multimodal LLMs to "dive deeper into the evaluations, preparation, and mitigation work done specifically for image inputs" and enable users to solve new tasks (OpenAI, 2023, n.p.). The multimodal language model allows users to analyze an uploaded image (Forlini, 2023). However, ChatGPT was criticized (Varshavskaya, 2024) for its limited capabilities when compared with a specialized model. However, unlike what Thompson (2025) has described, advances in ChatGPT image capabilities can perform scene classification and semantic segmentation by producing long narratives.

We developed a list of questions below to prompt ChatGPT (GPT-4V) to analyze our image corpus using QDA Miner and WordStat 8.0, based on the AI-assisted textual corpus extracted from images. Our study also employed QDA Miner and its affiliated WordStat 8.0 programmes to analyse the extracted keywords, key phrases, themes, and structures (Kang & Yang, 2024).

These AI image analysis prompts include the following:

Prompt 1: "What's happening in this mural image?"

Prompt 2: "Describe the emotional tone and setting."

Prompt 3: "Analyze this mural image and provide feedback on the overall impact on viewers."

Prompt 4: "Analyze if the mural image shows any asymmetrical power relationship in the intercultural change."

Prompt 5: "Analyze if the mural image displays any cross-cultural interactions between people and cultures."

Prompt 6: "Analyze if the mural image displays any identity negotiations and struggles among people and cultures."

Prompt 7: "Analyze if the mural image displays any marginalized and minority cultures trying to find their own agency."

Prompt 8: "Analyze if the mural image displays a new form of expression."

Prompt 9: "Analyze if the mural image reduces miscomprehension and misrepresentation among people and cultures."

3.2. Compilation of Our Image and Textual Corpora

Our study examined the murals embedded in three Hollywood movies (i.e., "Sister Act", "Artificial Intelligence", and "Blood In, Blood Out"). We developed interpretations and a typology of these murals. These three movies were also ethnicity-diverse (i.e., African Americans' "Sister Act", Anglo-Saxon Americans' "Artificial Intelligence", and Chicano/Hispanic/Mexican Americans' "Blood In, Blood Out"). Through examination of three Hollywood box office successes, we attempted to explicate the close relationships between murals and ethnic cultural production (to use Gonzalves' term) in a movie contact zone. Such conceptualization of murals-in-movies treated murals as "an element of the built environment that lends insight to cultural heritage, preferences, and change in a community" (Arreola, 1984, p. 409) to generate ZIME experiences.

"Blood In, Blood Out" (1993) (also known as "Bound by Honor") was a movie directed by Taylor Hackford. The movie described a fictitious Hispanic prison gang, "La Onda", in the early 1980s. The plot portrayed three main Hispanic/Chicano/Mexican American characters, Cruz, Paco, and Milko, and their life growing up in the poor districts of Los Angeles (Novo, 2023). These three individuals obtain their courage and strength in their struggle for identity in their lives (Novo, 2023). Its domestic revenue was $4.496 million (Box Office Mojo, 2025a).

"Sister Act" (1992), a crime musical comedy, was directed by Emile Ardolino and featured Whoopi Goldberg as an African American cabaret singer who later became a nun to escape from her death in the witness protection program (Asmelash, 2023). Whoopi Goldberg played the role of Deloris Van Carter, who witnessed the mob murder and was forced to escape to find asylum in a church. The comedy portrayed Whoopi Goldberg's interactions with Sister Mary Robert, Sister Mary Lazarus, Sister Mary Patrick, and Mother Superior. The global box revenue was $231.605 million with 39.7% international and 60.3% domestic revenue (Box Office Mojo, 2025b).

Finally, "Artificial Intelligence" (2001) was directed by Steven Spielberg and described a futuristic robotic boy, David, who a White Anglo-Saxon family adopted to substitute for their son who was in a coma. The story described David's pursuit to be loved as a real human being. The well-known movie critic, Roger Ebert (2001), observed that "[t]he movie's conclusion is too facile and sentimental, given what has gone before. It has mastered the artificial, but not the intelligence" (n.p.). As a global box office success, AI made $235.926 million worldwide (with 33.3% domestic, 66.7% international revenues) (Box Office Mojo, 2025c).

The movie murals presented in this study were collected through the researchers' extensive and in-depth viewing of the movies. Because these murals were part of the everyday landscape where the characters of the movies conducted their daily life, the murals are closely tied to specific scenes in each movie. For the purpose of this study, we included a total of 13 murals from these three Hollywood movies: three murals from "Artificial Intelligence" (N = 3), nine murals from "Blood In, Blood Out" (N = 9), and one mural from "Sister Act" (N = 1) (Refer to the image corpus, https://drive.google.com/drive/folders/1nLBRtQ_lX5AbwYSXejHkI-cITKM-qI9B?usp=drive_link) to see the murals-in-movies images. Below, we show only one image from each movie to abide by the fair use policy in copyrighted materials (Refer to Figures 1–3 below).

Figure 1. Sample screenshot from "Blood In, Blood Out". Copyright owned by Hollywood Pictures, a subsidiary of The Walt Disney Company.

Figure 2. Sample screenshot from "Artificial Intelligence". Copyright owned by Warner Bros Pictures.

Figure 3. Sample screenshot from "Sister Act". Copyright owned by Touchstone Pictures, a subsidiary of The Walt Disney Company.

4. Findings

4.1. Extraction of Keywords and Key Phrases

We relied on extracted keywords, key phrases, and word cloud data visualization from the corpus. As seen in Figure 4, extracted keywords demonstrated whether and how viewers may experience these murals in three Hollywood movies. Salient and top 20 keywords included "Cultural", "Community", "Identity", "Power", "Struggle", "Marginalized", and "Symbolic", among others. Some of the keywords with higher TF-IDF values also corresponded to the size of extracted keywords in the Word Cloud (Refer to Figure 4), including "Mexican" (28% of the cases, TF-IDF = 21), "Symbol" (20% of the cases, TF-IDF = 14.8), "Figure" (40% of the cases, TF-IDF = 21.4), "Skeleton" (9% of the cases, TF-IDF= 28.8), "Marginalization" (8% of the cases, TF-IDF = 4.2), among others (Refer to Table 1).

Figure 4. Word cloud analysis. Source: the authors.

Table 1. Keyword analysis.

Extracted Keywords	Frequency	%	TF-IDF
Cultural	903	2.11%	0.0
Mural	765	1.79%	0.0
Community	364	0.85%	0.0
Identity	333	0.78%	0.0
Imagery	208	0.49%	0.0
Urban	188	0.44%	0.0
Space	187	0.44%	0.0
Figures	171	0.40%	21.4
Public	161	0.38%	0.0
Visual	146	0.34%	0.0
Environment	144	0.34%	0.0
Power	139	0.33%	0.0
Murals	137	0.32%	0.0
Struggle	135	0.32%	0.0
Art	134	0.31%	0.0
Marginalized	127	0.30%	0.0
Mexican	119	0.28%	21.0
Social	118	0.28%	0.0
Graffiti	107	0.25%	18.8
Symbolic	105	0.25%	0.0
Expression	104	0.24%	0.0
Communities	103	0.24%	0.0
Image	102	0.24%	0.0
Institutional	102	0.24%	8.1
Form	100	0.23%	0.0
Chicano	99	0.23%	0.0
Historical	98	0.23%	0.0
Emotional	97	0.23%	0.0
Culture	95	0.22%	0.0
Figure	92	0.22%	3.5
Modern	89	0.21%	0.0
Agency	87	0.20%	0.0
Setting	86	0.20%	0.0
Presence	84	0.20%	3.2
Symbol	84	0.20%	14.8
Symbols	84	0.20%	0.0
Wall	84	0.20%	0.0
Intercultural	83	0.19%	0.0
Scene	83	0.19%	3.1
Expressive	82	0.19%	0.0
Indigenous	82	0.19%	6.5
Cultures	80	0.19%	0.0
Conflict	78	0.18%	2.9
Tension	78	0.18%	0.0
Representation	77	0.18%	0.0
Street	77	0.18%	0.0
Cross	76	0.18%	0.0
Life	76	0.18%	9.5
Viewers	76	0.18%	0.0
Dominant	74	0.17%	0.0
Heritage	74	0.17%	0.0
Minority	74	0.17%	0.0
Negotiation	74	0.17%	0.0
Narrative	73	0.17%	0.0
Interaction	71	0.17%	0.0
Real	66	0.15%	8.2
Painted	65	0.15%	0.0
People	65	0.15%	0.0
Traditions	64	0.15%	0.0
Visually	64	0.15%	0.0

Table 1. *Cont.*

Extracted Keywords	Frequency	%	TF-IDF
Spiritual	63	0.15%	7.9
Person	62	0.15%	10.9
Stylized	62	0.15%	10.9
Conclusion	61	0.14%	0.0
Contrast	60	0.14%	0.0
Neighborhood	60	0.14%	2.3
Everyday	59	0.14%	7.4
Narratives	59	0.14%	4.7
Symbolism	59	0.14%	2.2
Misrepresentation	57	0.13%	0.0
Sacred	56	0.13%	21.3
Human	53	0.12%	2.0
Lived	53	0.12%	2.0
Religious	52	0.12%	2.0
Characters	51	0.12%	9.0
Context	51	0.12%	1.9
Unequal	51	0.12%	0.0
Sense	50	0.12%	0.0
Traditional	50	0.12%	1.9
European	49	0.11%	23.4
American	48	0.11%	1.8
Contemporary	48	0.11%	1.8
Resistance	48	0.11%	0.0
Central	47	0.11%	8.3
Foreground	47	0.11%	11.0
Violence	47	0.11%	14.1
Memory	46	0.11%	0.0
Guadalupe	45	0.11%	27.1
Large	45	0.11%	3.6
Political	45	0.11%	0.0
Artwork	44	0.10%	3.5
Surrounding	44	0.10%	5.5
History	43	0.10%	0.0
Powerful	43	0.10%	0.0
Skull	43	0.10%	33.5
Multicultural	42	0.10%	0.0
Visible	41	0.10%	1.5
Forces	40	0.09%	5.0
Stereotypes	40	0.09%	0.0
Style	40	0.09%	0.0
Change	39	0.09%	0.0
Experience	39	0.09%	1.5
Individuals	39	0.09%	6.9
Latino	39	0.09%	3.1
Resilience	39	0.09%	4.9
Tradition	39	0.09%	0.0
Communicates	37	0.09%	0.0
Pride	37	0.09%	4.6
Skeleton	37	0.09%	28.8
Themes	37	0.09%	1.4
Dynamic	36	0.08%	2.9
Elements	36	0.08%	1.4
Meaning	36	0.08%	0.0
Interacting	35	0.08%	0.0
Language	35	0.08%	4.4
Walking	35	0.08%	10.5
Young	35	0.08%	13.3
Blending	34	0.08%	1.3
Identities	34	0.08%	0.0
Marginalization	34	0.08%	4.2

Table 1. *Cont.*

Extracted Keywords	Frequency	%	TF-IDF
Muralism	34	0.08%	4.2
Spaces	34	0.08%	2.7
Storytelling	34	0.08%	2.7
Suggest	34	0.08%	0.0
Asymmetrical	33	0.08%	0.0
Front	33	0.08%	7.7
Reduce	33	0.08%	1.2
Youth	33	0.08%	12.5
Artistic	32	0.07%	2.5
Concrete	32	0.07%	12.2
Iconography	32	0.07%	4.0
Layered	32	0.07%	1.2
Struggles	32	0.07%	2.5
Continuity	31	0.07%	3.9
Eagle	31	0.07%	33.5
Miscomprehension	31	0.07%	0.0
Reclaiming	31	0.07%	0.0
Woman	31	0.07%	18.7
Hallway	30	0.07%	18.1
Man	30	0.07%	9.0
Protection	30	0.07%	7.0
Survival	30	0.07%	1.1

Source: the Authors.

Additionally, extracted key phrases from the mural corpus also enabled scholars to understand the categories of ZIME experiences beyond the conventional "bag of words" approach that has been criticized for quantifying "the frequency of words in text documents" (Murel & Kavlakoglu, 2024, n.p.). To extract meaningful key phrases, we employed unsupervised key phrase extraction to understand better the ZIME experiences that could be evoked by murals in Hollywood movies. The popular TF-IDF statistics provide "a baseline to examine the frequency of each key phrase, multiplied by the inverse of their frequency in all documents of a collection" (IDF) (Papagiannopoulou & Tsoumakas, 2018, p. 889).

Repetitive key phrases clearly demonstrate the ZIME experiences evoked by murals in Hollywood movies. In Figure 5, dominant phrases such as "Cross Cultural", "Cultural Identity", "Public Space", "Cultural Symbols", "Identity Negotiation", "Public Art", "Intercultural Change", "Cross Cultural Interaction", "Community Identity", "Cultural Pride" among others clearly showed the contact zone characteristics of murals in Hollywood movies. Table 2 shows a list of extracted phrases with their frequency and TF-IDF values.
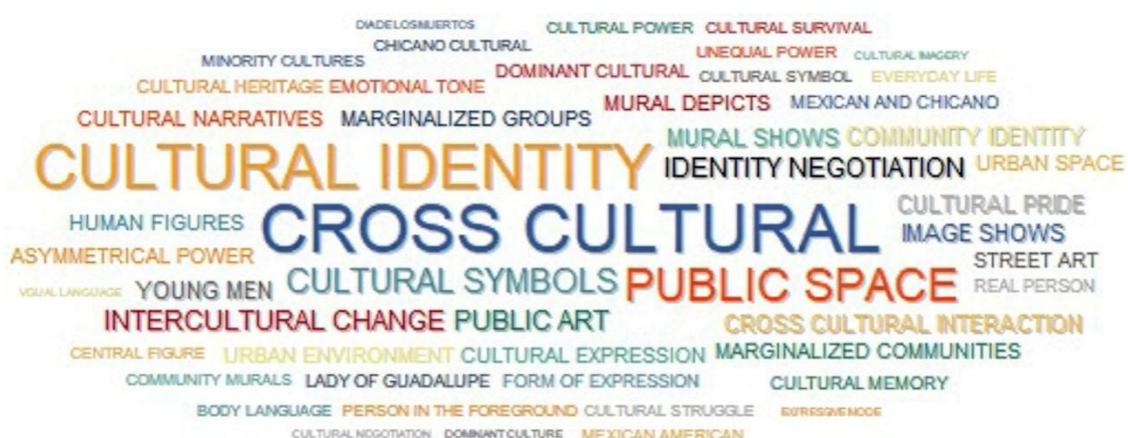

Figure 5. Word cloud analysis. Source: the authors.

Table 2. Keyphrase analysis.

Extracted Keyphrases	Frequency	TF-IDF
Cross Cultural	79	0.0
Cultural Identity	74	0.0
Public Space	56	4.1
Cultural Symbols	38	2.8
Identity Negotiation	32	0.0
Public Art	32	5.1
Intercultural Change	31	1.1
Cross Cultural Interaction	28	1.0
Young Men	27	17.2
Community Identity	25	1.8
Cultural Pride	25	4.0
Asymmetrical Power	24	0.0
Cultural Narratives	24	2.7
Human Figures	24	5.1
Marginalized Groups	24	2.7
Marginalized Communities	23	2.6
Urban Space	23	6.2
Cultural Expression	22	2.5
Street Art	22	2.5
Urban Environment	22	3.5
Real Person	21	10.7
Mexican and Chicano	20	6.7
Cultural Heritage	19	2.2
Emotional Tone	19	0.0
Form of Expression	19	1.4
Lady of Guadalupe	19	12.1
Cultural Memory	18	1.3
Dominant Cultural	18	4.8
Central Figure	17	8.7
Community Murals	17	7.1
Cultural Symbol	17	7.1
Everyday Life	17	4.6
Cultural Struggle	16	0.6
Minority Cultures	16	1.2
Unequal Power	16	1.8
Body Language	15	5.0
Chicano Cultural	15	4.0
Cultural Power	15	4.0
Cultural Survival	15	3.2
Mexican American	15	6.2
Cultural Imagery	14	3.8
Dominant Culture	14	3.0
Visual Language	14	3.8
Cultural Negotiation	13	1.5
D′De Los Muertos	13	8.3
Expressive Mode	13	4.4
Front of The Mural	13	8.3
Lived Experience	13	4.4
Misrepresentation among People and Cultures	13	0.5
Chicano Muralism	12	6.1
Cultural Continuity	12	5.0
Cultural Meaning	12	1.9
Asymmetrical Power Relationships	11	1.3
Community Centered	11	4.6
Community Driven	11	3.0
Cultural Agency	11	1.8
Cultural Presence	11	4.6
Expressive Form	11	1.8
Surrounding Imagery	11	7.0
Community Agency	10	2.1

Table 2. *Cont.*

Extracted Keyphrases	Frequency	TF-IDF
Cultural Erasure	10	2.7
Cultural Groups	10	2.7
Emotionally Charged	10	3.4
External Forces	10	3.4
La Virgen De Guadalupe	10	8.1
Mural Features	10	2.7
Mural Includes	10	4.1
Mural Is Located	10	3.4
Mural Represents	10	3.4
Painted Figures	10	5.1
Urban Setting	10	5.1

4.2. Topic Modelling

Text mining AI-assisted image analysis narratives provide objective categorizations and readings of extracted ZIME experiences evoked by murals in Hollywood movies. We proceeded with the topic modelling procedure through an unsupervised learning technique to summarize a set of terms to represent the corpus's overall topics (Murel & Kavlakoglu, 2024). Topic modelling is useful to decrease "the dimensionality of the corpus" (Blei, 2012, cited in Ahadh et al., 2021, p. 458) by identifying topics clustered through semantically associated words. As a machine learning and Natural Language Processing technique, topic modelling clusters documents based on the closeness, proximity, and similarity of the keywords and key phrases in the corpus (Zvornicanin, 2023). Our study relied on the popular unsupervised Latent Dirichlet Allocation (LDA) method because it assumes "each document is made of topics and each topic is in turn made up of different words" (Ahadh et al., 2021, p. 458).

After the topic modelling procedure, we identified eight topics; that is, "Asymmetrical Power Relationships" (Coherence Index = .398, N = 278), "Public Space" (Coherence Index = .397, N = 443), "Impacts on Viewers" (Coherence Index = .379, N = 219), "Marginalized Communities and Cultures" (Coherence Index = .377, N = 760), "Identity Negotiations and Struggles" (Coherence Index = .347, N = 1437), "Cross-Cultural Interactions" (Coherence Index = .346, N = 486), "Reduce Miscomprehension and Misrepresentations among People and Culture" (Coherence Index = .398, N = 278), and "A New Form of Expression" (Coherence Index = .333, N = 280) (Refer to Table 3).

To further examine if the evoked topics would vary among the characteristics of these Hollywood movies, we conducted a One-Way ANOVA analysis. None of the topics showed any statistically significant differences regardless of whether the Hollywood movies feature murals with themes related to Hispanic ("Blood In, Blood Out"), White ("Artificial Intelligence"), and Black Americans ("Sister Act") (Refer to Table 4). The lack of ethnic and cultural variations among topics demonstrated the consistency of ZIME experiences.

Table 3. Topic modelling results.

Extracted Topics	Selected Keywords	Coherence	Frequency (N)
Asymmetrical Power Relationships	Asymmetrical; Power; Unequal; Asymmetrical Power; Unequal Power; Cultural Power; Asymmetrical Power Relationships; Unequal Cultural; Unequal Cultural Power; Asymmetrical Intercultural; Power Dynamics	0.398	222
Public Space	Urban; Concrete; Space; Public; Graffiti; Setting; Environment; Street; Wall; Public Space; Urban Environment; Urban Space; Setting Is an Urban; Urban Setting	0.397	443
Impacts on Viewers	Emotional; Feel; Scene; Layered; Powerful; Sense; Tension; Emotional Tone; Creates A Powerful	0.379	219
Marginalized Communities and Cultures	Skeleton; Human; Figures; Imagery; Religious Figure; Surrounding Imagery; Chicano; Mexican; Latino; Communities; Traditions; Mexican and Chicano; Chicano Communities; Chicano Cultural; Mexican and Chicano Identity; African American; Mexican and Chicano Communities; American Communities; Latino Communities; Symbol in Mexican; American Urban; Marginalized; Minority; Agency; Groups; Cultures; Dominant; Marginalized Groups; Minority Cultures; Marginalized and Minority Cultures; Marginalized or Minority Cultures; Minority Agency; Minority Groups; Marginalized Communities	0.377	760

Table 3. *Cont.*

Extracted Topics	Selected Keywords	Coherence	Frequency (N)
Identity Negotiations and Struggles	Lived Experience; Guadalupe; Symbol; Depicts; Mexican; Eagle; Powerful; Symbols; Image; Spiritual; Lady of Guadalupe; Mexican and Chicano; Mural Depicts; La Virgen De Guadalupe; Mexican and Mexican; Mexican National; Spiritual and Cultural; Identity; Negotiation; Struggle; Cultural; Pride; Identity Negotiation; Cultural Identity; Cultural Struggle; Identity Negotiation and Cultural Struggle; Identity Struggle; Form of Identity; Cultural Negotiation	0.347	1437
Cross-Cultural Interactions	Cross; Interaction; Cultural; Interacting; People; Cultural Interaction; Cultural Understanding; Form of Cross; Cultural Interactions; Displays Cross; Cultural Exchange; Cultural Symbols	0.346	486
Reduce Miscomprehension and Misrepresentations among People and Cultures	Reduce; Miscomprehension; Misrepresentation; Cultures; Reduce Miscomprehension; Misrepresentation among Peoples and Cultures; Mural Helps Reduce Miscomprehension; Reduce Misrepresentation	0.341	123
A New Form of Expression	Iconography; Traditions; Skull; Muralism; Stylized; Expression; Expressive; Represents; Form of Expression; Expressive Form; Form of Visual Expression; Mural Expresses	0.333	280

Table 4. One-Way ANOVA results of extracted topics.

Extracted Topics	"Blood In, Blood Out" (Featuring Hispanic Americans)	"Artificial Intelligence" (Featuring White Americans"	"Sister Act" (Featuring Black Americans)	F-Value	*p*-Value
A New Form of Expression	149.89	123.40	105.76	0.43	0.66
Asymmetrical Power Relationships	54.54	75.72	77.93	3.34	0.08
Cross-Cultural Interactions	224.13	262.69	192.04	2.72	0.12
Identity Negotiations and Struggles	605.89	737.59	595.60	1.82	0.22
Impacts on Viewers	136.52	115.92	116.89	0.76	0.50
Marginalized Communities and Cultures	337.07	277.65	456.44	1.15	0.36
Public Space	247.00	163.60	219.87	0.53	0.60
Reduce Miscomprehension and Misrepresentations among People and Cultures	31.31	43.94	38.96	4.14	0.05

5. Discussion

Our six research questions attempt to examine if murals in Hollywood movies constitute a new form of expression (RQ5) to facilitate cross-cultural interactions (RQ2) to reduce miscomprehension and misrepresentation among peoples and cultures (RQ6). Additionally, we also examined whether Hollywood movies, as a contact zone of different (and sometimes marginalized) cultural and ethnic groups, could reduce asymmetric relationships (RQ1) to facilitate identity negotiation (RQ3) as their own agency (RQ4).

5.1. Murals in Hollywood Movies as an Intercultural Communication Zone

The three Hollywood movies selected for our study represented the multi-racial American society in the 20th century. Although the United States has claimed to be a melting pot of immigrants with diverse cultural and ethnic backgrounds, what has been portrayed in these movies shows instead the hybridity of races living in separate or sometimes segregated communities. For example, "Blood In, Blood Out" described the constant racial tension among African and Hispanic/Chicano gangs inside and outside the state prison. On the other hand, in "Sister Act", the African American communities were portrayed as run-down and infested with drug trafficking. A strong contrast to the poverty and deprivation associated with African and Hispanic/Mexican Americans, the Anglo-Saxon/White families and communities described in "Artificial Intelligence" have been portrayed as high-tech and modern. Combs (1993) observed that American movies often demonstrated both "sociological" and "narratological" aspects, and that movies are closely related to politics and society (p. 6). In these Hollywood movies, murals were included, yet demonstrated unique themes and typology that can elicit various viewers' experiences with their exposure to these murals.

In "Blood In, Blood Out", murals, as a new art form to express Hispanic Americans' lived experiences, seem to have dominated the landscape associated with the Hispanic American culture to reduce miscomprehension and

misrepresentation of this ethnic group in East Los Angeles. Arreola (1984) observed that murals can trace their origin back to pre-Columbian Mexico. During the 1960s, Chicano murals began to diffuse in the American urban landscape where there were a lot of Hispanic Americans.

In "Blood In, Blood Out", the geography of murals apparently corresponds to the demographic characteristics of the Hispanic American communities. Arreola (1984) also stated that "murals have an important socializing function in a Hispanic American community" (p. 414). As such, class struggle and group identity are two commonly identified themes in these movie murals. Arreola's (1984) extensive study of Hispanic American exterior murals also summarized key themes and artistic elements of Chicano murals (p. 418). For example, bright colors and bold outlines have been identified as essential elements of early Chicano murals (Arreola, 1984). Furthermore, pre-Columbian iconography, religious characters, and the Virgin of Guadalupe are commonly found in Hispanic American murals (Arreola, 1984). In the following discussion, we used murals taken from "Blood In, Blood Out" to demonstrate major mural themes that can be experienced by viewers of the movie (Refer to the image corpus, https://drive.google.com/drive/folders/1nLBRtQ_lX5AbwYSXejHkI-cITKM-qI9B?usp=drive_link).

Romo (1996) identified that the life and death theme is prominent in Chicano mural arts. This theme is shown by the wide use of skulls and skeletons, which can be attributed to early twentieth-century Mexican masters, particularly José Guadalupe Posada (Romo, 1996). The juxtaposition of religious characters and skeletons in the mural supports Romo's observation. The inclusion of essential Mexican American culture also addresses the role of murals to residents in the community. Romo (1996) found that, in community-based large-scale murals in the urban American landscape, culture has been one of the key themes. He further pointed out that "[a]lthough Chicano muralismo represents a vigorous current in contemporary American art, it has its roots in early Mesoamerican culture" (Romo, 1996, p.125).

As an intercultural communication, interaction, and exchange platform, murals in "Blood In, Blood Out" offer non-Hispanic movie-goers a chance to experience struggles and issues that Hispanic Americans have experienced daily. In the movie murals in our image corpus, one of the protagonists, Milko, was seen standing in front of a mural featuring a death theme. Milko, portrayed as a mixed White-Hispanic character in the movie, has constantly faced his own ethnic identity from the Hispanic prisoners. The skull image is also viewed as "an emblem of the mortality of man" (Cirlot, 1962, p. 285). In the movie, Milko has been associated with the killings of other gang members. Even though this scene appeared at the beginning of the movie when Milko was still an innocent young man, his presence in front of the skeleton seemed to predict his destiny in the movie. Compared with the vibrant presentations of a skull by using bold green and orange colors, non-Hispanic viewers learned that the skeleton image demonstrated another representation of the death theme unique to the Hispanic culture. Cirlot (1962) argued that a skeleton is often viewed as "the personification of death" in many allegories and emblems (p. 284). The hostile skeleton holding a weapon attempted to attack an angel-like character. The mural seemed to describe the fights between evil (i.e., the death or skeleton) and good (i.e., the angel).

Murals in "Blood In, Blood Out" immerse movie-goers in a chance to experience Hispanic cultural symbols. Two animal symbols were used to describe the life and death theme. A snake was attacked and eaten by an eagle. Bauman studied the Aztec culture and concluded:

> *Because the Aztecs considered the sun and the eagle as the same, it was said that when the sun rose in the morning sky, it was like the "eagle who ascends", so the Aztecs called it Cuauhtlehuanitl. In the evening, the sun was called Cuauhtemoc, the "eagle who fell."* (Caso cited in Bauman, 2005)

Cirlot's (1962) extensive research of the eagle symbol has concluded that, in pre-Columbian America, the eagle signified "the struggle between the spiritual and celestial principles and the lower world" (p. 88). Therefore, the mural demonstrated not only the life and death theme, but also the good and evil (religious) aspect of Hispanic culture. Romo (1996) identified other mural themes commonly found in Hispanic American murals: (1) politics; (2) socioeconomic conditions; (3) war, oppression, and conflict. These themes were also found in murals embedded in "Blood In, Blood Out." Although murals are usually created using the same techniques at various locations (such as on "private homes, a pulquería, a government building, a church, or other structures") (González, 1998, p. 157), the surrounding community will determine the subject of a mural painting (González, 1998). To extend González's (1998) spatial metaphor further, we argue that the contents of a movie will also influence the themes in mural paintings.

As a movie that portrayed brotherly love and family values, "Blood In, Blood Out" includes several scenes to talk about the importance of family, an essential cultural aspect of Hispanic Americans. According to Hofstede's (1997) cultural dimensions, Mexico has a relatively low individualism score (30 out of 100). This suggests that Hispanic Americans put more emphasis on collectivistic values of respecting older people, family harmony and cohesion, and in-

group association. In "Blood In, Blood Out", loyalty to a family or a gang has been a main theme. Two of the murals in our corpus portrayed the brotherly love among three protagonists (i.e., Milko, Cruz, and Paco) in the movie.

The distinctive cultural themes immerse non-Hispanic movie-goers to learn more about Hispanic customs. A noticeable mural theme in "Blood In, Blood Out" was the depiction of local customs. Arreola documented the development of murals and stated that "[b]y the nineteenth century, wall painting was a folk practice that involved depiction of simple scenes from everyday life" (pp. 409–410). This tradition is maintained in the Hispanic American communities. As Arreola (1984) observed, "interiors of restaurants are decorated with colorful murals, and the practice of painting exteriors of buildings for commercial purposes is also an extension of this vernacular folk tradition" (pp. 409–410). One of the murals in our image corpus showed bright colors and bold outlines, which have been characteristic of early Chicano mural painting (Arreola, 1984). The mural was painted outside a community center, which was traditionally viewed as public space in barrios (Arreola, 1984). As such, the mural has shown the formation of ethnic consciousness among Hispanic American residents in the community.

Similar to the culturally rich exterior murals in "Blood In, Blood Out", three interior murals that appeared in "Artificial Intelligence" have also displayed their cultural characteristics unique to white Americans, enabling viewers of other ethnic groups to learn about other cultural elements. Two mural images from "Artificial Intelligence" recorded a period of human history when there were still kings, queens, and noblemen. However, a close examination of the characters in these murals supposedly created by muralists of the future clearly showed that these historical characters were all Whites and the history being portrayed was dominantly European. Apparently, the murals were created with a race-biased rendition of human history. In the third image from the movie "Artificial Intelligence", Monica, who adopted David, was standing in front of a mural portraying two kids in a fairy tale. These two kids also look like white Americans. In "Artificial Intelligence", it has not been clearly discussed whether the company that produced David also manufactured robotic kids with various ethnic compositions. This mural suggested a racially charged depiction of robotic kids made by the company.

5.2. Murals in Hollywood Movies as an Agency for Intercultural Harmony

In "Blood In, Blood Out", the painting of murals in an electricity tower also represented Cruz's search for his own identity and recognition. Because of his drug problems, Cruz has been expelled from his family and the artistic circle. The completion of the mural painting at the end of the movie represented his re-inclusion into his family and a new beginning for these three protagonists. Romo (1996, p.135) observed the social recognition function of murals in the following:

> *For some, mural art is a means of gaining recognition when denied it in more traditional art arenas. One muralist explained why many artists begin painting murals: I think that a lot of the muralists had trouble getting their work shown in galleries, so they took it out into the streets.*

In "Sister Act", which portrayed a Black American (played by Whoopi Goldberg) seeking asylum in a predominantly white church, the church has become what Pratt (1991) called a "contact zone" where Black American culture collides with white or Catholic cultures. Sharing and appreciation of each other's culture has led to the rebirth of Whoopi Goldberg as well as the transformation of the church to align with local Black American communities. The only mural that was selected for analysis depicted a charity event to paint a mural outside a run-down building. The exterior mural has incorporated both White and Black American characters, with white nuns flying above Black American kids. The mural addressed the theme that the director tried to deliver inter-cultural and -racial harmony, appreciation, and integration of both cultures, echoing our proposition that murals or murals-in-movies can function as a contact zone. These characteristics have made the mural very different from Hispanic American murals. Furthermore, murals in these Hollywood movies showed the creation of the mural as a community effort. This depiction has demonstrated the nature of murals as an art form of communal works and identifications. As such, the public expressed their viewpoints about problems facing Black American communities; that is, the lack of religious guidance as depicted in "Sister Act".

6. Conclusions

As one of the greatest Mexican muralists, Orozco once said, murals are considered to be "the highest, the most logical, the purest and strongest form of painting" (cited in Romo, 1996, p. 146). Our study argued that murals in Hollywood movies should be examined as a new art expression that could evoke ZIME experiences. Our study showed the importance of integrating murals and movies into contemporary intercultural

communication research. In addition, the convergence of communication discourses delivered through a variety of media is an interesting research topic that is worth continual exploration.

In the above discussions, we have employed murals taken from these representative Hollywood movies to demonstrate the diversity of mural themes and the relationships between mural themes, culture, and movie-goers' ZIME experiences with the assistance of AI image analysis techniques. Derived from Pratt's (1991) contact zone theory, our image narratives from AI's image analysis software support the feasibility of treating murals in Hollywood movies as ZIME. The contact zone characteristics of these movie murals could encourage intercultural communication, interaction, and exchange. At the same time, murals also encourage civic engagement and participation, in particular among ethnic minority groups (Arreola, 1984; Gonzalves, 1998; Romo, 1996) to negotiate their own ethnic identity. Romo documented the political role of murals in "urban political struggles as well as in the farmworker movement" (p. 141). Murals have been used to supplement conventional political processes whenever these channels failed to address the concerns of minorities (Romo, 1996). Such a function has transformed murals into a form of civic rhetoric.

Limitations and Future Research Directions

The following constraints in data collection have limited our study. First, as we collected our mural images from only 3 Hollywood movies released in late 1990s and early 2000s, our image corpus did not permit us to include more recent Hollywood movies (such as "In the Heights" [2021] or "The Suicide Squad" [2021]) that are more cautious and responsive to racial equity, representation, and identity politics in the DEI era. Future research may collect and analyze mural images from more recent Hollywood releases to better study the shifts and variations of power asymmetry, ethnic identity negotiation, intercultural interactions, community building, and other ZIME issues. Secondly, despite our methodological innovations to study murals and movie murals as a ZIME phenomenon, computational text mining and image analysis techniques are constrained by their epistemological assumptions about whether the extracted keywords, keyphrases, and topics can properly represent the structures, meanings, and knowledge of the corpus (Caballero-Julia & Campillo, 2021; Haddadan et al., 2023). Future researchers may benefit from using a mixed method to examine Hollywood movies using expert interviews, audience responses, AI-assisted image analysis, and computational text mining techniques.

Author Contributions

Y.K. contributed to 70% of the article content (including idea conceptualization, literature review, data collection, analysis, and formatting of the paper), while K.C.C.Y. contributed to 30% of the article content (including method selection, AI-assisted Image Analysis, and Text Mining). All authors have read and agreed to the published version of the manuscript.

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Data Availability Statement

Upon request by emailing Kenneth C. C. Yang at cyang@utep.edu. For copyrighted mural images, refer to the image corpus, https://drive.google.com/drive/folders/1nLBRtQ_lX5AbwYSXejHkI-cITKM-qI9B?usp=drive_link.

Conflicts of Interest

The authors declare no conflict of interest.

Use of AI and AI-Assisted Technologies

During the preparation of this work, the authors used ChatGPT (GPT-4V)-assisted image analysis technique to analyze mural images and to generate narratives. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

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