Exploration of Intercultural Mechanism of Language Through the Interaction With Sensitive Qualities of Artistic Objects

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ABSTRACT

Through the study of 346 artistic products related to digital paintings from the Medieval period, the relationship between the intercultural mechanism of language in contemporary form and the qualities of the objects generated in the Middle Ages was studied. In this sense, the tool developed by Wingfield, C., & Connell, L. (2022) was used, in which semantic similarity based on user experience was analyzed. In relation to the qualities of the artistic object the darkness of the digitalized work was considered to analyze the tetrachoric coefficient as one of the fundamental sensitive factors in the artistic work, so the variables were reduced to the dichotomy: darkness of the digital work in the RGB system and concepts based on experience. Likewise, a classification of 57 relevant topics of the digital works were obtained. The results suggest the existence of a low relationship in the dichotomy: darkness of the image - concept based on experience, however was observed in that exploration that if the closeness of the concept increases in relation to the Middle Ages, there was less tendency to find works with a prominent darkness in the digital image. Which suggests that the formation of contemporary concepts related to the Middle Ages are not dependent on the darkness of the work. The intention of these studies lies on exploring the relationship of the intercultural mechanism of language based on semantic similarity -proposed by Wingfield, C., & Connell, in groups of contemporary users and the interaction with sensitive qualities of objects created in ancient times.

Keywords: Interaction with artistic objects, Construction of intercultural concepts, Digital products, Processes of interaction

INTRODUCTION

From a human perspective the interaction with objects can be approached from many perspectives: from affectations on the activation of various sensory mechanisms, complex cognitive processes, adaptability until generation of a variety of responses, just to name some of them. Likewise, the production of objects can be considered as the integration of systems that fuse a diversity of cultural factors such as language, color, shape, among many factors. One of

the most emblematic cultural artifacts in any culture is the artistic object, which integrates various languages and topics linked to a period. Depending on the characteristics of the artistic object is how a person interacts with it. However, it is observed a factor that has not been explored enough, in relation with the interaction process of a person with an artistic object that implies the construction of concepts, we mean to the exploratory part that makes one person linked to a particular characteristic of an artistic object. The incorporation of multiple factors that integrate the exploration with the object allow at some point the formation of a concept. In that sense is important to highlight that construction of concepts is also done with objects that were created in distant periods. The construction of the concept in this typology of objects can be through many different forms: face-to-face, in a virtual form, through readings, an oral discourse among others, which is based on the experience with the object. Consequently to this is important to consider the type of experiences that people have nowadays which contribute to construction of concepts. Actually a diversity of tools have been developed to explore the concepts that people have in relation with specifics topics and in consideration with a period. This can help to obtain an approximation to the phenomenon and thus detect fundamental factors in this process and its behaviour. On this study we focus on language like a system communication that is considered one of the most important factors that can transfer information through the time not only in the relation artistic-object to a person, but also in the relation artistic-object to cultural groups.

SYMBOLIC ACTIVITY AND CONFIGURATION OF LANGUAGE

Actually there are important studies in relation to acquisition of language and its processing in relation to human being. For example, some studies point out that speech processing in adults is based on precise and specialized networks located in the left hemisphere of brain, likewise the parameters of word segmentation, prosody and phonology begin to be mastered in the first year of life (Dehaene, Hertz, 2006). Additionally, other explorations have shown the existence of asymmetries in language processing directly related to vocalization (Ehret, 1987), (Petersen, 1984). Also a fundamental role in language has been observed like the function of discrimination between different rhythmic families and that is perceived from birth (Mehler, 1998), (Nazzi, 1998) further a preference to listen the native language is observed in people (Mehler, 1998), (Moon, 1993). However, these studies are focused on the phonological impact in the person's brain, but there is still much to explore in how different types of language affect thought, as well as how concepts are formed and distorted in relation to objects that do not count with an audible language. There are currently studies from the perspective of Linguistic Anthropology with the works of Lucy (1992), Gumperz and Levinson (1996), Slobin (1996), and more recently Boroditsky (2003), Deutscher (2010), Kramsch (2014) [12], which have been explored from thought until culture. Language can be defined, from the alternative perspective explored by Vygotsky (1962), Wertsch (1991), Maturana and Varela (1992), Becker (2000), Neuman (2008); a process as simple as an activity (Neuman & Nave,
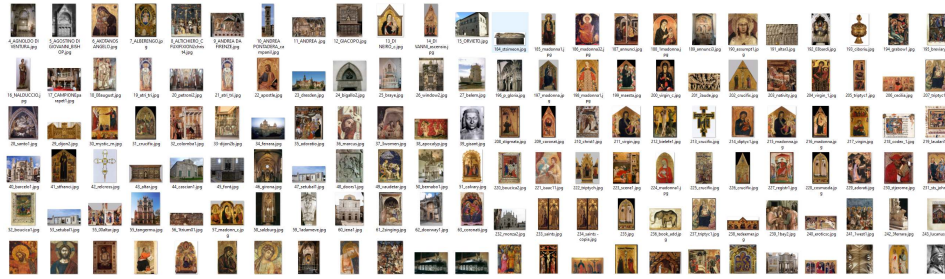
Figure 1: Total Works = 346. (Selection done by: Olmos P.L. & Gil T. J. 2022).

Table 1. Topics = 57; Total Works = 346 (Elaboration: Olmos P.L. & Gil T. J. 2022.

Topic	No.	Topic	No	Topic	No.	Topic	No.	Topic	No.
Abraham	1	Architecture	78	Consecration	1	Eve	1	Justice	1
Adam and Eve	2	Ascension	1	Crucifixion	31	Flagellation	1	Manuscript	12
Adoration	4	Assumption	2	Death	4	Hell	1	Moses	1
Altar	8	Biblia	1	Duke	3	Judas	2	Nativity	4
Angel	3	Bishop	4	Evangelist	1	Government	1	Pietà	2
Animal	2	Book	1	Erotic	1	Gloria	1	Old Testament	1
Annunciation	4	Cardinal	4	Emperor	1	Judgment	4	Noha	1
Apocalypse	1	Cerbone	1	Font	1	Madonna	20	Reliquary	3
Apostle	3	Christ	8	Expulsion	1	King	5	Pope	4
Archangel	1	Christians	1	Fortitude	1	Magi	1	Plato	1
Resurrection	1	Saint	38	Trinity	2	Tabernacle	1	The las supper	1
Virgin	41	Sin clasificar	20						

2010). The relevance of Language for some authors such as Perlovsky (2007) is to be linked to symbolic activity. This perspective is very interesting because the formation of concepts in human being not only starts from the interaction of a person with other people but also in the interaction with a great diversity of objects. Likewise, Jackendoff (1996) considered language as a hierarchical structure of meaning where determination of a superordinate concept is a necessary condition for determination of meaning (Jackendoff, 1996). In this sense, in order to explore the configuration of contemporary concepts from subordinate factors and activity, the following variables were detected: as a superordinate concept was enunciated the Medieval period and the concepts subordinated to it were linked to the recurrent topics that we can find on this period through the production of objects on this range of time. To obtain an approximation to semantic closeness between superordinate concepts and subordinate ones the tool developed by Wingfield C. & Connell was used.

METHODOLOGY

The process was integrated into five phases. In the first phase, 346 digital images of the most representative work of each medieval artist were selected. In the second phase, 346 artistic products from the Medieval Period

Table 2. Topics = 57; B1 = Brightness; B2 = Brightness; B3 = Brightness; B4 = Brightness; B5 = Brightness; AB = Average Brightness AD = Average Darkness; DT = Dominant Technique; T = Tempera; F = Fresco; P = Polychrome; Si = Silver; St = Stone; M = Marble; Br = Bronze; Iv = Ivory; A = Alabaster; O = Oil (Elaboration: Olmos P.L. & Gil T. J. 2022.

Topic	B1	B2	L3	L4	L5	AB	AD	DT	T	F	P	Si	St	M	Br	Iv	A	O
Abraham	55	85	35	75	15	53	202	1					1					
Adam and E.	45	85	55	50	55	58	197	1					1					
Adoration	45	87.5	62.5	57.5	37.5	58	197	4	4									
Altar	77.5	65.12	67.5	51.4	48.8	62.048	192.95	4	2					1		1		
Angel	78.33	71.66	48.33	55	18.3	54.33	200.67	1	1									
Animal	75	85	55	65	35	63	192	0										
Annunciation	92.5	85	75	57.5	50	72	183	4	2	2								
Apocalypse	55	35	55	75	45	53	202	1	1									
Apostle	71.66	85	65	58.3	58.3	67.664	187.33	2	2									
Archangel	65	95	45	65	25	59	196	1			1							
Architecture	66.52	64.67	61.33	56.6	50.8	59.966	195.034	9		4			1	9	1			
Ascension	65	95	65	95	95	83	172	1	1									
Assumption	95	95	85	85	25	77	178	0										
Biblia	65	75	45	85	65	67	188	0										
Bishop	77.5	70	60	50	32.5	58	197	3						3				
Book	15	85	85	75	95	71	184	0										
Cardinal	65	85	52.5	58.5	30	58.2	196.8	2		1				1				
Cerbone	75	55	71	78	33	62.4	192.6	1						1				
Christ	62.5	78.75	68.75	65	53.8	65.75	189.25	5	5	2				1				
Christians	95	75	65	35	75	69	186	1	1									
Consecration	95	85	65	75	35	71	184	0										
Crucifixion	64.87	74.03	55	56.6	43.4	58.784	196.216	20	20	4								
Death	71	83	49	51	27	56.2	198.8	2	1	1								
Duke	75	31.66	75	55	38.3	54.998	200.002	2									2	
Evangelist	15	65	95	95	75	69	186	1	1									
Erotic	85	75	55	75	55	69	186	1		1								
Emperor	75	65	45	85	5	55	200	0										
Font	85	35	45	95	5	53	202	0										
Expulsion	95	95	55	55	35	67	188	1		1								
Fortitude	35	55	21	71	25	41.4	213.6	1							1			
Eve	64	81	65	85	61	71.2	183.8	0										
Flagellation	85	75	55	65	25	61	194	1										1
Hell	65	75	45	85	35	61	194	1		1								
Judas	95	65	35	35	75	61	194	2		2								
Government	45	35	55	85	55	55	200	1		1								
Gloria	65	85	45	75	5	55	200	0										
Judgment	65	82.75	75	45	42.5	62.05	192.95	3		3								
Madonna	71	74.5	68	62	52	65.5	189.5	15	15	1								
King	45	55.83	68.33	78.3	38.3	57.164	197.836	2		1				1				
Magi	95	85	65	35	15	59	196	0										
Justice	45	35	35	65	75	51	204	1						1				
Manuscript	65.83	64.16	72.5	48.3	49.2	59.996	195.004	0										
Moses	95	55	75	25	95	69	186	0										
Nativity	82.5	52.5	67.5	60	25	57.5	197.5	4	4									
Pietà	85	65	65	55	25	59	196	2	2									
OlTestament	85	85	65	65	55	71	184	1		1								
Noha	95	15	74	35	55	54.8	200.2	0										
Reliquary	91.66	71.66	68.33	55	31.7	63.662	191.338	1				1						
Pope	59.25	65	65	57.5	40	57.35	197.65	0										
Plato	95	85	55	25	15	55	200	0										
Resurrection	85	75	45	45	15	53	202	1		1								
Saint	65.42	70.1	38	58.2	44.2	55.176	199.824	21	21	5		1						1
Trinity	35	85	85	85	65	71	184	1		1								
Tabernacle	55	75	95	35	85	69	186	1						1				
Last supper	85	85	75	85	35	73	182	1	1									
Virgin	63.78	74.02	67.68	56.5	51.8	62.752	192.248	24	24	1	1							
Sin clasificar	54.72	78.88	62.38	62.8	46.1	60.972	194.028	11	11				1					

were classified into 57 topics. This classification was based on repetition as a recurrent topic. In the third phase, the 5 dominant colors and their average luminosity were obtained from each work, from this information the percentage of darkness was obtained in relation to the maximum luminosity corresponding to R = 255, G = 255, B= 255 in the RGB system. The data of interest were those related to get the luminosity of color of each work from the RGB system. In the fourth phase, the distance between the contemporary concepts formed by people from experience and the most representative topics of Medieval Period was obtained. This based on technics developed by Wingfield, C., & Connell, L. (2022) where the behaviour of semantic similarity of topic and time could be observed. In the fifth phase, data was analyzed from the tetrachoric coefficient in order to explore the relationship between darkness of image and the contemporary concept of the Medieval Period formed by people from experience.

PROCESS DESCRIPTION

Figure 1 shows an example of selection of 346 representative digital works of the Medieval Period. Each representative work corresponds to an author of the medieval period.

The artistic objects were classified into 57 topics according to the iteration of topic, the classification can be observed on Table 1.

Table 1 shows iterative topics, and were those related to Architecture with 78 works, Virgin with 41 works, Saints with 38 works, Crucifixion with 31 works, Madonnas with 20 works and Manuscripts with 12 works. Likewise, it is observed that topics focus on the religious ideas of period. For the extraction of work's darkness in RGB system, the average of luminosity of five dominant colors was obtained for each work.

It can be seen in Table 2 that the dark average was 193,283 on an RGB system. Additionally, it was detected with classification that the dominant technique was Tempera with 119 registered works. On the other hand, to analyze the tetrachoric coefficient (rt), the average of dichotomy considered for this study was obtained for each image based on Guilford and Fruchter (1984), where Average Darkness was AD = 193.283. Likewise, to obtain the semantic distance the Euclidean distance of each topic was obtained in relation to contemporary experience of users, where for Concept Distance was (CD)=2.510. According to data, information was visualized based on Abascal and Grande (2014) and is shown in Table 3.

Based on these results the rt of group was obtained; rt = −0.2765766. The results suggest the existence of a low relationship on the dichotomy: darkness of the image - contemporary concept based on experience. However, it was observed with the rt that was an inverse relationship, where to the increase of closeness of concept in relation to the Medieval Period less tendency to find dark colors in digital image of artistic objects, which suggests that the formation of concepts related to the Medieval Period are not so dependent on one of the qualities of an artistic work like is the darkness.

Table 3. Topics = 57; AD = Average Darkness; AC = Average Concept; CD = Concept Distance. (Elaboration: Olmos P.L. & Gil T. J. 2022.

Topic	AD	CD	AC	Topic	AD	CD	AC
Abraham	+	0	−	Fortitude	+	2.34637848	−
Adam and E.	+	0.914162	−	Eve	−	0.91416188	−
Adoration	+	3.365313	+	Flagellation	+	0	−
Altar	−	2.94492	+	Hell	+	2.49671148	−
Angel	+	1.106897	−	Judas	+	0	−
Animal	−	5.651705	+	Government	+	2.27562509	−
Annunciation	−	5.560144	+	Gloria	+	0	−
Apocalypse	+	2.761318	+	Judgment	−	3.10959889	+
Apostle	−	1.161458	−	Madonna	−	0	−
Archangel	+	1.665616	−	King	+	2.04443614	−
Architecture	+	2.426954	−	Magi	+	1.6300931	−
Ascension	−	2.44602	−	Justice	+	1.42904248	−
Assumption	−	3.4409	+	Manuscript	+	2.54164505	+
Biblia	−	0	−	Moses	−	0	−
Bishop	+	1.597385	−	Nativity	+	1.94095257	−
Book	−	4.458668	+	Pietà	+	0	−
Cardinal	+	2.179653	−	O.Testament	−	0	−
Cerbone	−	0	−	Noha	+	0	−
Christ	−	0	−	Reliquary	−	0	−
Christians	−	0	−	Pope	+	2.56483711	+
Consecration	−	1.92494915	−	Plato	+	0	−
Crucifixion	+	2.85816479	+	Resurrection	+	2.9352143	+
Death	+	5.04532786	+	Saint	+	2.07264576	−
Duke	+	0.66094621	−	Trinity	+	1.57811472	−
Evangelist	−	3.26197551	+	Tabernacle	+	1.30072376	−
Erotic	−	6.0275402	+	The last sup	+	0	−
Emperor	+	1.79714108	−	Virgin	−	1.93019104	−
Font	+	2.16990033	−	No Classific	+	0	−
Expulsion	−	1.86795268	−				

CONCLUSION

From the exploration of relationship: intercultural mechanism of language based on semantic similarity in groups of contemporary users and interaction with sensitive qualities of objects created in distant times, five interesting findings were obtained: A) A low relationship was observed in the dichotomy: dark quality of the image – contemporary concept based on the person's experience. B) It was observed that the less dark qualities the artistic work had, the stronger the concept was in relation to time. C) The exploration in these studies indicates that the qualities of artistic work do not have a decisive influence on the configuration of concepts about objects created in distant times, at least those related to Medieval Period. D) The intercultural mechanism of language is seen as a stronger factor than color of an artistic work. E) The integration of a concept is a complex process that involves: a diversity of languages and qualities of object in a hierarchized process.

REFERENCES

Abascal, E y Grande, I. (2014). *Fundamentos y Técnicas de investigación comercial.* (12ª Ed) Madrid: Edit. Esic.

Boroditsky, L. 2003. Linguistic relativity. In *Encyclopedia of Cognitive Science*, L. Nadel (ed.), 917–992. London: Macmillan.

Claire Kramsch. Language and Culture. *AILA Review* 27 (2014), 30–55. doi 10.1075/aila.27.02kraissn 1461–0213 / e-issn 1570–5595 © John Benjamins Publishing Company

Dehaene-Lambertz, G., Hertz-Pannier, L., & Dubois, J. (2006). Nature and nurture in language acquisition: anatomical and functional brain-imaging studies in infants. *Trends in neurosciences*, 29(7), 367–373. 2006 Elsevier

Deutscher, G. 2010. *Through the Language Glass. Why the World Looks Different in Other Languages*. New York NY: Metropolitan Books.

Ehret, G. (1987) Left hemisphere advantage in the mouse brain for recognizing ultrasonic communication calls. *Nature* 325, 249–251

Guilford, J., y Fruchter, B. (1984). *Estadística aplicada a la Psicología y a la Educación*. Mc Graw Hill.

Gumperz, J. & Levinson, S. (eds). 1996. *Rethinking Linguistic Relativity*. Cambridge: CUP.

Jackendoff, Ray. "Conceptual semantics and cognitive linguistics." (1996): 93–129.

Lucy, J. 1992. *Language Diversity and Thought: A Reformulation of the Linguistic Relativity Hypothesis*. Cambridge: CUP. DOI: 10.1017/CBO9780511620843

Mehler, J. *et al*. (1988) A precursor of language acquisition in young infants. *Cognition* 29, 143–178

Moon, C. *et al*. (1993) Two-day-olds prefer their native language. *Infant Behav. Dev.* 16, 495–500

Nazzi, T. *et al*. (1998) Language discrimination by newborns: toward an understanding of the role of rhythm. *J. Exp. Psychol. Hum. Percept. Perform.* 24, 756–766

Neuman, Y., & Nave, O. (2010). Why the brain needs language in order to be self-conscious. *New Ideas in Psychology*, 28(1), 37–48.

Perlovsky, L. (2007). Symbols: integrated cognition and language. In R. Gudwin, & J. Queiroz (Eds.), Semiotics and intelligent systems development (pp. 121–151). Hershey, PA: Idea Group.

Petersen, M.R. *et al*. (1984) Neural lateralization of vocalizations by Japanese macaques: communicative significance is more important than acoustic structure. *Behav. Neurosci.* 98, 779–790

Slobin, D. 1996. From 'thought and language' to 'thinking for speaking'. In *Rethinking Linguistic Relativity*, J.J. Gumperz & S. Levinson (eds), 70–97. Cambridge: CUP.

Wingfield, C. & Connell, L. (2022) Sensorimotor distance: A grounded measure of semantic similarity for 800 million concept pairs. *Behavior Research Methods*."