The art-space of a global community: the network of Baroque paintings in Hispanic-America

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Abstract— **This paper presents the results of a multi-disciplinary collaboration in Digital Humanities that focuses on the multi-scale analysis of the network of Baroque paintings in the territories of the Hispanic Monarchy from the 16th through the 18th centuries. We apply graph analysis and visualizations as well as natural language analysis over a database of over 11,000 artworks in order to address three types of questions related, respectively, to the formation and sustainability of large cultures, the semantic content of the network we analyze, and the role of art as an institution that contributes to sustain large-scale societies. The results also help to design a methodology that can be exported to other projects in Digital Humanities.**

Cultural Networks; Art-space; Cultural Areas; Baroque; Digital Geography of Art; Complex Systems; Graphs; Visualizations

I. INTRODUCTION

A 2010-2011 international exhibition traveling from Madrid to Mexico City and showcasing dozens of paintings from the 16th to the 18th centuries, all related to the former Hispanic Monarchy, poses the problem of the shared identities of the peoples and cultures living in the territories of the Spanish Habsburgs [1]. An intricate political system [2] that recognized some of the particular customs and laws of the different territories was able to keep together and connected political areas as European territories like Flanders, the Dukedom of Milan, and the Kingdom of Naples, the kingdoms in the Iberian Peninsula unified under Isabella and Ferdinand in the 15th Century, the American Viceroyalties of New Spain (including the Philippines) and Peru (later on also the viceroyalties of New Granada and Río de la Plata), and at some moments Portugal, Brazil and Goa. The research project behind this exhibition attempts to shed light into the processes that led to the commonalities observed by art historians in the paintings circulating across these territories in the Early Modern Age. Although the four volumes accompanying the exhibit are written by art historians, it is important to note that in different ways some of the essays included in the publications point out at some important issues of cultural transfers, the evolutionary role of art, or the relationships between religion and pro-sociality that are being studied in other sciences: What is a cultural area? [3] Is it different from a political one? How does a community stay together? Can a political entity of almost global dimensions last? Do symbols and art foster the sustainability of large-scale societies? What are the patterns of diffusion and the processes of cultural transfer among diverse territories and peoples? [4][5][6]

An example of the complexity of the tasks at hand is the case of Peter Paul Rubens [7]. The Flemish painter got his training in Antwerp, traveled extensively through Italy, visited Spain and was commissioned by two different Spanish monarchs. If Ruben's production and that of his workshop are large, his influence is especially felt through the carvings books that he sent by the thousands to different places in Europe, Seville and, from there, to the America. All around Europe and America his carvings served as models of themes and genres for the copies required by customers from local painters. In many cases, personal touches by the creators and the inclusion of local motives raise the issue of imitation and copy. Can we say that Rubens is the single most influential painter of the whole period on both sides of the Atlantic, even if it is through carvings that his art spreads? How should be Ruben's works considered? Are they to be described as Flemish, Italian, Spanish, American, or simply, Catholic or Baroque? [8]

Another interesting case is that of Bernardo Bitti [9], an Italian Jesuit who moved to Lima in 1575 and is considered an integral part of the history of art in Peru and the Andes. Patrons in Lima, Cuzco, and La Paz commissioned his works and his disciples also contributed to the spread of his style and the diffusion of the religious themes and characters that make up most of his production. Are Bitti's paintings to be considered Andean, or European, or simply Christian? How

do we label and classify the paintings of American painters who, for the most part, follow the style of European masters and take on religious themes? How do we establish local appropriations and narrate the particular histories of art of the different territories?

These issues lead to a more important question, that of the role of symbols and, in this case, painting in the formation and sustainability of large-scale societies. Also, the existence of a network of paintings, artists, and shared themes that spread over two continents for such a long period of time points to the definition of what constitute a community: how do different communities interact under large political entities? Are they to be considered under the lens of global complex systems? These problems are crucial in historical terms, but are even more important as humankind is entering a phase of intense communications and exchanges that reach all corners of the planet and that is producing an unprecedented level of interaction between cultural communities. Do we know how cultural communities react under these pressures? Are we developing a shared repertoire of global symbols that can be understood by members of all cultures? As globalization moves on, is humankind also weaving a network of artists and cultural artifacts that help sustain the economic and political processes? Are there phases and cycles in these processes? Do we have the conceptual tools to tackle these problems? [10,11]

In this paper we analyze the network of Hispanic Baroque paintings from 1550 to 1850. We divide the data set of 11,443 works from Spain and Latin America in 25-year periods in order to study the evolution of the paintings' 211 descriptors. We try to answer three questions: 1) Is it possible to create and sustain global communities through a shared network of images and symbols? 2) In the case of the network of paintings we are considering, what type of religion and what type of art contribute to the very existence of the network? 3) Is art a candidate for one of the institutions that help sustain large-scale societies and large-scale interactions?

II. METHODOLOGY

Over the last few years, we have collected an online BaroqueArt [12] database of 12791 paintings and 1636 creators associated with the territories of the Hispanic Monarchy from the 16th to the beginning of the 19th centuries. The database also contains 405 series, 195 schools and 2482 geographical locations. On top of the data stored under a traditional entity-relation model, we implemented a system of annotations that would allow to work on the objects stored in the database and that would provide enough flexibility to describe all aspects of any artwork. The resulting descriptors [13] application works as an add-on to the administration interface of projects developed under the Django framework. Using the ORM (Object-Relational Mapping) framework, we are able to add descriptions to the objects in the database thanks to an associative vector (key/value store) that allows define a hierarchy in a structure similar to an ontology. From a set of 211 keys or descriptors

we carried out a manual semantic annotation of all artworks (with an average of 5.85 descriptors/work and peaks of 14 per work).

To analyze the resulting dataset we represent it as a graph in which artworks are nodes and that relations among them are established as a function of the descriptors shared by the works. If an artwork is described through 7 descriptors and another work is also using the same set of descriptors, then we say that these artworks are connected through a weighted link with weight 7. We limited our experiment to the period 1550-1850 and divided the global graph into 12 sub-graphs, each of them covering a period of 25 years. To better handle the size of the dataset, relations among nodes were only created if the weight of the link was 6 (except for the first and last periods, with fewer entities, that it was set to 5). [14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25]
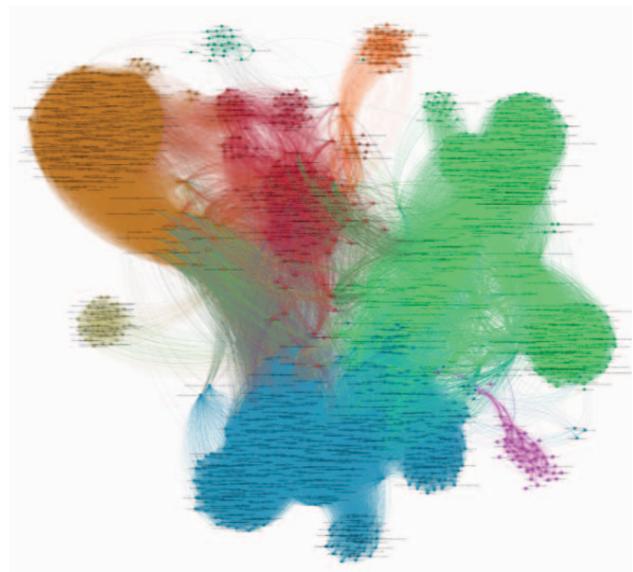

Figure 1. Graph for Period from 1750 to 1775

Then, for each of the periods of our data we determine which are the classes of modularity, that can be considered super-nodes, and calculate the distances between clusters by measuring the frequency of use of descriptors in the artworks contained in the cluster. We apply our own algorithm to distribute those super-nodes in a 2D space so that their relative positions represent the relative distances among them (the closer the clusters are, the more similar descriptors they use). We are aware that 100% accuracy is impossible because of the size of the descriptors pool we are using, that would require a higher dimensional space.

Once these clusters are organized in our space with a size proportional to the amount of artworks they have, we go back to the descriptors they contain and we generate the areas of influence of each descriptor as a potential field. As it is normal that, due to the ontological organization of the descriptors, some of these areas contain other areas, we also represent the borderlines of the areas to show how these

intersections play out. This allows us to generate different views of the **art-space**, taking into account elements such as time, descriptors by modularity class, or specific descriptors closely related to current discussions by art historians specializing in the period.
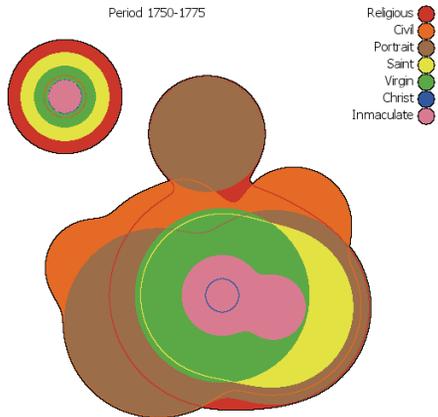

Figure 2. Descriptors area representation for the Period 17570-1775

Finally, we calculate distances between modularity classes in different time periods so that we can infer which modularity class evolve from a previous one. This is fundamental for a better understanding of the generation of families of artworks and the variants that this evolution produces, what would help us to connect this process with explanations in political, artistic or economic discourses.[1]

III. DISCUSSION

Sperber and Hirschfeld [26] have established that a "cultural group is held together by a constant flow of information, most of which is about local transient circumstances and not transmitted much beyond them. Some information, being of more general relevance, is repeatedly transmitted in an explicit or implicit manner and can end up being shared by many or even most members of the group. 'Culture' refers to this widely distributed information, its representation in people's minds, and its expressions in their behaviors and interactions." This begs the questions of how large can a cultural group become and what happens to this information as it is transmitted over and over again across a huge territory and long periods of historical time. Can a culture, understood as widely distributed information, be sustained over time and space? How stable this culture can really be as it is distributed? How the very transmission of cultural information produces alterations and compromises the existence of a single culture?

In the case of the network of paintings related to the Hispanic Monarchy, we can say that this art constitutes the base of what can be described as a culture, which is not exclusive of the Hispanic world, but has many common elements with European Christianity and, especially, with Catholicism. This is a religious, Catholic community as

religious and Catholic is most of the information being distributed across this network over the 1550-1850 period. It is true that 1725 sees a deep decline in the production of religious paintings in our database (around 20%), but it is only in the period 1750-1775 that a peak in the production of "civil" paintings brings together both classes of artworks. From 1775 onwards the production of religious art continues falling down dramatically —all categories of religious paintings, but specially in the category of "saints", that plays an important role in the first phases of evangelization in America— in comparison with former periods, while civil paintings keep growing to top all categories of painting at the end of our period. It is also important to note the growth of portraits follows a parallel path to that of civil paintings from 1725 onwards.
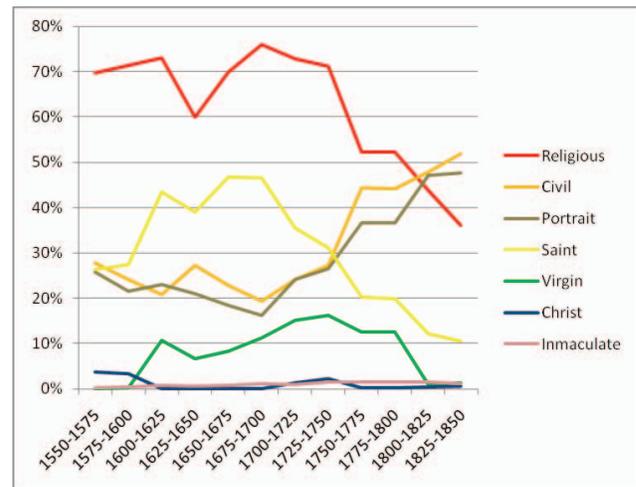

Figure 3. Evolution of % of descriptors in time

The analysis of the evolution of this information also shows that the semantic content moves from the stability offered by the religious themes towards the diversity of local references related to civil paintings[2]. It is the possibility of going from the religious to the civil, and within the religious, from one set to another, through the "portrait" descriptor that enables the diversification of contents in the network. In this respect, around 1700 "portrait" becomes the trigger that will make possible the shift of the weight of already existing semantic information from one area to another in this particular network over time. Over time, the representation of individual human beings in portraits experiences a transfer from religious models to civil and local models in what seems to resemble the development of the kind of subjectivity normally associated with Modernity. As this happens the original network expands its space and reduces its concentration around the original classes of modularity (see Figure 5).

The second question we posed has to do with the type of religious representations contained in the network. After analyzing the data, it can be said that this is not a Christ-

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centric Christian community as representations of Christ form the smaller clusters (in blue in our images) within the religious descriptors in each period. However, starting with the period 1600-1625 a cluster of paintings of the Virgin Mary takes shape within the religious cluster and stays stable throughout the periods until 1775-1800 and always proportional to other religious sets until the end of our time span. The Marianne religiosity is one of the common elements of the different Christendoms [28] that emerged in Latin America as a result of the European colonization. According to Burucua et al. [29], the Virgin is the symbol of the religious synthesis of both the indigenous and the European cultures. For the native peoples the Virgin is associated with the Pachamama in the Andes, with the Mother Land, and also served as the link to re-connect with their own supernatural history prior to Christianity. The importance of the different Virgins of Guadalupe in America (the Guadalupe of Extremadura who is originally an Immaculate and is transformed in the Andes, and the Guadalupe of Mexico) [30] is felt in the results of the natural language analysis [31] performed on the text of the titles of all the artworks in the database. Out of the 1777 paintings containing the word "Virgin", 703 are "Guadalupes" what constitutes a clear superiority of this American devotions over the European ones introduced early in the conquest, such as the Virgin of the Rosary (82), Virgin of Carmen (34), or Virgin of Merced (30). After the Guadalupes, and among the American representations of the Virgin, the Colombian Virgin of Chiquinquirá has the highest number of items (30), closely followed by the Andean Virgin of Pomatá (19) and the also Andean Virgins of Copacabana (16) and Candelaria (12), these very related to indigenous goddesses of the Mother Land[3].

The cluster of paintings using the descriptors for the Virgin Mary overlaps with two other clusters, "saints" and "portraits". The first overlapping gives a clear snapshot of the religious representations favored by this emerging culture as it is captured in the network of paintings and, at the same time, it helps explain the lesser importance of the theme of Christ in the network. Virgins and Saints are the favorite religious beings of these new Christians as they are the symbols that concentrate at the same time the universal and the local dimensions of the community. The universal dimension allows all groups to recognize themselves as part of the same religious community via the common history represented in the stories of the Virgin and the Saints through a shared set of iconography. The flexibility of Virgins and Saints is achieved through the adoption of local dimensions as special dedications and the protection of places and groups become determining factors of the American Christianity. As the religious orders extended their influence across America, they used the power of images to send the new Christians the right message about the models they were to follow. The normal tendency of each order to showcase

the life and miracles of their patron saints can be traced in our database. Just to give an example, during the early period of 1600-1625 there are 451 paintings containing the word "saint" in the title, of which the highest number belongs to San Francis, a clear victory of the Franciscans over their rival order of the Dominicans whose representative appears only 12 times. In the first positions of this period, we also find Saint Peter (48), Saint John (45), Saint Joseph (27), Santa Catalina (22), Saint Ignatius (20), Saint Jerome (16), and Saint Anthony (14). With the canonization of Saint Rose of Lima in 1671 by Clemens X, this flexibility gets maximized thanks to the possibility of American Christians to become Saints and, therefore, local icons of the new religious and political communities.

The second overlapping has to do with the role of "portraits" in the topology of this type of cultural network. If it is clear that "portraits" share its space with "virgin" and "saint", it is also clear that "portraits" becomes a common denominator for both the religious and the civil clusters. The competition among the different orders active in America to showcase their own saints explains, in part, the important role of portrays in this network, as the orders are for a long time the main clients of painters and workshops. Also, the propagandistic element of the Counter-Reformation and its use of images to raise strong feelings in the faithful have to be taken into account when explaining the role played by portrays in our network. However, it is important to note that the size of the civil area in our representations only grows proportionally larger to the religious one around the 1775-1800. This is the period when the consciousness of the *criollo* elite gets channeled towards what will become the movements for national independence from Spain. It is the portrait of the human figure that gives technical continuity to the tradition of creating models of human imitation. However, whereas the religious portraits would reinforce the global links of the Baroque culture at both sides of the Atlantic, the civil portraits would focus on the local figures that would become the human models for the newly created political entities [32].

Third, the inter-dependence of art and religion in this network begs the question of the evolutionary role of art and symbolic networks in the sustainability of global communities. This also helps to understand how cultural networks —networks in which interpersonal relations are mediated by the interactions with cultural objects and phenomena— serve the purpose of harnessing the humans' evolved social psychology in order to interact with other humans and groups at great distances. In [33] the authors have proven that the existence of norms that sustain fairness in exchanges among strangers are connected with the diffusion of institutions such as market integration and the participation in world religions. Their research confirms the hypothesis that modern world religion may have contributed to the sustainability of large-scale societies and large-scale interactions. We propose that art is another institution that contributes to the arising and sustainability of large-scale societies. Here, we have used the case of the formation of an

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[3] We do not discuss here other cases of "European" Virgins that keep their names in America but whose iconography get substantially transformed in America.

artistic network of paintings, schools, themes, genres, and artists whose development goes along with the expansion and colonization of the Hispanic Monarchy across America until the independence of the nations in the American continent. But we have to be cautious as we establish the role of symbolic networks in the organization of large-scale communities. In the case we study, the semantic content of the network is overwhelmingly religious, that is, art is the vehicle that religion uses to travel from one human community to another. At the same time, this network of paintings is established on top of a trade network as the market of art is one of the most important world markets at the time. The market of art extends from the workshops of the Low Countries to the merchants of Seville to the patrons of Cuzco and any other population in Hispanic America [34].

IV. CONCLUSSIONS

This work has allowed us to prove the role that symbols play in the formation and sustainability of a culture that extends over two continents and lasts with some cohesion over 150 years as deduced from the constant size of the areas covered by the main large descriptors in our database. At the end of the period the descriptor "civil" takes over the first position in our network. This culture is made up of religious information and this religious information shows the importance of the descriptors "virgins" and "saints" over most of the time studied here. However, the role of the "portrait" descriptor is especially relevant as a bridge between the religious and the civil paintings. Lastly, we emphasize the role of art as an institution that might become a candidate to explain the sustainability of large-scale socities.

These are samples of some of the questions that can be asked using this methodology in which different disciplines collaborate to offer a muti-scale analysis of a complex, global phenomenon. The work ahead will necessarily include a tuning of the method to further dig into the semantic data and take advantage of the geographic information already associated to the network. The final objectives are to fully develop the concept of the baroque space, and the art space of cultural and political communities, and eventually to establish the foundations of a digital geography of art and culture.

ACKNOWLEDGMENT

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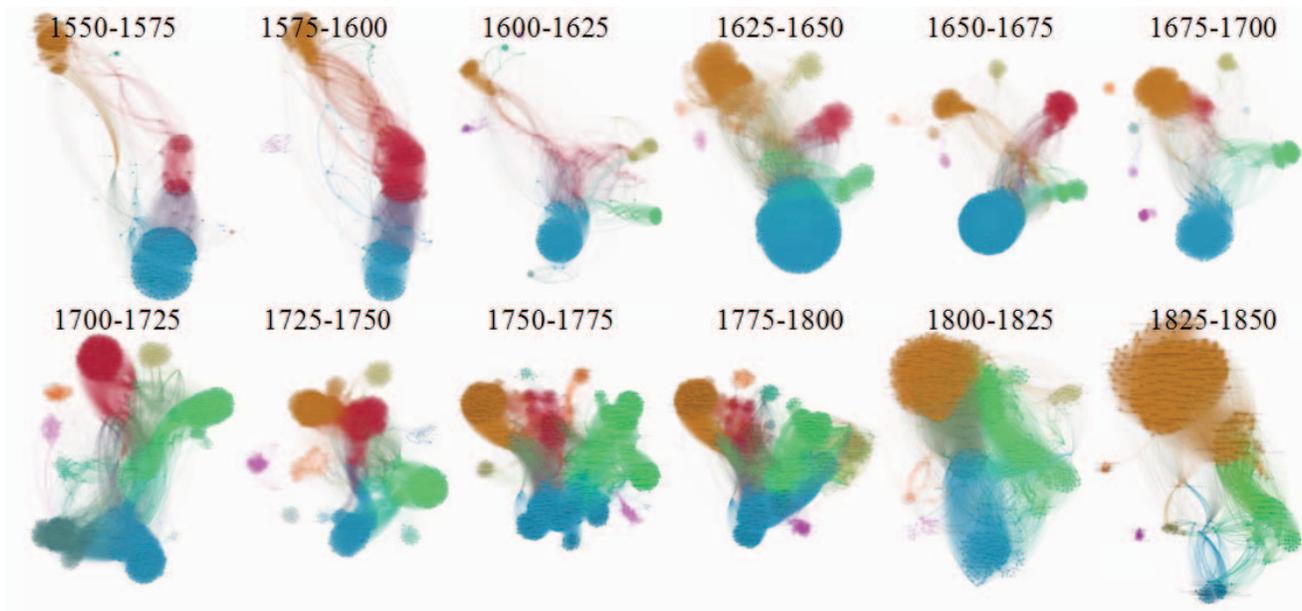
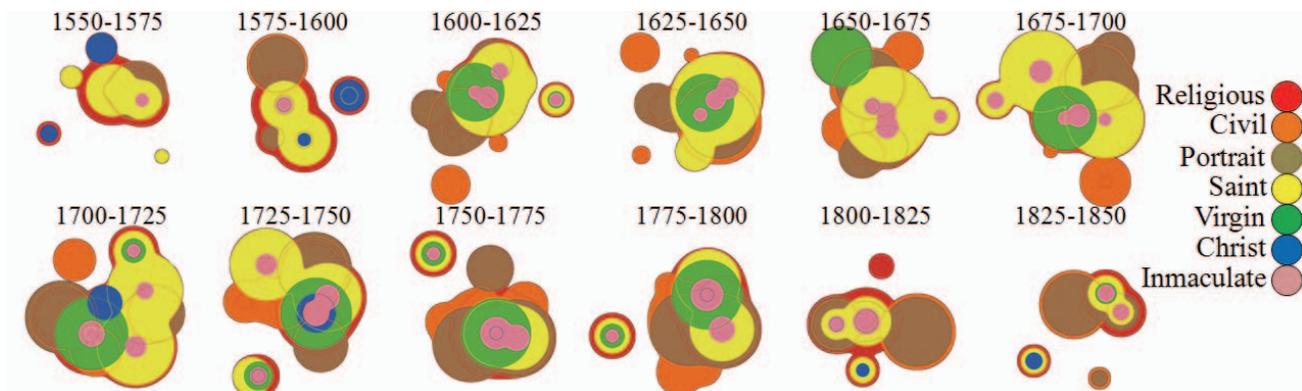Figure 4. Graphs for artworks dynamics for the 12 periods

Figure 5. Descriptors area representation for the 12 periods