Patterns of Choice: The Prix Ars Electronica Jury Sessions

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Patterns of Choice: The Prix Ars Electronica Jury Sessions

Dietmar Offenhuber


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Patterns of Choice: The Prix Ars Electronica Jury Sessions

Dietmar Offenhuber

Social Network Analysis (SNA) has become a critical tool of artistic practice, adopted by a large number of media artists and activists and used for investigation and critique of political and economic systems. This form of analysis, however, has hardly ever been applied to the field of media art itself, as a system of institutions, festivals and individual networks. Within this system, festivals and competitions play a crucial role in shaping the field. They are stepping-stones for emerging artists and allow scholars to probe the state of the field.

Among the numerous media art competitions that exist today, the Prix Ars Electronica holds a special place. For one, it is among the oldest of its kind. It has been carried out annually since 1987 in conjunction with the Ars Electronica Festival, which has been held since 1979. Furthermore, the award is highly prestigious in terms of both its endowment and its public visibility. As demonstrated in a related study, a significant proportion of media artists have at some point submitted a project, received an award or participated in a jury session for the competition [1]. Throughout its history, the Prix has consisted of three to eight categories, inviting a wide range of submissions including blockbuster animation movies, contemporary sound art and experimental media art, as well as online community projects. Each category awards one main prize called the Golden Nica, two Awards of Distinction and 12 Honorary Mentions. Since 1998, the competition has also included a category for young local artists under the age of 19, and, since 2004, a fellowship grant for artists younger than 26 [2,3].

This article discusses the relevance and applicability of social network visualization for understanding the structure and social dynamics behind such a heterogeneous and historically rich institution as the Prix Ars Electronica by examining the network of co-juror relationships and award decisions. As the field of media art keeps evolving and changing, questions emerge about the relationship between these fields and categories within the competition and how this relationship is reflected in the social composition of the juries and the track record of their decisions.

To answer these questions, methods of network analysis used in the social sciences seem applicable. Other scholars have, for example, investigated jury decisions in cultural competitions, such as the Eurovision Song Contest, by using social network analysis to gain insight into the interplay between culture and political agendas [4,5]. For these methods of analysis, a wealth of relevant and suitable data is available in digital archives and data repositories. Currently, however, such approaches and data sets play little role in humanities research.

Research Questions

One of the commonplace themes in media art is the convergence of art, science and technology [6]; interdisciplinarity—or the rejection of disciplines altogether—has therefore always been seen as a defining property of the field [7]. The Prix Ars Electronica has embodied this idea since the beginning. Its scope transcends the art world and addresses commercial companies and organizations, academics and autodidactic enthusiasts. The result is an often startling mix, spanning across works such as commercial Hollywood productions, hybrid artworks, theoretical essays and on-line community platforms. The question arises as to how these seemingly foreign fields and categories relate to one another in the context of the competition. Furthermore, how is this mixture reflected in the social structure of the competition—the relationship between and among the organizers, the juries and their decisions? Finally, is the structure of the competition a result of historical development or the result of a programmatic vision?

To address these questions, I will use the term social network with a disclaimer: This article is not directly investigating the private and professional connections between jurors or artists. Rather than exposing hidden arrangements and networks through investigative journalism, this article is aimed at understanding what can be gleaned from public data—by focusing on the relationships between publicly known facts. As Josh On has demonstrated in his seminal piece: They Rule (2001)—showing the personal interconnections between members of Fortune 500 companies’ directorial boards—even commonplace public data can unveil an additional dimension of information if aggregated and examined as a network [8].
The following analysis is based on a set of simple, uncontroversial facts: first, who participated in the same jury session and, second, who got awards from this jury. The resulting jury network reflects to a large degree the preferences of the organizers, who are responsible for selecting and inviting the jurors. However, as jury members often have the opportunity to recommend other jurors—formally or informally—the network also reflects acquaintanceships, or “weak ties” [9], between these jurors. An Ars Electronica jury session is an intense 3-day process, during which hundreds of entries need to be discussed and the jurors get to know each other very well, if they have not done so before. In a typical jury session, five to six jurors collectively decide on the winners of the Golden Nica, the Awards of Distinction and the Honorable Mentions from the pool of non-anonymous submissions, which often exceed 500 entries per category. A jury session concludes with a statement collectively authored by the jurors, justifying their decisions.

DATA SOURCES AND REPRESENTATION

The dataset used in this study was generated entirely from information available on the Ars Electronica website [10]. The data include the list of jurors for the different categories of the Prix Ars Electronica and the list of artists and projects receiving awards from these juries, covering the entire history of the competition since 1987. By combining the information about jurors, jury sessions and award recipients, I have extracted two different networks. The first network describes the co-juror relationships among persons participating in jury sessions over the years (Article Frontispiece); the second network represents the connections among the artists who were selected by the Prix juries (Color Plate B). Each node in these networks represents either a person or a jury session from a specific category and festival year. A connection between these nodes either describes a person’s participation in a specific jury session or the receipt of an award from a jury. The networks are bi-partite, which means they only contain connections between persons and jury sessions—never direct connections between persons.

Currently, the Prix encompasses seven different categories, including Computer Animation/Film/VFX; Digital Musics & Sound Art; Interactive Art; Hybrid Art; Digital Communities; U19; and [the next idea]. Over the years, the categories have changed substantially: categories such as Computer Graphics were dropped while others, such as Digital Communities, were introduced. Yet others, such as the theory-focused Media.Art.Research Award, part of the 2007–2009 competition, made only brief appearances. Many categories have also undergone substantial programmatic shifts over the years or have changed their name. For the sake of consistency and simplicity, I have grouped similar categories of the same “pedigree” together, for example grouping the categories of Digital Music and Computer Music into a branch of Music categories, and categories such as World Wide Web, net.art and net.vision into a branch of Net-Based Arts.

This study is part of the Mapping the Archive project presented at the 2009 Ars Electronica Festival (Fig. 1) [11]. The study is closely related to the quantitative analysis of Ars Electronica submissions by Gerhard Dirmoser, who collected a complete dataset of individual submissions and traced their “echoes” in publications [12]. Both studies were conducted using semospace, a network visualization tool I have been developing together with Gerhard Dirmoser since 2004 [13]. The software is based on a force-directed layout paradigm [14] that was adapted for the real-time layout of large networks including radial and timeline representations. Network centrality measures were calculated using Ulrik Brandes’s Visone tool [15].

THE JURY NETWORK

Analysis of the jury network reveals the first surprising fact about the jury network: It forms a single cohesive structure instead of multiple isolated network fragments. This indicates a strong movement between the different categories,
explained by the fact that many jurors have participated in more than one category over the years. With one exception, there has never been a jury session without a juror who participated in another Prix Ars Electronica jury in an earlier or later year. The network supports the impression that Ars Electronica represents a very well-connected social system. Furthermore, the jury network shows distinctive regions corresponding to the different categories—some are more central than others. Some categories appear as heavy, compact clusters, while others form an extensive, intricate web. Still other categories appear as narrow ribbons winding between the perimeters of other categories.

The categories Computer Animation and Computer Graphics are among the oldest categories of the competition. Having shared many jurors over the years, they appear in the layout as tightly connected with one another. Their concentrated appearance results from the fact that in the early years of the competition the field was small, and especially in the first 6 years the jury composition changed very little. Another early category, Computer Music, shows a similarly pronounced center but also has fringes reaching out to other categories—reflecting programmatic changes toward a more interdisciplinary approach in later years. By contrast, the categories of Interactive Art, Hybrid Art and the categories covering net-based art forms form an extensive mesh without a clear center, though still sharing many of the same jury members. These initial observations already tell a story about the nature of the different fields involved—while the Animation category is well defined and shows little change over time, Interactive and Hybrid Art have been subject to continuous changes and redefinitions.

**INDIVIDUAL JURORS: HUBS AND BRIDGES**

Besides the overall morphology of the network, the roles of individuals are of special interest. Some jurors occupy the center of a cluster, having been invited many times to a jury session of the same category. In network terminology, these persons have a high degree centrality. Usually, these are jurors who have had a great influence on the programmatic direction of a specific category. Examples of such hubs are the U.S.-based curator and composer Naut Humon, who has shaped the music competition for many years; net activist Joichi Ito for the net-based art categories and the Digital Communities category; and Sirikit Amann, the organizer of U19, the “junior” category. The importance of these three individuals is emphasized by the fact that other jurors in the same categories changed frequently and seldom participated more than twice.

Other jurors, such as the artists Michael Naimark and Christa Sommerer (who teaches at the art academy in Linz) have participated overall in fewer jury sessions but have served in more than one category. In the network layout, these persons act as bridges connecting different categories—without them the network would break into many unconnected “islands.” In network terminology, they have a high betweenness centrality [16]. Nodes with a high betweenness centrality often occupy important positions in real-life social networks, being facilitators of information exchange between different fields.

By inviting individuals such as Naimark and Sommerer to the juries of different categories, the organizers acknowledge their transdisciplinary competence. Therefore, the bridges in the network established by those jurors can be read as the organizers’ perspective on interdisciplinarity. One particularly interesting example is the history of Bill Buxton’s involvement in Ars Electronica juries. He was first involved as a member of the Computer Music jury in the late 1980s. He joined the Interactive Art jury in the early 1990s and 10 years later he participated once again as juror of the Computer Animation category (Fig. 2). This path reflects his professional trajectory from electronic music to Human-Computer Interaction and, as a research scientist in a 3D software company, to visual interfaces.

The record of jury participations not only reflects the personal histories of the individuals involved but also shows trends and connections in the whole field of media art. The differences in the roles of jurors can be also expressed through their network centrality measures. Among the jurors with the highest number of jury participations...
structures a network of award winners, which can be repeated in order to construct a network for the jury session from 1987 to 2009; on the right, persons ranked by their betweenness centrality measure, specifying the percentage of all shortest paths in the network running through the specific node.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Degree</th>
<th>Juror</th>
<th>Betweenness %</th>
<th>Juror</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12</td>
<td>Sirikit Amann</td>
<td>3.29</td>
<td>Naut Humon</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>Naut Humon</td>
<td>2.60</td>
<td>Jean-Baptiste Barrière</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>Alfred Nemecke</td>
<td>2.40</td>
<td>Michael Naimark</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
<td>Horst Hörtner</td>
<td>2.17</td>
<td>Christa Sommerer</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td>Joichi Itó</td>
<td>2.09</td>
<td>Horst Hörtner</td>
</tr>
<tr>
<td>6</td>
<td>9</td>
<td>Loren Carpenter</td>
<td>1.95</td>
<td>Joichi Itó</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>Roger Frank Malina</td>
<td>1.90</td>
<td>William Buxton</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>Gerhard Johann Lischka</td>
<td>1.60</td>
<td>Roger Frank Malina</td>
</tr>
<tr>
<td>9</td>
<td>8</td>
<td>Rolf Herken</td>
<td>1.57</td>
<td>Florian Hecker</td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>A.J. Mitchell</td>
<td>1.37</td>
<td>John Markoff</td>
</tr>
</tbody>
</table>

Table 2. Artists and companies who received the most awards (primarily names from the Computer Animation and Visual Effects categories)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Degree</th>
<th>Artist</th>
<th>Betweenness %</th>
<th>Artist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>John Lasseter</td>
<td>1.47</td>
<td>Tamás Waliczky</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>Tamás Waliczky</td>
<td>1.29</td>
<td>Paul DeMarinis</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>Industrial Light &amp; Magic</td>
<td>1.28</td>
<td>Golan Levin</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>Golan Levin</td>
<td>1.2</td>
<td>PIXAR</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>PIXAR</td>
<td>1.06</td>
<td>Shelley Estkar</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>Alejandro Viñasao</td>
<td>1.06</td>
<td>Paul Kaiser</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
<td>Paul DeMarinis</td>
<td>0.93</td>
<td>Carsten Nicolai</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>Bob Sabiston</td>
<td>0.91</td>
<td>Alessandro Ludovico</td>
</tr>
<tr>
<td>9</td>
<td>4</td>
<td>Andrew Stanton</td>
<td>0.85</td>
<td>John Lasseter</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>Kristi Allik</td>
<td>0.76</td>
<td>Scott Sona Snibbe</td>
</tr>
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</table>

Table 1. A comparison of degree and betweenness centralities of persons in the jury network.

The process used to generate the jury network can be repeated in order to construct a network of award winners, which are associated with the jury session from which they received an award such as the Golden Nica, an Award of Distinction or an Honorable Mention. Compared to the coherent structure of the jury network, the result offers a different picture: The artist network is more fragmented. This can be explained by the higher diversity of awarded artists and the fact that it is rarer for an artist to receive multiple awards, compared to the high number of jury members who participate in more than one year. Still, a substantial number of artists have indeed received more than one award. Most of these artists are part of two large and dense sub-networks, which shape the most prominent features of the artist network. The smaller sub-network is composed of winners of the categories dedicated to young artists, U19 and [the next idea]. It may be speculated that at some point these two “islands” will merge, once an award winner from U19.

or the Next Idea competitions wins a prize in one of the main categories.

Some artists have received multiple awards either in the same category or in different fields. While jurors serving on different category juries reflect the organizers’ perspective on interdisciplinarity, artists winning in different categories reflect interdisciplinarity in artistic practice. A number of artists have received awards in both Computer Animation and Interactive Art, but none in both an animation and a net-based arts category. Tamás Waliczky, one of the most successful Prix participants, has received awards in Computer Graphics, Computer Animation and, later on, in Interactive Art. Maurice Benayoun’s record shows a similar transition from Computer Animation in the early 1990s to Interactive Art in the late 1990s. A similar pattern emerges in the early 2000s, showing a transition of artists previously awarded in Interactive Art moving on to receive awards in net-based art forms: Digital Music and Hybrid Art.

The Networks Combined: Artists as Jurors

The organizers of the competition often invite awarded artists to join a jury in subsequent years. In order to account for this fact, I combined the jury and artist networks. In the resulting network, the role of an individual as either a juror or an artist is expressed through the direction of the link connecting the person to a jury session: links from a jury session to a person, for example, indicate that the person received an award from that particular jury. The combined network contains over 2,000 nodes, showing the intertwinedness of the different fields in a more distinctive way. For instance, only the combined network shows the central role of the Interactive Art category in the history of the Prix Ars Electronica, which occupies a central location between the other categories. This role can be confirmed by looking at the centrality values. In terms of degree centrality, the highest number of prizes to single artists was awarded in the animation category (Computer Graphics, Computer Animation and Interactive Art), while the individuals with the highest betweenness centralities are mostly individuals primarily involved in Interactive Art (Table 2).

Most interestingly, the combined network reveals the distinct decision patterns in the interaction between jurors and awarded artists in the network (Fig. 3). The first pattern describes a situation where the same juror awarded a prize to
the same artist repeatedly over multiple years. On the structural level, this pattern can be identified by isolating four-node cycles in the network. Notably, this pattern was quite common during the first 5 years of the competition, when the field was much smaller and less diverse (Fig. 3, left). A second pattern shows mutual award exchanges—an artist has received an award from a jury that included an artist who has received an award in an earlier year from a jury in which the former artist served as juror. This pattern can also be identified by finding four-node cycles in the network; in this case, all nodes in the cycle have the same number of incoming and outgoing links (Fig. 3, middle). A third pattern shows an artist receiving an award from a jury in which the artist participated as a juror, a case that occurred only once in the Prix history so far: film director Mark Dippé in the Computer Animation category 1998 (Fig. 3, right). However tempting, these patterns cannot be interpreted as evidence of a juror’s personal agenda, since the personal influence of a juror on the decision is limited, keeping in mind that a jury consists of five to six individuals making a joint decision.

**THE TEMPORAL DIMENSION**

The last aspect of this paper concerns the temporal development of the jury composition. Organizing the jury network along a temporal axis reveals how the number of categories and jurors grew over time. Initially, Prix juries consisted of a relatively small group of individuals who served as jurors for multiple consecutive years. Over the course of the past 20 years, the juries became more diverse and jurors changed more frequently. Still, the overall composition and format of the competition juries remained remarkably consistent, judging from the fact that individual jurors from the very early Prix years kept getting invited until recently.

The role in and impact of individual jurors on the general competition is most strongly visible in the temporal view. A few individuals stand out in particular. Naut Humon, for example, played an important role in the Music juries between 1997 and 2006, when he participated every single year. During this period, he was the only constant factor on the jury, as other jurors were frequently changed. Before 1997 and after 2006, however, Humon did not participate in any jury of the Prix Ars Electronica (Fig. 4).
chi to held a similar position during the
decade of 1995 to 2004 in the networked-
art–related and Digital Communities
categories.

It is worth mentioning that the tran-
sition between the three major eras of the
festival, shaped by the artistic direc-
tion of Gottfried Hatzinger, Peter Wei-
bel and Gerfried Stocker, did not leave
significant traces in the jury structure in
general. The competition expanded and
evolved, but the fundamental orientation
of the competition remained unchanged.
This phenomenon represents a strong
contrast to competing media art awards
such as the Transmediale Award, which
underwent some dramatic changes and
re-orientations, including the abolition
of all categories in 2005 [17].

CONCLUSION
Who are the artists and jurors that have
been most successful and influential
for the Prix Ars Electronica? The jury
networks give an ambiguous answer.
Counting awards and jury participa-
tion, the Computer Animation and Visual
Effects categories play a dominant role.
Directors and companies such as John
Lasseter, Pixar and Industrial Light and
Magic have received more awards than
any other participating artists so far.
Furthermore, the same two categories
have had the greatest continuity over time:
Their jury constellations have changed
less often than in the other categories.
Many might see this prominence of
counter animation as anachronistic,
given the peripheral place of animation
in the current media art discourse. How-
ever, shifting the focus to a different set
of network properties—the relative loca-
tion of categories and individuals—
changes this picture. In this respect,
the Interactive Art category holds a cen-
tral location in the network between all
other categories. Accordingly, artists and
jurors associated with interactive, hybrid
and net-based art have the highest be-
tweenness centrality values; they form
the bridges and interfaces that connect
all other categories. This difference is
a strong argument for the additional
benefit of network analysis. While statistics
of awards and jury participations are
reflected in the raw data, the different
roles of individuals and the relationships
between the categories are only revealed
in the network representation.
The comparison of the jury and the
award networks shows different perspec-
tives on the interfaces between the
different categories and their evolution
over time. On the other hand, the award
network shows the perspective of artistic
practice, as far as connections between
fields are concerned. The temporal as-
pect shows how different fields of prac-
tice have influenced each other, reflected
in the biographies of individual artists.
While rarely acknowledged in the histo-
ries of media art, computer graphics and
animation were an important influence
on the further development of interac-
tive art, as reflected in the personal tra-
jectories of artists such as Peter Weibel,
Maurice Benayoun or Tamás Waliczky, all
of whom received awards in the Computer
Animation category.

Of course, one has to keep in mind
what the links in these networks actu-
ally represent and not get carried away
with speculative interpretations. Still,
relational data such as the examined
networks contain a wealth of implicit in-
formation that is not immediately obvi-
ous in the raw data. In the future, the
study could be extended in two ways:
First, to complement the Ars Electronica
data set with social network information
from other sources, such as professional
and institutional affiliations, data from
social networking sites or participa-
tion in other festivals and conferences.
A second possibility would be a textual
analysis of the collaboratively authored
jury statements and comparison of their
terminology and references with the so-
cial network data gathered for this study.
We have already started to explore the
more qualitative trajectory in the scope
of the Mapping the Archive project men-
tioned earlier. The key question remains,
what characteristics can be explained
through the relationships that are repre-
sented in the network—the interactions
between jurors, artists and curators? In
this respect, the purpose of this article has
been to show how much implicit in-
formation is contained even in a limited
data set. The two networks paint a rich
picture of the Prix Ars Electronica as a
social system, its actors, their decisions
and their interconnections [18].

References and Notes

Unedited references as provided by the author.

1. Drimoser, G. Ansätze einer quantitativen Kunst-
drimoser.public1.linz.at/ars/>.
2. Stocker, G., Lopoldeder, H., and Schöpf, C. Ars
Electronica 1979–2009: The First 30 Years. Hatje
Cantz, 2010.
3. Druckrey, T. Ars Electronica: Facing the Future: A Sur-
4. Yair, G. and Maman, D. The Persistent Structure
of Hegemony in the Eurovision Song Contest. Acta
5. Fenn, D., Suleman, O., Elstathou, J., and Johnson,
N.F. How Does Europe Make Its Mind Up? Connec-
tions, Cliques, and Compatibility between Countries
in the Eurovision Song Contest. Physica A: Statistical
6. Wilson, S. Information Arts: Interactions of Art, Sci-
7. Mitchell, W. J. T. Interdisciplinarity and Visual Cul-
8. On, J. From They Rule to We Rule: Art and Activ-
ism. In G. Stocker and C. Schöpf, eds., Unplugged:
Art as the Sense of Global Conflicts. Hatje Cantz,
2002.
9. Granovetter, M. S. The strength of weak ties. Ameri-
can Journal of Sociology 78, 6 (1973) 1360.
10. Ars electronica. Ars Electronica Festival History.
2010; <www.aec.at/festival_history_de.php>.
11. Stocker, G. and Schöpf, C. Human Nature—Ars
12. Dirmoser, G. Quantitative Kunsthistorik—ARS
publ1.c.linz.at/media/>. 
2009; <http://vis.mediaartresearch.at/webarchive/
14. Fruchterman, T. M. J. and Reingold, E. M. Graph
Drawing by Force-directed Placement. Software—
Software for Visual Social Network Analysis. In Geograph
Drawing, 2002; 354–357.
16. Freeman, L. C. Centrality in Social Networks: I.
Conceptual Clarification. Social Networks 1, 3 (1979)
215–239.
17. transmediale. transmediale05. 2005; <http://
archive.transmediale.de/05/page/detail/
detail.0.persons.303.2.html>.
18. The jury networks can be explored interac-
tively using the semospace software tool at the fol-
lowing address: <http://vis.mediaartresearch.at/

Glossary

topological distance—the term “distance” in this
article usually refers to topological distance (the
number of steps along network paths between two
nodes) rather than metric distance (the geometric
position in the layout).

bi-partite graph—a network graph whose nodes can
be divided into two different sets. Connections are
only allowed between two nodes belonging to differ-
ent sets, never between nodes of the same set. In
the example above, the two sets describe either persons
or jury sessions. Persons can only be connected via
a shared jury session node.

network centralities—a considerable number of
metrics have been developed for describing and
quantifying the location of a node in relation to the
network it is embedded in. The three most basic cen-
trality measures are degree centrality, describing the
number of incoming or outgoing connections of a
code; closeness centrality, the average topological
distance to all other nodes, and betweenness centrali-
ity, describing the percentage of shortest network
paths that flow through a specific node. Network
centralities are essential for understanding the role
and importance of a node in a network in which in-
formation is exchanged.