Making Engagement Visible: The Use of Mondrian Transcripts in a Museum

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Abstract: This paper describes how we have used a new transcription system we call Mondrian Transcripts to study visitor engagement and expand professional vision (Goodwin, 1994) in a museum. Methods, concepts and findings from this paper contribute to research concerning interest driven learning (Azevedo, 2013; Ito et al., 2009, Crowley & Jacobs, 2002), how people "make places" for learning while moving through different types of physical or information environments (Taylor & Hall, 2013; Ma & Munter, 2014; Marin, 2013; Lave et al., 1984) and the design of learning environments that can advance professional design practice. Empirical data include 1) 22 case studies of complete museum visits that captured continuous, multi-perspective video and audio records of visitor mobility and interaction and 2) audio, video and survey based data from a professional development and design session with museum educators, exhibit designers, curators and archivists.

Introduction and organization of paper

The setting and empirical basis of this research is a two year ethnographic study to understand how visitors cultivate interests in and learn about the diverse historical and cultural heritage of American Roots and Country music while visiting a nationally renowned museum located in the mid-South region of the United States. As part of this work, we collected a purposive sample of complete museum visits across 22 visitor group cases including 11 family groups (2-5 visitors per group) over a period of six weeks (twenty-four days of data collection). These 22 case studies captured continuous, multi-perspective video and audio records of visitor group mobility and interaction through small GoPro cameras worn by visitors with no researchers present. In addition, following their visit we conducted 1-2 hour post visit interviews with all visitor groups and we connected with visitors on various social media platforms in order to follow online the content that visitors collected and shared from their visit. Table 1 summarizes this work.

Table 1: Overview

Overview of 22 Visitor Groups & Followed Social Media Posts

The table reads from left to right with each row corresponding to one of 22 groups of museum visitors. For example, Group 1 from Pittsburgh, PA completed their visit together in 1:40. Of the 3 people in the group, 2 shared single posts to the followed social media platforms of instagram and facebook. Together, these posts received 16 likes & comments.

	Hometown * family group	Visit Length (hr:min)	People * musician	People w/ Post ○ 40-60 yrs old ● 20-30 yrs old • 10-20 yrs old	Type of Post single post/platform x# of photographs album/collage { } multiple visitors	Likes & Comments
1	Pittsburgh, PA	1:40	●●●	●●	{} {}	16
2	Fresno, CA	1:09	●●	●		101
3	Staten Island, NY	47	●●			
		1:04	●			
		1:08	●			
4	South Korea	52	●			
		56	●	●		29
5	TX *	3:43	●●●●	•		7
6	Nova Scotia & MI	1:37	●●	●		169
7	Cordele, GA	1:34	●●●			
8	Holland, MI	1:09	●●●●	●		5
9	Staten Island, NY	44	●●	●●	{} {}	58
10	Iowa City, IA *	1:46	●●●			
11	St. Mary's, PA*	1:09	●●●●	•		4
12	Owings, MD *	1:16	●●●●	●●●		103
13	London, UK *	1:07	●●●●			
14	Atlanta, GA	1:39	●			
		2:12	●			
15	GA & England	1:05	●●●●			
16	Hazlet, NJ *	1:25	●●●●			
17	Washington, D.C.	58	●●	●●	{} {}	58
18	Big Sur, CA *	49	●●●●●	•●	{} {}	55
19	Sunrise, FL *	1:56	●●●			
20	Milwaukee, WI *	1:08	●●●●	○		5
21	Port Charlotte, FL *	1:04	●●●●	•○	{} {}	98
22	Chicago, IL *	38	●			
		1:33	●●	○		8
	Range:	38 to 3:43	2 to 5	1 to 3	0 to 13 Online Postings	4 to 169

The first part of this paper introduces Mondrian Transcripts as a transcription system to: 1) visually transcribe museum visitor's physical movement and conversation over space and through time and 2) study how visitors engage in museum gallery spaces. This work draws from and extends Interaction Analysis (Jordan & Henderson, 1995) and Time Geography (Hagerstrand, 1970) and reflects our recent efforts to describe and use what we call "Interaction Geography" in studies of learning (Shapiro & Hall, 2017; Shapiro, 2017). The second part of this paper describes how we have used a dynamic visualization environment that allows for multi-modal analysis of Mondrian Transcripts, which we call the *Interaction Geography Slicer (IGS)* (Shapiro & Hall, 2017; Shapiro, 2017), to support a professional development and design session with museum professionals at this museum. This session aimed to demonstrate new ways to conceptualize and design for visitor engagement and learning. This work is part of a larger design study (Cobb, Confrey, diSessa, Lehrer & Schauble, 2003) that aims to advance museum professional's learning about how design practice can create opportunities for interest-driven learning in and beyond their gallery spaces (Azevedo, 2013; Ito et al., 2009, Crowley & Jacobs, 2002).

Mondrian Transcripts and visitor engagement

Figure 1 below displays a museum gallery space and maps the physical movement within that space of two (of five) members of a family we call the "Bluegrass Family" (not pictured in the image). On the left in "floor plan display", movement is shown over a floor plan of the gallery space (e.g. as if you were looking "down" onto the space). On the right in "timeline display", movement unfolds continuously over a timeline. On the timeline display, vertical position corresponds to vertical position on the floor plan. In addition, line pattern corresponds to horizontal position on the floor plan. Adhir (*orange*) is 25 years old and Blake (*blue*) is a 6-year old boy.

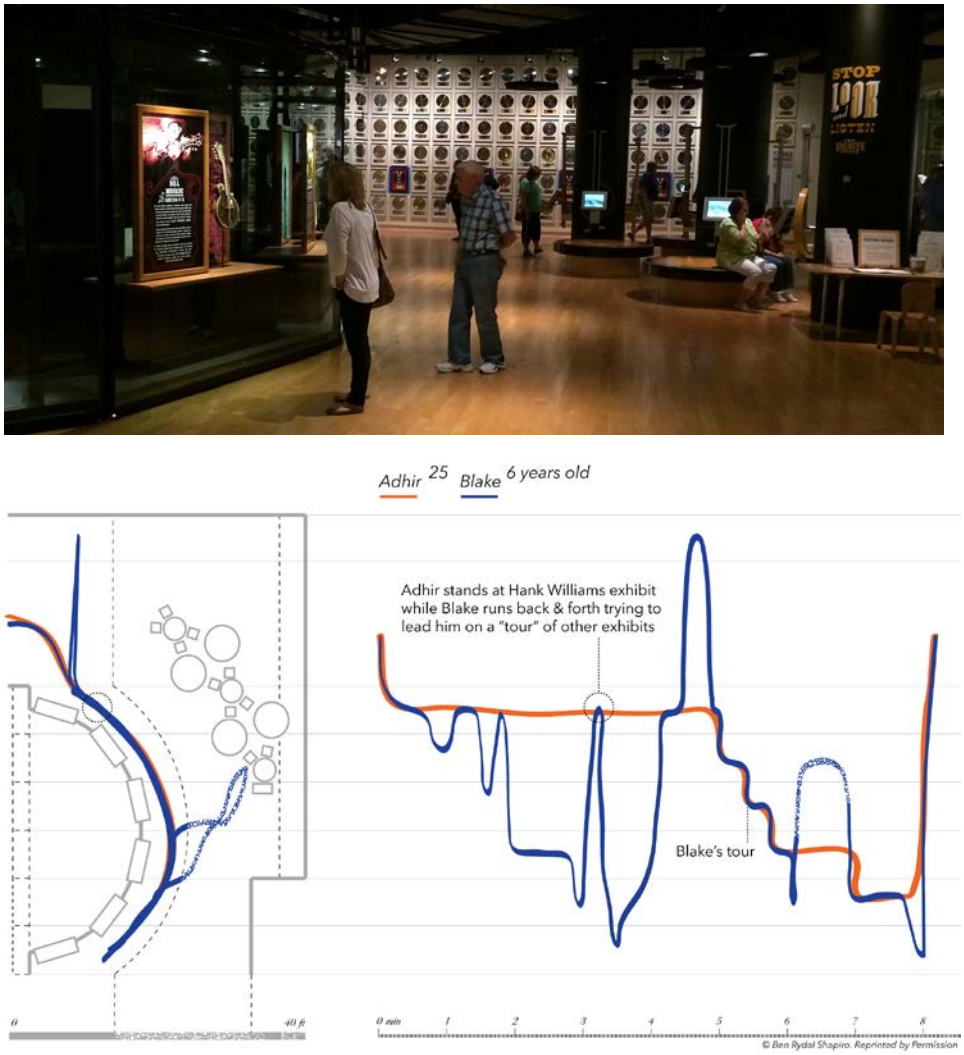

Figure 1. A museum gallery space & Adhir and Blake's mobility over space and space-time.
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The plan display shows where Blake and Adhir go within the gallery space, while the timeline display shows how they interact with exhibits and one another in space and over time. For example, using the timeline display, one can see that during the first five minutes Blake is moving quickly (apparently running) back and forth across the gallery space in what appears to be multiple, frantic attempts to draw Adhir away from an exhibit dedicated to Hank Williams where he remains standing (straight orange path in space-time from roughly 0-5 minutes). After four failed attempts, Blake finally appears to succeed in leading Adhir on what we describe as a "tour" of other exhibits in the gallery, indicated by their intertwined paths from approximately minutes 5-6.

Figure 2 below maps the physical movement of two other members of the Bluegrass Family, Blake's brother Jeans (green) and their sister Lily (yellow). The timeline display illustrates how Jeans and Lily move through the gallery space nearly always together (apart only during minutes 4-5).

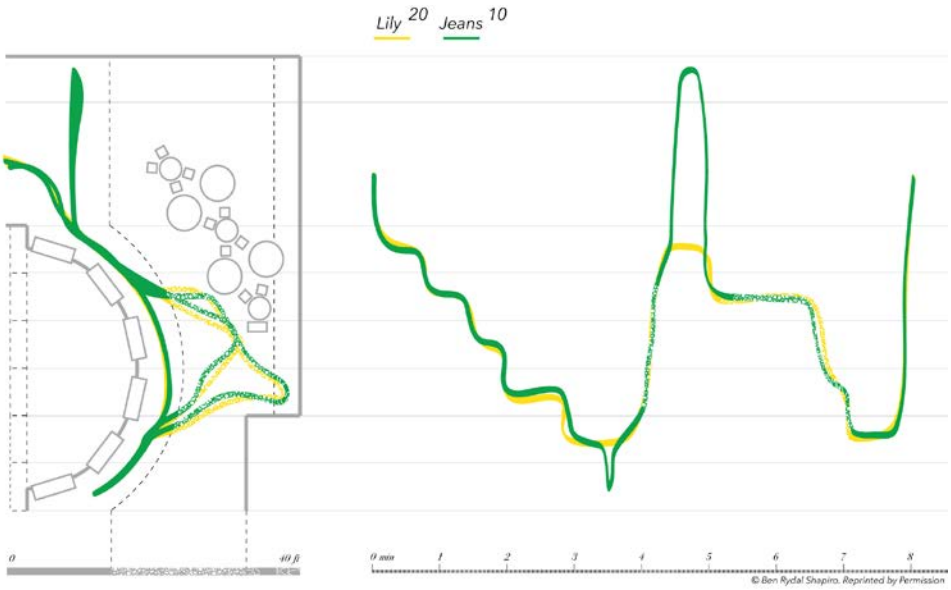

Figure 2. Jean's & Lily's mobility over space and space-time.
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Together, Figures 1 and 2 show how pairs within the Bluegrass Family move and engage with exhibits and one another in starkly different ways. While Blake produces a "recruitment" mobility pattern in response to Adhir's persistent pattern of "reverence" (e.g., he later explains his attachment to the troubles in Hank's life), Jeans and Lily produce an intertwined path that is similar to the "tour" mobility pattern later achieved between Blake and Adhir. On closer examination, all four young people and their paths are entangled in ways that allow: 1) Lily to soothe the emotions of Adhir (her fiancé), 2) Jeans to lead Blake away from the Hank Williams exhibit to give them privacy, and 3) Lily and Jeans (with help from Mom) to help Blake to succeed in "recruiting" Adhir to follow a tour. Blake's dramatic (blue) path is produced in relation to other members of the family, who eventually help him take Adhir on a tour of other musicians.

Figures 1 and 2 also demonstrate how the visible qualities (e.g., pace, duration, shape, distance) and relationships (e.g., intersections, weaving, splitting, proximity) among movement paths in Mondrian Transcripts support and deepen different analytical framings of engagement. For example, they provide a means to study how people engage by managing personal and social distance between family members (Hall, 1966). However, Mondrian Transcripts also demonstrate that these distances are not only interactional phenomena as traditionally conceived but are also related to the spatial layout of the gallery space. For example, Blake and Adhir's respective mobility patterns of recruitment and reverence are partly a response to the spatial location of the Hank Williams exhibit in relation to other artists in the gallery and how this sequence can be experienced as a path over time.

Figure 3 below extends the design of Mondrian Transcripts in a variety of ways. First, it maps the simultaneous physical movement of all five members of the Bluegrass Family (now including the mother in purple). Second, it similarly maps the Bluegrass Family's conversation. To do this, talk is transcribed using standard conventions of conversation analysis, colored by speaker, and organized in relation to physical movement through space and over time. Conversation "boxes" group topically related talk. Thicker boxes on the floor plan show repeated conversations in the same area of space.

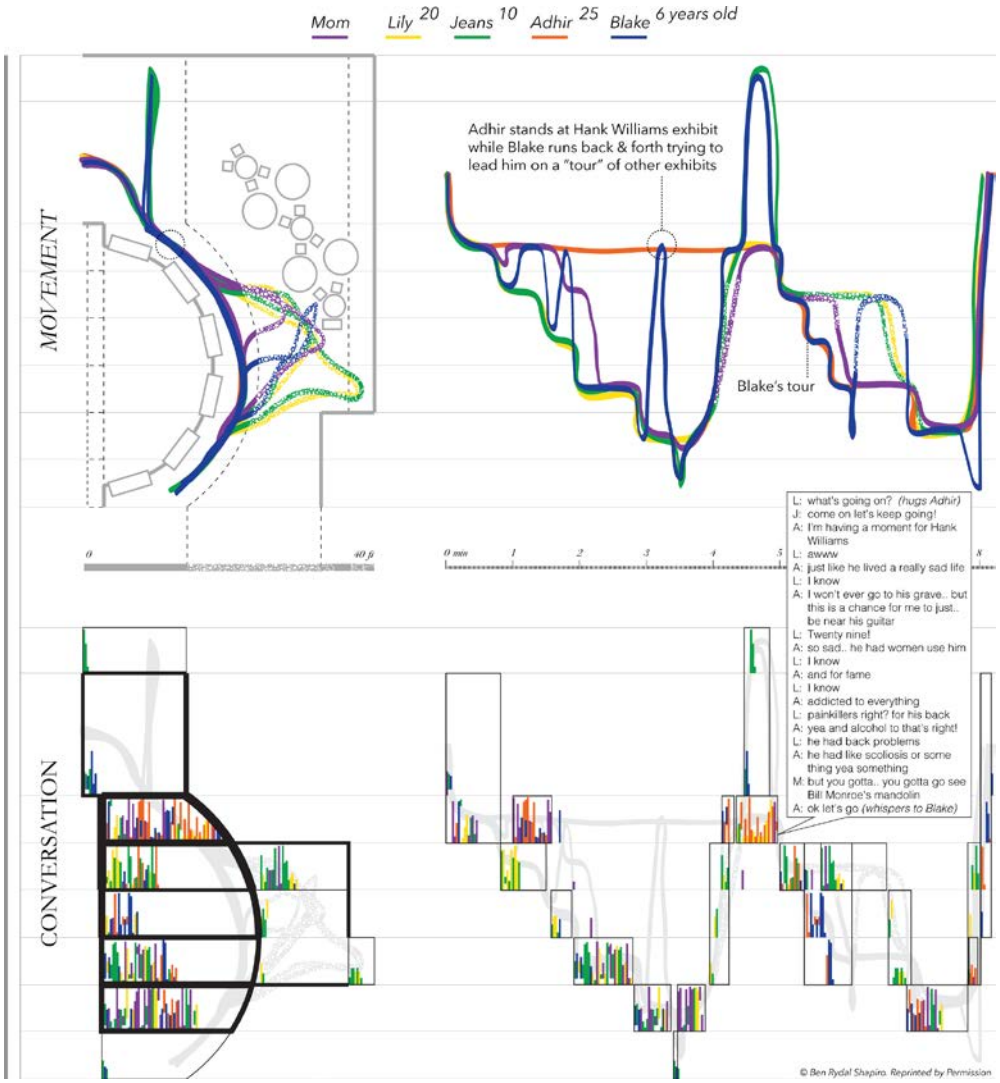

Figure 3. Mondrian Transcript of the Bluegrass Family's Interaction Geography.
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Figure 3 shows how the design of Mondrian Transcripts supports and deepens an understanding of engagement as both a response to the built environment and produced in interaction and mobility (Cleveland & Fisher, 2014). The Bluegrass Family's mobility shows how the family manages personal and social distance and likewise produces patterns of mobility that can be studied as a "meshwork" or as a form of "learning on the move" (Ingold, 2007; Taylor, 2013; Taylor & Hall, 2013). For example, the mother's mobility (named Mae) appears to "lag" behind other members of the family in a manner that could indicate she is overseeing and managing her family. Lagging patterns in space-time are common and in this case, indicate the need for closer analysis of Mae's mobility. In this example, closer analysis reveals how Mae often joins her family to make connections across exhibits for her children, thus helping to manage their engagement and learning. Additionally, the family's mobility and conversation illustrates how this family is intimately connected to one another as well as a particular semi-circular set of exhibits within the gallery space. Put another way, the family's mobility and conversation patterns show how the family selectively creates a "personally edited" (Lave et al., 1984; Ma & Munter, 2014) version of the gallery space that extends or elaborates the meaning of exhibits in ways relevant to the personal and social history of the Bluegrass Family.

Figure 3 also illustrates the embodied work of museum visitor groups that we call "engagement contours" (ECs). Engagement contours are comprised of topically bounded sequences of movement and talk that often repeat and accumulate over space and through time in relation to the physical environment and other

people. Engagement contours have a spatial and temporal footprint and are connected in ways that further the concept of "personal editing" as previously described. In Mondrian Transcripts, each visual box in the timeline display that bounds a set of intersecting movement paths and conversation indicates an engagement contour. Within engagement contours members of the Bluegrass Family arrange themselves in different types of interactional formations, similar to what (Kendon, 1990) calls "facing formations" and what (Marin, 2013) calls "ambulatory sequences". One result of this, as shown in Figure 3, is that repeated engagement contours in the same area of space accumulate to produce dense conversation "boxes" or "textures" on the floor plan. Another result is that things like "Blake's tour" become visible as forms of "place making" or "inhabitation" that are spatially and sequentially experienced in relation to the physical environment and other people. Thus, the concept of engagement contours furthers Marin's innovative efforts to begin to put Kendon's concept of a "facing formation" (e.g. how people spatially organize their bodies in interaction) into motion in studies of learning on the move (Taylor, 2013; Taylor & Hall, 2013). Moreover, it specifically theorizes engagement as both 1) a response to the built environment at different grain sizes (e.g. ECs can be studied at one exhibit or at the scale of a gallery space) and 2) produced through people's interaction and mobility. Research rarely considers both of these aspects of engagement simultaneously primarily due to methodological limitations.

Figure 4 below is a set of "small multiples" from the *Interaction Geography Slicer (IGS)* and further illustrates the kinds of comparative analysis that can be explored using Mondrian Transcripts. The figure compares the movement of four different families/groups in three different types of gallery spaces within the museum. Columns distinguish different families while rows distinguish different museum gallery spaces. All displayed information is set to the same spatial and temporal scales. The Taylor Swift Family did not visit the Hall of Fame Rotunda Gallery thus we substituted an image of the entire museum and superimposed the movement of all families in each gallery space.

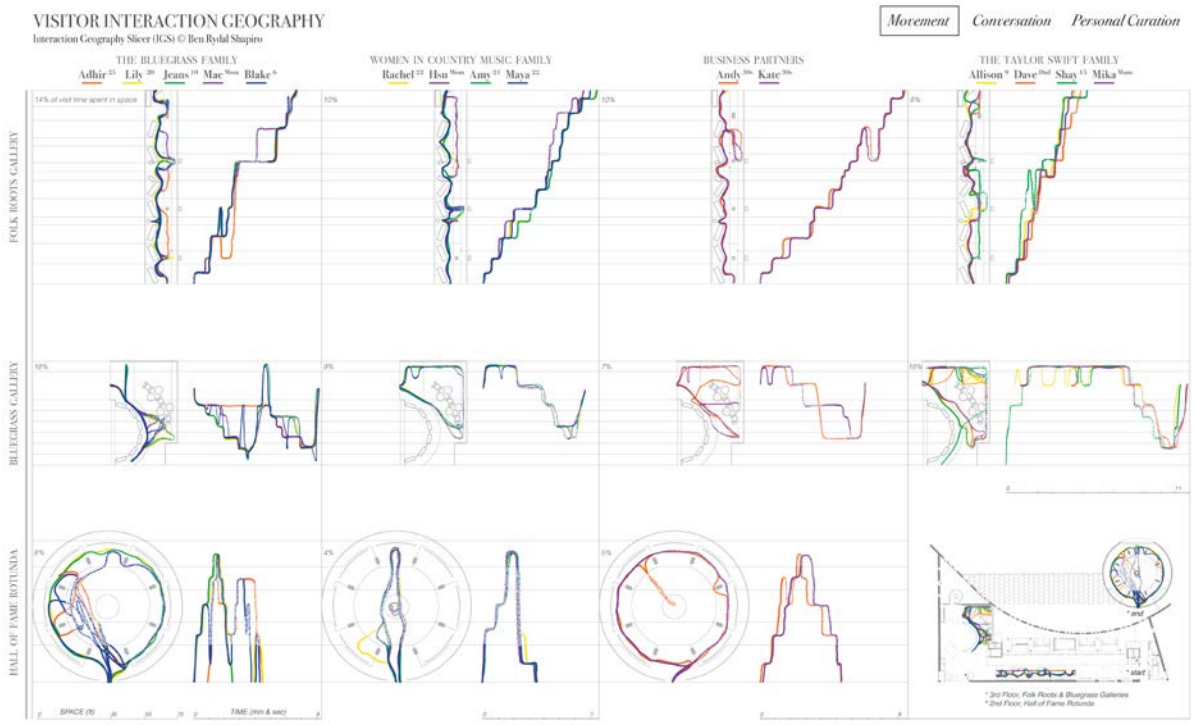

Figure 4. Small multiples of family mobility from Interaction Geography Slicer (IGS).
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Figure 4 illustrates broader use of Mondrian Transcripts in a variety of ways. First, it highlights similarities and differences in how engagement can be a response to the built environment. For example, for all groups the "Folk Roots Gallery" (a narrow, linear space) conditions particular linear ways of moving indicated by similarly sloped lines in space-time that rarely lead to repeated engagements. In contrast, the "Bluegrass Gallery" and "Hall of Fame Rotunda Gallery" (both open plan spaces with different supports for sequential engagement) promote a wide variety of movement patterns (in both space and space-time) and a great number of repeated engagements in some visitor groups.

Second, Figure 4 helps to further show how people and groups "personally edit" gallery spaces (Lave et al., 1984; Ma & Munter, 2014). For example, for those who know these gallery spaces (e.g., museum curators), it is immediately apparent that the Bluegrass Family primarily visits and spends time at exhibits that reflect content from Bluegrass and early Country Music, whereas the Women in Music Family engages with exhibits featuring female artists. Mondrian Transcripts provide a new means to conceptualize and visualize personal editing as processes of selecting and "making places" within the museum for group exchange and in ways that are driven by the personal and social history of individuals and groups.

Third, Figure 4 further illustrates how Mondrian Transcripts aim to meet provocations to develop a "graphic anthropology" to study meshworks of mobility (Ingold, 2007). In particular, Figure 4 shows how Mondrian Transcripts make processes by which visitor groups come together and split apart (e.g. meshworking) visible as a form of space-time mobility and how these can vary across visitor groups and gallery spaces. Mondrian Transcripts cannot tell us what goes on inside these meshworks, but they do draw our attention to moments and places of potential importance where, in this work, multi-party engagement with museum exhibits and their content rises and falls over space and through time.

Lastly, Figure 4 begins to demonstrate a developing space-time vocabulary of what we call "interaction geography" (Shapiro & Hall, 2017) that draws from both established "constraints" paradigms and emerging "new mobilities" paradigms in human geography (Hagerstrand, 1970; Sheller & Urry, 2006; Cresswell, 2010). For example, the Bluegrass and Women in Country Music Families illustrate significant variation in family "path braiding" (e.g., the pace and spatial density of engagement contours). In comparison, the Business Partner's movement within the Hall of Fame Rotunda Gallery shows a lagged pattern of "path following", in which Cindy follows Andy's movement closely, but almost always trails about one minute behind. Likewise, across visitor groups, sharp "cuts" in space-time typically indicate young children who are running between family formations or trying to draw adults to other parts of the museum.

Using Mondrian Transcripts to extend professional vision

We now shift our focus to describing how we used a dynamic visualization environment that allows for multi-modal analysis of Mondrian Transcripts, which we call the *Interaction Geography Slicer (IGS)* (Shapiro & Hall, 2017), during a professional development and design session with museum professionals at this museum.

Two *starting points* informed our design. First, visitor learning is not the primary focus of this museum's design departments (e.g., they primarily design exhibits, marketing campaigns, and social media presence). For example, museum educators see their mission as "fitting" learning programs to museum content and exhibits after these have been designed/built. Second, as in any museum organization (Schauble et al., 1997), departments within the museum possess what we describe as an idealized view or model of their visitors. For example, there is a prevalent view across all departments that museum exhibits are a fixed curriculum that visitors succeed or fail to understand as opposed to a view of visitor engagement and interaction as an "enacted curriculum", where learning is in the hands of visitors (Crowley & Jacobs, 2002; Louw & Crowley, 2013).

Our *design goals* were thus: 1) to provide methods and concepts to bring a more expansive view of learning to museum professionals and 2) to challenge with empirical cases the "idealized" view of gallery spaces and museum visitors described above. Our long-term goal, shared with our partners at the museum, is to identify opportunities for designing more equitable, expansive and productive learning in museum gallery spaces. Bringing learning sciences and museum design together is a promising but challenging design space.

In a half day workshop with 15 museum professionals, we used Mondrian Transcripts within the Interaction Geography Slicer (IGS) to help create an environment for joint exploration and discussion of what 4 different visitor families/groups were doing in 3 different gallery spaces (e.g., the visitor groups shown in Figure 4). The IGS allowed museum professionals to use Mondrian Transcripts as a means to study in highly interactive ways visitor's movement, conversation and what we call "personal curation" (e.g. people's use of personal information devices to capture, edit and share exhibit content during their visit). Moreover, the IGS also synced transcript and audio and video data from multiple-perspectives (e.g. from cameras worn by each visitor within a group) to each visitor's movement, conversation and personal curation as visualized in Mondrian Transcripts. Thus, museum professionals could study a visitor group's mobility, switch seamlessly to study their conversation and personal curation, isolate particular members of that visitor group, isolate particular regions of space and sequences of time during their visit, read transcript (e.g. what people were saying) and listen/watch audio and video from the perspective of each family member. Figure 5 below provides a snapshot from the session of museum professionals using the IGS to study the Bluegrass Family as previously described. The bottom right image in the figure displays video (from a camera worn by Lily) selected by a museum curator at a point in space and time when the family is gathered together at an exhibit dedicated to Maybelle Carter.

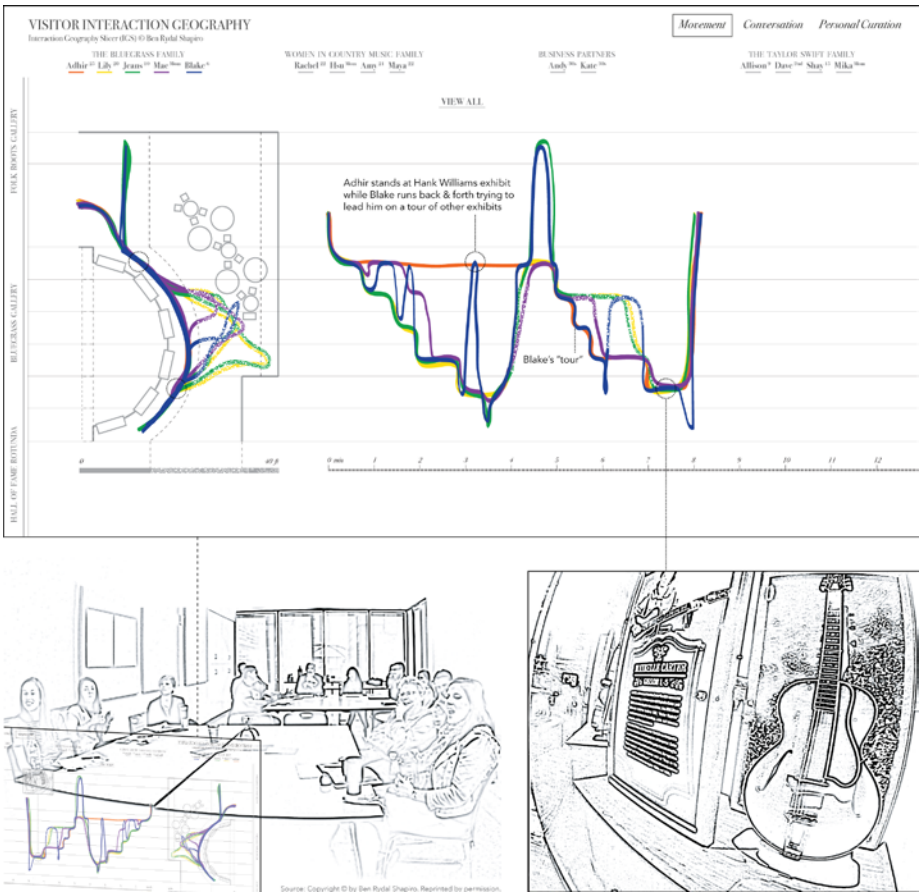

Figure 5. Museum Professionals using the Interaction Geography Slicer (IGS) to study the Bluegrass Family. *Source: Copyright © by Ben Rydal Shapiro. Reprinted by permission.*

One of the more powerful sequences during the workshop was one that triggered a dramatic shift in professional vision (Goodwin, 1994) among lead designers and educators regarding the movement and experiences of Blake from the Bluegrass Family. When museum professionals first saw Blake's highly mobile paths, as previously described, few believed that he could possibly be learning. Some expressed concern that his seemingly erratic mobility might even be undermining the intended design of exhibits by distracting other members of his family during their museum visit. However, the workshop provided numerous opportunities for museum professionals to unpack Blake's (and other young children's) mobility patterns as a form of learning on the move. For example, in addition to confronting Blake's "tour", museum professionals studied how in one gallery space Blake, after failing to get an adequate answer to a question he asked from Adhir, ran to another gallery space across the museum to find and get an adequate answer from his brother Jeans only to run back across the museum once again to deliver his "found" answer to Adhir in the original gallery space. By the end of the workshop, museum professionals were studying and asking questions about Blake's (and other young children's) mobility that demonstrated an understanding that young children's seemingly erratic patterns of mobility could be quite intentional efforts to engage and learn and were also opportunities for learning design. There were even jokes about hiring Blake as a museum ambassador for bluegrass music.

While there is not space to present further empirical material in this paper, we believe that exploring Mondrian Transcripts with the Interaction Geography Slicer (IGS) allowed museum professionals to see their visitors in new ways and to challenge idealized models of museum visitors as relatively passive consumers of intended design in ways that were previously impossible. Likewise, this work supported conversations between museum professionals that rarely occur. As one museum educator described in the post-survey, "I recall the productive cross-department conversation about visitor behavior, engagement, learning. We seldom (never?) have the opportunity to discuss visitor experience in the gallery—with our content—across departments. I also enjoyed and benefited from the visitor conversations in relation to specific space and artifacts—good to "see" the exhibit through their eyes and mind rather than assume their view, takeaways, paths, etc.".

Conclusion and next steps

Current and future work continues to develop and address inherent limitations in this early work in order to a) advance Mondrian Transcripts (theoretically and computationally) for use by others working in a variety of settings and at different scales (e.g., schools, neighborhoods, cities) and b) use Mondrian Transcripts to support professional development and new design practices. While illustrated with data from a museum, these methods and concepts are quite general purpose and may provide new possibilities for research and learning designs that consider space, learning and mobility.

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