

Making digital choreographic objects interrelate

A focus on coding practices

SCOTT deLAHUNTA AND FLORIAN JENETT

Dance is a field of artistic practice(s) commonly associated with bodily movements and with the concept of a choreographer making certain kinds of decisions about where and when these movements will be performed in front of an audience on a stage. There is plentiful evidence for this understanding of dance even though there is little consensus within the field itself about things like the physical training of dancers, the education of choreographers or even if choreography needs to include dancers. Still a large part of the dance field pays deep attention to human movement and a host of associated and evolving practices experienced through and with movement. And as with experience, dance can be understood as something continuous, ephemeral, i.e. disappearing from moment-to-moment and difficult if not impossible to document. However, this conception of dance as impossible to document has been thoroughly challenged, first by artists and then scholars exploring how ideas and concepts occurring in movement and in choreographic creation can be recorded, analysed and shared. Instead of focusing on ideas about movement or about dances, these approaches have concentrated on forms of logic occurring intrinsically in movement and movement making. Results of this research have been and continue to be published for further study and engagement, testing the impact such “choreographic ideas” might have on the world outside of the rehearsal studio (cf. deLahunta 2013).

In the discussion to follow, we will draw attention to some dance artists who have been amongst the first to explore alternative approaches to the documentation and transmission of movement ideas. The relevance for digital cultures is that these artists and their collaborators embraced digital media as the most effective means of doing this work, to render the “complex spatial-corporeal-

temporal relationships involved in dance [...] visible, accessible and comprehensible to a reader” (deLahunta 2013: 174). We will show how this basic interest on the part of choreographers in using digital media tools has developed in parallel with other evolutions in human-computer relations.

The examples of digital dance documentation we will refer to in this chapter come under the heading of *Choreographic Objects*, the title of a series of workshops organised in 2008-2009 centring on the output of four research teams working in collaboration with the well-known choreographers William Forsythe, Siobhan Davies, Wayne McGregor and Emio Greco | PC.¹ These teams were working to bring choreographic ideas and processes into newly productive exchanges with both general audiences and other specialist knowledge areas. The digital resources developed to mediate this exchange included interactive scores and installations, choreographic software agents and digital dance archives. “Created with the intention to articulate and disseminate choreographic thought” (Blades 2015: 26), these resources constituted the *choreographic objects* that were the focus of the workshops.

Seen from this perspective, the concept of *choreographic objects* can be used to frame other projects seeking to document and disseminate the unique working procedures of renowned dance artists. Some of these *choreographic objects* once published, e.g. William Forsythe’s “Improvisation Technologies” or Anne Teresa de Keersmaeker’s “A Choreographer’s Score”, have been subject to much further analysis and study. Conceived of as the beginnings of a “new form of dance literature” (Groves et al. 2007: 91), they have been valued for their potential educational benefit, as a reference for interdisciplinary research, discussed critically by performance scholars and taken as a stimulus for other artists and designers. This chapter intends to pose a new question about these *choreographic objects*. As information abstracted from the corporeal, digitised and now existing as computable data, can they still best be thought of as capturing and communicating the unique approaches of individual artists? Does the condition of being data suggest an even more fundamental change to the ways in which we think about the nature of *choreographic objects*? They have already been studied in their own right as a partial basis for a new philosophy of movement (cf. Portanova 2013; Sutil 2015). Should they be re-considered as they enter the datasphere as *digital objects*, more in line with the ideas of digital philosophers and researchers?

We will use the application, practice and function of annotation to explore the connection between *choreographic objects* and *digital objects*. There are

1 Cf. <http://projects.beyondtext.ac.uk/choreographicobjects>

three perspectives on annotation to pay attention to; 1) as a means of communicating principles of movement or choreographic practice which we will refer to as ‘annotation for representation’; 2) as a practice of coding audiovisual media when studying human movement behaviour which we call ‘coding annotation’; and 3) when the function of annotation is to assist machine-based information processing or interoperability, or ‘computable annotation’. It should become clear that ‘coding annotation’ has particular relevance because of the practice of annotating as a way of thinking about time-based phenomena.

INTEROPERABILITY

In May 2015, Yuk Hui and Simon Worthington convened a workshop at Leuphana University Lüneburg titled *Future for the Annotation of Digital Objects* to explore “new conceptualisations and practices of annotation” of *digital objects* with a critical focus on the limits of technical annotation standards and systems developed mainly to assist machine-based information processing or interoperability on the Web (cf. Hui/Worthington 2015). Many who are not directly involved in creating or studying such annotation standards and systems will not be aware of the scope of this development. And the stakes are high when it comes to creating tools individuals can use to annotate and index text, audio and visual materials on the Web in ways that will harness the power of interoperability; that is having the capacity for linking and sharing, being tracked back to origins, stored and searchable.² Hui’s concept of *digital objects* draws on the thinking of philosophers of technology like Gilbert Simondon and Bernard Stiegler to elaborate on a new direction of investigation that is concerned with the “relationality between the object” which has been digitised and its programmable milieu comprised of data networks (cf. Hui 2012: 390). Materials such as YouTube videos and Flickr images, are the digital objects to which Hui refers, “composed

-
- 2 Organisations involved in developing annotation tools for users include venture capital supported start-ups such as Genius (<http://genius.com/web-annotator>) with an initial investment of \$15 million dollars in 2012, higher education coalitions supporting interoperable web annotation like Hypothes.is (<https://hypothes.is/annotating-all-knowledge>) and online scholarly publishing initiatives such as Scalar (<http://scalar.usc.edu/scalar>), funded by the Andrew W. Mellon Foundation and National Endowment for the Humanities. Technology providers have sprung up around European research projects such as Europeana, a major digital platform for cultural heritage that uses PUNDIT, a web annotation tool developed by NET7.

of data and formalised by schemes or ontologies that one can generalise as metadata” (Hui 2012: 380).

The World Wide Web Consortium (W3C), the main organisation developing open standards for ensuring “the long-term growth of the Web”³, first began its work on annotation soon following the advent of the Semantic Web in the late 1990s. This included work on *Annotea*, a user focused project that appears to have run from 1999-2003 aiming to enhance collaboration by making it possible to attach comments to a Web document.⁴ Another project was the Open Annotation Collaboration (OAC) project that ran in three phases from 2009-2013.⁵ In its Guiding Principles, the OAC states that its efforts are to “allow the sharing of annotations across clients, servers, and applications. It will not, in any way, prescribe user interfaces” (OAC 2013). In other words, the OAC was set up to establish a standards framework for getting computers and programs to reliably talk to other computers and programs across the Internet, and many current projects base their systems in the OAC framework (see Footnote 2). Since 2014, it appears these two branches have merged as the World Wide Web Consortium (W3C) has a new working group dedicated to developing a specification for a decentralised and open annotation infrastructure “as a new layer of interactivity and linking on top of the Web. It will allow anyone to annotate anything anywhere” (W3C 2016).⁶

CODING, OBSERVATION AND THEORY

We turn briefly now to annotation software designed for the systematic study and annotation of audiovisual (audio-video) media for the purpose of scientific research. Specifically, we will look at multi-modal annotation tools designed to flexibly accommodate a range of various user-defined coding schemes used by researchers studying phenomena such as modes of human or animal communication, behaviour and social interaction.⁷ Coding in this context does not refer to computationally interacting with a corpus of digitised material, but to classifica-

3 Cf. <https://www.w3.org/>

4 Cf. <https://www.w3.org/2001/Annotea>

5 Cf. <http://www.openannotation.org/about.html>

6 Cf. <https://www.w3.org/annotation>

7 Two of the more popular and widely used of these tools are ELAN and ANVIL: Cf. <https://tla.mpi.nl/tools/tla-tools/elan/elan-description>) and <http://www.anvil-software.org>

tion systems derived from conceptual taxonomical frameworks corresponding to specialised theories and approaches, e.g. from studies of distributed cognition or psycholinguistics. This means the tools are designed as well as chosen accordingly “against the background of specific theoretical assumptions” (Rohlfing et al 2006: 122). The tool’s designer optimises for a limited range of these theoretical possibilities by, for example, supporting two different annotation procedures referred to by Michael Kipp, the creator of ANVIL, one of the more popular existing tools, as top-down or bottom-up coding. This is a way of expressing the different approaches the researcher who might use for coding or annotating the recording of behavior in question in ANVIL. Top down refers to higher-level concepts with bottom-up referring to the annotating of smaller units, with both procedures usually meeting in the middle in practice. For example, a study of gestures might involve the researcher coding from bottom up the “so-called gesture phases (preparation, stroke, hold, retraction) and then encode the actual gesture” (Kipp 2014: 429). But this does not say much about the depth of knowledge and methodological approaches the expert researcher brings to the study. In 2006, a widely cited workshop report comparing multimodal annotation tools made it clear that the choice for a specific software tool meant not only comparing the available programs. It also meant evaluating what the gain would be over low tech, perhaps more stable ‘traditional’ tools for data collection and analysis (cf. Rohlfing et al. 2006).

These software tools have emerged from the field of study they are intended to be used for and are often developed by an individual or small team for non-commercial research purposes (e.g. ANVIL is free to download and use). This is an extreme contrast with the efforts to ‘annotate the web’ described above, not only in terms of scale, but also technically. For example, a section on ‘interoperability’ in a 2014 report by Kipp still refers mainly to the possibility of importing and exporting datasets in formats readable in other software (cf. Kipp 2014). However, these tools do correspond to the development of *choreographic objects* in that they focus on the documentation and analysis or coding of time-based phenomena for the purpose of deepening understanding of a range of human activities. There are contrasts here with dance as an artistic practice, but it is not that an artistic practice does not come with a set of assumptions and methods, and it is not that process in the sciences is any more or less subjective than in the arts. But arts practice is not accustomed to nesting its assumptions in quite the same way in relation to what is valued as the outcome of its process. The particular kind of instability this gives rise to means that a more or less general coding scheme does not have the same status or value for arts practice as it might for science practice. Although a dance notation system like Laban or Benesh can be

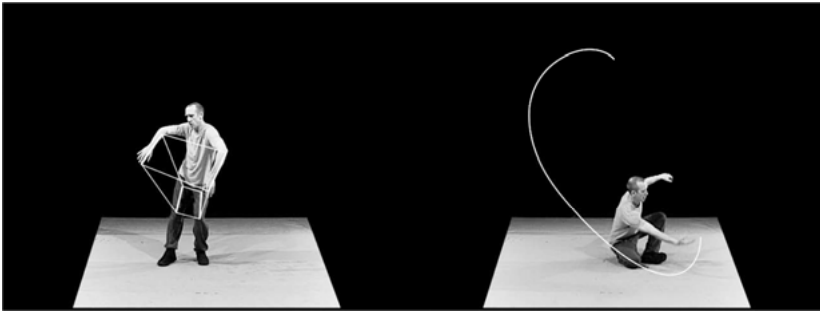
used as a kind of coding scheme, in practice these existing systems are not in general use (as compared to music notation) for a variety of reasons. However, we can annotatively subject dance to the top down and bottom up encodings of science researchers, and some collaborative inter-disciplinary work has been done in this area, e.g. a linguistics analysis of the semiotics of dance performance and a study of distributed cognition in the context of dance creation (cf. Kirsh et al. 2009; Fernandes/Jürgens 2013). In any case, what will become important for our discussion here is the process of annotation itself, the labour involved in the close study of human activity, in our case in the context of choreographic and dance practice, and the nature of the coding involved.

CHOREOGRAPHIC OBJECTS TO DIGITAL OBJECTS

The examples that follow are drawn from three projects developed by or in close collaboration with the choreographers, William Forsythe and Deborah Hay. As a reminder, there are three perspectives on annotation to pay attention to; 1) as a means of communicating principles of movement or choreographic practice [annotation for representation]; 2) an approach to coding the audiovisual media [coding annotation]; and 3) to assist machine-based information processing [computable annotation].

Motivated by a need to quickly transmit principles of improvisation he had developed with his company Ballet Frankfurt in the 1980s, William Forsythe turned to digital multi-media. Beginning development in collaboration with the Center for Art and Media Karlsruhe (ZKM) in the early 1990s as a training platform for the company, earlier versions included recordings of performance works from several angles alongside short lectures from Forsythe augmented by “graphic overlays” or video annotation (Ziegler 2007: 34). After several iterations a version was published in 1999 as a CD-ROM under the title *Improvisation Technologies: a tool for the analytical dance eye* (Forsythe 1999). The annotations are drawn directly on top of a video image of Forsythe performing demonstrations of these principles for the camera (Figure 1). The result is a collection of nearly 65 short demonstrations most using this form of annotation to show movement paths and map out “spatial relationships in and around his body” (Groves 2007: 92). This combination of movement demonstration, verbal description and annotation draws out movement ideas and makes them explicit. It also entangles the idea in a composite form of communication, which through simultaneous demarcation shows how conceptual or mental parameters can shape the force and trajectory of a movement.

Figure 1: Screenshots from Williams Forsythe's CD-ROM *Improvisation Technologies*



Credit: William Forsythe, Nik Haffner, Christian Ziegler, Volker Kuchelmeister, Yvonne Mohr, Astrid Sommer, ZKM/Zentrum für Kunst und Medientechnologie, Karlsruhe, Deutsches Tanzarchiv Köln/SK Stiftung Kultur.

At the time of its development, this *choreographic object* was not thought of in terms of computational data, even though some of Forsythe's compositional ideas drew on the concept of "recursive algorithms [...] fixed variations that we created through a long, painstaking process, not unlike that of computer programming" (Forsythe/Kaiser 1999: 68). The naming and organisation of the principles of improvisation themselves would have occurred in the practice, in the rehearsal studio, some time before they were transposed to the multi-media environment of the CD-ROM. For the design and development of this environment, these names would become a fixed classification or coding system that enabled cross-referencing between Forsythe's short demonstrations and video of three of his dancers using the principles. Watching one of these videos, the specific principle in use at any one time shows up on the timeline as an 'clickable' annotation. Here the background of assumptions and methods that bring the coding and annotations together into meaningful relationships correspond to a theory of movement generation associated with a single artist.

While all the audiovisual material published on the CD-ROM was digitised and programmed in Macromedia Director, as already written this particular *choreographic object* was not thought of in terms of computational data. In part this had to do with the time, the Web was in its relative infancy and it was the "multi-media era" according to Geert Lovink, Founder of The Institute of Networked Cultures. In an interview on the history of the CD-ROM in the arts, Lovink states that "the central desire of CD-ROMs was to blow up traditional forms of navigation", but the weakness of the CD-ROM was that it was "a closed envi-

ronment, a data monade” (Lovink 2015). Despite the definite limitations this presents for re-imagining this particular *choreographic object* as a *digital object*, the reason for including it in our discussions here, in addition to the observations on coding and annotation above, is because of the successful precedent it set in showing how a unique set of principles of movement in dance could be effectively elucidated using computer-aided design. *Improvisation Technologies* was also the inspiration for the next example in our list.

In 2005, Forsythe embarked on another project using video annotation this time to elucidate principles of choreography with the aim of helping audiences perceive the organisational structures in a dance he had choreographed in 2000 titled *One Flat Thing, reproduced*. In collaboration with Norah Zuniga Shaw and Maria Palazzi from The Ohio University and a team of designers, animators and researchers, the project was developed over a period of four years eventually launching on-line in April 2009 with the title *Synchronous Objects for One Flat Thing, reproduced*.⁸ Video annotation for representation is used extensively throughout the website, not only to draw attention to two key choreographic structuring components, the cueing and alignment systems (Figures 2 & 3), but also as a part of instructional videos. This project embraced the concept of computational data, largely through deriving calculable evidence from a close analysis, coding and annotation of the high-definition digital video shot of the dance from the front and above. In an essay titled *Dance, Data, Objects*, Shaw and Palazzi explain this process of developing the ‘spatial’ and ‘attribute’ data that was used to generate the variety of Objects that exist on their website. Much of this work was manual, either “built from the dancers’ first hand accounts” of the choreographic structure, indexing their responses as attribute data into an Excel file or through the animators painstakingly selecting “pixel points on each dancer in both the top and front views of the source video” to generate the spatial data (Zuniga Shaw/Palazzi 2009). Zuniga Shaw writes, “The process of decoding OFTr was a creative dialog that dilated between insider accounts and outside observation, analytical needs and aesthetic interests” (ibid.: n. pag.).

8 Cf. <http://synchronousobjects.osu.edu>

Figure 2: Form Flow. Still from annotated video illustrating alignments, the way in which Forsythe designs relationships in space and time



Credit: Synchronous Objects Project, The Ohio State University and The Forsythe Company.

Figure 3 Cueing System. Still from annotated video illustrating the complex system of cueing in One Flat Thing, reproduced



Credit: Synchronous Objects Project, The Ohio State University and The Forsythe Company.

This coding of audiovisual media involved close and extensive observation work by domain experts, dance practitioners, dance researchers and assorted animators and designers who themselves became expert observers over time. This is where the process of annotation itself, for the purposes of our discussion here, as ‘coding annotation’, focuses on the labour involved in the close study of human activity and how this process produces computable data. And, in the case of *Synchronous Objects*, this data when digitally re-materialised, for example as abstract animations on the website, could be said to represent different aspects of the choreography while appearing in forms that no longer look like the dance entity *One Flat Thing, reproduced*. As there are no longer dancers directly involved, this becomes choreographic thinking or movement knowledge that exists in the absence of bodies, and Forsythe, Portanova and others have both proposed different kinds of arguments in this direction, suggesting something other than a translation or symbolic representation (as with dance notation) of information is going on (cf. Forsythe 2012; Portanova 2013).

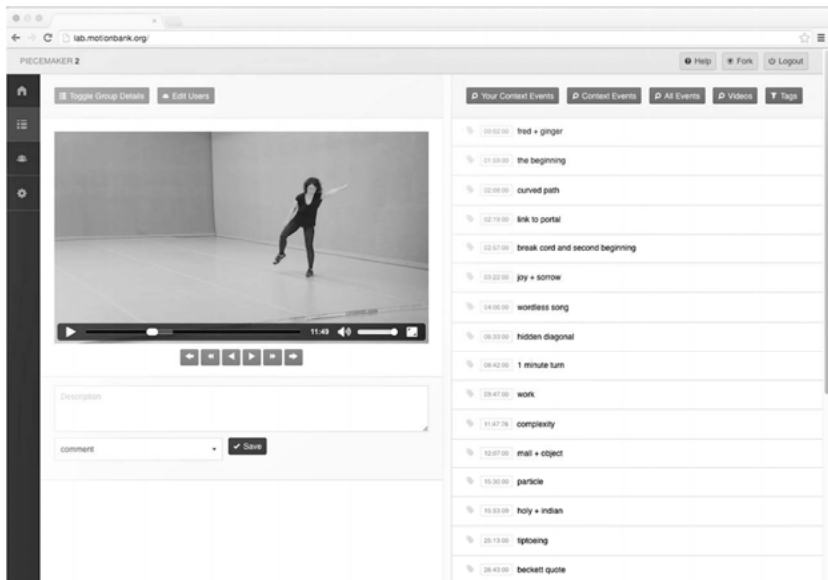
Synchronous Objects for One Flat Thing, reproduced certainly succeeds as a *choreographic object*. It has evidentially brought choreographic ideas and processes into newly productive exchanges with both general audiences and other specialist knowledge areas. And because the provenance of these ideas, the body/ not the body, has been challenged through computation the results of this project start to take on the shape of something with the potential of Hui’s *digital objects*. But here is where we can apply the distinction Hui made between two processes, 1) the ‘datafication of objects’, which corresponds to the coding and data work done on the dance entity *One Flat Thing, reproduced*, and 2) the ‘objectification of data’, which refers to the corresponding computational entity, comprised of data and metadata, for which every move is ‘conditioned by its technical milieu’ (Hui 2012: 389). For the purposes of our discussion here and referring back to the above paragraph, this milieu is the network running between machines and other programmes, it is the Web. In this way, *Synchronous Objects* presents us with something that is not quite yet a *digital object*. But it is moving toward that possibility.

In 2010, Motion Bank a research project of The Forsythe Company was inaugurated in Frankfurt, Germany to explore further what computation could bring to the process of creating *choreographic objects*. With significant support from a variety of funders including the German Federal Cultural Foundation, the project was designed to run in its first phase for four years. The Motion Bank core team emphasized digitization as an “integral part of Motion Bank from the start” (Cramer et al. 2015) and designed recording setups to ensure that everything captured could be available to computation. All recording situations were

installed and calibrated to allow for as little ‘noise’ as possible so software algorithms might help extract features and recognize relevant patterns in the data. This was combined with the use of an annotation tool called Piecemaker, a software that assists in scoring video recordings of dance and sharing this information with others. Piecemaker was initiated as a research project by The Forsythe Company member David Kern to support the organisation and recall of materials created by Forsythe and his performers in the rehearsal studio. Thinking back to the coding practices of scientists making close observations of human activity and using coding annotation software like ANVIL, Forsythe’s rehearsal constitutes an activity for which Kern was developing a tool corresponding to ‘domain expertise’ in dance.

In the context of Motion Bank, this software was reprogrammed for use in the development of its on-line digital scores with selected guest choreographers and as a standalone tool for use in the studio. (Figure 4) Using this software renamed Piecemaker2 (PM2), annotation sets or markers could easily be related and provide access to multiple versions of the same event (e.g. video, audio, motion capture, scores, etc.). This enabled building connections that could generate useful representations both during and post-annotation. As with the *Synchronous Objects* project, the quantification of the dances of the Motion Bank guest artists into data involved a combination of computational and manual work. This meant often many hours of computer based video processing, for example to subtract the background of the image leaving only the silhouettes of the performers; alongside watching the same video for nearly as many hours in order to annotate and describe time based events the computer would not be able to recognize on its own.

Figure 4: Piecemaker2 (PM2) annotation software. Based on Piecemaker originally developed by David Kern, The Forsythe Company



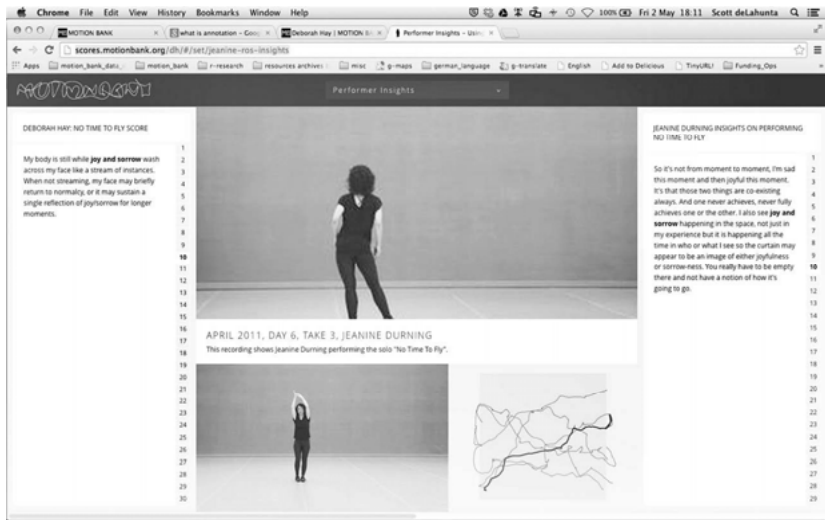
Credit: Reprogrammed by Motion Bank. Screenshot: Florian Jenett. On Video: Jeanine Durning performing her adaptation of *No Time to Fly* by Deborah Hay.

The specific example of how this coding annotation was used in (Figure 5) is drawn from the Motion Bank project with the choreographer Deborah Hay from the website *Using the Sky*⁹, which is based on her existing solo *No Time to Fly* (2010). *No Time to Fly* has a written score, which the performers Jeanine Durning, Juliette Mapp and Ros Warby were each invited to adapt as an individual solo. These solo adaptations were each filmed seven times and this material provides the main recorded data for the web publication. The site also takes the score for the website's 'tempo', and the 29 sections of the score are aligned with the video recordings. One part of the website, visible in Figure 4, is based on Performer Insights. This gives the reader a chance to view a solo adaptation alongside the score and a running commentary of the performer; also functioning as 'annotation for representation'. Hay's score does not offer the performer precise movement instructions, so this commentary gives the reader insight into

9 Cf. <http://scores.motionbank.org/dh>

how the written score is translated into movement by the performers. Hay would refer to this as when the “body encounters language” in her work (Hay 2013).

Figure 5: Performer Insights. Using the Sky. An online score of Deborah Hay’s work No Time to Fly



Credit: Motion Bank. On Video: Jeanine Durning performing her adaptation of *No Time to Fly* by Deborah Hay.

This description of the Performer Insights screenshot indicates the ways in which the coding [annotation] of the audiovisual material was similar to the coding [annotation] work done on *Synchronous Objects*. It involved extensive observation work by domain experts, dance practitioners, researchers coming together with the acquired dance expertise of the creative coders and computer scientists working on the project. As with *Synchronous Objects*, this coding work was essential for creating the website *Using the Sky* which aims to draw attention to and elucidate aspects of Deborah Hay’s choreographic approach. In this sense, the coding annotations themselves remain “hidden to the viewer” (Blades 2015: 29); in the same way as the information in the Excel files in the archives of the *Synchronous Objects* project is hidden. It is worth mentioning that there are no annotations drawn on top of the recorded digital video because Deborah Hay’s specific choreographic approach resisted such visual representations. In this sense, the published result clearly strengthens the class of things we have been describing as *choreographic objects*, as it corresponds to the idea that what is

specific about Hay's approach, her choreographic ideas and processes, can be communicated via a unique *choreographic object*.

However, unlike the previous *choreographic object* projects, a cluster of new developments occurred with Motion Bank. Firstly, a new annotation tool, in ways similar to ANVIL, has emerged from the dance field. Secondly, a general set of annotation principles has been articulated that draws attention to time over the recording of image or sound (cf. Jenett 2015). Thirdly, this conception of time as the core axis of organisation has a uniquely digital dimension to it. It is part of both the data and the metadata of these objects and starts to clarify the transition from *choreographic object* to *digital object*.

ANNOTATION FINDS ITS PLACE

Our goal in writing this has been to work through some ideas about how annotation in the creation of *choreographic objects*, as emergent from the artistic practice of dance, comes into contact with the kinds of annotation efforts demonstrated not only by the W3C initiatives described above in our second paragraph, but also by projects such as Genius, Hypothes.is and PUNDIT (see Footnote 2) which were all in attendance at the fourth iAnnotate Symposium in May 2016 in Berlin.¹⁰ iAnnotate's inaugural meeting in 2013 posted the following on their homepage: *Building a community to enable the annotation of the world's knowledge*. We can avoid this hyperbole, but we can't avoid the changes brought about by digital technologies, and how we are increasingly woven into the "media-intensive milieu comprising networks, images, sounds, and text, which we generalise as data and metadata" (Hui 2012: 380).

Hui and Worthington embed this phrase in the description of their 2015 workshop *Future for the Annotation of Digital Objects*:

"Annotation finds its place, not only in the sense of assisting information processing and enhancing the searchability of digital objects [...], but also as interaction and concretisation of relations between the users and the objects with which they interact." (Hui/Worthington 2015)

We would make a further proposal for the practice of annotation as a way of thinking that builds relations with and extends upon a background of 'domain

10 Cf. <http://iannotate.org/2016/>

expertise', whether that is artistic, scientific or scholarly, in time-based phenomena such as dance.

So far, we have discussed three kinds of annotation that go into the creation of *choreographic objects*: 'annotation for representation' as in drawing on top of video, 'coding annotation' or the practice of analysing audiovisual media, and 'computable annotation' to assist machine-based information processing. And we looked at the connection between our notion of *choreographic objects* and Hui's notion of *digital objects* as a way of distinguishing and investigating these modes and their various potentials more philosophically. It was our intention here to start a discussion we expect to continue as more dance documentation and digitisation projects come on-line, and we build on our choreographic coding projects to make intersections with data-driven research with various other fields.¹¹ One parting observation: as research becomes more "subsumed under calculation" (Hui 2012: 390) the expertise, skills and intuitions human activity researchers bring and use to recognise and code phenomena (annotation as a way of thinking) whether in dance or ethnographic work, will increasingly be fused with algorithmic procedures.

REFERENCES

- Blades, Hetty (2015): "Affective Traces in Virtual Spaces: Annotation and emerging dance scores." In: *Performance Research* 20/6, pp. 26-34.
- Cramer, Franz Anton/Jenett, Florian/deLahunta, Scott (2015): "A Conversation on Motion Bank." In: Barbara Büscher/Franz Anton Cramer (eds.), *MAP* (media archive performance), May 27, 2016 (<http://www.performap.de/map6/medien-und-verfahren-des-aufzeichnens/a-conversation-on-motion-bank>)
- De Keersmaeker, Anne Theresa/Cvejić, Bojana (2012): *A Choreographer's Score*, Brussels: Mercatorfonds.
- deLahunta, Scott (2013): "Publishing choreographic ideas: discourse from practice." In: Mick Wilson/Schelte van Ruiten, (eds): *SHARE: Handbook for Artistic Research Education*, ELIA: Amsterdam, pp. 170-177.
- Fernandes, Carla/Jürgens, Stephan (2013): "Video annotation in the TKB project: linguistics meets choreography meets technology." In: *International Journal of Performance Arts & Digital Media* 9/1, pp. 113-132.
- Forsythe, William (1999): *Improvisation Technologies: A Tool for the Analytical Dance Eye*, Karlsruhe: Hatje Cantz Verlag.

11 Cf. <http://choreographiccoding.org>

- Forsythe, William (2012): "William Forsythe discusses synchronous objects as choreographic objects." In: YouTube Channel of ACCAD at Ohio State University, May 27, 2016 (<https://www.youtube.com/watch?v=uQdZBOVYLdI>)
- Forsythe, William/Kaiser, Paul (1999): "Dance geometry." In: *Performance Research: A Journal of the Performing Arts* 4/2, pp. 64-71.
- Groves, Rebecca/deLahunta, Scott/Zuniga Shaw/Norah (2007): "Talking About Scores: William Forsythe's vision for a new form of dance 'literature.'" In: Sabine Gehm/Pirkko Husemann/Katharina von Wilcke (eds.), *Knowledge in Motion*, Bielefeld: transcript, pp. 91-100.
- Hay, Deborah (2013): "On Language. Introduction to Concepts. Using the Skype Motion Bank On-Line Digital Dance Scores." May 11, 2016 (<http://scores.motionbank.org/dh/#/set/introduction-to-concepts>)
- Hui, Yuk (2012): "What is a Digital Object?" In: *Metaphilosophy* 43/4, pp. 380-399.
- Hui, Yuk/Worthington, Simon (2015): "Workshop: Future for the Annotation of Digital Objects", Centre for Digital Cultures, Leuphana University Lüneburg, June 01, 2016 (<http://hybridpublishing.org/2015/05/workshop-future-for-the-annotation-of-digital-objects-12-13-may-2015/>)
- Jenett, Florian (2015): "Notes on annotation." In: *Performance Research* 20/6, pp. 24-25.
- Kipp, Michael (2014): "ANVIL: The video annotation research tool." In: Jacques Durand/Ulrike Gut/Gjert Kristoffersen (eds.), *Handbook of Corpus Phonology*, Oxford: Oxford University Press, pp. 420-436.
- Kirsh, David/Muntanyola, Dafne/Jao, R. Joanne/Lew, Amy/Sugihara, Matt, (2009): "Choreographic Methods for Creating Novel, High Quality Dance." In: *Workshop, Design and Semantics of Form and Movement*, pp. 188-195.
- Lovink, Geert (2015): "Q & A on the History of CD-ROMs in the Arts with Marie Lechner." In: *Institute of Network Cultures Blog*, May 18, 2016 (<http://networkcultures.org/geert/2015/02/04/cd-roms/>)
- Open Annotation Collaboration (OAC) (2013): "Open Annotation Guiding Principles." May 16, 2016 (<http://www.openannotation.org/documents/GuidingPrinciplesRevised.pdf>)
- Portanova, Stamatia (2013): *Moving without a Body: Digital Philosophy and Choreographic Thoughts*, Cambridge, MA: MIT.
- Rohlfing, Katharina/Loehr, Daniel/Duncan, Susan/Brown, Amanda/Franklin, Amy/Kimbara, Irene et al. (2006): "Comparison of Multimodal Annotation Tools - Workshop Report." In: *Online-Zeitschrift zur Verbalen Interaktion* 7, pp. 99-123.

- Sutil, Nicolás Salazar (2015): *Motion and Representation: The Language of Human Movement*, Cambridge, MA: MIT.
- W3C (2016): “What are Web Annotations.” In: *Web Annotation Working*, May 21, 2016 (<https://www.w3.org/annotation/>)
- Ziegler, Chris (2007): “Electronic Memory Design.” In: Emio Greco | PC/AHK Amsterdam (eds.), *Capturing Intention – Documentation, Analysis and Notation research based on the Work of Emio Greco*, Amsterdam: PC and Amsterdam School of the Arts, pp. 34-41.
- Zuniga Shaw, Norah/Palazzi, Maria (2009): “The Dance, The Data, The Objects.” In: *Synchronous Objects for One Flat Thing*, reproduced by William Forsythe, Ohio: The Ohio State University.

