Kinesemiotics: a pilot research on the interdisciplinary study of dance discourse

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1. The background

The first idea of Kinesemiotics emerged about three years ago during a non-academic conversation I was holding at a lunchtime informal meeting with colleague and fellow Italian Professor Massimiliano Zecca. It emerged from the converging interests of a linguist and semiotician with a keen interest in multimodality and technology and those of an healthcare engineer specialised in robotics with a keen interest in movement and performance. Kinesemiotics is indeed a bridging area of research that offers great potential for interdisciplinary projects that focus on movement-based human communication especially when performance is involved.

Interest towards the study of dance movement and in general towards movement-based communication has shown a considerable increase in recent years, especially from specialists in robotics, movement recognition, visual effects. These studies have focused in particular on the mechanics of movement and movement sequences and have made use – sometimes very sporadically – of categories belonging to traditional dance notation systems like Benesh notation (see McGuiness-Scott 1983) or Labanotation (Laban 1956). A common denominator of these studies was the use of different areas of technological and scientific expertise to create effective protocols for capturing movement flow.

Why a focus on dance then? Because dance is a worldwide form of communication that is inherent in most cultures and that involves the elaboration, performance and transmission of
cultural values, beliefs and identities. This scenario is particularly appealing to scholars in robotics:

“Dance interweaves with other aspects of human life, such as communication and learning, belief systems, social relations and political dynamics, loving and fighting, and urbanization and change [...] robotic dance has many social effects in society [...] it is a kind of interactive social behaviour, in particular human-robot interaction” (Peng et al. 2015: 281).

Yet, a proper interdisciplinary area of research that focuses on dance discourse studies had not clearly emerged. Most studies made use of Laban Movement Analysis categories to investigate the expressive nature of dance movement for specific purposes. Laban Movement Analysis was created in the first half of the 20th century to annotate ballet choreography mostly in terms of body part positions in space and physical quality of movement involved. Zhao and Badler (2001), for example, focused on the role of gestures in conversation to find out whether it was possible to build effective computerised conversational partners capable of extracting, understanding, and also simulating meaningful movement patterns. Similarly, Camurri, Lagerlöf, and Volpe (2002) worked on movement cues in dance performance sequences to investigate their emotional content; they distinguished between “propositional movements” – gestures with an established meaning that is conventionally recognised in specific contexts – and “non-propositional movement” (Camurri et al. 2002: 214) – movement qualities like rhythm, tempo, force, heaviness, lightness, which can be related to a wide range of gestures. In this study, which investigated specifically the emotions of anger, fear, grief, and joy, professional dancers were asked to perform choreographed sequences created ad hoc; each dancer was left free to express the required emotions in their own way, they were video-recorded and the recordings were then presented randomly to two groups of selected spectators: both groups showed similarities in emotion recognition.
Other studies focused more on the dancer’s relationship to movement rather than on audience response: Bläsing, Tenenbaum, and Schack (2008) investigated the cognitive mechanism through which movement is learnt and remembered by dancers through structure recognition, which showed significant differences between novice and expert dancers and between amateurs/beginners and professionals.

Laban Movement Analysis along with Baternieff Fundamentals\(^1\) were also used in the area of robotics research by Lourens, van Berkel and Barakova (2010), who annotated automated communication of emotions and mental states in robots. However, their use of terminology is sometimes inconsistent – *effort categories* become *effort factors* when analysed in movement combination patterns – and, in this particular case, no specific work on dance was made.

Most of these works focus on dance to find out effective ways of capturing meaningful movement patterns for different applications. Their use of Laban Movement Analysis involves categorise – not *structures* – and it focuses in particular on the notions of *body* in terms of body parts and *space* in terms of size and form of environment. The use of terminology in most studies is not consistent as Labanotation categories and categories borrowed by other annotation systems are adapted to the specific aims of each study, which is an inevitable consequence of working with these very complex manual notation systems that are not generated by a comprehensive linguistic and semiotic theory.

Kinesemiotics works on the theory and analytical model of the Functional Grammar of Dance (Maiorani 2017), which was created precisely to address the need for a framework to analyse dance as a form of communication and explore whether dance discourse can be automatically tracked and recorded in a non-visual form. It offers a specific theoretical

\(^1\) Imgard Baternieff was a student of Laban who analysed movement of polio patients and dancers and used a combined annotation system specifically for dance therapy.
background and it can provide analytical categories for analysing movement structures that incorporate space as a meaning-making component.

2. Kinesemiotics and the Functional Grammar of Dance

Kinesemiotics is currently focusing on ballet as a form of dance that has been developing not just as entertainment but also as a form of communication and as a cultural product that changes with time and society. Notwithstanding its relative popularity, ballet is a form of performance enjoyed by smaller audiences with respect, for example, to musical theatre, opera, circus: ballet audiences can still be defined as an élite. The problem is that as soon as ballet moves away from popular narratives, non-specialist audiences find it difficult to enjoy it. Its language is really shared by a very restricted number of practitioners and connoisseurs and this prevents a wider audience to appreciate its cultural function. This limitation also explains why dance discourse analysis has remained a quite exclusive area of research.

The Functional Grammar of Dance (henceforth FGD) has been initially applied to ballet; it is modelled on the Hallidayan Functional Grammar model for verbal language (henceforth FG) and is informed by Systemic Functional Linguistic theory (Halliday & Matthiessen 2013). The FG model of analysis of verbal language traces systematic connections between the non-linguistic dimension of a text – its Context of Situation – and the structural and lexical choices that realise its linguistic dimension, which Halliday defines as lexicogrammar: “grammar and vocabulary are not different strata; they are two poles of a single continuum, properly called lexicogrammar” (Halliday & Matthiessen 2013: 24, original emphasis). The Context of Situation of a text is informed by a wider context of culture (Halliday & Matthiessen 2013: 33) and can be described by three co-existing, variable categories of human experience: Field – the topic, the ongoing socio-semiotic activity; Tenor
– the types of relationships and the roles that are established through the ongoing socio-semiotic activity; and Mode – the role of language and other semiotic systems in the ongoing socio-semiotic activities (cf. Halliday & Matthiessen 2013: 33–34). These contextual variables are accounted for by specific overarching language functions that Halliday defines as metafunctions (Halliday & Matthiessen 2013: 30): respectively the Ideational metafunction, the Interpersonal metafunction and the Textual metafunction. These metafunctions activate respectively the Ideational meanings, Interpersonal meanings, and the Textual meanings of the Semantic stratum of a text which are then realised by lexicogrammatical structures. Choices are made both at syntagmatic and at paradigmatic level and are aimed at making the text functional to its context. This model (Figure 1) informs the FGD, which considers dance as a language ad describes it as a system of choices among movement-based structures that realise specific meanings activated by the Contexts of Situation. The FGD Context of Situation is performance-specific and is informed by a wider Context of Culture. For example, a ballet like Sleeping Beauty, with its plot, characters and locations, can be considered as a Context of Situation. The Context of Situation of a performance is described through the use of three contextual variables – Field, Tenor, and Mode – that will activate specific meanings in the form of choreographic affordances. More specifically, the Field is the narrative or the abstract topic of the performance; the Tenor is the relationship or ensemble of relationships that each meaningful dancing body builds and entertains on stage on two levels: a) with other meaningful bodies or items on stage and b) with the audience; the Mode is the choreographic composition that will enable all variables to work in integration.

Unlike what happens in verbal language, meaning in dance is created through movement structures that work in relationship with space as a semiotic dimension (Maiorani 2011): space enables and contributes to dance meaning-making processes. As a result, the analysis of dance discourse based on choreographic affordances has to be divided into two
stages: the structural analysis of movement in the *physical space* and its contextual analysis in the *contextual space*.

Choreographic affordances are ranges of movements that are available for each choreographer to use according to a specific style to realise dance discourse. They are basic movement components on which the choreographer can elaborate to create specific meaningful combinations, sets of movement choices that are performed in the *physical space* and then acquire specific meanings when combined with the *contextual space*. The *physical space* is the actual space where performance occurs; the *contextual space* is determined by the scene set including background, props, and all items on stage. The stage physical space is thus divided into areas of contextual value (for example a throne in a corner, a Christmas tree at the centre of the stage, etc.).
Choreographic affordances that are available to realise Experiential meanings are the *Narrative directions of projections* of arms and hands, legs and feet, head and torso. The concept of projection is fundamental for understanding how movement makes meaning by interacting through space as projection is enacted by dancers and created by choreographers.

Choreographic affordances that are available to realise Interpersonal meanings are the *Interactive directions of projections* of arms and hands, legs and feet, head and torso, and *Modality Patterns*. Interactivity can be directed either towards or away from other bodies or items on stage or towards the audience (in this case they build an inclusive relationship with the audience). *Modality patterns* define the ways of delivering information through patterns that determine the relationship between the dancer/s and the discourse they are realising: intensification in the case of jumps, repetition in the case of cyclical figures, and chained information in the case of développés. These patterns can be used singularly or in combination.

Choreographic affordances that are available to realise Textual meanings take into consideration the traditional partitions of the dance text: the solo, which is a dance unit performed by just one dancer; the *pas-de-deux*, a dance unit performed by two dancers; the group, which is a dance unit performed by three or more dancers but not all dancers on stage; the ensemble, a dance unit performed by all dancers on stage.

This model of the FGD was first used in the manual analysis culminating in the position represented in Figure 2 and it is intended to offer a general idea of what type of information the protocol we are developing for automated recognition is trying to capture.
3. An example of manual analysis

3a. An example of manual analysis of movement in the physical space

Figure 2: Arabesque – Aurora’s solo in The Sleeping Beauty, Act I

3a.1. Narrative directions of projections

In the physical space of the stage, the ballerina arrives at a position called arabesque and projects her right arm upwards and her right hand slightly backwards to indicate a connection with what is in the background and that she is above it at the same time. Her left arm and hand are raised perpendicularly and are pointing at the audience. Her head and torso also face the audience. One leg is solidly on the ground on her point so that she is grounded
but elevated, the other is raised perpendicularly behind her to show she is retained by what is positioned on stage in that direction.

3a.2 Interactive directions projections and Modality Patterns

In the physical space of the stage, the right arm and hand of the ballerina engage with what or whom is behind her, her left arm and hand as well as her torso and head engage with the audience. One leg shows her elevated position in relation to the place where she is standing, the raised leg behind her engages with what or whom pulls her back. There is clear but complex interpersonal tension in this position, which is part of a narration.

3a.3 Choreographic unit

In the physical space of the stage this dancer is performing a solo: the experiential and interpersonal meanings she realises are personal and have to do with her own actions and interactions.

3b. An example of manual analysis of movement in the contextual space

The silhouette in Figure 2 represents Princess Aurora in Sleeping Beauty in Act I, when she is attending her birthday ball in the royal palace, surrounded by her court and all the invited characters, just before the sleeping spell is cast on her.

3b.1 Meanings realised by the Narrative directions of projections

The background prop is a big hall of a royal palace: the ballerina-Aurora is projecting her right arm and hand towards the court and friends behind her, showing she belongs to the court but that her social status is superior. She projects her left arm and hand towards the audience to show her position and the beauty of her court, and she reinforces this inclusive
attitude with her straight torso and head, which are also projected towards the audience. She elevates herself on her right leg as she belongs to the palace as a person of high status and her left leg and foot point at the thrones where her parents, the King and Queen, are sitting: she is the Princess and still under their guidance and power.

3b.2 Meanings realised by Interactive direction of projections and Modality Patterns

Princess Aurora interacts with her court and with the audience at the same time by showing her status and her position and making the audience share in her glory. She also reminds the audience that she is coming from a royal family.

3b.3 Meanings realised by the Choreographic unit

Aurora’s solo thematises her role of young Princess in the ballet story. At this point her relationship with the court is defined, events are seen from her point of view and she shares the celebration of her status and birthday with the audience.

4. Kinesemiotics so far: a collaboration with the English National Ballet

The procedure followed in the example of manual analysis presented above informed the protocol that was established for a series of experiments carried out at Loughborough University in May and June 2015 in collaboration with Professor Massimiliano Zecca. Further experiments were subsequently carried out with professional ballet dancers from the English National Ballet in 2017, thanks to seed funding awarded by the Loughborough University CALIBRE programme. The Kinesemiotics team included Professor Zecca and Dr Russell Lock from Computer Science at Loughborough University. Dr Lock is a computer scientist with a keen interest in interdisciplinary research whom I met at an interdisciplinary research seminar at Loughborough University and who immediately joined the team with enthusiasm providing
the precise type of expertise and perspective that Professor Zecca and I needed for the development of Kinesemiotic studies.

The experiments with professional dancers from the English National Ballet took place at the company’s London headquarters and involved First Soloist Junor Souza, Principal Ballet Master and Bolshoi and Royal Opera House former Principal dancer Irek Mukhamedov, and the Director of the Engagement Department Fleur Derbyshire-Fox. Movement tracking was carried out through the Perception Neuron MOCAP System by NOITOM, which allowed for the integration of the motion capture with the motion visualisation. Dancer Junor Souza was asked to perform initially basic movements and positions to calibrate the sensors. We then tracked his live performance of several short sequences including jumps, basic pirouettes and développés in several positions; eventually we recorded part of the Prince’s solo in Act 1 of Swan Lake. Movement was tracked on the basis of the structures described by the FGD. Data is currently being mapped and paired with space labelling. Results are at a very initial stage but they are also very promising and show a semantic richness that actually portrayed the dancer’s personal interpretation. Data also showed through a complex movement perspective how the dancer was going through a recovery process from a recent injury. Kinesemiotics findings and further research that is being set up have the potential to change radically dance archival and teaching techniques, rehabilitation, and the way in-progress choreographic creations are stored and shared. Further research is being carried out in this direction and in the creation of a user-friendly interface for data collection, analysis and representation.
SELECT REFERENCES


