WhoLoDancE: Towards a methodology for selecting Motion Capture Data across different Dance Learning Practices

WhoLoDancE partners[i]

ABSTRACT

In this paper we present the objectives and preliminary work of WhoLoDancE a Research and Innovation Action funded under the European Union's Horizon 2020 programme, aiming at using new technologies for capturing and analyzing dance movement to facilitate whole-body interaction learning experiences for a variety of dance genres. Dance is a diverse and heterogeneous practice and WhoLoDancE will develop a protocol for the creation and/or selection of dance sequences drawn from different dance styles for different teaching and learning modalities. As dance learning practice lacks standardization beyond dance genres and specific schools and techniques, one of the first project challenges is to bring together a variety of dance genres and teaching practices and work towards a methodology for selecting the appropriate shots for motion capturing, to acquire kinetic material which will provide a satisfying proof of concept for Learning scenarios of particular genres. The four use cases we are investigating are 1) classical ballet, 2) contemporary dance, 3) flamenco and 4) Greek folk dance.

Author Keywords

Dance Learning; Motion Capture; Human Movement; Whole-Body interaction; Dance practices and genres.

ACM Classification Keywords

H.5.5. Information interfaces and presentation (e.g., HCI): Sound and Music Computing—Systems. J.5. Arts and Humanities: Performing arts (e.g. dance, music).

INTRODUCTION

WhoLoDancE is a three years (January 2016-December 2018) Research and Innovation Action, under the framework of ICT2015 of H2020 aiming at designing and developing whole body interaction tools to support dance learning.

DANCE LEARNING PRACTICES

Dance education is mainly an example of "learning by doing" and the development of embodied knowledge, whereas technological tools can support the analytical and conceptualizational abilities of dance students, and choreographers. Currently there is not one single repository of these teaching methods, neither is there a repository of dance actions that would support the development of the teaching of dance. Learning based on ICT (Information and Communication Technologies), and whole-body-interaction in particular, can largely benefit from the outcomes of applying it in the field of dance, as dancers are experts in embodied communication and dance is by its nature multimodal. WhoLoDancE data-driven tools will be provided with a measurement of human-system interaction fostering non-linear approaches to adaptive learning and cognitive artifacts for effective human learning. Dance is traditionally a practice that is passed from body to body, and whilst there are established and codified dance 'techniques' that are genre specific these techniques evolve through the teaching itself. Some techniques are therefore more prescriptive than others, and those that are more prescriptive tend to be guarded by a named innovator or the developer of the technique. But aside from the specifics of these techniques, there are teaching methods that connect all studio based teaching of dance and whilst these methods are moderated according to context (whether within a professional/vocational teaching context, or a recreational context, etc.) and according to genre, there are underlying principles that pertain to all good teaching of dance. The WhoLoDancE multimodal repository will enable the usage of data analytics supporting the identification of effective teaching methods and practices showing commonalities and differences between them to support the future teaching of dance within a variety of contexts.

DANCE LEARNING PRINCIPLES

As the aforementioned dance genres provide a huge diversity in both the kinetic vocabularies and the teaching methodologies, one of the big challenges is to find learning objectives that are common across genres. We aim for a systematic way of selecting shots beyond the differences of the kinetic material. A focus group, with the participation of dance teachers of all genres, agreed that the following *Learning Principles* summarize the different teaching styles applied in different practices:

1. Mimesis: imitation/copying: the teacher is teaching the student a specific movement or sequence of

movements and the student follows the movement. This is a case where the learning is largely based on observational abilities of the students as they are asked to see and do;

2. Generative: the teacher gives the student an exercise/phrase/sequence as a starting point to achieve technical and creative goals. In this case the student is allowed to generate new kinetic material, or alter things as long as he or she is consistent with the technical or creative goals;

3. Reflexive: the student is given a movement task/image/to work with, improvising without trying to achieve a specific phrase/sequence and the teacher provides feedback. In this case the memorization ability of the student is challenged, as in contrary to the mimetic approach the student has to remember the sequence, rather than see and do, and at the same time is allowed to alter or generate new material, as in the generative approach;

4. Traditional also known as "command style teaching": where the teacher makes all the decisions and the learner follows, while the teacher "commands" what the student must correct or change to achieve the good performance of the movement. The method requires precision and accuracy of performance.

MOVEMENT PRINCIPLES

The aim of the WhoLoDancE is to develop learning tools that will be designed upon the principles of contemporary models of dance learning and teaching. The research will focus not only on teaching steps by mimicking, but also on enhancing the student's movement literacy, increasing the learners' ability to analyze her/his own movement, and enhancing movement skills that will feed into the development of the student's creativity, musicality and broader dance experience.

Following the approach of the interdisciplinary focus group, we proposed ten essential *Movement Principles* that can summarize the embodied skills which are to be improved in each dance learning process, independent of the dance genre and style. From our preliminary investigations, we defined a first list of movement principles

1. Symmetry: The use of the two sides of the body (right vs. left side, arm, leg) etc., both in position and while moving. The ability to do the same thing simultaneously or sequentially using both sides. Each Movement Principle includes also the opposite. Playing with asymmetry and isometry is included in this principle.

2. Directionality: The awareness of body orientation in space. Usually this is derived from the position of hips and torso, but interesting postures might derive from the various directions of each body part in relation to a space, e.g., the audience, the camera, the studio.

3. Balance: The ability to stand and move in balance, but also out of balance, depending on whether the line of gravity falls within the line of your supporting limb(s) or not. The awareness of the different vector forces on your body.

4. Alignment – Posture Stability: The awareness of the geometry of the body (e.g., the axes (sagittal, horizontal, vertical) and planes, and how the relations of different body parts and joint create "lines" in the body shape.

5. Weight bearing vs. Gesturing: This principle is about the difference between movement that is concerned with bearing weight (weight transference, stepping.) and movement (gesture) that is not bearing weight but which has intention/expression

6. Gross vs. Fine Motorics/Isolation/Articulation: The ability to distinguish small movements done by specific body parts e.g., hand or one hip, or one shoulder, without moving the rest of the body, vs. moving larger parts of the body as a whole.

7. Coordination: One of the most important skills practiced in every kind of dancing, which is about the ability to synchronize or not different parts of the body that can move in the same or separate tempos.

8. Motion through Space: Progressing through space or towards particular directions, paths etc. "Moving through space vs. dancing on the spot. Also the body as moving point in space, or as continuously changing moving volume.

9. Rhythm and phrasing. The ability to move in particular (predefined or improvised) rhythms. This principle is also about how the dancer's movement is related or not to the music and its rhythmical aspects (tempo, time signature, rhythmic patterns etc.).

10. Stillness. While movement seems to be the essence of dance, a dancer needs to improve her/his ability to remain still, whether this is a part of a choreography or interpretation of rhythmical pauses, and exercise for balance and isolation of body parts. Stillness is usually connected to the notion of being present and has been investigated in previous interdisciplinary work.

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