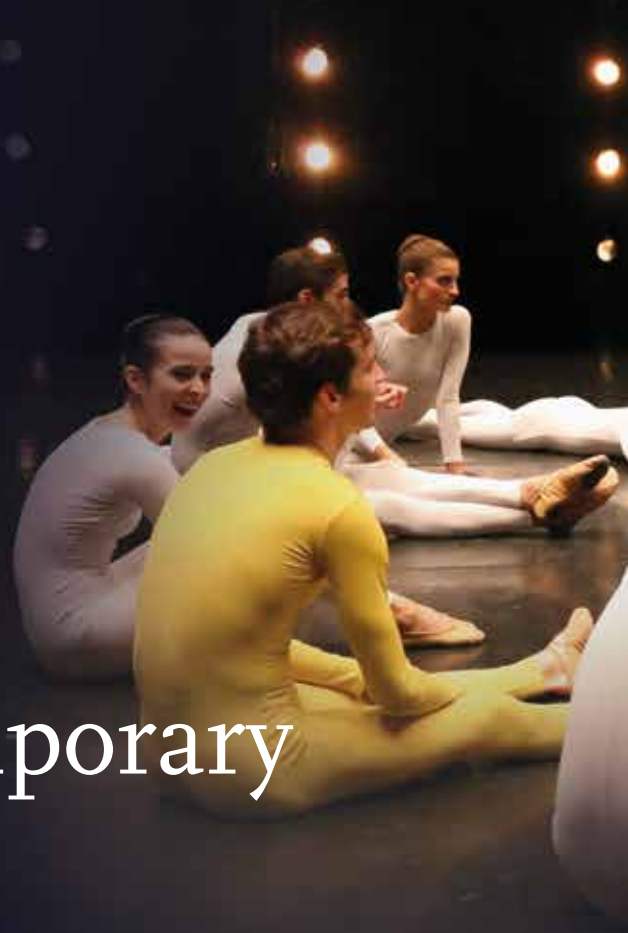
Impact Objectives

- Perform theoretical and innovative interdisciplinary research on the intersection of multimodal communication and cognition, performance studies and computer vision
- Document, transmit and preserve the unexplored knowledge contained in performance composition processes
- Assist artists with creative tools to facilitate their choreographic/dramaturgic practices on a collaborative basis



Translating contemporary dance and theatre

BlackBox, an innovative arts and cognition research project, is changing the way we understand dance and theatrical performance. Principal Investigator, ***Professor Carla Fernandes*** *from the* ***NOVA University School of Social Sciences and Humanities*** *in Portugal talks about their work at the intersection of language, culture and cognition*

What are the main aims of the BlackBox (*A collaborative platform to document performance composition: from conceptual structures in the backstage to customizable visualizations in the front-end*) project?

Our research aims to contribute to, preserve and visualise the ephemeral and intangible in cultural heritage. The full title of the project is very telling. During our research process, we are constantly moving from what's invisible to what's visible, therefore attempting to unveil, as much as possible, what is usually not seen or understood by the most general audiences of contemporary dance pieces. Our focus in this work is on three very contrasting performing artists/composers as our main case studies and respective data, collected for analysis during their rehearsal phases: conceptual choreographer João Fiadeiro from Atelier Re.Al (end 2014 to the middle of 2016); choreographer Rui Lopes Graça, resident at CNB, the National Ballet Company (mid 2016 to present date) and a third invited artist who we are currently in the final stages of appointing. With this third artist, we hope to break new ground in the delicate, unstable and rather difficult territory of analysing decision-making processes in real time by analysing, with the use of biomedical sensors, creativity exercises where the interaction between thoughts, words, gestures and bodies is incredibly rich and complex.

How do you structure the project and make the concepts involved in each discipline intelligible to each other?

We follow four broad threads of research: Multimodal Communication & Cognition; Performance Studies & Information Visualisation; Computer Vision & Motion Tracking; and Neurosciences & Human Behaviour in Creative Settings. This project is, both literally and metaphorically speaking, about 'translating' different phases and moments of cognitive processes in creativity settings where the performance of the human body is involved. I would say that we have decided to take the hardest path by accepting the challenging task of translating the formulation and fermentation of ideas while these are still emerging in the minds of our selected performing artists into their own words and gestures (in almost real time) while explaining those ideas to us in the team. Then, there is a second 'translation' moment, where we closely accompany and video record their instructions towards the dancers, who will necessarily interpret those words and gestures into other full-body movements. Our project draws on a wide range of expertise. We have four postdocs, two PhD students, one research assistant and several external collaborators for tasks that go from video annotation and speech transcriptions to web design and the production of artistic animated infographics, as well as the editing of video documentaries as outreach cultural products of the project.

What challenges have you faced whilst getting such an ambitious project off the ground?

I am the first person from my institution to win or even apply for a European Research Council (ERC) grant. Putting forward my detailed application was virgin territory for the NOVA School of Social Sciences and Humanities. I designed the project single-handedly. It is also the first ERC grant to be awarded to an Arts and Cognition project which situates itself at the scientific crossings of Cognitive Linguistics, Performing Arts, Gesture Studies and Computer Vision. For me, taking the road less travelled has always been my motto in life and it seems that the harder it is, the more interesting I find it!

Uniting creativity and high-end technology

__BlackBox__ is a ground-breaking project developing a web-based collaborative platform for the documentation of compositional processes in contemporary dance and theatre. The research team are using established artists and performers as case studies to revolutionise advanced research on performing arts

Being able to understand how dancers and creative artists communicate has been a challenge that has spanned history. To explore this, a state of the art research project at the NOVA School of Social Sciences and Humanities in Lisbon, Portugal is bringing together work in linguistics, computer studies and a range of other disciplines.

The project known as BlackBox (A collaborative platform to document performance composition: from conceptual structures in the backstage to customizable visualizations in the front-end) aims to translate artistic conceptual structures in the work of specific artists into various types of visualisations – point clouds, 3D video annotations, animated infographic films or 360 degree virtual reality documentaries. The ultimate aim is for a collaborative platform, which is to be launched at the conclusion of the project in 2019.

EXPLORING COMMUNICATION

BlackBox Principal Investigator Carla Fernandes explains that speech in performance, according to the CRT method, is not available to the performer and thus 'the locus of all information production during an improvisation performance is the performer's body, with its movements and its interaction with the environment. Whenever we are in a social space, we are always communicating, just by the very presence of our bodies, and even when those bodies are not in motion.' Even the most subtle state change can be vital, explain Fernandes and her collaborators Dr Vito Evola and Joanna Skubisz in a recent paper: 'Possibly the most inconspicuous body movements are the ones produced during gaze shifts, which are fundamental during silent interactions and have the social function of conveying inferential information,' they note.

MULTIDISCIPLINARY APPROACH

The BlackBox team draws on a wide range of expertise and interests. The core team are: Professor Fernandes; Dr Stephan Jürgens, an expert in performance studies and new media technologies; Dr Vito Evola, whose research is on multimodal cognitive semiotics; Dr Cláudia Ribeiro, who works on computer vision and machine learning; Rafael Kuffner, who is completing a PhD in video-based rendering; Joanna Skubisz, whose doctoral research concerns embodied teaching practice; Liz Vahia, a social and cultural anthropologist; and Dr Ana Rita Fonseca, a neuroscientist.

The first approach to the research is the CRT method (composition in real time), an internationally-renowned way of working, developed by João Fiadeiro, which 'focuses on the creative process rather than on the product', says Fernandes. During the 'CRT Game', the method is practised and innovative performance ideas are generated. Key to the CRT philosophy is that 'the creative act cannot result from an intention or personal projection (whether explicit or implicit) but has to be the result of an encounter. An encounter with time, space, one another, a thing or an affection', according to Fiadeiro himself. This method was originally designed as a way of enabling collaboration during the composition process.

INNOVATIVE VIDEO ANNOTATION

Any pioneering project needs tailor-made technical methods. One major impact the project is already having is via the video-annotation tool developed specifically for the team's research. This software, provisionally called 'Creation-Tool/DancePro', which is currently available in beta version, allows the recording and annotation in real-time of any performance using the human body. It also allows annotations, focusing on specific physical details, of previously-recorded footage.

The software is being used and tested outside the project in institutions such as Coventry University, UK, The University of California at Los Angeles (UCLA), Universidade Federal da Baía, Brazil, Melbourne University, Australia, and the University of Porto, Portugal. Additional functions are being developed, such as 3D capabilities. 'The software functions as a digital notebook for personal annotations,' explains Fernandes. She notes that 'the tool allows different video annotation types – marks, text, audio, ink strokes and hyperlinks – and different modes of annotation and video visualisation: either continuous, sustained'.

The software, which has wide range of potential applications, including the domains of gesture studies, anthropology, sports studies educational settings and journalism, is the first to allow real-time annotation to be taken during performance rehearsals. Fernandes notes that these advances,

> *What happens during the expert-group performances is a remarkably fluid and coordinated awareness of how their body-mind presence and their actions fit together in tune with the presence and actions of each other, in a clearly cohesive pattern of relations*

nonetheless, are underdeveloped in the area of Gesture Studies research. She believes that they could deliver valuable information about the way human and virtual characters interact, as well as providing new data on semi-automatic ways of annotating and validating video data.

ARTIST CASE STUDIES

Artists in residence are providing real life case studies for the BlackBox research. There are currently two, soon to be three, performers whose work is the subject of the team's research: choreographers João Fiadeiro (the inventor of the 'CRT method') and Rui Lopes Graça, at CNB. These artists have allowed the team to video record their performances extensively and use it as the basis for thorough analysis. 'The first case study, with João Fiadeiro, gave rise to what we have called a 'Floor Study' which has investigated non-verbal coordinated collaboration across three different testing groups. There were five expert performers who are also CRT practitioners, five professional dancers unfamiliar with CRT, and a third group of five participants with no background in performing arts at all,' Fernandes notes.

They have recorded hundreds of rehearsal hours (using four HD video cameras, from four different angles), which have to be processed, annotated and analysed collaboratively by the entire team, in order to allow the production of the final Arts&Science visualisations and outreach products for the end-users of the platform.

VALUABLE RESULTS

Evola, Skubisz and Fernandes state that perhaps the most surprising finding in the contrastive data up to now, which uses the case study of João Fiadeiro, was that the Expert Performers were clearly coordinating their collaboration successfully despite not using speech at all. 'They produced no instances of communication focused movements, avoiding gaze contact, including a near absence of mutual gaze, normally considered fundamental for joint attention. Although it may sound paradoxical, by avoiding social recognition during the performance, the performers connect with

BlackBox team playing the "CRT game" with choreographer João Fiadeiro at his studio Re.Al, in Lisbon. Photographer: José Ramos.

Experiments using sensors with the choreographer Rui Lopes Graça. Photographer: Carla Fernandes.

their dance partners in a highly focused and mindful way, as they are all tuned to expect that type of behaviour, hence establishing an extremely well coordinated collaboration and communication.'

This is only the beginning for the BlackBox team. In the coming months, Fernandes and Jürgens will add to the sizeable academic and outreach outputs of the project by producing a documentary film on Fiadeiro's compositional process for presentation to the public. Also coming up is the third case study, which, as she explains: 'intends to dig further into a choreographer's body-mind condition, while composing a new piece from scratch, by using bio-medical sensors to validate the hypothesis around collective and collaborative creativity tasks, where the focus of analysis is a human mind and body being constantly re-interpreted by other bodies that are not their own.' The ultimate ambition is to use the techniques and methods developed (from 3D reconstructions to animated infographic films or VR 360° documentaries) in order to create a collaborative archival platform of artistic and compositional processes for the future of contemporary dance/theatre documentation.

Project Insights

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CONTACT

Professor Carla Fernandes
Principal Investigator

T: +351 217908300, ext. 1413
E: carla.fernandes@fcsh.unl.pt
W: http://blackbox.fcsh.unl.pt/

PRINCIPAL INVESTIGATOR BIO

Professor Carla Fernandes holds an MA from the NOVA School of Social Sciences and Humanities, Lisbon, Portugal, and a PhD from NOVA and the Vrije Universiteit Amsterdam. At present, her research focus is in the intersection of Linguistics, Cognition, Gesture Studies (from cognitive and ethnographic perspectives) and the Performing Arts, particularly concerning the preservation of ephemeral/intangible cultural heritage, and the annotation of multimodal corpora in creative and collaborative settings towards the analysis and documentation of contemporary dance. Prior to leading BlackBox, she was Principal Investigator of the 'TKB project' (A Transmedia Knowledge-Base for performing arts), funded by FCT Portugal, and which currently works as the main Portuguese archival platform for contemporary dance and theatre documentation (http://tkb.fcsh.unl.pt) She has also been Research Partner in several EU-funded projects at the crossings of arts and science and the digitisation of intangible Cultural Heritage. Last year she edited a book, *Multimodality and Performance* (Cambridge Scholars' Publishing, 2016).