Digital Creativity
2004, Vol. 15, No. 1, pp. 32–38

1462-6268/04/1501-0032$16.00

From lab to stage: practice-based research in performance animation

Jorgen Callesen[1] and Katrine Nilsen[2]

[1] University of Aarhus, Denmark
joca@skydebanen.net

[2] Stage and production designer
katz22@wanadoo.dk

Abstract

Performance animation is a new artform, which opens new possibilities in the performing arts. Experimental practice-based research in this area is necessary to integrate digital media, motion capture and tracking technology in a meaningful way. This article describes an experimental research project based on collaboration between artists and researchers developing artistic prototypes.

Keywords: artistic prototypes, performance animation, performing arts, research and production methodology

1 Introduction

The performance animation toolbox project is an artistic practice-based research project carried out in the Narrativity Studio at the Interactive Institute in Malmö, Sweden. The project was based on a series of performance animation workshops held from autumn 2001 until summer 2002, followed by two experimental productions autumn 2002.

Performance animation is a term adapted from animated film production, where motion-capture data recorded from a performer's movements is used to create 3D-amination for film and computer-games. In this project, the term is used in a much broader sense, covering various aspects of physical interaction influencing real-time computer-generated sound, film and animations projected onto the stage.

The aim of the project was to develop performance techniques and technological solutions to enable the participating artists to work with physical interaction and digital media on their own terms. The long-term goal is to integrate performance animation into modern dance, physical theatre and puppet theatre, with a point of departure in performance tradition, abilities and knowledge.

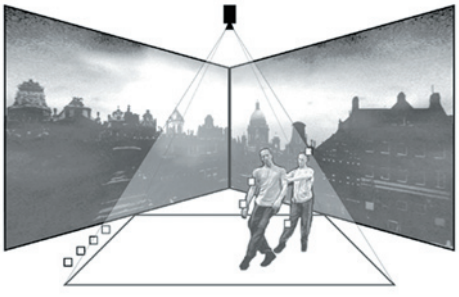
The participants were students, researchers, programmers, technicians and a wide rage of professionals with a background in the performing arts, including stage and lighting designers, scriptwriters, puppeteers, actors, animators and dancers.

The new techniques were developed as prototypes through collaborative interdisciplinary experiments, some of which were finally used in the experimental productions.

2 Defining the research project

The integration of performance animation techniques in the performing arts opens a lot of new artistic possibilities, but also requires research and development on many different levels.

Performance animation is still a very immature art form. Most of the tools on the market are developed for professional character-animation in film and computer-games. It is new to use the techniques in a live situation, where the performers are directly confronted with an audience, or where the audience are invited on stage, using the equipment provided to create an experience for themselves and others. The existing tools cannot be implemented for the stage in dance performances and theatre plays using 'normal' production methods. This requires new competences from both the technical staff and the creative team.



	Dramaturgy/choreography		aesthetics/design
technology	sensors/mapping techniques	dynamic systems/databases	audio/visual expression
	Magnetic motion capture	Inverse kinematics	2D/3D graphics character design
	Video tracking	Steering behaviours	Digital set design
	Infra red	Games AI	Trick film
	Joystick	State machines	Sound design
	Temperature	Self organising maps	Electronic music
	Touch pads		

Figure 1. Performance animation is an art form combining technology, dramaturgy/choreography, aesthetics and design.

Our aim was therefore not only to create new uses of motion capture and real-time 3D animation for performance, but also to investigate how existing technologies, media formats and digital aesthetics can be applied in these areas, and to develop methods to do so. As such, the research field of performance animation for live performances is a new area.

To obtain an overview, we created a general model based on a simple theatrical situation, where a performer is influencing an interactive set design through various types of sensors (Figure 1).

Each area in the model is known in research and development and in various production environments, but these new combinations and uses require re-development, re-design and re-formatting of the media and tools, as well as a rethinking of the development-process and theory behind it.

3 Developing a research method

Artists and producers from the performing arts are well aware that there are new expressive possibilities in computer technology and want to reflect the emerging digital media culture in their performances. But there is still a big gap between vision and realisation.

Compared to traditional theatre technology, the technology for performance animation is still very complex and fragile, requiring high-level specialists to operate it; even now, when computers have become more and more integral to running the technical side of theatre. Furthermore it involves the use of projection-screens or monitors on stage, which even today represents special tasks for many theatres to handle, involving extra budgets and external staff. Theatres and producers testing out the new technology and staging techniques on their audiences through experimental productions are therefore taking a substantial risk.

On the other hand, the nature, effects and quality of real-time animation used in live performances are very difficult to test in

a lab situation, since they can only be truly experienced when they are used for a specific purpose in an actual production. To produce an actual piece using these new technologies for performance animation will in most cases therefore also, by its nature, constitute research.

In academic research environments, there is a long tradition of conducting research and development in test labs, with well-defined methods and standards for publication of the results. Many experimental uses of new media and technology in performances are already seen in this context, because there are the resources for research available – for example, the digital theatre project at Århus University 2001–2002 (Callesen 2003, Kjølner and Szatkowski 2003).

But the problem with artistic practice-based research in academic environments, is that they are often unable to draw on the practical knowledge, experience and artistic skills in house to be able to define the research questions effectively, and carry out meaningful experiments, seen from the perspective of the production environments. Experimental performance and laboratory prototypes have shown that new concepts developed in academic environments such as telepresence, autonomous agents, non linear storytelling, robotics, augmented and virtual reality can be used to create new kinds of theatre. To produce an actual performance piece, and to test it out on real audiences, is a big step to take. Before doing so, we believe that professional artists from production environments must be involved in the research process.

This was the case in the ambitious summer academy in Hellerau, Germany 2000, where capacities from the European performance art, theatre and dance community were invited to develop, discuss and evaluate such concepts. Even though there were rich opportunities for the invited artists to carry out hands-on experiments, the outcome was very speculative and academic and the publication format was a 774-page book (Leeker 2001). As pointed out by the participating German director Jo Fabian it is not meaningful for the artist to produce an actual piece of art in such a short time. It is more the question for the artist to understand the potential of the new technology on a conceptual level and to discuss the possible content of a mediated interactive performance. For this the hands-on experience is very useful. (Leeker 2001 pp. 312)
In research projects and experimental projects involving advanced technology there is always a risk that the artists become ‘study objects’ or special guest stars.
This is because they are often invited on a short term basis to solve specific artistic problems, such as doing ‘a choreography with a robot’ or ‘design a responsive virtual set’, whereas the researcher has a tradition for long-time research projects with well defined thesis. The artist also needs a longer study period to grasp the nature and the possibilities of the new technology to be able to develop his or her own ideas. In the performance animation toolbox project we aimed to find out how a person with artistic skills would define the research questions.

This can, of course, be a hard task, since the artist may not grasp all the aspects of the often very speculative concept created by the academic researcher or the technical developer, who is normally defining the project in relation to the body of research in the field.

The initial phase in the performance animation toolbox project was to create a laboratory set-up for testing the thesis about virtual puppets and improvisational theatre in mixed-reality environments. The thesis about

the virtual puppet states that the aesthetics, dramaturgy and methods from traditional puppet theatre enables performing artists from a variety of disciplines, such as actors and dancers, to relate to computer animated imagery and sound—not only on a technical level, but also emotionally and socially (Callesen, Kajo and Nilsen 2003). The thesis about improvisational theatre implies that it is possible to involve the audience on stage in a meaningful way, by integrating concepts and methods from improvisational theatre and pedagogical drama in the stage arts (Callesen, Kajo and Nilsen 2003).

The method was to be based on the principle that performers need to work in dialogue with the digital material, and therefore we needed a functional system at a very early stage in the project, that would fulfil the needs of the artists involved. We tried to solve this problem by involving artists and researchers as well as creative and technical developers in designing the method and technical set-up. (Figure 2)

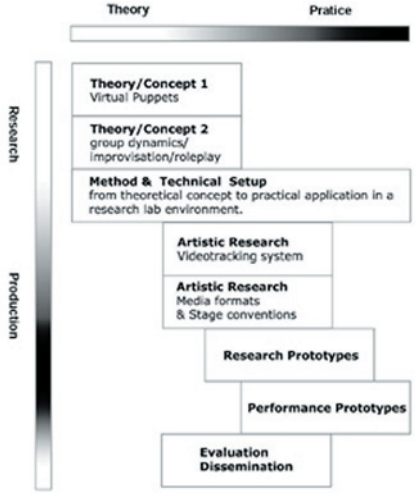


Figure 2. From lab to stage: a process model for practice based research in a theatrical art lab combining methods from research and production.

4 Development of prototypes

After designing and building the performance animation set-up, we went through the different phases in the process model involving different external participants at different stages (Figure 2).

In the first workshops, which we call 'artistic research', we went through a series of very free and experimental sessions, trying out a lot of audio-visual staging and playing techniques, with the aim of developing a repertoire to draw from in the workshops to follow. At the same time, we would develop an interface and a parser for a videotracker, enabling us to analyse theatrical actions among a group of 3 performers.

The final workshop-session was a three-day workshop, carried out in collaboration with Malmö University College Department of Art and Communications. It involved performers, technicians, directors and designers from Sweden's free theatre groups participating in the theatre festival KONKRET in Malmö 3–5 May 2002. For this workshop we had prepared a series of artistic prototypes to demonstrate the principle of performance animation in the particular set-up. It was then the task of the invited artists to define a project and a research question from this basis in collaboration with the researchers.

During the three days of the workshop, we produced five different prototypes. The results were shown to an audience, and discussed among the group with invited evaluators with a background in theatre and performance; and finally published on a CD-ROM (Callesen, Kajo and Hallborg 2002). The CD enables the participants to recreate the experiments through a simulator and in this way demonstrate and develop the idea further with their own creative teams. There were no conclusive results, but many of the prototypes showed great potential to be developed for actual performances, which is discussed in the article "The Performance Animation Toolbox: developing tools and methods through artistic

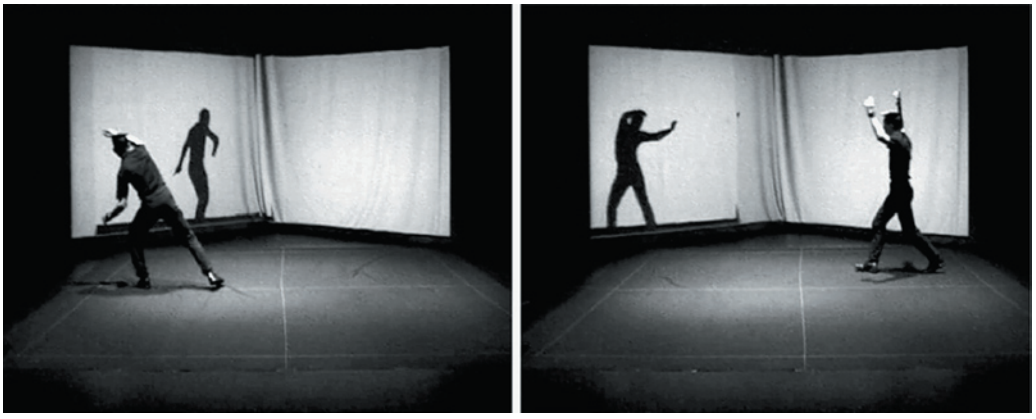


Figure 3 Research prototype *Dancing Shadows* made in collaboration with modern dancer Peter Juhl Nielsen, Copenhagen. The shadow in the digital video articulate dynamic gesture and movement from modern dance and physical theatre. It is controlled by a combination of the participant's movement and an autonomous agent giving it own dynamic life.

research" (Callesen, Kajo and Nilsen 2003).

In Spring 2002, the research group was contacted by a producer from the Malmö City Festival, who wanted to involve digital media-based installation and performance pieces in the programme. With a point of departure in our research prototypes, we decided on producing an interactive 'ghost story', *Spirits on Stage*, for a large circus-tent at the festival site. The producer wanted a product to satisfy her audiences, and we had to spend some time underlining that she would get a production-prototype produced by a team from a research institute, and not a production company. In this case there was a risk on both sides. She would commission something that had never been tried on stage before, and the research group had to produce an actual piece with a set deadline, for an audience. This brought both benefits and problems. The research team had to focus their work and draw on all their artistic and technical skills to produce and optimise the animations, sound design, digital settings, tracking system and game engine used in the work. In this phase, the method was far more production-oriented than in earlier research phases. The goal was to create a great experience for an audience with the material and tools available.

Spirits on Stage is a narrative space where participants can explore the city of Malmo through a new perspective. (Figure 5)

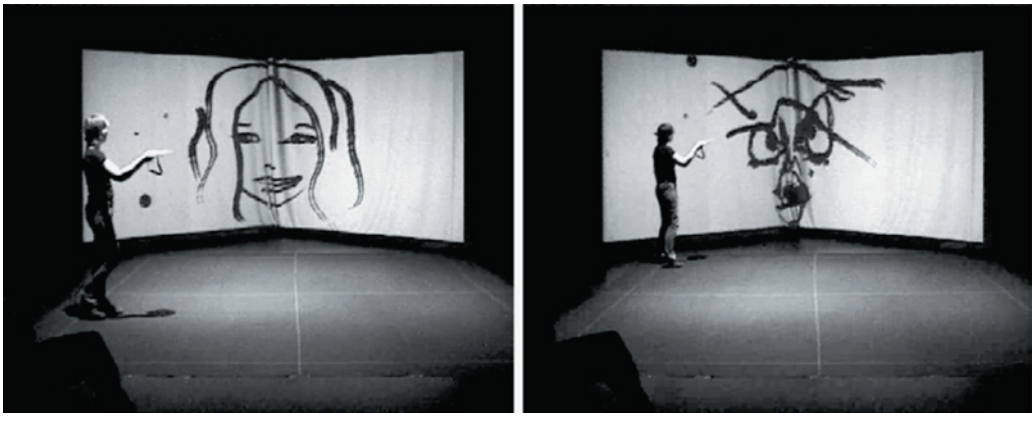


Figure 4 Research prototype *The SheMonster* made in collaboration with animator Anna Kellert and theatre director Christina Evers. The installation for a performance space is based on traditional frame animation. When you walk from side to side at the back of the stage the character will change facial expression and flirt. When you approach it – it transforms into a monster.

The stage-setting, with projections and sounds of Malmö as a ghost town, creates an atmospheric frame for collaborative exploration and play. *Spirits on Stage* provides an individual experience for those actively participating on stage, but also a performance experience for the audience present. There is room for three participants at a time, who become their own ghost by dressing in a 'ghost cape'. For each ghost-cape there is a ghost avatar in the 'other Malmö'. In this virtual Malmö, the avatar-ghosts are discovering the surroundings. Depending on the collaboration between the participants, different levels of stories in the hotspots will unfold.

The performances were documented on video and are now together with the prototype valuable research material.

5 Conclusion

To involve artists, technical developers and academics in research or creative development problems they have to have a proper understanding of each other's language, working methods and professional aims. This means a serious learning process, where you have the time and skill to get to know each other's domains and to define new boundaries between them.

It also requires new publication-formats and evaluation methods, because people from production environments rarely read academic papers and academics don't have access to experience from the practical artistic process. An example of such a new format is the CD-ROM we created from a theatre festival workshop, where the different prototypes are simulated

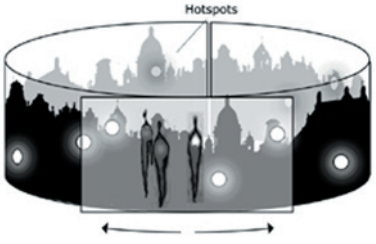
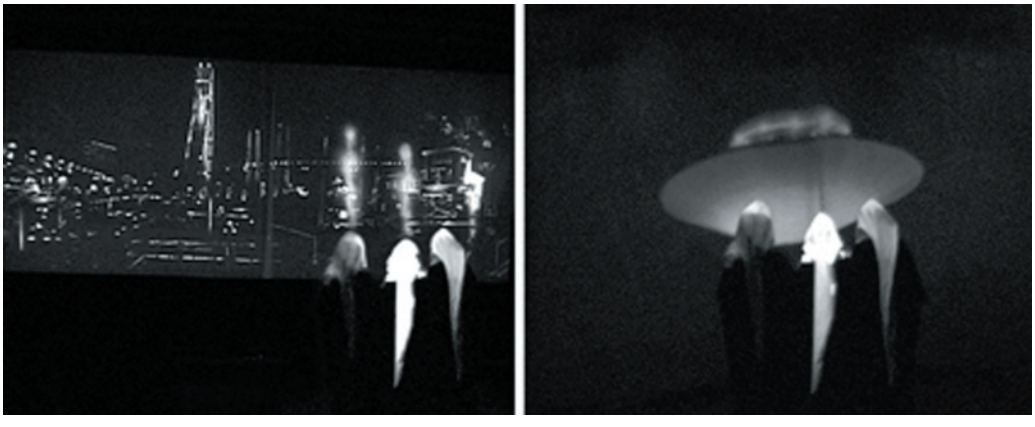


Figure5. Production prototype *Spirits on Stage*. An interactive ghost story for a performance space with audience participation. Commissioned by the City of Malmö festival August 2002.



in such a way that they can be experienced, enjoyed and evaluated by the user (Figure 3-4). This format fits both academics and artists, since it refers to the actual experience. (Callesen, Kajo and Hallborg 2002)

We believe that artistic practice-based research is a new type of research that requires new methods and competences, and perhaps a new definition of what professional research is. There are no set answers on how to find a method for this; it can only develop over time. The performance animation toolbox project is an example of experimental research searching for an answer to this question in practice.

Acknowledgments

Marika Kajo (researcher), Michael Johansson (artist, researcher), Simon Løvind (researcher, games designer), Johan Torstensson (programmer, developer)

References/further reading

Callesen, J. (2003) The family factory: developing new methods for live 3D animation. In Madsen, K.H. *Production methods: behind the scenes of virtual inhabited 3D worlds*. Springer-Verlag, London.

Callesen, J., Kajo, M. and Hallborg, A. (2002) KONKRET workshop; documentation and prototypes (CD-ROM available from joca@skydebanen.net).

Callesen, J., Nilsen, K. and Kajo, M. (2004) Performance Animation for the stage arts: developing tools and methods through artistic research. In Carver, G and Beardon, C (eds.) *New visions in performance: the impact of digital technologies*. Swets & Zeitlinger, Lisse, The Netherlands.

Kjølner, T. and Szatkowski, (2003) Dramaturgy in building multimedia performances: devising and analysing. In Madsen, K.H. *Production methods: behind the scenes of virtual inhabited 3D Worlds.* Springer-Verlag, London.

Jørgen Callesen was born in Denmark in 1966. He received his MA in Information and Media Science in 1995 from Århus University. Worked as a planner for theoretical studies at the multimedia design education Space Invaders, Copenhagen, Denmark in 1995–1997. Studied puppetry at the Ernst Busch theatre school, Berlin 1998-99, as part of his PhD studies in Information and Media Science, Aarhus University, Denmark 1998–2001. Lecturer at Malmö University College, Sweden Dept. of Art and Communication, and Researcher at the Interactive Institute 2001–2002.

Katrine Nilsen was born in Denmark in 1965 and received her degree in Production and Stage Design from Denmark's Design School in Copenhagen in 1998. Since then she has been working as a designer for exhibitions, film, theatre and dance performances in Denmark and Sweden. Since 2001 she has been part of the research project Performance Animation Toolbox, at the Interactive Institute in Malmö, Sweden, developing new effects and methods for virtual stage design.