4TH SKIN: THE PERFORMING BODY AS INTERFACE FOR INTERMEDIA ONENESS IN STAGE-BASED INTERACTION

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Abstract: '4th Skin' is a term I coined in 2013, describing metaphorically the visual representation of a layer of multimedia skin covering a dancer's moving body, changing its appearance in real-time, on stage. It is also the title of one of my Interactive Art projects and the name of a technological platform for video mapping on moving bodies, produced for the technical implementation of the project.
The first skin is generally accepted to be our body's skin. Our clothing is very often defined, in direct and transportable meaning, as our second skin. The third skin is the 'architecture, technology and environment' that surround us, as Scott Drake defines in his book from 2007 [1].
What I call 4th skin in the context of Media Art, is a digital, real-time video skin, showing different actions, relations and experiences, captured with a wireless web camera attached to the performers body, transforming and placing the character in different dramaturgical contexts.
While creating and implementing the multiple formats of this project, my main artistic goal was to achieve what I call 'Intermedia Oneness' between different media and performers on stage. Intermedia Oneness could be defined as a state of immersive artistic experience, governed by a horizontal structure of relations, where no media, nor human or digital performer takes the lead. They are all connected in real-time with the help of technological platforms (hardware and software). The performing body becomes an interface, which I call the 'Intermedia Body', generating or manipulating audio-visual content through its actions or presence in certain areas on stage.
I initiated, co-created and co-produced the multidisciplinary artistic project *4th skin* in the context of Media Arts and Interactive Dance, at the Interface Cultures Department (University of Art and Design, Linz). A group of creatives from the fields of Contemporary Dance, Sound Art and Interaction Design were involved.
The different formats of this project were presented in diverse artistic and educational contexts in Europe (Austria, Romania, Spain, England, Germany, Portugal) and USA (Cleveland, Ohio), between 2013 and 2015.
We created two interactive dance performances. A performative installation with public participation was implemented in a gallery. Numerous interactive improvisation sessions and workshops with dancers and media artists took place.
Conceptually and artistically, the project was developed together with Dolma Jover - a Spanish choreographer, dancer and dance instructor. I invited Cristian Iordache, a Romanian interaction designer, long term collaborator of KOTKI visuals Studio in Bucharest, to realise the interactive platform for video mapping on moving bodies following my interaction concept. KOTKI visuals was the main project funder and supporter. The creative and performative contribution of Sorin Paun aka Randomform, a Romanian sound artist, Viltė Švarplytė (Estonia), Juan Camilo Herrera (Columbia), dance performers and Henning Schulze, a German interaction designer, were crucial for the realisation of the different project versions.
Keywords: performance, interactive art, media art, contemporary dance, interactive dance, video mapping, digital performer, stage-based interaction, art & technology.

1.INTRODUCTION

'We are and we are not our bodies. In dancing with creatures of code it is tempting to suggest that we are no longer confined by our body's volume, weight, gravity and matter, that we are free to choose the extension of ourselves…
… Dancing with our virtual other pushed the boundaries of our kinespheres, extending our movement in previously unimagined ways… The dancers were required to see and move from both the actual and the virtual point of view and to keep these positions in tension kinaesthetically and proprioceptively through feedback loops of interaction'[2]
In *4th skin* and the interactive dance projects to follow, I observe how body perception changes when it becomes an interface for intermedia oneness on stage. How methods of artistic creation are changing for dancers and media artists while performing together with 'creatures of code', as Carol Brown, a New Zealand choreographer, working in London is 1995, defines the so called 'digital performers' in her article from 2006 [2].
Our artistic research process included development based on creation of concepts, dramaturgy, interactive platforms connecting in real-time visual media artists, choreographers, sound artists and performers.

The artistic concept of *4th skin* is closely related to the subjects of self-exploration, illusion of control and manipulation, using the vantage point to challenge our perception of reality.

The identity and memory of one's body and its presence in a given context interact with the limits of the movements and the technology in use. The performing body becomes an interface for interaction and surface for visual expression at the same time. The interdependence between dancer, filming device and body mapped video projection reveals another perspective on the relation between oneself and the world around.

The project idea is also rooted in the visual exploration of how a video projection can change or influence the appearance of a naked or dressed body. The performer is used as a screen surface, the body is visually transformed, adding another layer of interpretation.

Video content, captured in real-time with a small wireless camera attached to the hand of the dancer is projected back on the moving body, creating a layer of 'multimedia skin'. The movements generate the point of view for the video footage. The aesthetics of the video projection are of real-time footage taken with two devices: a wireless webcam and a wireless microscope: thus we have two different depths of viewpoint and a certain level of either abstraction of the subject or revealing details, which are not easily observable with naked eye.

The choreography is created depending on the video mapped body projection, which the performer does not actually see during the performance. Video projection, movements and sound generate each other.

The second interactive dance performance version was developed during a Stage-based Interaction workshop with Klaus Obermaier at the Interface Culture Department in November 2013.

The first part with the body projection was filmed by the performer onstage, the second part with the projection on the wall was performed by the media artist, live, and the real-time footage was projected on the wall.

Video content, captured in real-time with a wireless camera was projected back on the performer's body, creating a layer of multimedia 'skin'. The performer was holding the camera. Her movements generated the point of view for the video footage.

The choreography created was dependant on the body projection, which the performer did not see during the performance. Video projection, movements and sound were all live and generating each other.

The first part with the body projection was filmed by the performer onstage, the second part with the projection on the wall was performed by the media artist, live, and the real-time footage was projected on the wall.

"For me the interactive media is a dancer and this idea affects every single detail in the work process. In my case, I needed to be particularly sensitive to the physical and corporal space. *4th skin* was created by taking into consideration every single detail connected with what I film, how I do that and which space I use in case I want to get the adequate projection of a body part I'm filming on my body. This state of alertness brought me a "new" body mentality in terms of spatial awareness." [4]

2. ARTISTIC CONCEPT, WORK PROCESS AND DESIGNING INTERACTIONS

I outlined the idea and the concept of a 'multimedia skin', during a Fashionable Technology workshop led by Prof. Dr. Sabine Seymour in December 2012, at the Interface Cultures Department in Linz.

Video content, captured in real time with a wireless web camera and held by the dancer is projected back on her/his body, creating a layer of 'digital skin'. The video mapped projection represents the vantage point of the person, showing what she/he is 'exploring' with the video camera while performing.

A concept video was created as a practical outcome of this workshop, together with my colleague Henning Schulze. We experimented with different actions done by a performer and filmed with a typical webcam attached to his/her hand. The captured video footage was projected in real time on the chest, back or face of the performer, completely changing the appearance of those body parts.

Juan Camilo Herrera and Vesela Mihaylova contributed as performers to the creation of the *4th skin* concept video, exploring with the web cameras different objects and surfaces, performing different actions and interacting with the video projection in real time.

The aim was to visualize the concept simulating a video mapped body projection, a multimedia skin, generated by the point of view, moving together with the performer, following her/ his movements.

The only software involved in the implementation of the activities filmed for the concept video was Resolume Arena. I used it to realize the real-time body projection of the video footage captured by the webcam attached to the hand of the performer. There was no technologically mediated interactivity involved in the production of the concept video. This was supposed to happen in a future development stage.

Inspirational for this development phase of the project were the early intermedia dance performances of Klaus Obermaier, created in collaboration with Chris Harring: "D.A.V.E." (1998-2000) and partially "Vivisector" (2001-2002). Especially in relation to video projection becoming part of one's body and the body part of the projection.

"What's novel about D.A.V.E. is the concentration of the projections on the body in motion while avoiding conventional spatial and screen projections. You don't think about the video anymore; it just belongs to the body. It's a part of the body, or rather the performer is part of the video. The boundaries grow indistinct and are deactivated. Video projection, physical presence and acoustic environment thus blend into a symbiosis and create their own new reality: D.A.V.E. – digital amplified video engine." [3]

Starting from a similar point, I further developed the artistic and interaction concept using video footage captured in real-time by the dancers themselves, projected back on their bodies while moving.

In March 2013, I invited Dolma Jover to discuss a possible future collaboration for the creation of an interactive dance performance. I presented the project idea to her, the concept video, the interaction concept and described how I imagine connecting live performers body mapped video projection, sound and space.

We started working simultaneously on the visual concept and the choreography, organically related to the body projection, the video content, the interaction design, sound scape and technical implementation. I imagined a performative aesthetic which takes into consideration that the video projection is a metaphor of the inner voice or a digital performer "stuck" on the body, interacting with a real dancer on stage while being part of the dramaturgy.

Together we created the first version of *4th skin*, an interactive dance performance for three performers, which was presented at Ars Electronica Festival 2013. The choreography and the artistic direction involved 2 dancers on stage and me as media artist, off-stage, connected in real-time. Viltė Švarplytė and Juan Camilo Herrera performed the choreography based on movements relating their bodies in different ways to the wireless web camera or the wireless microscope. Visually intertwining in the same time the video feed projected back on the bodies, live. The clothes were used to extend the bodies and transform them into multidimensional, flexible screens. The sound was created by Randomform during the 5 rehearsal days we all had together in Linz, before the premiere at the festival. Basically the whole performance came together during the final days.

Fig. 1: 4th skin, an interactive dance performance for three performers, Ars Electronica Festival 2013

After this working process, Dolma Jover and I decided to develop a longer and deeper exploration involving lots of tests, improvisation sessions and rehearsals. We wanted to experience ourselves what it means to relate to the wireless webcam as a partner on stage and create a completely different performance version. We also wanted to develop further, together with the interaction designer Cristian Iordache, a stable and flexible interactive software for video mapping on moving bodies and interactive wall projection with the possibility to use real-time video footage and previously produced motion graphics and to develop artistic and commissioned projects using this methodology.

After many rehearsal hours, the dramaturgy was outlined and the creative direction was clear: we chose to work only with real-time footage of body parts, having projection on the body and interactive projection on the wall behind the performer. Only one previously produced video animation was used, projected on the wall, representing a simple square space as a context for the action. In this version the camera could be seen also as a mirror or as an eye extension placed on the hand, showing an outside point of view. Using choreographed movements, the performer pointed the camera to her face or different body parts without seeing in real-time what exactly she was filming, recontextualising them to create new meanings. The body mapped projection showed actions of exploration: face,

hands and other details. The camera was placed in different parts of the body, forcing the performer to perform an action to get close to it, into its area of observation. The camera was used as a fixed point and the body moved around it. Alternatively the camera was used as the moving point in the hand of the dancer, who stayed still. The majority of the time the dancer faced the wall, in order to be better integrated visually into the whole projection. More metaphorically, she was on a journey of inner exploration, partnering with a digital performer on stage: the public could interpret this process and was offered the possibility to perceive all visual layers at once: performing body, video mapped projection and interactive wall projection as a whole, moving organism.

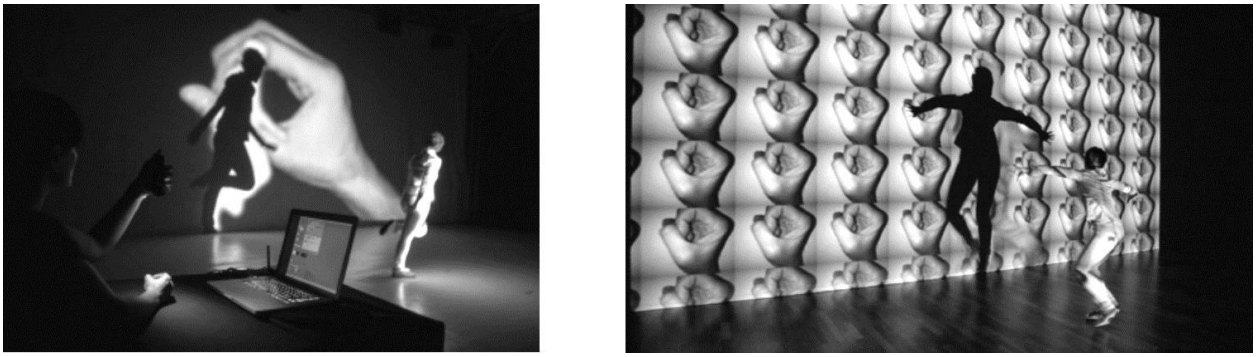

Fig.2: 4th skin, an interactive dance performance for two performers, 2014 - 2016

We were both playing all roles simultaneously: creative director, art director, choreographer, dancer, media artist, performer, technician, project manager, producer, videographer and so on. We were working at a distance, but closely with Cristian Iordache, the interaction designer, who kept developing the customized software according to the needs of the performance. The sound artist Randomform, also based in Romania, was regularly sent video footage from our rehearsals in order to get into the atmosphere and produce the soundscape of the performance. I had regular Skype meetings with both of them to give them input and discuss the results.

The sound for both performances was previously produced, not generated in real-time, Randomform performed it live. It was more of a sound space, creating a context of sound for the whole experience to happen within and to make it even more immersive.

"When I composed the music for *4th skin*, I wanted to cover an array of different sound textures and patterns that range from ambient calm to bursts of noise and rhythms that change and intensify as the performance evolves.

I used processed field recordings as the main element of the piece to add a sense of the surrounding environment and started to construct the composition from there, adding layers of electronic textures and rhythms. I wanted the music to act as another layer that interacts with the dancer, giving the illusion of control and manipulation. Is the dancer moving to the sound or the sound is following the dancer?" [5]

3. TECHNICAL DEVELOPMENT AND IMPLEMENTATION

A complex patch had to be created by Cristian Iordache from scratch, using MAX MSP Jitter programming environment to connect or customize different objects. The *4th Skin* interactive platform was specially made taking into consideration the artistic and interaction concept of the different project's versions.

We needed 3 types of input to choose from, for the video projection on the body/-ies and on the wall: one from the wireless webcam, a second one from the wireless microscope and a third option to play pre-produced video content. Each of these visual inputs was assigned a certain video effect, programmed in the software, depending on the dramaturgy of the performance. Two versions of the same patch were created: one for two body mapped projections on stage and a second for only one body mapped projection. The interactive wall projection, coming from the same beamer, was part of both patches, triggered by the dancer's movements and position in space.

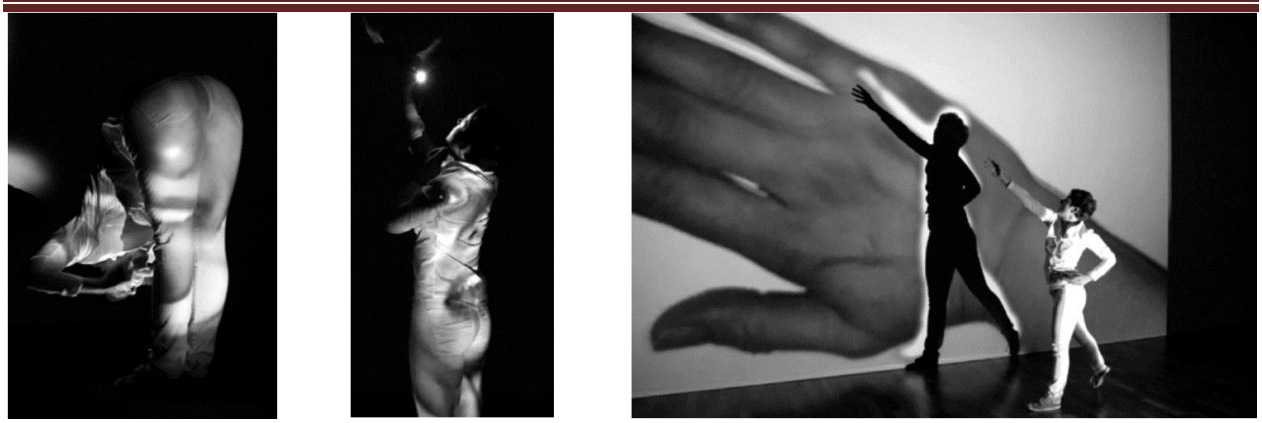

Fig.3: 4th skin, an interactive platform for video mapping projection on moving bodies.

A Kinect camera was used to perform bloop detection in order to make possible the video mapped projection on the body. The use of only one Kinect severely limited the space on stage where the dancer/s were detectable, which influenced the choreography. We performed some tests with a MAX object for schelleton detection, in order to achieve a more precise body mapping but the patch was very unstable and thus unreliable.
The delay from the body projection visible on the wall was a major challenge. We couldn't find another technical solution or project that had already solved this problem at that time, because it was more of a hardware issue caused by a delay of signals in the configuration of the Kinect-software-video beamer, rather than software error. The only solution was to visually trick the viewer, using video content to make the delay invisible.
There were only two light sources on stage: the video projection and the led light on the wireless webcam or microscope, used during filming. The darker the space, the more powerful the immersive effect of the performance.
The short throw video beamer was the only workable solution in order to achieve 2 projections coming from the same source at the same proximity to the performer and the wall as the Kinect camera was.
In 2013 there was no technical solution for video mapping on moving bodies available on the market, using one Kinect camera and being mobile with flexible set-up possibilities for different spaces. The technical rider of the project was intentionally kept as simple as possible for fast and easy implementation, since the interactive platform was supposed to be used by myself, mainly for rehearsals, live performances, research improvisation session, participatory installations in galleries or workshops with dancers and media artists.

4. CONCLUSION

'Interactivity, as a mode of technical mediation within a collective infrastructure, points to a new understanding of environments of relations and a relational aesthetics based on interhuman exchange or physical interaction, to a new technological kinesthetics. To work with the designing of digital interfaces in dance means to organize a sensory and intelligent space for communicative acts that are inherently changeable and unpredictable. The space is not "set" for a fixed choreography, but programmed for potential interactions and movements in which partners behave within a network of relays and responses, and in which technologies and media generate realities and perceptions. Interaction thus involves the whole environment, and it maps its "world" through the continuous biofeedback it receives via direct sensory stimuli which are also technically mediated (sound, image projection, tactile sensors, wearable computing built into textiles, etc).'[6]
Various artists and art groups have been developing projects and finding their way into the interactive realm involving media art, contemporary dance and sound art, since Johannes Birringer wrote the paragraph above in 2003.
Numerous interactive dance projects have emerged using a horizontal structure of relations between different media and the performing body as interface for intermedia oneness on stage. Non-linear dramaturgy with multiple performative outcomes using improvisation techniques, allow the exploration of interactions of different embodiments and their environments.
After working on 4*th Skin* in all its versions, getting in touch with multiple and very different collaborators and public, there is still place for improvement, exploration and performance creation with the same concept and technical solution. It could be developed further including interaction between movement and sound generation,

introducing new features in the interactive software or finding ways to give more possibilities for open end exploration and real-time creation of interactive media performance involving also public participation.
This would offer a common ground for deeper real-time communication between the artists involved, using the performer/-s as interface/-s in the context of the collective consciousness of an inclusive and ubiquitous Intermedia Body: an always evolving structure of connections between all media on stage.

Apendix

Relevant links with photos and video trailers

http://kavdanska.eu/res/M.Kavdanska_PORTFOLIO.pdf
https://vimeo.com/98286574
https://vimeo.com/135001276
https://vimeo.com/74582372
https://vimeo.com/93122856

Festivals, exhibitions, conferences where 4*th Skin* was presented between 2013 and 2016

Ars Electronica Festival, Linz, Austria, 2013 *(interactive dance performance for 3 performers)*
"Use at Your Own Risk" , Victoria Art Center & MNAC Bucharest, Romania, 2014 *(interactive dance performance for 3 performers and participatory video installation)*
Vila-Real en danza, "Festival en Danza Breu", Spain, 2014 *(interactive dance performance for 2 performers and workshop with dancers)*
Kinetica Art Fair, London, UK, 2014 *(interactive dance performance for 2 performers)*
"Dans/ Tehnologie/ Interactivitate", CNDB, Bucharest, Romania, 2014 *(interactive dance performance for 2 performers and project presentation)*
SoundART, Köln, Germany 2014 *(interactive dance performance for 2 performers)*
Unpainted Media Art Fair, Munich, Germany, 2014 (video/ documentation showcase)
Post Screen Festival, Lisbon, Portugal, 2014 (video/ documentation showcase)
Espacio Enter'14, Canarias, Sapin, 2014 (video/ documentation showcase)
International Meeting for Performance Research, Bilbao, Spain, 2015 (presentation)
INTERMEDIA BODY: artistic research meetings, AEC, Linz, Austria, 2016 (presentation)

REFERENCES

[1] DRAKE, Scott. (2007), The Third Skin: Architecture, Technology and Environment, 1 University of New South Wales Press.
[2] BROWN, Carol. (2006), 'Learning to Dance with Angelfish: Choreographic encounters Between Virtuality and Reality', pp. 85-100 from "Performance and technology. Practices of Virtual Embodiment and Interactivity", edited by S. Broadhurst, J. Machon, 2006, PALGRAVE MACMILLAN)
[3] http://www.exile.at/dave/project.html
[4] Quote from Dolma Jover, choreographer & performer in 4th Skin, talking about her experience while creating the project.
[5] Quote from Sorin Paun aka Randomform, sound artist & musician, sharing his motivation and work process while creating the sound scape for *4th Skin*
[6] "Dance, the body and the internet", Johannes Birringer. (c) 2003, Design and Performance Lab, Brunel University London.