

Carla Montez Fernandes
CLUNL - Centro de Linguística da Universidade Nova de Lisboa /
Linguistics Centre of the New University of Lisbon
carla.fernandes@fsh.unl.pt

Stephan Jürgens
INET-MD – Centro de Estudos de Música e Dança / Centre for Music and
Dance Studies

Transdisciplinary research bridging cognitive linguistics and digital performance: from multimodal corpora to choreographic knowledge-bases

Keywords: *digital performance; cognitive linguistics; multimodal corpora; digital archives; dance documentation models; video annotation tools; user-centred design; dance features retrieval.*

ABSTRACT

This paper presents the **Transmedia Knowledge Base project** (TKB), a transdisciplinary project coordinated by Carla Fernandes at CLUNL¹, lying in the interstices between cognitive linguistics, contemporary dance studies and the new media technologies, accommodating two other endeavours to develop user-centered interaction design in the realm of digital performance.

Building on practice-based research collaborations with choreographers Rui Horta in Portugal, Emio Greco in Amsterdam (in the framework of the international project *Inside Movement Knowledge*²) and Lisbon-based choreographer Stephan Jürgens (with his digital performance **.txt**), the authors try to integrate the three idiosyncratic but closely-related perspectives into a common frame, thus hoping to enhance the development of interactive knowledge bases sharing similar conceptual structures.

An interactive multimodal glossary designed by Carla Fernandes to accommodate Horta's conceptual structure in the TKB project, as well as a parallel hypertext glossary of Emio Greco's terms and definitions used to improve the code of his installation DS/DM (*Double Skin/Double Mind*) are currently being compiled.

Stephan Jürgens also has been developing an evolving web-based glossary for digital performance over the past few years, which consists of compositional concepts, technical principles and forms of collaboration. This glossary serves both as “translator” of the bodily knowledge of choreographers and performers, and as “generator” of new creative strategies for the collaborative design of interactive systems for live performance. An example of this methodology is presented in this paper, which demonstrates the application of a compositional

¹ <http://www.clunl.edu.pt/PT/projecto.asp?id=1555&mid=138>

² *Inside Movement Knowledge* (IMK) is an interdisciplinary research project, which involves researchers from the Netherlands Media Institute, the Amsterdam School for the Arts, the Theatre & Dance Studies Department at Utrecht University, and a group of international collaborators, where Carla Fernandes is included.

concept to explore the custom-built TKB video annotator in its condition of creation-tool in the choreographic process.

Introduction

The understanding, organization and transmission of the core concepts of a specific knowledge domain inevitably depends on a structured analysis of the discourses originated inside that domain.

Knowledge is organized in our memory under distinct domain headings; terminologies differ from domain to domain, which precisely is what allows metaphorical transfers, such as the ones occurring in interdisciplinary projects and their subsequently emergent “translation” processes.

Cognitively oriented discourse/semiotic analysis offers both theoretical insights and motivates representational requirements for the semantics of tools such as Emio Greco’s *DS/DM* installation or the TKB’s video annotator, based on Horta’s interactive multimodal glossary, or the user-centred creation tool we are developing for TKB as well.

The closely-related research projects presented in this paper, as examples of inter- and trans-disciplinarity practices, try to integrate methods and theories developed in the disciplines of contemporary choreography, linguistics, and new media art, with methods and theories derived from cognitive science and semiotics, with the ultimate aim of providing new insights into the realm of human meaning production.

Creativity and innovation occur less and less within a discipline, but increasingly in the contact zone of various disciplines. New technologies are used especially to share knowledge that would otherwise be restricted to the happy few insiders, members of the domain specific communities in question.

By crossing different research methodologies, world perspectives and idiosyncratic intentions, thus allowing their productive inter-contamination, we wish to implement the fundamental trans-boundary circulation of ideas and implicit concepts, by starting to

build the grounding pillars for a toll-free bridge between (only) apparently separated knowledge areas.

The potential of evolving glossaries in collaborative creative processes will be discussed regarding the creation of interactive knowledge databases, the reflection and analysis of the individual artistic creative process, and the generation of new creative strategies in the field of performative rich media environments.

Three endeavours to develop user-centered interaction design in the realm of digital performance will be described in the next sections, focusing both on their similarities and specificities and following an integration approach as much as possible.

1. The TKB project: a Transmedia Knowledge-Base

Strongly correlated to the other two endeavours to be presented below, indeed currently functioning as an umbrella for both of them, the *TKB project* aims at the design and construction of an open-ended multimodal knowledge base to dynamically document, structure, annotate and browse a range of recently created digital dance pieces. It offers above all a transdisciplinary university-based structure for reflection on original documentation models for contemporary choreography and performance.

The TKB research project³ was designed and started by Carla Fernandes at CLUNL in 2008 as a follow-up of the previously gained experience with the semiotic micro-analysis of Rui Horta's piece *SetUp*⁴ in the framework of a Post-Doctoral research project; it is currently running under her own coordination with the collaboration of several international research partners, namely: *Espaço do Tempo*⁵ (Rui Horta's Choreographic Centre in Montemor-o-Novo); University of Amsterdam – AHK (with Bertha Bermudez and Scott DeLahunta); Ohio State University (Advanced Computing Center for the Arts and Design / Forsythe Foundation, with Norah Zuniga Shaw); *Universidade Nova de Lisboa*: Faculty of Social and Human Sciences (CLUNL -

³ The TKB Project has been accepted for EU and national funding in August 2009.

⁴ A practice-based research case-study described in Fernandes & Costa 2009 (in print). "Looking for the linguistic knowledge behind the curtains of contemporary dance: the case of Rui Horta's creative process" in *Art, Bain and Language*, Special Issue of *International Journal of Arts and Technology*. Inderscience Publishers.

⁵ http://www.oespacodotempo.pt/en/prog.php?idpan=pro_det&recid=477

Linguistics Centre, with RuteCosta, and INET-MD, with Stephan Jürgens) and Faculty of Science and Technology (Interactive Multimedia Group - Department of Computer Science, with Nuno Correia); and *Universidade do Porto* (CLUP – Linguistics Centre, with Isabel Rodrigues).

It situates itself in a hybrid territory between cognitive linguistics, dance research and new media technologies and its initial motivation and start-up questions were the following:

- How is a choreographer's *imagic* (not only verbal) type of thought translated into an embodied-type of *thought in motion* via the dancers?
- Can choreography be interpreted as thoughts in motion?
- What is the impact of verbal language on the dancers' movements?
- When does the dancing body demand words and vice-versa?

The global purpose of TKB, since its very beginning, has been to extend the scope and application of the “documentation” concept to contemporary dance in different ways by taking a closer look at the cognitive process of *choreographic thinking* and therefore hopefully contribute to the domains of multimodal corpora, terminological ontologies, cognition and verbal-nonverbal relations.

TKB's main aims include three complementary components, namely:

- 1 - Linguistic annotation;
- 2 – Custom-made software for annotation and motion analysis;
- 3 - Creation-oriented tool.

Component 1, *Linguistic annotation*, includes the following applications:

- i) Video indexation and verbal annotation of multiple rehearsal videos;
- ii) Creation of an ideosyncratic glossary to define the terms used;
- iii) Prototype of online archive for Portuguese contemporary dance.

By using a custom-made video annotator, the aim of this component has been to annotate and index original videos from dance performances, shot on site during their creation and rehearsal phases, in a first stage those corresponding to the piece *SetUp* by Rui Horta, being contrasted with two other pieces by the same choreographer, with

which it is considered to form a trilogy: *Pixel – SetUp - Scope*. This first case study will be followed by the analysis of Stephan Jürgens' digital performance *.txt* during TKB's further developments, both for contrasting and evaluation purposes.

The methodology followed for this first component is the one underlying the linguistic annotation of textual *corpora* (in the same way as done for the *SetUp* case study while using the ANVIL video annotation tool), where digital videos instead of texts are parsed, in order to enable the analysis of movement sequences that may be tagged as the “minimal units” or *dancemes* (our suggestion) of each choreographer's “grammar”.

The lexical annotation of video frames is based on the principles of the conceptual metaphor theory and its “embodiment” postulates (Johnson 1990). It has been applied to:

- a) the influence or direct effect of the use of speech in contemporary dance upon the more distinctive, recurrent or emblematic gestures, phrases or body movement sequences;

- b) other choreographic elements such as the physical space (architectural structures), the multimedia resources, the lights design, the sound, or even the spectator's participation in the event. This initiative has led us to the development of the TKB itself in its present configuration: a transmedia knowledge base also in the sense that the several different modalities (verbal and non-verbal) are contaminating each other in such a way that it is not the aesthetic body anymore which is in the foreground of our analysis, but rather the interconnections of choreographic thought and human motion in the whole piece as a unit.

The motivation for the creation of an idiosyncratic glossary (Component 1. ii) to define the terms used by Rui Horta has derived from the need felt in the first place by each of the research teams involved to *come to terms* with the obviously different, culture-bound and case-specific terminology used by the choreographer in question. Moreover, we have soon realized that the iterative design of the TKB's interface and related digital archive would have to be closely articulated with the data contained in the verbal annotations. And this naturally implied that their structuring categories, principles or basic units should be defined as precisely as possible, in order to allow the retrieval and translatability of at least the more relevant or salient analytical features into the

computational parameters needed for a more automatic recognition process in the near future.

In this sense, an interactive multimodal glossary is currently under development to be structured as a work-in-progress Knowledge-Base of choreographic elements used by Rui Horta and his interpreters; it is intended to be a rather flexible tool, in the sense that its underlying structure, inspired by the *Frame theory* (in its derivation from artificial intelligence applications to linguistics and lexicographical products), will be adapted to accommodate other choreographers' concepts and possible taxonomies as well, as is the case with our partner Bertha Bermudez working for the *DS/DM* hypertext glossary with Emio Greco|PC in Amsterdam.

Besides gathering, defining and ordering textual and visual data, the emphasis will be placed on the investigation, creation and design of a multimodal interactive user interface, where terms, definitions, descriptions, notations and live demonstrations will be available to the viewer through video, sound and icons.

Concerning the prototype for a Digital Archive (component 1. iii) of selected Portuguese contemporary dance creations, our mid-term aim is to gradually compile in an interactive Transmedia Knowledge Base the newest creations of international choreographers showing interest in this initiative, as well as, in the longer run, to cover the existing resources documenting the choreographic productions of the last three decades in Portugal. The future digital archive should also include the existing press and television previously existing documentation, and a spectator's gallery for feed-back and audience intervention after a piece is premiered.

Component 2, the development of a custom-made software tool for annotation and motion analysis, includes the following modules:

- i) A video annotator
- ii) An Information & Knowledge Management
- iii) A motion analysis research plug-in

This component includes the development of a custom-made video annotator⁶, an information & knowledge management system as the interface to connect its three different modules and a motion analysis research module: towards a multi-person semi-automatic system to analyze the human body motion in video dance sequences (cf. Guo 2006). According to Norman (2009:4), “exploitation of datasets of this complexity calls for novel index-based retrieval tools, where annotated data features can be identified in response to multiple, composite query criteria” which is exactly what we intend to experiment in this component.

The three mentioned modules will correspond to two different applications: one for annotation and another one, web-based, for content access and browsing.

Component 3, a Creation-oriented tool, includes the development of a tool for the choreographers’ creation process and their personal archives.

The development of the prototype for a creation-oriented tool is to be based on the outcomes of the earlier stages of the TKB project, particularly on the results of the annotated video corpora and the possibilities provided by the software development with the aim of feeding back to the choreographic creative process.

A choreographer’s creation process is evidently highly individual and specific, which is why the design of the video annotator as creation-tool will be approached from a combination of the practitioner and researcher’s perspective. For the development of a first prototype, choreographer and researcher Stephan Jürgens was invited to collaborate on the design and test the future web-based TKB interface with regard to his creative process and choreographic methods.

The interface is planned to provide different modes for different types of users, e.g., choreographers or archive users. One important way of using the TKB annotator is a user-led mode allowing a choreographer to annotate relevant information in real-time

⁶ The research partners responsible for this module (from the *Interactive Multimedia Group* at FCT/UNL) have previously developed algorithms for image and video annotation that will be generalized in the scope of the TKB project. It is a framework for the identification of semantic events that can be tailored for a specific application, combining low level image processing with classification mechanisms in order to annotate images or videos.

during rehearsal and performance; simultaneously the annotator can serve as an auxiliary tool for personal archiving intentions of the artist. Naturally this user-led mode provides more access privileges to the annotator than a user-centred mode, in which a researcher, for example, can investigate existing annotations made by a given choreographer and authorized for public consultation; or the researcher might want to add on his own comments. The difference between both modes is that the choreographer can customize the interface for his needs, whereas the archive user has much fewer access privileges.

The TKB annotator interface will be developed by a new media designer with the collaboration of Stephan Jürgens and Rui Horta⁷. Most of the annotator's specifications will be derived from the results of the manual video annotations⁸, which in their turn will inform the digital archive itself.

2. A Digital Performance Glossary applied to the *TKB creation-tool*

Over the past few years, Jürgens has been developing a constantly evolving glossary for digital performance, consisting of compositional concepts, technical principles and forms of collaboration. This glossary serves in part as “translator” of the bodily knowledge of choreographers and performers, and partly as “generator” of new creative strategies and the collaborative design of interactive systems for live performance. The glossary is planned to be made available online and further developed on basis of user feedback and input. Its main principles can be employed to quickly and efficiently create the specific terminology used with the TKB annotator. For example, the concept of “**Development Cycle**” was applied to develop the research questions presented below for testing the TKB creation-tool. According to this principle, choreographic processes

⁷ We also count on a contemporary dance-expert consultant, Maria José Fazenda, a dance anthropologist at Lisbon's Higher Education School for Dance, and a facilitator consultant for the project's knowledge circulation, Scott DeLahunta, Writing Research Associates, Amsterdam.

⁸ We hope to be contributing for pioneering ways of processing this type of manually annotated data and are aware that this will be an important challenge for our research group in the sense that usually (and quoting Melissa Terras) “humanities data has a tendency to be fuzzy, heterogeneous, of varying quality, and transcribed by human researchers, making humanities data difficult (and different) to deal with computationally.” In ReACH: Researching –Science Analysis of Census Holdings, AHRC Arts and Humanities e-Science Workshop Series, Project Report, <http://www.ucl.ac.uk/reach/>.

in the field of Digital Performance can be divided into two cycles consisting of the following phases:

Cycle one: creation of a work

1. Artistic concept: research and training (e.g. working with a new interactive system)
2. Creating material
3. Designing strategies for interaction
4. Developing micro- and macro-structures of the performance

Cycle two: iteration of the work

5. Public performance
6. Documentation of the work (rehearsal and performance)
7. Re-staging / re-creating a work

Phases 1-4 can be considered a first cycle (creation of a work) and phases 5-7 a second cycle (iteration of the work after creation). Phase 7 of the second cycle leads back into one or more phases of the first cycle.

Three tasks have been developed for the TKB creation-tool to address design creative strategies within specific phases of the Development Cycle:

Task 1 (first cycle, phases 2-3)

Choreographers working with interactive systems often experience difficulties in recording rehearsal sessions in a satisfactory way. While it is common practice to film the dancer's movement in rehearsal efficiently, it is often impossible to film the projected visual output of the interactive system simultaneously.

We are documenting rehearsals in which interactive systems with projected visual output are used, by means of the custom-built TKB video annotator, which provides the possibility to synchronize two or more video streams and annotate the choreographer's ideas, comments or sketches. In this way we can clearly visualize correlations between the dancers' movement and the visual output of the interactive system.

Task 2 (first cycle, phase 4)

In the 1980ies and 90ies *mapping* approaches were prevalent to define the relation between sensory input and multimedia output of an interactive system. During the past years attempts have been made to improve the “intelligence” of interactive systems, for example to develop computational forms of perception and interpretation of the input as a base for adequate output (Bevilacqua et al. 2007; Downie 2005; Camurri et al. 2005).

For this second task we have developed a glossary for Stephan Jürgens’ digital solo performance *.txt* (2007-09). Subsequently it will be tested how this glossary can help to improve the programming of two specifically selected scenes of this work. In other words, we will examine how to use this particular glossary in combination with the parameters of the motion analysis module of the TKB interface, in order to program a more autonomous yet meaningful media output of the interactive system.

Task 3 (second cycle)

Finally, we will focus on the potential of the TKB interface for re-staging a digital performance, which corresponds to the second development cycle. A group of dancers with diverse training backgrounds will work on re-staging selected scenes from the *.txt* project. The goal here is to compare how the different dancers make use of the existing annotations to learn and perform the solo. A further research question here is whether the manual annotations can successfully communicate the choreographer’s intentions; and to what extent the dancers should use the annotation tools themselves.

3. The *DS/DM* glossary⁹

Dance Company Emio Greco | PC (ICKamsterdam) and the research group Art Practice and Development (Amsterdam School of the Arts) have established a partnership with Carla Fernandes aiming at joint work methods and outcomes within the TKB project, mainly regarding linguistic-related issues, such as the organization of terminological data into interactive knowledge-bases.

⁹ Acknowledgements to Bertha Bermudez for her partnership in the framework of the TKB project.

Since the beginning of their artistic work, dance company Emio Greco | PC has focused on an internal reflection of their artistic praxis. This reflection has led to the development of different activities within the field of art practice based research, dance education and dance discourse. Through their interdisciplinary research project *Inside Movement Knowledge* (started September 2008 in Amsterdam), questions around dance transmission, documentation models, dance notation and recreation have been confronted with different disciplines like dance notation, cognitive linguistics and new media design. In the framework of Bertha Bermudez's partnership with Carla Fernandes, part of this research project is also to create a hypertextual glossary, under Fernandes' supervision, due to represent the cognitive schema of the artistic work produced since 1995 by Emio Greco and Pieter C. Scholten.

The Emio Greco | PC generic glossary aims to reveal and define the terminology used among their creative process, as well as to investigate new trends on issues of interaction and dance documentation. The glossary project has departed from a first draft of the *Double Skin /Double Mind* workshop glossary, created as a tool of communication between the different disciplines involved within the *IMK* project. Throughout three years, the original draft of terms will be complemented with concepts relating to the *basic principles* of the work (contextual concepts that help understand the main philosophical and creative ideas of the choreographers), *creative structures* like pre-choreographic elements, phrases and overall performance structures and concepts revealed in the choreographers' discourse.

Conclusions and further developments

Common to the three projects described above, each of them involving interactive online glossaries or knowledge-bases, is their implicit user-centred approach. Furthermore, all these glossaries in progress have been designed according (and are oriented) to two different types of end-users: those having access to the respective glossaries' "back-offices" and those not having access to them. In other words, once each glossary annotation grid has been stabilized, with categories, types, principles or minimal units to be indexed and annotated in their respective tracks, only the researchers and the

choreographers involved in the whole process will have access to the main programming frames of the glossaries. The external end-users, such as any dance student, scholar or the general audience of a particular choreographer, will not be able to change the original semantic grid or frame, although they are strongly encouraged to make comments to all the categories and tracks previously annotated. To give just one example, Rui Horta's broad knowledge-base will include a public-dedicated gallery, where a world-open space should work as hopefully the beginning of an original and democratic database of audience responses/criticism to the annotated performances available in the digital archive.

To summarize, while each choreographer and respective research team can (and are meant to!) customize their own annotations' *slots* and *fillers*, the external users can only add their comments to the already existing annotation tracks. *Slots* cannot be altered, since their customization requires a complete re-programming of the conceptual frame as a coherent whole.

Through the development of the three parallel endeavours described in this paper, Rui Horta, Emio Greco | PC, Stephan Jürgens, and their respective researcher teams aim to provide the broader public with further understanding of their unique individual universes, and ultimately a deeper insight into the dance creative praxis in general.

In conclusion, it seems that, at the present, several perspectives on the use of ICT technologies in general, and the need for project-specific cross-disciplinary terminology in particular, have greatly benefited from the analysis of digitized dance video and motion tracking/capture data (Lansdale et al. 2003; Norman. 2006). Publications on the development and use of glossaries and *lexica* evolving during the creative process (Shaw and Lewis, 2006) are very few. We hope to contribute with the TKB creation-tool to show how, based on such specific glossaries, intuitive programming possibilities can be provided for artists in the realm of digital performance, empowering them to design new creative strategies for their particular artistic processes.

The potential of evolving glossaries in collaborative creative processes has been discussed regarding the creation of interactive knowledge-bases, the reflection and

analysis of the individual artistic creative process, and the generation of new creative strategies in the field of performative rich media environments.

TKB's web-based broader application is scheduled to be launched by 2012, with both its theoretical and practice-based results being especially relevant for the dance-related structures in Portugal, higher education schools for contemporary dance and choreography, contemporary art museums and for knowledge building inside the scientific communities of linguistics, cognition, multimodal corpora and new media technologies. Its final outputs should include the creation from scratch of a new customized video annotator, the iterative design of all its software applications, a prototype for an interactive digital archive and a motion capture plug-in for applied research. Future developments should include the production of compressed video visualizations of body motion in dance and the use of neurology's imaging technology (fMRI) over the involved choreographers and dancers' mental spaces after a piece has been performed.

REFERENCES:

- Bevilacqua, F., Guédy, F., Schnell, N., Fléty, E. & Leroy, N. (2007) Wireless sensor interface and gesture-follower for music pedagogy. *2007 Conference on New Interfaces for Musical Expression (NIME07)*. New York.
- Brandt, P.A. 2005. Spaces, Domains, and Meaning. Essays in Cognitive Semiotics Bern: Peter Lang Verlag.
- Camurri, A., De Poli, G., Friberg, A., Leman, M. & Volpe, G. (2005) The MEGA Project: Analysis and Synthesis of Multisensory Expressive Gesture in Performing Art Applications. *Journal of New Music Research*, 34, 5 - 21, November 04, 2008.
- Correia, N. et al. 2002. Annotations as multiple perspectives of video content. In Proceedings of the 10th ACM international conference on Multimedia. ACM MULTIMEDIA '02. ACM Press, New York, NY, 283-286.
- DeLahunta, S. 2006. Constructing Memories in http://tkbproject.files.wordpress.com/2009/01/scottdehunta_2006_constructing-memories.pdf

- Downie, M. (2005) *Choreographing the extended agent : performance graphics for dance theater. Massachusetts Institute of Technology. Dept. of Architecture. Program In Media Arts and Sciences.*
- Fernandes, C. & Costa, R. 2008. "Indexação vídeo e anotação linguística de criações coreográficas contemporâneas: para uma ontologia multimédia" in *Estudos Linguísticos / Linguistic Studies*, Edições Colibri: Lisboa, pp. 11-18.
http://tkbproject.files.wordpress.com/2009/01/carlafernandes_linguistic-studies-journal.pdf
- Fernandes, C. & Costa, R. 2009 (forthcoming). "Looking for the linguistic knowledge behind the curtains of contemporary dance: the case of Rui Horta's creative process" in *Art, Brain and Language. Special Issue of International Journal of Arts*. Inderscience Publishers.
- Guo, F. & Qian, G. 2006. Dance Posture Recognition Using Wide-baseline Orthogonal Stereo Cameras. In *Proceedings of the 7th international Conference on Automatic Face and Gesture Recognition (April 10 - 12, 2006)*. FGR. IEEE Computer Society, Washington, DC, 481-486.
- Jesus, R., Abrantes, A., Correia, N. 2006. Photo Retrieval from Personal Memories using Generic Concepts. *Advances in Multimedia Information Processing - PCM*, Springer LNCS. 4261: p. 633-640.
- Johnson, M. 1990. *The body in the mind*. Chicago: Chicago University Press.
- Jürgens. S. 2008. "Expanding Choreographic Resources: Generative Techniques in Contemporary Life Performance and New Media Art" in: Tércio, Daniel (ed.) *TeDance - Perspectives on Technologically Expanded Dance*, Lisbon, Faculdade Motricidade Humana/Technical University of Lisbon.
- Kipp, M. 2008. "Spatiotemporal Coding in ANVIL" In: *Proceedings of the 6th international conference on Language Resources and Evaluation (LREC-08)*.
- Lansdale, J., Deveril, Carr, L., Hall, W. & Miles-Board, T. (2003) Decentering the dancing text: from dance intertext to hypertext. *Proceedings of the fourteenth ACM conference on Hypertext and hypermedia 1-58113-704-4*. Nottingham, UK, ACM.
- Lakoff, G. & Johnson 1999. *Philosophy in the Flesh: The embodied Mind and its challenge to Western Thought*. New York: Basic Books.
- Norman, S. J. (2006) Generic Versus Idiosyncratic Expression in Live Performance Using Digital Tools. *Performance Research*, 11, 23 - 29
- Norman, S. J. et al. 2009. AMUC Research Report – Associated Motion capture User Categories. Culture Lab: Newcastle.

Shaw, N. Z. & LEWIS, M. (2006) Inflecting Particles: Locating generative indexes for performance in the interstices of dance and computer science. *Performance Research*, 11, 75 - 86