

COST  
Domain Committee "ICT"

COST Action 287

Gesture Controlled Audio Systems
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**FINAL EVALUATION REPORT**

*Period: March 2003 to June 2007*

The first part (para. 1-8 ) is prepared by the Management Committee of the Action and presented to the relevant Domain Committee or directly to the Committee of Senior Officials.

The report is a "cumulative" report, i.e. it is updated annually and covers the period beginning from the start date of the Action.

The second part (para. 9) is prepared by the "ad hoc" Evaluation Panel established by the Domain Committee and edited by the Rapporteur.

The third part (para. 10) is prepared by the Domain Committee.

## CONTENTS

### 1. OVERVIEW: ACTION IDENTIFICATION DATA

## Action Identification Data

COST Action 287: “*Gesture Controlled Audio Systems*”

DC Recommendation: 17/10/2002

CSO Approval: 03/12/2002

Start date: 10/03/2003 <sup>(1)</sup>

Duration: 48 months

Extension: none

End date: 30/06/2007

First MC meeting: 10/03/2003

Last MC meeting: 11/05/2007

Final Report: 15/08/2007 <sup>(2)</sup>

Evaluation Report: xx.09.2009 <sup>(2)</sup>

DC Evaluation:

Number of signatories: 15

Signatories and date of signature:

Austria	Greece	Norway 20/03/2003
Belgium 16/05/2003	Hungary	Poland
Bulgaria	Iceland 05/07/2004	Portugal 01/08/2005
Croatia	Ireland 12/03/2003	Romania
Cyprus	Israël	Slovakia
Czech Rep.	Italy 14/03/2003	Slovenia
Denmark 05/09/2003	Latvia	Spain 25/09/2003
Estonia	Lithuania	Sweden 16/05/2003
Finland 20/03/2003	Luxembourg	Switzerland 17/04/2003
France 05/05/2003	Malta	Turkey
Germany 12/03/2003	Netherlands 12/03/2003	United Kingdom 12/03/2003

Institutes of non-COST countries: Faculty of Music, McGill University, Canada.

Area: ICT

Action Web site: [http:// www.cost287.org](http://www.cost287.org)

Chair:

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DC Rapporteur: Prof. Dr. Michael Ansorge,

Univ. of Applied Sciences of Western Switzerland, Fribourg, Switzerland

External Evaluator: Prof. Dr. Rolf Grossman, Academic Director, Univ. of Lüneburg, Germany

(1) Date of the first MC meeting

(2) When the report is received by DC Secretariat. A reworked version of the final report was received on 24.06.2008.

## 2. OBJECTIVES

The main objective of the **Cost287–ConGAS** Action was to contribute to the advancement and development of musical gesture data analysis and to capture aspects connected to the control of digital sound and music processing.

The objective were detailed as follows:

- To establish links with connected fields of research (multi-modal interface research, smart user interfaces, smart sensors/actuators for multimedia presence / interaction), intelligent interfaces for elderly and disabled, including rehabilitation technologies for all, etc.). In establishing these links, **Cost287–ConGAS** will try hard to have an impact on social domains other than just the music field (tool research for assistance, ergonomic research in common mass tools and utilities, acoustic ecology, etc.).
- To improve the knowledge in the relationship between sound and gesture, on the the mathematical/scientific side and on practical implementations.
- To improve new gestural processing of sound, carefully studying the typical structure of musical/instrumental gesture (division between control and sound production, audio feedback, and visual cues and sound production).
- To explore distributed interactive multimedia technologies (multi -platform and multi-operating-system integrations using networking protocol and technologies).
- To coordinate most prominent efforts at European level in this field, linking together several research centers that are currently working separately in this field.
- To promote the developments and applications of new technologies. This Action was promoting further development of interactive installation and distributed collaborative arts. Besides new applications and opportunities to explore new markets (e.g. interactive installation for museum, public places and new artistic performances) provided by its development, the **Cost287–ConGAS** action aimed at widening participation of music making and stage performance, and alternative paths to musical creativity and expressivity for many people, including those for whom conventional instruments were not an option due to physical constraints. The Action contributed to coordinate the different research realities in European countries to share and cross-fertilize their experience.

## 3. TECHNICAL DESCRIPTION AND IMPLEMENTATION

The work on the **Cost287–ConGAS** Action was articulated along the following steps:

- State-of-the-art investigation and refined specifications of research planning within the Action itself, which involves:
  - Gestural control taxonomy and classification (interaction and performance control description and definition; investigation on prior art techniques and algorithms for gesture-sound integration).
  - Sound control definition and classification.
  - Multimodal interface design classification.
- Establishment of design methods and techniques, which involves:

- Study and design of a standardized common framework to investigate and describe the existing forms of gesture and sound control;
  - Design and implementation of infrastructure software/hardware tools of the common framework;
  - Implementation of new and also existing algorithms for sound control and gesture-sound interaction in the established framework;
  - Development of a common database for gesture algorithm description and implementation (this database should be freely accessible and the Action may accept external contributions to it).
- Experimentation and Assessment of Design Methods and Tools, that will involve:
    - Development of software/hardware demonstration tools and vehicles for general and specialized public (to be used in conferences, fairs, exhibitions, etc.);
    - Development of on-line demonstrators for download and experimentation;
    - Production-grade software creation.
  - Establishment of Guidelines and Protocols, that will provide a formalized documentation on the results obtained in the previous steps, in connection with – and possibly contributing to – several standardization efforts.
  - Dissemination and Diffusion, an ongoing activity during the whole duration of the Action. It was encompassing the following activities:
    - Organization of WG meetings dedicated to specific aspects and problems in the field;
    - Yearly organized scientific conference devoted to Gestural control in Music, coordinated with other related symposia.
    - Participation to special conference sessions in other international conferences, such as the *International Computer Music Conference – ICMC* (<http://www.icma.org>), the *DAFx Conference* (<http://www.dafx.de>), European Symposia such as the *Italian Colloquio di Informatica Musicale* (<http://www.xivcim.org>), the French *Journées d’Informatique Musicale* (<http://www.gmem.org/evenements/jim2002/jim.htm>), etc.

The scientific program of the **Cost287–ConGAS** Action aimed at an efficient cooperation of every interested research group. Working Groups have been designed so that each research group may participate according to its own background and interest. The Action was using common servers and repositories and Free Software groupware tools to be able to share any information they wish to.

The work of the Action was organized along the following working groups:

WG1 “Capture/Analysis methods and technologies”

WG1 Coordinator: Prof. Daniel Arfib, LMA-CNRS Marseille (F)

The WG 1 aimed at providing an answer to this issue: “How to analyze a gesture”, which implicitly includes the question “what is a gesture?”. In this frame, it will compile information and valuable resources on hardware and software of sensing technologies. Furthermore WG1 aims to provide the basic foundations concerning gesture oriented to sound production, in order to make a link with WG2 and WG3 to get an overall picture of **Cost287–ConGAS**.

## WG2 “Input Technology”

WG2 Coordinator: Dr. Kia C Ng, University of Leeds (UK)

The activity of WG2 has focused on collecting and compiling resources for the development and implementation of low-level hardware devices, performing benchmarks and measurements on both experimental and commercially available devices, etc. WG2 has also aimed to survey sensing technologies using Computer Vision and pattern recognition techniques such as motion tracking and face tracking with live video, as well as multi sensory fusions.

## WG3 “Integrated Applications”

WG3 Coordinator: Dr. Andy Hunt, University of York (U.K.)

The activity of the WG3 has focused on the integration of the work carried out in WG1 and WG2 producing concrete applications of low-level and sensing technologies, bringing together developments from arts and sciences in order to promote multidisciplinary integrations.

During the second year, this structure was consolidated by the addition of two Transversal Working Groups (or TWGs):

TWG1 also known as the *Book* TWG

TWG1 Coordinator: Prof. Marc Leman, IPEM Ghent (Belgium)

The Book TWG was devoted to the design and the organization of a book dedicated specifically to **Cost287–ConGAS** objectives; while this book will be issued after the end of the action, its conception and design was started very early on through this TWG.

TWG2 also known as the *Website* TWG

TWG2 Coordinator: Sandra Pauletto, York University (U.K.)

The **Cost287–ConGAS** website needed active maintenance and constant update; while it was already been set up and filled in with usual information, it needed to be kept a lively source of information with constant work: this TWG was responsible for this work.

## 4. PARTICIPATION AND COORDINATION

### 4.1 Management Committee

Chairperson:

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MEMBERS		
FRANCE	Prof. Daniel Arfib, LMA-CNRS, Marseille	Prof. Sylvie Gibet, VALORIA, Université de Bretagne du Sud
GERMANY	Prof. Gunnar Johannsen, University of Kassel	Dr. Thomas Hermann, Research Assistant, Neuroinformatics Group, Faculty of Technology, Bielefeld University
ICELAND	Prof. Hiltor Thordarson, Music Department, Iceland Academy of the Arts	
IRELAND	Prof. Mikael Fernström, University of Limerick, Dept. of Computer Science and Information Systems	Dr. Sile O'Modhrain, Ph.D., Principal Research Scientist, Palpable Machines Group, Media Lab Europe
ITALY	Prof. Nicola Bernardini, Electronic Music Professor, Conservatorio Statale di Musica "Cesare Pollini", Padova	Prof. Antonio Camurri, Associate Professor, DIST - Università di Genova
NETHERLANDS	Dr. Bert Bongers, Dept. of Computer Science, Vrije Universiteit Amsterdam	
NORWAY	Assoc. Prof. Jan Tro, Acoustics Group, Dept. of Electronics and Telecommuni- cations, Norwegian University of Science and Technology (NTNU)	Prof. Rolf Inge Godøy, Institutt for musikk og teater, Oslo University
PORTUGAL	Prof. Alvaro Barbosa, Universidade Católica Portuguesa, Escola das Artes - Dept Som e Imagem	Prof. Luis Teixeira, CITAR - Centro de Investiga ção Ciências e Tecnologias das Artes, Universidade Católica Portuguesa
SPAIN	Prof. Xavier Serra, Director, MTG-IUA-UPF	Prof. Sergi Jordá, MTG IUA-UPF
SWEDEN	Dr. Sofia Dahl, TMH - Department of Speech, Music and Hearing, KTH - Royal	Dr. Roberto Bresin, PhD, TMH - Department of Speech, Music and Hearing,

	Institute of Technology	KTH - Royal Institute of Technology
SWITZERLAND	Mr. Alain Crevoisier, Center for Engineering and Technology Transfer (CeTT), University of Applied Science Western Switzerland	
UNITED KINGDOM	Dr. Kia C Ng, School of Computing, School of Music, University of Leeds	Dr. Andy Hunt, Department of Electronics, University of York

## 4.2 Participating Institutions

1. Ghent University, ARTeM (Art, Recherche, Technologie et Musique asbl), Belgium.
2. McGill University, Canada.
3. Aalborg University, Denmark.
4. Helsinki University of Technology, Finland.
5. LMA-CNRS Marseille, Université de Bretagne-Sud, France.
6. University of Kassel, Bielefeld University, Germany.
7. Iceland Academy of the Arts, Iceland.
8. University of Limerick, Media Lab Europe, Queens University, Ireland.
9. Conservatorio “C.Pollini” Padova, DIST - University of Genoa, Italy.
10. Vrije Universiteit Amsterdam, Netherlands.
11. Norwegian University of Science and Technology (NTNU), Oslo University, Norway.
12. Universidad Católica Portuguesa, INESC Porto, Portugal.
13. Universitat Pompeu Fabra, Spain.
14. Royal Institute of Technology, Sweden.
15. University of Western Switzerland, Switzerland.
16. University of Leeds, University of York, United Kingdom.

## 4.3 Meetings of the Management Committee (MC)

- Inaugural MC Meeting. Brussels (B), March 10th, 2003.
- First **Cost287–ConGAS** MC Meeting. Genova (I), April 18th, 2003.
- Second **Cost287–ConGAS** MC Meeting. Bielefeld (D), January 9th, 2004.
- Third **Cost287–ConGAS** MC Meeting. Barcelona (E), October 12th, 2004.
- Fourth **Cost287–ConGAS** MC Meeting. Vannes (F), May 21st, 2005.
- Fifth **Cost287–ConGAS** MC Meeting. Salerno (I), November 23rd, 2005.
- Sixth **Cost287–ConGAS** MC Meeting. Leeds (UK), May 10th, 2006.
- Seventh **Cost287–ConGAS** MC Meeting. York (UK), February 1st, 2007.

- Eight **Cost287–ConGAS** MC Meeting. Reykjavik (IS), May 11th, 2007.

#### 4.4 Meetings of the Working Groups (WGs)

- WG3 Meeting. Genova (I), April 18th, 2003.
- WG3 Meeting. Stockholm (SE), August 6th, 2003.
- WG1 Meeting. Marseille (F), November 27th-28th, 2003.
- WG2 Meeting. Leeds(UK), March 30th, 2004.
- WG1 Meeting. Oslo (N), December 2nd-3rd, 2004.
- WG3 Meeting. York (UK), March 22nd-23rd, 2005.
- WG2 Meeting. Leeds (UK), June 1st-2nd, 2005.
- TWG2 Meeting. Bielefeld (D), June 13th-14th, 2005.
- TWG1 Meeting. Padova (I), June 16th-17th, 2005.
- TWG1 Meeting. Salerno (I), November 22nd, 2005.

#### 4.5 Short-Term Scientific Missions

During its lifetime, **Cost287–ConGAS** has awarded 26 Short-term Scientific Missions (STSMs). A short synopsis follows (full details can be found at <http://www.cost287.org/documentation/stsms/index.html>).

- Scientist: Martin Kaltenbrunner  
 Organization: Universitat Pompeu Fabra, Barcelona (E)  
 Date: 19.02.2004 – 05.03.2004  
 Host: Media Lab Europe, Dublin (EI)  
 Topic: Design of tangible objects for the reacTable  
 Final Report: [http://www.cost287.org/documentation/stsms/report/reactable\\_congas2004.pdf](http://www.cost287.org/documentation/stsms/report/reactable_congas2004.pdf)  
 Related Papers: [16, 15]
- Scientist: Pashalidou Panagiota-Styliani  
 Organization: University of York, York (UK)  
 Date: 31.03.2004 – 18.04.2004  
 Host: Neuroinformatics Group, Faculty of Technology, Bielefeld University, (D)  
 Topic: Comparison of different audio control systems  
 Final Report: [http://www.cost287.org/documentation/stsms/report/pashalidou\\_report.pdf](http://www.cost287.org/documentation/stsms/report/pashalidou_report.pdf)  
 Related Papers: [13]
- Scientist: Sandra Pauletto  
 Organization: Electronics Department, University of York, York (UK)  
 Date: 02.08.2004 – 13.08.2004  
 Host: Neuroinformatics Group, Faculty of Technology, Bielefeld University, (D)  
 Topic: Interactivity and interfaces in data sonification.  
 Final Report: [http://www.cost287.org/documentation/stsms/report/pauletto\\_report.doc](http://www.cost287.org/documentation/stsms/report/pauletto_report.doc)



- Scientist: Loïc Kessous  
 Organization: CNRS-LMA, Marseille (F)  
 Date: 25.10.2004 – 03.11.2004  
 Host: Hochschule für Gestaltung, Karlsruhe (D)  
 Topic: Natural networks for mapping gestures to sound synthesis.  
 Final Report: [http://www.cost287.org/documentation/stsms/report/kessous\\_report.doc](http://www.cost287.org/documentation/stsms/report/kessous_report.doc)  
 Related Papers: [17]
- Scientist: Mark T. Marshall  
 Organization: University of Limerick (IE)  
 Date: 01.10.2004 – 31.10.2004  
 Host: McGill University (Canada)  
 Topic: Investigation and Evaluation of Sensors and Interfaces for Musical Expression.  
 Final Report: [http://www.cost287.org/documentation/stsms/report/marshall\\_report.doc](http://www.cost287.org/documentation/stsms/report/marshall_report.doc)
- Scientist: Till Bovermann  
 Organization: Bielefeld University (D)  
 Date: 31.10.2004 – 08.11.2004  
 Host: UPF, Barcelona (E)  
 Topic: Improving the tDesk's (Bielefeld) design by the human computer interface of the reacTable(UPF).  
 Final Report: [http://www.cost287.org/documentation/stsms/report/bovermann\\_report.doc](http://www.cost287.org/documentation/stsms/report/bovermann_report.doc)
- Scientist: Enrico Costanza  
 Organization: MediaLab Europe, Dublin (IE)  
 Date: 28.10.2004 – 05.11.2004  
 Host: UPF, Barcelona (E)  
 Topic: Tangible Musical Interfaces.  
 Final Report: [http://www.cost287.org/documentation/stsms/report/costanza\\_report.doc](http://www.cost287.org/documentation/stsms/report/costanza_report.doc)
- Scientist: Hembing Li  
 Organization: IPeM, Belgium (B)  
 Date: 12–14.01.2005; 23–27.05.2005  
 Host: HUT, (FIN)  
 Topic: 1) Define a physical model of the Chinese guqin instrument;  
       2) Make recordings (doctoral dissertation).  
 Final Report: [http://www.cost287.org/documentation/stsms/report/Li\\_report.doc](http://www.cost287.org/documentation/stsms/report/Li_report.doc)
- Scientist: Bruno Giordano  
 Organization: University of Padua, Padua (I)  
 Date: 20–31.05.2005  
 Host: KTH, (SE)  
 Topic: Studying expression of emotional intentions in walking, and the ability of listeners to recognize them.  
 Final Report: [http://www.cost287.org/documentation/stsms/report/giordano\\_report.pdf](http://www.cost287.org/documentation/stsms/report/giordano_report.pdf)
- Scientist: John Williamson  
 Organization: University of Glasgow, (UK)  
 Date: 10–24.09.2005  
 Host: Neuroinformatics Group, Faculty of Technology, Bielefeld University, (D)  
 Topic: Developing systems for exploring high-dimensional data sets, incorporating predictive models of likely user interest.  
 Final Report: [http://www.cost287.org/documentation/stsms/report/williamson\\_report.pdf](http://www.cost287.org/documentation/stsms/report/williamson_report.pdf)

- Scientist: Erwin Schoonderwaldt  
Organization: KTH, Stockholm (S)  
Date: 09–22.01.2006  
Host: IRCAM, Paris (F)  
Topic: Exchange ideas and share facilities between the Augmented violin project at IRCAM and the Bostran project at KTH.  
Final Report: [http://www.cost287.org/documentation/stsms/report/schoonderwaldt\\_report.pdf](http://www.cost287.org/documentation/stsms/report/schoonderwaldt_report.pdf)
- Scientist: Amalia de Götzen  
Organization: University of Verona, (IT)  
Date: 20–26.03.2006  
Host: Aalborg University in Copenhagen, Copenhagen (DK)  
Topic: Work related to an ongoing project about a well known HCI predictive model in an audio perspective: the Fitts' model.  
Final Report: [http://www.cost287.org/documentation/stsms/report/degotzen\\_report.pdf](http://www.cost287.org/documentation/stsms/report/degotzen_report.pdf)
- Scientist: Kjetil Hansen  
Organization: KTH, Stockholm (S)  
Date: 09–22.01.2006  
Host: Iceland Academy of Arts, Reykjavik (IS)  
Topic: Finding ways to play new musical instruments.  
Final Report: [http://www.cost287.org/documentation/stsms/report/hansen\\_report.pdf](http://www.cost287.org/documentation/stsms/report/hansen_report.pdf)
- Scientist: Asri Ibrahim  
Organization: University of York (UK)  
Date: 26.03–08.04.2006  
Host: Neuroinformatics Group, Faculty of Technology, Bielefeld University, (D)  
Topic: Task Analysis for Sonification Application Usability Evaluations.  
Final Report: [http://www.cost287.org/documentation/stsms/report/ibrahim\\_report.pdf](http://www.cost287.org/documentation/stsms/report/ibrahim_report.pdf)
- Scientist: Matthew Paradis  
Organization: University of York (UK)  
Date: 01–15.04.2006  
Host: McGill University, (Canada)  
Topic: Mapping tools – Developing a universal sensor input translation utility.  
Final Report: [http://www.cost287.org/documentation/stsms/report/paradis\\_report.pdf](http://www.cost287.org/documentation/stsms/report/paradis_report.pdf)
- Scientist: Cornelius Pöpel  
Organization: University of Birmingham (UK)  
Date: 10–30.08.2006  
Host: McGill University, (Canada)  
Topic: Develop new ways of extracting and using this gestural information for sound synthesis.  
Final Report: [http://www.cost287.org/documentation/stsms/report/poepel\\_report.pdf](http://www.cost287.org/documentation/stsms/report/poepel_report.pdf)
- Scientist: Jean–Julien Filatriau  
Organization: Université Catholique de Louvain (BE)  
Date: 1–21.10.2006  
Host: Infomus Lab, DIST–Università di Genova  
Topic: Experiment gesture mappings based on free motions using the EyesWeb platform for the control of these synthesis techniques.  
Final Report: [http://www.cost287.org/documentation/stsms/report/filatriau\\_report.pdf](http://www.cost287.org/documentation/stsms/report/filatriau_report.pdf)
- Scientist: Marcos Alonso  
Organization: Music Technology Group, Barcelona (E)

- Date: 1–10.10.2006  
 Host: KTH, Stockholm (S)  
 Topic: add the DJ scratch model developed at KTH to the reacTable developed at MTG.  
 Final Report: [http://www.cost287.org/documentation/stsms/report/alonso\\_report.pdf](http://www.cost287.org/documentation/stsms/report/alonso_report.pdf)
- Scientist: Ginevra Castellano  
 Organization: Infomus Lab, DIST Università di Genova (IT)  
 Date: 8–15.10.2006  
 Host: KTH, Stockholm (S)  
 Topic: Develop a system in which audio–visual feedback is provided to users who are free to move in space.  
 Final Report: [http://www.cost287.org/documentation/stsms/report/castellano\\_report.pdf](http://www.cost287.org/documentation/stsms/report/castellano_report.pdf)  
 Related Papers: [10]
  - Scientist: Jyri Pakarinen  
 Organization: TKK, Helsinki (FI)  
 Date: 10–24.10.2006  
 Host: McGill University, (Canada)  
 Topic: Formulate a salient control strategy for the virtual slide air guitar.  
 Final Report: [http://www.cost287.org/documentation/stsms/report/pakarinen\\_report.pdf](http://www.cost287.org/documentation/stsms/report/pakarinen_report.pdf)
  - Scientist: Henri Penttinen  
 Organization: TKK, Helsinki (FI)  
 Date: 13–17.11.2006; 8–12.1.2007  
 Host: Luleå University of Technology, Luleå (S)  
 Topic: Investigate how changes in the mechanical design of the kantele affect its tonal, dynamical, and radiational behavior and how to apply this knowledge for sound synthesis purposes.  
 Final Report: [http://www.cost287.org/documentation/stsms/report/penttinen\\_report.pdf](http://www.cost287.org/documentation/stsms/report/penttinen_report.pdf)
  - Scientist: Smilen Dimitrov  
 Organization: Aalborg University in Copenhagen, Copenhagen (DK)  
 Date: 2–12.11.2006  
 Host: KTH, Stockholm (S)  
 Topic: combine the research in DJ scratching together with the research in friction models.  
 Final Report: [http://www.cost287.org/documentation/stsms/report/dimitrov\\_report.pdf](http://www.cost287.org/documentation/stsms/report/dimitrov_report.pdf)
  - Scientist: Alexandre Bouenard  
 Organization: Valoria Lab, Université de Bretagne Sud (FR)  
 Date: 10–24.01.2007  
 Host: McGill University, (Canada)  
 Topic: Analyze instrumental gestures to extract pertinent features during performances, and to use these features for re–synthesis.  
 Final Report: [http://www.cost287.org/documentation/stsms/report/bouenard\\_report.pdf](http://www.cost287.org/documentation/stsms/report/bouenard_report.pdf)  
 Related Papers: [12]
  - Scientist: Alexander Refsum Jensenius  
 Organization: Oslo University (NO)  
 Date: 17.02–03.03.2007  
 Host: McGill University, (Canada)  
 Topic: Develop a working GDIF namespace for various controllers available in the Input Devices and Music Interaction Laboratory (IDMIL), McGill University.  
 Final Report: [http://www.cost287.org/documentation/stsms/report/jensenius\\_report.pdf](http://www.cost287.org/documentation/stsms/report/jensenius_report.pdf)  
 Related Papers: [14]

- Scientist: Anne-Marie Burns  
 Organization: free-lance PhD researcher (Canada)  
 Date: 04 – 31.03.2007  
 Host: Infomus Lab, DIST-Università di Genova  
 Topic: Explore the possibility to use an already developed algorithm or a similar one to perform a hand-tracking task in space.  
 Final Report: [http://www.cost287.org/documentation/stsms/report/burns\\_report.pdf](http://www.cost287.org/documentation/stsms/report/burns_report.pdf)
- Scientist: Matthias Demoucron  
 Organization: IRCAM Paris (FR)  
 Date: 14–31.05.2007  
 Host: McGill University, (Canada)  
 Topic: Get a complete description of violin player gesture, including bow speed and position on the string.  
 Final Report: [http://www.cost287.org/documentation/stsms/report/demoucron\\_report.pdf](http://www.cost287.org/documentation/stsms/report/demoucron_report.pdf)

## 5. RESULTS

The results and activities on the **Cost287-ConGAS** Action will be presented according to individual working groups. The results are described in the text below, quoting references within section Dissemination of results.

### 5.1 WG1 “Capture/Analysis methods and technologies”

WG1 Coordinator: Prof. Daniel Arfib, LMA-CNRS Marseille(F)

The main activities of WG1 during the first **Cost287-ConGAS** year 2003-2004 were:

1. WG1 Meeting, Genova April 2003. The object of this working group was defined by these three topics, related to Gesture Controlled Audio Systems:
  - Signal and emotion, Esthetics and meaning;
  - Meanings of gesture;
  - Learning gesture.
2. WG1 Meeting, Marseille October 2003:
  - Presentations of the work of the delegates in this domain.
  - Creation of a local web site with a report of the talks (<http://cost287.free.fr>).
  - Intervention of WG1 inside the global **Cost287-ConGAS** project was defined (definition of themes, bibliography, seminars etc.).
3. Bielefeld, January 2004.  
 During the MC meeting, coordination of the different WG1 activities and results was discussed with the proposition of a “Transversal Working Group” (TWG) (see Sec.5.4).
4. Leeds, March 2004.  
 Participation of different members of WG1 inside the WG2.

In 2004/2005, WG1 activities have concerned the expansion of materials concerning WG1's themes, some of them being present on the WG1 Web site <sup>1</sup>. A WG1 seminar has taken place in Oslo, with a number of excellent presentations. A substantial progress was achieved this year regarding the preparation of the **Cost287–ConGAS** Book (cf. Annexe A of the current document), including set up of the Table of Contents and specification of lead editors of the chapters, and some recommendations concerning publishing and methodology that can help the future Transversal working group on the book. WG1 delegates have participated to the cross pollinisation with other WGs and MC and they have presented the **Cost287–ConGAS** Action at different conferences.

The main activities of WG1 during the second **Cost287–ConGAS** year 2004-2005, in addition to the MC and WG1 meeting participation, were:

1. Presentation of WG1 activities, within **Cost287–ConGAS** MC Barcelona, October 2004;
2. WG1 Book session, Oslo December 2nd, 2004;
3. WG1 Seminar *Basic issues of gesture and musical sound*, Oslo December 3rd, 2004, with presentations by WG1 members. The detailed program and abstracts' speeches are online <sup>2</sup>;
4. WG1 Dissemination: **Cost287–ConGAS** presentation at SMC'04 Sound and Music Computing, IRCAM, Paris (F), October 20-22, 2004.

The main concern of WG1 in 2005-2006 has been twofold:

1. Help the presentation of **Cost287–ConGAS** by the presentation of good papers at the conferences where **Cost287–ConGAS** had a session related to the question "What is a gesture". This includes the reviewing process of such conferences or attached publications.
2. Help the process of the book construction by
  - refining the table of contents so that the chapters themselves are complementary to each other;
  - defining with WG2 and WG3 the limits of the book, so that the table of content is coherent.

In 2006–2007 WG1 has organized and hosted a Workshop on gesture classification at the Department of Musicology, University of Oslo. This workshop has also been an occasion to further discuss and refine the contents of the upcoming **Cost287–ConGAS** book.

## 5.2 WG2 “Input Technology”

WG2 Coordinator: Dr. Kia C Ng, University of Leeds (U.K.)

WG2 was primarily responsible for organizing and promoting the GIMS (*Gesture Interfaces for Multimedia Systems*) symposium. The Symposium on Gesture Interfaces for Multimedia Systems <sup>3</sup> was first hosted by the University of Leeds in 2004. The event was co-organized with partners of **Cost287–ConGAS** and published a proceedings (ISBN 1 902956 37 4) with 14 papers.

WG2 activities during the year 2003-2004:

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<sup>1</sup> <http://cost287.free.fr>

<sup>2</sup> <http://www.hf.uio.no/imv/forskning/forskningsprosjekter/musicalgestures/events/congasseminar/index.html>

<sup>3</sup> <http://www.leeds.ac.uk/aisb/gims>

1. **Cost287–ConGAS** Symposium on Gesture Interfaces for Multimedia Systems, Leeds, March 29th, 2004.  
 Attended by over 30 delegates from all over the world.  
 Symposium Chairs: Kia Ng, Antonio Camurri, Nicola Bernardini.  
 Good interaction with the wider Artificial Intelligence domain.  
 This event has been organized within the “AISB 2004 Convention: Motion, Emotion and Cognition” (AISB: Artificial Intelligence and Simulation of Behavior), 29 March 2004 to 1 April 2004.  
 For further information: <http://www.leeds.ac.uk/aisb/gims>  
 GIMS photos: <http://icsrim.leeds.ac.uk/congas/photos-aisb-gims-2004/>  
 WG2 meeting photos: <http://icsrim.leeds.ac.uk/congas/photos-congas-wg2-2004/>
2. **Cost287–ConGAS** WG2 meeting, Leeds, 30 March 2004.
3. A mini-symposium on sound and interaction between KTH, York and Leeds (for details, please see WG3 report Section 5.3).

In 2004/2005, the **Cost287–ConGAS** WG 2 has continued to enhance the resources on the main topics of this WG on interaction technologies with the WG2 website (<http://icsrim.leeds.ac.uk/congas/>) to provide relevant bibliographies, information and links. On going activities include the forthcoming **Cost287–ConGAS** Book, particularly on the section which is to focus on the sensing and interaction technologies.

In addition to the participation to MC meeting and the organization of internal meeting, WG2 activities during 2004-2005 were:

1. Dissemination, Relevant Events and Meetings:
  - September 13th-15th, WEDELMUSIC 2004, Univ. Pompeu Fabra, Barcelona;
  - October 26th, 2004, Leeds Music Technology Conference, Leeds, U.K.;
  - October, 14th-15th, 2004, British Council Conference on Advances in Motor Research in Hemiparetic Cerebral Palsy Organized by the School of Sport and Exercise Sciences and ICSRiM;
  - October 10th-14th, 2004, ISMIR 2004: 5th International Conference on Music Information Retrieval, Audiovisual Institute, Univ. Pompeu Fabra, Barcelona;
  - October 29th-30th, 2004, Invited visit and meeting on WG2, McGill University, Canada;
  - November 1st-6th, 2004, International Computer Music Conference, Miami, USA;
  - December 2nd, 2004, **Cost287–ConGAS** WG1 Seminar and Meeting, University of Oslo;
  - March 18th, 2005, Music via Motion Workshop, National Science Week, ICSRiM – University of Leeds, U.K.;
  - April 12th-15th, 2005, AISB 2005, University of Hertfordshire, U.K.
2. Dissemination, Events and Meetings:
  - May 26th-28th, 2005, International Conference on New Interfaces for Musical Expression (NIME), University of British Columbia, Vancouver, Canada;
  - June 20th - July 1st, 2005, Art Trail Soundworks 2005, Cork City, Ireland;
  - July 4th-5th, 2005, 5th MUSICNETWORK Open Workshop, Vienna, Austria;

- July 25th-29th, 2005, EVA International Conference, London, U.K.;
- November 30th - December 2nd, 2005, AXMEDIS 2005, Florence, Italy.

### 3. Results and Publications:

- **Cost287–ConGAS** WG2 Website: <http://icsrim.leeds.ac.uk/congas>

In 2005-2006 the WG2 continued the activities as in the previous year, maintaining the WG2 website with related publications and sensor relative links, actively working on the ConGAS book project, and enlarging the dissemination and publicity activities.

The activities of this WP contributed naturally towards the **Cost287–ConGAS** Book.

For dissemination, the WG2 chair has participated presentations and publications in several related international events (for complete information see references [65, 60, 68, 70, 69, 74, 54, 67, 66] in the bibliography provided on Section 6.1.1).

Invited presentations/participations involving ConGAS WG2 chair include:

- Allegro con Bit, 14 March 2006, Rome, Italy;
- JISC Conference 14 March 2006, Birmingham, U.K.;
- White Rose University Consortium/National e-Science Centre Introduction to e-Infrastructure Workshop, 28 March 2006, Leeds, U.K.;
- UK National Science Week, Music via Motion (MvM) Workshop, 29 March 2006, Leeds, U.K.;
- AHRC ICT Methods Network Music Expert Seminar, 3 March 2006, Royal Holloway, University of London, U.K.

Events organized include:

- 1st I-MAESTRO Workshop, Paris, France (June 2006), co-located with NIME06;
- 2nd COST287-ConGAS International Symposium on Gesture Interface for Multimedia Systems (GIMS 2006), 9-10 May 2006, Leeds, UK<sup>4</sup>.
- In addition to scientific and technical paper sessions on the first day, GIMS 2006 has been organized in association with FUSELEEDS 2006 (an international music festival organized by the Leeds City Council) with a public Demo Session on the second day with over 700 visitors at the West Yorkshire Playhouse.

In 2006–2007 the WG2 has continued the activities as in the previous year. It maintained the WG2 website with related publications and sensor relative links, actively working on the ConGAS book project, and enlarging the dissemination and publicity activities.

### 5.3 WG3 “Integrated Applications”

WG3 Coordinator: Dr. Andy Hunt, University of York (U.K.)

<sup>4</sup> <http://www.icsrim.org.uk/gims>

The activity of the WG3 focused on the integration of the work carried out in WG1 and WG2 producing concrete applications of low-level and sensing technologies, bringing together developments from arts and sciences in order to promote multidisciplinary integrations. In 2003-2004 the work within WG3 has covered the participation at the Interactive Sonification Workshop at Bielefeld University, January 2004. The Workshop brought together researchers from all over the world, but especially Europe, to look at the combination of interaction and sound. The best results of the workshop have been published in a special issue of IEEE Multimedia, April 2005 (guest editors: Thomas Hermann and Andy Hunt, both **Cost287–ConGAS** delegates).

More events have followed this workshop:

- a) A mini-symposium on sound and interaction between KTH, University of York and University of Leeds leading to the following plans for research:
  - To share ideas on interaction, analysis and synthesis of emotion, and sonification; lots of potential for collaboration are individuated.
  - To develop a mind-map about the possible structure of a **Cost287–ConGAS** book.
  - To plan some research visits.
- b) Stella Pashalidou's STSM.
- c) Workshop day in Leeds (hosted by Kia Ng, UK delegate, and WG2 chairman) See Section 6.2.

2004-2005: WG3 has been forging collaborations between researchers who are involved in developing applications where human gesture controls sound. The birth of the biennial Interactive Sonification workshop is one example of the outcome in this area. A Special Issue of IEEE Multimedia has been published, led by WG3 members. Strong links were established with the ICAD community on Auditory Display. Researchers from Stockholm, York and Bielefeld (all WG3 members) are collaborating on a variety of projects, including looking into EU funding for the use of interactive sound to improve land-mine detection. WG3 is also gathering information about research in the EU which allows humans to interact with sound, and aims to publish this in Volume 3 of the forthcoming **Cost287–ConGAS** book.

In addition to the participation to MC meeting and the organization of internal meeting, WG3 activities during 2004-2005 were:

- March 21st 2005, PD Educational Workshop: PD is a Free Software graphical programming environment for real-time MIDI and audio manipulation, and it is both excellent (flexible, Free Software, etc.) and “complicated” (few defaults, blank screen, diffuse tutorials mostly written by developers). The group joined in with their own experiences and thoughts about PD and how it relates to **Cost287–ConGAS**, i.e. how PD can be used in the context of gestural control of audio systems<sup>5</sup>.
- May 18th-20th, 2005, MCmeeting and International GestureWorkshop, Vannes (France): Till Bovermann was on a STSM in Barcelona with Martin Kaltenbrunner, investigating the possibilities for interacting with intelligent tables. As a result, a OSC protocol for data exchange via Open Sound Control was established called TUIO. Results have been compiled into a poster for the Gesture Workshop GW 2005 that was presented in Vannes.

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<sup>5</sup> [http://www-users.york.ac.uk/adh2/PD\\_WG3.html](http://www-users.york.ac.uk/adh2/PD_WG3.html)



- July 2005 ICAD Workshop: Thomas Hermann, Andy Hunt and Bill Martens are running a half-day workshop on auditory data mining in Limerick. ICAD's focus is on interaction this year and so it is indeed very relevant to **Cost287-ConGAS6**.<sup>6</sup>

The main activity of WG3 during 2005/2006 has been the planning, preparation and writing of the **Cost287-ConGAS** Book. Members have continued to promote **Cost287-ConGAS** at major international conferences.

Two STSMs supported:

1. Asri Ibrahim (University of York) to Bielefeld;
2. John Williamson (Glasgow University, Interactive Systems Group) to Bielefeld, planning to investigate the dynamics of interaction in gestural audio interactions, in the context of interactive sonification.

Several papers in particular have been submitted to ICAD - the International Conference of Auditory Display.

The second Workshop on Interactive Sonification was planned to take place in York on Feb 3rd 2007.

In 2006-2007 the WG3 has continued the activities as in the previous year, actively working on the ConGAS book project, and enlarging the dissemination and publicity activities.

#### 5.4 Transversal Working Groups (TWGs)

WG2 Coordinator: Dr. Kia C Ng, University of Leeds (U.K.)

The 2nd MC Meeting in Bielefeld raised the following issues (among others):

- a) The WG Layout defined some broad thematic areas which tended to be interesting for most delegates;
- b) As a result, all delegates participated to more than one Working Group (some of them taking part to all three);
- c) While this situation contributed to providing very positive scientific exchanges and was indeed capable of fulfilling the scientific scope of the action, it did not fare too well in reaching useful practical goals (such as promoting dissemination, writing a book, maintaining the website etc.);

Therefore, the MC decided to establish some Transversal Working Groups (TWGs). TWGs were supposed to be small task forces (i.e. 3-5 people) of highly committed individuals spanning all regular WGs and fulfilling specific objectives. TWGs featured the contribution of specialists outside the MC.

The MC decided to take some time to determine the detailed structure of TWGs (Chairs, Members, Overall Agenda, Scheduling, etc.). Hence, TWGs were fully established at the MC Meeting in Barcelona (October 2004).

The TWG1-Book was composed by:

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<sup>6</sup> See details on <http://www.idc.ul.ie/icad2005/>  
(note added in proof: see also <http://www.icad.org/biblio?page=10> ).

- Marc Leman (TWG Chairperson);
- Marcelo Wanderley;
- Andy Hunt;
- Gualtiero Volpe.

TWGs Meetings 2004-2005:

- TWG1 meeting (**Cost287–ConGAS** Book): Bielefeld, June 13-14 2005;
- TWG2 meeting (**Cost287–ConGAS** Web Site): Padova, June 16-17 2005.

TWGs Meetings 2005-2006:

- TWG1 meeting (**Cost287–ConGAS** Book): Salerno, November 22 2005

TWGs Meetings 2006-2007:

- TWG2 meeting (**Cost287–ConGAS** Web Site): York, February 02 2007;
- TWG1 meeting (**Cost287–ConGAS** Book): Ghent, April 23 2007.

TWG Results

The results of the work of the TWGs is reflected in the Table of Contents of the upcoming **Cost287–ConGAS** Book (cf. Section A) (for TWG1) and through the website itself (<http://www.cost287.org>) (for TWG2).

## 6. DISSEMINATION OF RESULTS

### 6.1 Publications and Reports

#### 6.1.1 Scientific Documents

This section presents the bibliography produced by **Cost287–ConGAS** delegates during the lifetime of the Action. References [9, 6, 3, 7, 1, 2, 5, 4, 8] are related to joint work by several **Cost287–ConGAS** delegates and related colleagues. References [6, 8] are full-blown presentations of the **Cost287–ConGAS** Action. References [13, 14, 16, 12, 15, 10, 11] are papers that emerged from STSM missions.

#### Joint publications:

- [1] A. M. Burns and B. Mazzarino. Finger tracking methods using eyesweb. In Gibet et al. [3], pages 156–167.
- [2] A. Crevoisier and P. Polotti. Tangible acoustic interfaces and their application for the design of new musical instruments. In *Proceedings Proc. of the 2005 International Conference on New Interfaces for Musical Expression – NIME05, May 26-28 2005, Vancouver, Canada, 2005*. Online Version available: [http://hct.ece.ubc.ca/nime/2005/proc/nime2005\\_097.pdf](http://hct.ece.ubc.ca/nime/2005/proc/nime2005_097.pdf)
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- [7] K. C. Ng, editor. *Proceedings of Cost287–ConGAS 2nd International Symposium on Gesture Interfaces for Multimedia Systems (GIMS) 9-10 May 2006*, Leeds, UK, 2006.
- [8] K. C. Ng, N. Bernardini, A. Hunt, and D. Arfib. **Cost287–ConGAS**: Gesture controlled audio systems. In *Proceedings of the 5th MUSICNETWORK Open Workshop, Universität für Musik und darstellende Kunst Wien, Vienna, Austria, 2-4 July 2005*, 2005.
- [9] K. C. Ng, A. Camurri, and N. Bernardini, editors. *Proceedings of the Cost287–ConGAS Symposium on Gesture Interfaces for Multimedia Systems*. The Society for the Study of Artificial Intelligence and the Simulation of Behavior, 2004. ISBN 1 902956 37 4.

### **Full-blown presentations of the Cost287–ConGAS Action:**

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- [8] K. C. Ng, N. Bernardini, A. Hunt, and D. Arfib. Cost287–ConGAS: Gesture controlled audio systems. In *Proceedings of the 5th MUSICNETWORK Open Workshop, Universität für Musik und darstellende Kunst Wien, Vienna, Austria, 2-4 July 2005*, 2005.

### **STSM publications:**

- [10] Ginevra Castellano, Roberto Bresin, Antonio Camurri, and Gualtiero Volpe. Expressive control of music and visual media by full-body movement. In *Proceedings of NIME-07*, 2007.
- [11] Sylvie Gibet and Alexandre Bouenard. Sound synthesis by simulation of percussive gesture of a virtual animated agent. In Ng [7].
- [12] Thomas Hermann, Stella Paschalidou, Dirk Beckmann, and Helge Ritter. Gestural interactions for multi-parameter audio control and audification. In Gibet et al. [3], pages 335–338. [http://dx.doi.org/10.1007/11678816\\_37](http://dx.doi.org/10.1007/11678816_37).
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- [15] Loïc Kessous and Daniel Arfib. The scangloves: a video-music instrument based on scanned synthesis. In Ng et al. [9]. ISBN 1 902956 37 4.
- [16] Alexander Refsum Jensenius, Antonio Camurri, Nicolas Castagné, Esteban Maestre, Joseph Malloch, Douglas McGilvray, Diemo Schwarz, and Matthew Wright. Panel: the need of formats for streaming and storing music-related movement and gesture data. In *Proceedings of the International Computer Music Conference 2007*, Copenhagen, DK.

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- [17] D. Arfib, J. M. Couturier, and J. J. Filatriau. Some experiments in the gestural control of synthesized sonic textures. In Gibet et al. [3], pages 296–299.
- [18] D. Arfib, J. M. Couturier, and L. Kessous. Design and use of some new digital musical instruments. In Camurri and Volpe [26], pages 509–518. Online version available.
- [19] G. Baier, T. Hermann, S. Sahle, and U. Stephani. Sonified epileptic rhythms. In *Proceedings of the 12th Meeting of the International Conference on Auditory Display (ICAD), 20-23 June 2006, London, 2006*.
- [20] T. Bovermann, T. Hermann, and H. Ritter. Tangible data scanning sonification model. In *Proceedings of the 12th Meeting of the International Conference on Auditory Display (ICAD), 20-23 June 2006, London, 2006*.

- [21] E. Brazil and M. Fernström. Investigating concurrent auditory icon recognition. In *Proceedings of the 12th Meeting of the International Conference on Auditory Display (ICAD), 20-23 June 2006, London, 2006*.
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- [24] A. Camurri, B. Mazzarino, M. Ricchetti, R. Timmers, and G. Volpe. Multimodal analysis of expressive gesture in music and dance performances. In Camurri and Volpe [26], pages 20–39. Online version available.
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#### 6.1.2 Administrative Documents

- 2003-2004:
  1. Inaugural **Cost287–ConGAS** MC Meeting Minutes;
  2. First **Cost287–ConGAS** MC Meeting Minutes;
  3. Second **Cost287–ConGAS** MC meeting Minutes;
  4. WG1 Meeting Minutes;
  5. WG2 Meeting Minutes;
  6. WG3 Meeting Minutes;
  7. Financial Report (2003-2004);
  8. Annual Plan (2004-2005).
- 2004-2005:
  1. Third **Cost287–ConGAS** MC Meeting Minutes;
  2. Fourth **Cost287–ConGAS** MC Meeting Minutes;
  3. WG1 Meeting Minutes;
  4. WG2 Meeting Minutes;
  5. WG3 Meeting Minutes;
  6. Financial Report (2004-2005);
  7. Annual Plan (2005-2006).
- 2005-2006:
  1. Fifth **Cost287–ConGAS** MC Meeting Minutes;
  2. Sixth **Cost287–ConGAS** MC Meeting Minutes;
  3. TWG1 Meeting Minutes;
  4. Financial Report (2005-2006);
  5. Annual Plan (2006-2007).
- 2006-2007:
  1. Seventh **Cost287–ConGAS** MC Meeting Minutes;
  2. Eighth **Cost287–ConGAS** MC Meeting Minutes;
  3. Oslo Workshop Report;



4. Financial Report (2006–2007);
5. Final Report.

## 6.2 Conferences and Workshops

**Cost287–ConGAS** Symposium on Gesture Interfaces for Multimedia Systems - GIMS04. Leeds, March 29th 2004.

Attended by over 30 delegates from all over the world. Good interaction with the wider AI domain.

Symposium Chairs: Kia Ng, Antonio Camurri, Nicola Bernardini This event has been organized within the “AISB 2004 Convention: Motion, Emotion and Cognition” (AISB: Artificial Intelligence and Simulation of Behavior), 29 March 2004 to 1 April 2004.

For further information, please see <http://www.leeds.ac.uk/aisb/gims>

**Cost287–ConGAS** Session. 6th International Gesture Workshop. Vannes, May 20th 2005.

This event has been organized within the “6th International Workshop on Gesture in Human-Computer Interaction and Simulation”, University Bretagne Sud, Vannes (F) - from 18 May 2005 to 20 May 2005.

For further information, please see <http://www-valoria.univ-ubs.fr/gw2005/>.

**Cost287–ConGAS** Presentation at Sound Music Computing SMC05. Salerno, November 24th 2005.

A **Cost287–ConGAS** poster session was held the first day of the conference, attended by over 50 people. For further information and detailed programme, please see <http://www.smc05.unisa.it/>.

2nd **Cost287–ConGAS** International Symposium on Gesture Interfaces for Multimedia Systems - GIMS06. Leeds, May 09th-10th 2006.

First day, the scientific and technical paper session was attended by over 30 participants.

In addition, the GIMS2006 has been organized in association with FUSELEEDS2006 (an international music festival organized by the Leeds City Council) with a public Demo Session on the second day with over 700 visitors at the West Yorkshire Playhouse.

For further information, please see <http://www.leeds.ac.uk/icsrim/gims/>.

**Cost287–ConGAS** Poster and Demo Session at the International Conference on New Interfaces for Musical Expression - NIME06. IRCAM, Paris - June 6th 2006.

The number of participants was approximately 250. The major attendees were professional, researchers and artists, working on musical interfaces and music technology.

**Cost287–ConGAS** posters and demos were selected through the NIME review process (peer-reviewed), and are published in the NIME 06 proceedings (Proceedings of the international conference on New Interfaces for Musical Expression-NIME 06, IRCAM-Centre Pompidou, Paris, France, June 4-8 2006) For further information, please see <http://recherche.ircam.fr/> and the detailed programme is available online at <http://recherche.ircam.fr/equipes/temps-reel/nime/program-summary.pdf>

**Cost287–ConGAS** Presentation and dissemination at the second Sound and Music Computing Summer School, Barcelona, 24–28 July 2006.

The school was attended by ca. 70 PhD and post-doctoral students and highly qualified senior professors. Further information can be found at <http://www.soundandmusiccomputing.org/summerschool/barcelona2006>

**Cost287–ConGAS** Presentation during the COST–TIST ARM, IST2006 Conference, Helsinki, November 22nd 2006

**Cost287–ConGAS** Public Presentation during the Final **Cost287–ConGAS** Meeting, Reykjavik, May 12 2007

The Final **Cost287–ConGAS** Meeting was the occasion for an open-door public presentation and demonstration at the Academy of Arts in Reykjavik which was attended by approx. 70 people.

### 6.3 Web site

The Web site of COST Action 287 provides a general description and documents of the Action, links to participants, MoU, meetings minutes, MC material, etc. The home page advertises on next events related to the Action while the EVENTS section keeps track of past events, collecting minutes and reports too. The Documentation page has been implemented with an STSM section containing STSMs work-plans and Final Reports. The future plan for this section is to allow young STSM scientists to put their contribution online directly.

2005-2006 website development has been the creation of two online web forms to collect data on researchers and projects dealing with the **Cost287–ConGAS** scientific fields of study. Second steps will be the publication of all data collected after a proper validation by the national delegates.

The URL of the website is <http://www.cost287.org>.

### 6.4 Scientific and Technical Cooperation

Working liaison with other COST Actions in the field of telecommunications and teleinformatics and other scientific communities:

- COST 219-ter Action “Accessibility for All to services and terminals for next generation mobile networks”. Participation of Cost287 Chairperson Nicola Bernardini to 219-ter MCM Copenhagen, October 19th 2004.
- A collaboration has been established with the AISB Society for the Study of Artificial Intelligence and the Simulation of Behavior (<http://www.aisb.org.uk/>) during the 1st **Cost287–ConGAS** Workshop in Leeds.
- Strong links are being made with the ICAD Community on Auditory Display (<http://www.icad.org/>).

### 6.5 Transfer of Results

In the frame of the research activities in Gestural Audio Control undertaken in WG3, a contact was initiated with the company Lukotronik<sup>7</sup> that is active in motion capture. Within this connection, WG3 extended their software system with an OpenSoundControl export module to significantly facilitate the creation of real-time systems. The interface is in principle capable of sending information according to the TUIO protocol, developed during a **Cost287–ConGAS** STSM by Till Bovermann.

WG2 established several contacts with related industries particularly on sensor acquisition devices such as iCubeX and AtoMIC and La Kitchen, and motion tracking companies including VICON Ltd.

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<sup>7</sup> [www.lukotronik.com](http://www.lukotronik.com)

Several research topics facilitated by the **Cost287–ConGAS** Action have led to the development of audio interaction techniques for visually disabled persons (as in the novel auditory sports game “Blindminton”). These techniques have been tested with blind sportsmen from the paraolympic discipline “goalball” in 2006.

The systems derived from these techniques have spurred the interest of several European mobile phone companies.

The transfer of results of the **Cost287–ConGAS** Action is now continuing to take place in the context of follow-up Action COST IC0601.

## 7. ECONOMIC DIMENSION

The number of Signatories of the **Cost287–ConGAS** Action has constantly increased during its lifetime. Denmark signed the MoU in September 2003 (after start of the Action), Iceland was accepted by an MC vote at the beginning of July 2004 (07/05/2004). The last new entry was Portugal - represented by two delegates - that signed the MoU the 1st of August 2005.

Number of Signatories of <b>Cost287–ConGAS</b> (2003-2007):	15
Non-COST institution participating to this Action:	1
Estimated number of new Signatories (2006-2007):	1
Total Estimated number of Signatories of <b>Cost287–ConGAS</b> :	15
Total duration:	4 years
Frequency of MC Meetings (per year):	1-2
Frequency of WG/TWG Meetings (per year):	1-2
Frequency of Symposia (per year):	1-2


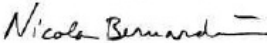
Estimated cost of the **Cost287–ConGAS** Action:

Estimated number of Person-years per year per signatory involved in Action:	2	
Estimated cost per person-year:	3,000	
Number of travel per year:	4-5	
Cost per signatory per year:		6,000
Total costs for the first year (14 signatories):		61,800
Total estimated costs over 3 years for 16 signatories:		270,000
Total estimated costs over 4 years:		321,200

Funds received from the Commission:

First year 2003-2004: €51,011.95  
 Second year 2004-2005: €61,800.00  
 Third year 2005-2006: €65,268.00  
 Fourth year 2006-2007: €71,921.34

Fourth Year Financial Report

		<b>COST OFFICE</b> Avenue Louise 149 B-1050 Brussels, Belgium Tel + 32 2 533 336 00	
<b>COST GRANT AGREEMENT</b>			
<b>Preliminary Financial Report</b>			
<b>Final Financial Report</b>			
Period : July 1st 2006 - June 30rd 2007 COST Action : 287 Action title : ConGAS - Gesture Controlled Audio Systems Grant Holder : Prof. Nicola Bernardini Institution : Università degli Studi di Genova - DIST Country : Italy Date of report : 01/07/2006 - 31/05/2007			
<b>I. INCOME</b>			
<b>COST GRANT AGREEMENT</b>		73,576.86 €	
(1) First Downpayment	Date :	96,797.50 €	
(2) Second Payment	Date :	25,485.44 €	
(3) Carry-over from previous grant, if applicable		9,638.40 €	
Total received : (1) + (2) + (3)		71,921.34 €	
<b>II. EXPENDITURE</b>			
<b>A. Science Expenditure (Specify on corresponding sheets)</b>			
(1) Total travel to Meetings - according to enclosed table	39,892.20 €		
(2) Total Workshops - according to enclosed table	5,000.00 €		
(3) Total STSMs - according to enclosed table	18,399.17 €		
(4) Training Schools	0.00 €		
(5) Dissemination, Publications	0.00 €		
(6) Others Total	953.76 €		
<b>Total Science Expenditure (sum 1 to 6)</b>	<b>64,245.13 €</b>		
<b>B. Secretarial support (maximum 15% of A.)</b>	<b>9,636.77 €</b>		
<b>C. Total expenditure (= A + B)</b>	<b>73,881.90 €</b>		
<b>III. OUTSTANDING BALANCE</b>			
<b>-1,960.56 €</b>			
I declare that the above expenses have occurred and that the relevant documents (invoices and receipts) will be kept for further auditing by the ESF COST Office or by the European Commission.			
Date: 5/28/07	Signature: 		

## 8. SELF EVALUATION

Synthetically, the *Cost287-ConGAS* action was set up to achieve the following objectives:

1. To establish links with connected fields of research (multi-modal interface research, smart user interfaces, smart sensors/actuators for multimedia presence/ interaction), intelligent interfaces for elderly and disabled, including rehabilitation technologies for all, etc.).
2. To improve the knowledge in the relationship between sound and gesture, on the mathematical/scientific side and on practical implementations.
3. To improve new gestural processing of sound, carefully studying the typical structure of musical/instrumental gesture (division between control and sound production, audio feedback, and visual cues and sound production).
4. To explore distributed interactive multimedia technologies (multi -platform and multi-operating-system integrations using networking protocol and technologies).
5. To coordinate most prominent efforts at European level in this field, linking together several research centers that are currently working separately in this field.
6. To promote the developments and applications of new technologies, and in particular promoting further development of interactive installation and distributed collaborative arts.
7. To promote the transfer of scientific results and knowledge to industrial applications and projects.

*Cost287-ConGAS* was successful in reaching Objectives 1-6, because it achieved:

- a) Widespread world-wide consensus in the related fields, with the participation of 16 countries (including Canada) and 26 academic institutions
- b) Extensive cross-fertilization of research with 26 Short Term Scientific Missions funded and carried out during the course of the Action. On top of the formal documents required by the Action, every STSM produced a special poster explaining each specific project. Every poster was made publicly available through the action's website.
- c) Extensive participation to already existing conferences with special sessions in most of the largest conferences in the field (ICMC - International Computer Music Conferences, SMC - Sound and Music Computing Conferences, NIME - New Interfaces for Musical Expression Conferences, SMC – Sound and Music Computing Summer Schools, EVA – Electronic Information, Visual Arts & Beyond Conferences)
- d) The sponsoring of new workshops and symposia that gave way to new research directions (ISon - Interactive Sonification Workshop, GIMS – Gesture Interfaces for Multimedia Systems, etc.). The creation of these workshops and symposia took place within the course of the Action and are now continuing on a periodic basis.
- e) The creation of a book, *Musical Gestures Sound, Movement, and Meaning* (M.Leman and R.I.Godoy, editors) which was published by Routledge in 2009/2010. This book collected the scientific results achieved during the course of the action and laid out the foundations for the research field.

Some difficulties were encountered in achieving significant results in point 7 (Industrial Technology Transfer). While some connection with specific industrial assets were made (Lukotronic, VICON, AtoMic, iCubeX, etc.) and some results were achieved (such as the design

and implementation of the TUIO Protocol in industrial motion-capture devices, the design and implementation of the G/DIF gesture interchange protocol, etc.), the knowledge accumulated and produced by the action remained largely untapped, as of now, by industrial and commercial endeavours. These difficulties may be ascribed to the foundational character of the Action: it must be considered that industrial attention to gesture applications (for games, fitness, etc.) came at a later stage (notably with the introduction of the *Nintendo Wii* interface, for example), after the end of the Action. While there are no hard facts that connect these large-scale industrial successes with the action, it is highly possible that the coordination and dissemination roles played by *Cost287-ConGAS* have had some indirect impact in the introduction of these new scientific disciplines and technologies.

## 9. EVALUATION

### 9.1 Evaluation panel and evaluation procedures

The evaluation panel was composed of the following members:

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The evaluation has been based on the following components:

- i) Memorandum of Understanding and related documents;
- ii) Joint attendance to the closing COST 287 Workshop organized in Reykjavik at the Iceland Academy of the Arts on May 11-12, 2007, by Prof. Grossmann, Dr. Ferreira and Prof. Ansoerge;
- iii) Final progress report and Minutes of the final MC meeting celebrated in Reykjavik on May 11, 2007;
- iv) Documents produced during the lifetime of the COST Action 287 and made available on the dedicated websites, namely ( <http://www.cost287.org> ) for the Action, ( <http://cost287.free.fr/> ) for WG1, and ( <http://icsrim.leeds.ac.uk/congas/> ) for WG2;
- v) Elected Papers from the COST 287 – ConGAS Session organized at the 6th International Gesture Workshop in Vannes, France, May 20th 2005, as kindly made available by Prof. Sylvie Gibet, French MC member of COST 287.

### 9.2 Results versus objectives

*(Originally claimed objectives as stated in the MoU are provided in cursive text, whereas the evaluation comments are given in plain text).*

Specific objectives:



- *To improve the knowledge in the relationship between sound and gesture*

The fundamental aspects concerning the interrelations between sound and gesture were duly handled in Working Group 1 of COST 287, with contributions to gesture models. This was an absolutely necessary activity of rather theoretical nature, which is still open to further research. COST 287 succeeded in clarifying concepts, in setting up specific seminars (e.g. “Basic issues of gesture and musical sound”) and workshops (e.g. on gesture classification), and dedicated a large part of the book (cf Annex A of this report) to the subject.

- *To provide new gestural processing of sound*
- *To explore distributed interactive multimedia technologies*

COST 287 addressed these issues by designing core software and hardware tools of a common framework, by developing new algorithms for sound control and gesture-sound interaction, and by setting up a shared database for gesture algorithm description and implementation. This work was then complemented by setting up demonstration vehicles for the general and specialized public, whereas guidelines and protocols were also established as a contribution to later standards.

- *To establish links with connected fields of research*

Purpose was to enable a mutual cross-fertilization by integrating diverse technologies into the research activities of the Action (e.g. multi-modal interfacing, smart user interfaces, smart sensors / actuators for multimedia presence / interaction, intelligent interfaces for elderly and disabled, rehabilitation technologies for all) while stimulating new research in these technologies based on the sound-gesture centered activities in COST 287. This issue was well handled and led to identifying application areas and social domains that can benefit from these progresses (e.g. music, tools for assistance, design of ergonomic tools and utilities for the large public, acoustic ecology, etc.).

- *To promote the developments and applications of new technologies*

The concepts elaborated are applicable to a large range of new application fields, including music technology, music information retrieval, arts events, interactive installations for museums, public places, new kinds of artistic performances, but also sports and rehabilitation. This potential was even further strengthened when the COST 287 decided to establish a link with the at that time emerging field of sonification.

Contacts with the company Lukotronik (motion capture) led COST 287 to developing an OpenSoundControl export module on basis of the TUIO protocol established during an STSM, which significantly facilitates the creation of real-time systems. Contacts were established with companies dealing with sensing devices (e.g. iCubeX, AtoMIC, La Kitchen) and motion tracking (VICON Ltd.). Further contributions enabled the development of audio interaction techniques for visually disabled persons, which were tested by blind sportsmen (paraolympic discipline “goalball”, 2006).

COST 287 succeeded indeed in validating the concepts through demonstrators addressing a large palette of application areas, and the Action succeeded in establishing bridges with several companies. It would have been nice however involving some companies directly in the consortium and getting them apply the new technologies.

- *To coordinate most prominent efforts at European level in this field*

Fifteen COST countries were participating to the COST 287 Action, complemented by the Faculty of Music of the McGill University / Canada which played a very active role within the Action, leading to an Action involving 26 institutions. Additionally to gathering European key players in the field, COST 287 cooperated with COST 219ter and with the AISB Society for

the Study of Artificial Intelligence and Simulation of Behavior. Links were also established with the EU FP6 project Sound-to-Sense / Sense-to-Sound (S2S2) with participation of several COST 287 members.

The Action succeeded in largely involving young researchers in the multidisciplinary research activities by means of 26 innovative Short-Term Scientific Missions, each of them being documented in a report and presentation poster available on the COST 287 website. The topic enabled also a good gender representation at senior and junior levels.

Dissemination took place through a series of workshops and conferences, additionally to journal articles, including contribution to special issue of IEEE Multimedia, conference publications, etc. Last but not least, the consortium produced the authoritative book “Musical Gestures: Sound, Movement, and Meaning”, cf. Annexe A. The overall number of publications amounts to 70. Dissemination took also place in form of public music concerts organized at occasion of conferences / workshops in view of demonstrating the latest results achieved and of awakening the interest of the audience.

Hence, the COST 287 Action was indeed successfully coordinating research in the field at European level. It did very well at research level, regarding also involvement of scientists / artists from diverse horizons and cultures contributing to a multi-disciplinary approach, with an emphasis on neat and intense involvement of STSMs in the RTD activities. Dissemination was very well and originally implemented. However, the link with regional and international projects could have been more intense.

### **9.3 Outcome and achievements**

A summary of the main results achieved are furnished along Items a) to e) furnished in Section 8 of the report, and along the different entries in Sub-Section 9.2.

### **9.4 Impact of the Action**

The Action participants underline the importance and usefulness of the regular cooperation enabled between partners through COST 287, especially when considering the wide multi-disciplinary nature of the research field embracing ICT aspects on the one hand side, and ISCH aspects on the other hand side when considering society oriented applications. COST 287 was essential in supporting the set up of the cooperation network, and COST 287 was also instrumental through the STSMs organized and by supporting the creation of a new series of workshops / conferences that continue taking regularly place after the closure of COST 287. Finally, COST 287 contributed to enlarging the fundamental understanding of gesture-sound interactions, and enabled the technological development and practical experimentation.

Finally, COST 287-ConGAS enabled outstanding research activities taking place in the international scene within the area of gesture controlled audio systems.

### **9.5 European added-value**

COST 287 was instrumental in bridging the fragmented research activities undertaken in Europe in the field. It enabled experts and young researchers to regularly meet through topically centred workshops and broader annual conferences. It enabled the coordination of the research cooperation with COST 219ter, with international associations and with the international project Sound-to-Sense / Sense-to-Sound. An intense cooperation was also taking place with the McGill University from Canada, including mutual visits.

The usual COST funding instruments were used, including meetings, workshops and conferences, and 26 very successful Short Term Scientific Missions, several of them leading to joint publications, and one to setting a software protocol targeted to gesture-sound interfacing. Recommendations were also outlined.

## **9.6 Coordination and management**

The COST 287 Action was implemented with a dynamic and participative management style, the breakdown of the Working Groups covering theoretical and methodological aspects (WG1), the gesture / sound interfacing technology (WG2), and application targeted activities (WG3). Moreover, in the course of the Action, it was decided to launch two Transversal Working Groups, TWG1 being dedicated to preparing the COST 287 book (cf. Annex A), whereas the TWG2 was set up for handling the Web site.

The Action was coordinated in an efficient manner over its lifetime.

## **9.7 Dissemination of results**

Dissemination was taken care of over different channels. Firstly, the results collected were demonstrated in the frame of experimental music concerts open to the public audience. Of course, the dissemination was also ensured through usual channels in form of journal papers, including contributions to special issues of the IEEE Multimedia journal, in form of conference publications (notably for ICMC, SMC, NIME, EVA, DAFx), and in incorporating results in PhD theses. Finally, the consortium produced the authoritative book “Musical Gestures: Sound, Movement, and Meaning”, cf. Annexe A, systematically addressing the gesture-sound interaction problem in the specific frame of music performance. Globally, the number of specific papers linked to the Action amounts to 70.

## **9.8 Strengths and weaknesses**

Strengths of COST 287 encompass: i) setting up a European scientific network on gesture / sound interaction gathering most active and prominent experts, including link with McGill University in Canada; ii) contribution to the theoretical and methodological understanding of the underlying mechanisms connected to gesture / sound interactions; iii) contribution to the technological software and hardware implementation of gesture / sound interfaces; iv) initiating new series of workshops and conferences (ISon - Interactive Sonification Workshop, GIMS – Gesture Interfaces for Multimedia Systems, etc.) continuing to take place on regular basis. v) dissemination; vi) organization of demonstration concerts.

Short Term Scientific Missions were especially successful within COST 287, because of the large involvement of young researchers through the 26 STSMs implemented, and because of the often very new experiments undertaken, related publications produced, and STSM presentations made at workshops / meetings.

Gender balance was to a certain level also successful within the COST 287 Action regarding involvements at both senior and junior levels.

On the other hand side, although part of the research undertaken was of blue sky nature, and although contacts with companies were indeed launched and provided constructive stimuli for research within COST 287, a more intense interaction with companies, including participation of some of them within COST 287, would have been welcomed. Similarly, it is felt that cooperation with regional and international projects, especially at the EU FP level, could have been denser.

## 9.9 Recommendations

COST 287 emerged from the former trans-domain COST Action G6-DAFx focused in Digital Audio Processing that initiated the international conference DAFx “Digital Audio Effects” which still occurs annually (<http://www.dafx.de/> ). COST 287 succeeded in pursuing the research with focus on gesture-sound interactions from an IST / ICT perspective, but with clear links with the ISCH Domain and involvement of the related community. The seminal work undertaken in the frame of COST 287 was recognized and encouraged to get pursued with focus on sonification in the scope of the running COST Action IC0601 “Sonic Interaction Design”, which was launched in Spring 2007.

Hence, the recommendation of initiating a follow-up COST Action was anticipated in this case.

Additional detailed recommendations were suggested by the external expert regarding:

- a) Encouragement of further strengthening the dialogue between technology driven research (e.g. signal processing, controlling interfaces) and human / culture centered activities;
- b) Further deepen the theory and methodology oriented research;
- c) Widen the links with international arts festivals like ISEA and Ars Electronica;
- d) Slightly improve the information access on the **COST 287-ConGAS** website, which is less easily usable from the open audience (e.g. structured along WGs and STSMs, use of acronyms etc.).

## 10. DC REMARKS

COST Action 287 has strengthened the European expertise in the field of gesture controlled audio interfaces and systems, with an emphasis on music-oriented applications, with a wider extension and experimentation in the general gesture-sound interfacing arena in multimedia, and also in assistive and rehabilitation technologies. This activity was recognized as seminal and important, notably in the developing context of sonification, which gave rise to the already launched follow-up Action COST IC0601. As such, COST 287 is considered as a successful COST Action.

## A. ANNEX: The Cost287–ConGAS Book: Table of Contents

Reference: Rolf Inge Godøy and Marc Leman (Editors), *Musical Gestures: Sound, Movement, and Meaning*, Routledge / Taylor & Francis Group Ltd, NY / USA and Oxon / UK, Sept. 2009 for the electronic publication (ISBN 0-203-86341-0), and Jan. 2010 for the printed publication (ISBN 978-0-415-99887-1), 320 pages.

### PART I: Gestures in Music

- 1 Why Study Musical Gestures ?
- 2 Musical Gestures: Concepts and Methods in Research
- 3 Gestures in Performance
- 4 Music and Gestures: A Historical Introduction and Survey of Earlier Research

### PART II: Gestural Significations

- 5 Gestural Affordances of Musical Sound
- 6 Music, Gesture, and the Formation of Embodied Meaning
- 7 The Functional Role and Bio-kinetics of Basic and Expressive Gestures in Activation and Sonification

### PART III: Gesture Generation and Control

- 8 Gesture and Timbre
- 9 Sensorimotor Control of Sound-producing Gestures
- 10 Visual Gesture Recognition: From Motion Tracking to Expressive Gesture
- 11 Conductors' Gestures and Their Mapping to Sound Synthesis

*The Foreword and Editors' Preface, providing tribute to the COST 287-ConGAS framework having hosted the activities, are available on the Webpage (<http://www.ebookstore.tandf.co.uk/html/moreinfo.asp?bookid=536975225>).*