

Annex3
to Doc. WGCEM/1/00



COST Action 287

Gesture Controlled Audio Systems

FINAL PROGRESS REPORT

Period: from March 2003 to June 2007

This Report is prepared by the MC of the Action and presented to the relevant Technical 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.

CONTENTS

1 OVERVIEW: ACTION IDENTIFICATION DATA

COST Action 287

Title: *Gesture Controlled Audio Systems*

TC Recommendation: 17/10/2002

First MC meeting: 10/03/2003

CSO Approval: 03/12/2002

Last MC meeting: 11/05/2007

Start date: 10/03/2003

Final Report: 15/08/2007

Duration: 48 months

Evaluation Report:

Extension: up to 30/06/2007

TC Evaluation: approved

End date: 30/06/2007

Number of signatories: 15

Signatories and date of signature: (day/month/year)

Belgium, 16/05/2003

Iceland, 05/07/2004

Portugal, 01/08/2005

Denmark, 05/09/2003

Ireland, 12/03/2003

Spain, 25/09/2003

Finland, 20/03/2003

Italy, 14/03/2003

Sweden, 16/05/2003

France, 05/05/2003

Netherlands, 12/03/2003

Switzerland, 17/04/2003

Germany, 12/03/2003

Norway, 20/03/2003

United Kingdom, 12/03/2003

Institutions from non-COST countries: *Faculty of Music, McGill University, Canada*

Area: Telecommunications Information Science and Technology

Action Web site: <http://www.cost287.org>

Chairperson:

Title, name: *Nicola Bernardini*

Tel.: +39-335 7063282

Affiliation: *Conservatorio di Padova*

Fax: +39-06 233200750

Postal Address: *Via Eremitani, 8*

E-Mail: *chair@cost287.org*

P.O. code, City: *I-35121 PADOVA*

Web: <http://www.conservatoripollini.it>

Country: *Italy*

TC Rapporteurs: *PD Dr. Michael Ansorge, Switzerland*

External Evaluator: *Dr. Rolf Grossman, Germany*

2 OBJECTIVES

The **Cost287–ConGAS** Action intends 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 can be 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.
- Promote the developments and applications of new technologies. This Action will promote 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 will widen participation of music making and stage performance, and alternative paths to musical creativity and expressivity for many people, including those for whom conventional instruments are not an option due to physical constraints. This Action aims 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** will articulate itself 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 will encompass the following activities:
 - Organization of WG meetings dedicated to specific aspects and problems in the field;
 - Scientific conference every year 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 aims 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 will use common servers and repositories and Free Software groupware tools to be able to share any information they wish to.

4 PARTICIPATION AND COORDINATION

4.1 Management Committee

Chairperson :

Nicola Bernardini
Conservatorio Statale di Musica “Cesare Pollini”
Via Eremitani, 8
35121 Padova, Italia
Tel: +39 335 7063282
Fax: +39 06 233200750
E-mail: nicb@sme-ccppd.org

Vice-Chairperson :

Prof. Daniel Arfib
LMA-CNRS Marseille
Chemin Joseph Aiguier
13402 Marseille, Cedex 20 - France

Tel: +33 (0)4 91 164210
Fax: +33 (0)4 91 220875
E-mail: arfib@lma.cnrs-mrs.fr

Scientific Secretary :

Roberta Fraguiglia
DIST - Università di Genova
Viale Francesco Causa, 13 16145 GENOVA, Italia
Tel. +39 010 353 23 11
Fax. +39 010 353 29 48
E-mail: roberta@infomus.dist.unige.it

MEMBERS**BELGIUM :**

Prof. Marc Leman
Ghent University
Research-Professor

Dr. Todor Todoroff
ARTEM (Art, Recherche, Technologie et Musique asbl)
President

CANADA :

Prof. Marcelo Wanderley
McGill University - Faculty of Music

Dr. Philippe Depalle
McGill University - Faculty of Music

DENMARK :

Dr. Kristoffer Jensen
Aalborg University Esbjerg
Department of Software and Media Technology
Associate Professor

Dr. Thomas Moeslund
Aalborg University
Laboratory of Computer Vision and Media Technology
Assistant Professor

FINLAND :

Prof. Vesa Välimäki, D.Sc.(Tech.)
Helsinki University of Technology
Department of Electrical and Communications Engineering
Laboratory of Acoustics and Audio Signal Processing

Prof. Tapio Takala
Helsinki University of Technology
Telecommunications Software and Multimedia Laboratory

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
Neuroinformatics Group
Faculty of Technology
Bielefeld University
Research Assistant

ICELAND :

Prof. Hiltor Thordarson
Iceland Academy of the Arts
Music Department

IRELAND :

Prof. Mikael Fernström
University of Limerick
Department 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
Conservatorio Statale di Musica “Cesare Pollini”
Padova, Italia
Professor

Prof. Antonio Camurri
DIST - Università di Genova
Associate Professor

NETHERLANDS :

Dr. Bert Bongers
Dept. of Computer Science
Vrije Universiteit Amsterdam

NORWAY :

Assoc.Prof. Jan Tro
Acoustics Group
Department of Electronics and Telecommunications
Norwegian University of Science and Technology (NTNU)

Prof. Rolf Inge Godøy
Oslo University
Institutt for musikk og teater

PORTUGAL :

Prof. Alvaro Barbosa
Universidade Católica Portuguesa
Escola das Artes - Dept Som e Imagem

Prof. Luis Teixeira
Universidade Católica Portuguesa
CITAR - Centro de Investiga ção
Ciências e Tecnologias das Artes

SPAIN :

Prof. Xavier Serra
MTG-IUA-UPF

Director

Prof. Sergi Jordá
MTG-IUA-UPF

SWEDEN :

Dr. Sofia Dahl
KTH - Royal Institute of Technology
TMH - Department of Speech, Music and Hearing

Dr. Roberto Bresin, PhD
KTH - Royal Institute of Technology
TMH - Department of Speech, Music and Hearing

SWITZERLAND :

Dr. Alain Crevoisier
Center for Engineering and Technology Transfer (CeTT)
University of Applied Science Western Switzerland

UNITED KINGDOM :

Dr. Kia C Ng
University of Leeds
School of Computing
School of Music

Dr. Andy Hunt
University of York
Department of Electronics

4.2 Participating Institutions

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

24. University of Western Switzerland, Switzerland
25. University of Leeds, United Kingdom
26. 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 follow (full details can be found at <http://www.cost287.org/documentation/stsms/index.html>).

- Scientist: Martin Kaltenbrunner
Organization: Universitat Pompeu Fabra, Barcelona (E)
Nationality: Spain
Date: 19.02.2004 – 05.03.2004
Host: Media Lab Europe, Dublin (EI)
Topic: Design of tangible objects for the reactTable
Final Report: http://www.cost287.org/documentation/stsms/report/reactable_congas2004.pdf
Related Papers: [43, 42]

- Scientist: Pashalidou Panagiota-Styliani
Organization: University of York, York (UK)
Nationality: Greece
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
Related Papers: [32]

- Scientist: Sandra Pauletto
Organization: Electronics Department, University of York, York (UK)
Nationality: Italian
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

- Scientist: Loïc Kessous
Organization: CNRS-LMA, Marseille (F)
Nationality: France
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
Related Papers: [44]

- Scientist: Mark T. Marshall
Organization: University of Limerick (IE)
Nationality: Ireland
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

- Scientist: Till Bovermann
Organization: Bielefeld University (D)
Nationality: Germany
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

- Scientist: Enrico Costanza
Organization: MediaLab Europe, Dublin (IE)
Nationality: Italy
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

- Scientist: Hembing Li
Organization: IPeM, Belgium (B)
Nationality: China
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

- Scientist: Bruno Giordano
Organization: University of Padua, Padua (I)
Nationality: Italy
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

- Scientist: John Williamson
Organization: University of Glasgow, (UK)
Nationality: United Kingdom
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
- Scientist: Erwin Schoonderwaldt
Organization: KTH, Stockholm (S)
Nationality: Sweden
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
- Scientist: Amalia de Götzen
Organization: University of Verona, (IT)
Nationality: Italy
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
- Scientist: Kjetil Hansen
Organization: KTH, Stockholm (S)
Nationality: Sweden
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
- Scientist: Asri Ibrahim
Organization: University of York (UK)
Nationality: British
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

- Scientist: Matthew Paradis
Organization: University of York (UK)
Nationality: United Kingdom
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

- Scientist: Cornelius Pöpel
Organization: University of Birmingham (UK)
Nationality: Germany
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

- Scientist: Jean–Julien Filatriau
Organization: Université Catholique de Louvain (BE)
Nationality: Belgium
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

- Scientist: Marcos Alonso
Organization: Music Technology Group, Barcelona (E)
Nationality: Spain
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

- Scientist: Ginevra Castellano
Organization: Infomus Lab, DIST Università di Genova (IT)
Nationality: Italy

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

Related Papers: [12]

- Scientist: Jyri Pakarinen
Organization: TKK, Helsinki (FI)
Nationality: Finland
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

- Scientist: Henri Penttinen
Organization: TKK, Helsinki (FI)
Nationality: Finland
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

- Scientist: Smilen Dimitrov
Organization: Aalborg University in Copenhagen, Copenhagen (DK)
Nationality: Macedonia
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

- Scientist: Alexandre Bouenard
Organization: Valoria Lab, Université de Bretagne Sud (FR)
Nationality: France
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

Related Papers: [22]

- Scientist: Alexander Refsum Jensenius
Organization: Oslo University (NO)
Nationality: Norway
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
Related Papers: [36]
- Scientist: Anne–Marie Burns
Organization: free–lance PhD researcher (Canada)
Nationality: 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
- Scientist: Matthias Demoucron
Organization: IRCAM Paris (FR)
Nationality: France
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

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 WG 1 aim is to 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** .

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 is 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 is defined (definition of themes, bibliography, seminars etc.).
3. Bielefeld, January 2004.

During the MC meeting, coordination of the different WG1 activities and results is discussed with the proposition of a “Transversal Working Group” (TWG) (see Sec. 5.4 on page 25).
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 ¹. A WG1 seminar has taken place in Oslo, with a number of excellent presentations. The big advance for this year is the preparation of the congas Book, with a definition of a table of contents with the definition of chapter leaders, 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 pollenisation with other WGs and MC and 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. ²
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

¹<http://cost287.free.fr>

² <http://www.hf.uio.no/imv/forskning/forskningsprosjekter/musicalgestures/events/congas-seminar/index.html>

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 (UK)

The activity of WG2 focuses on collecting and compiling resources for the development and implementation of low-level hardware devices, perform benchmarks and measurements on both experimental and commercially available devices, etc. WG2 also aims 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.

The Symposium on Gesture Interfaces for Multimedia Systems³ 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**:

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 sec. 5.3 on page 23).

³<http://www.leeds.ac.uk/aisb/gims>

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, UK
- 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, UK
- April 12th-15th, 2005, AISB 2005, University of Hertfordshire, UK

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, UK
- 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 continues the activities as in the previous year. It maintains 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 contribute 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 [57, 52, 60, 63, 62, 67, 45, 59, 58] in the bibliography provided on Sec. 6.1.2 on page 28)

Invited presentations/participations involving ConGAS WG2 chair include:

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

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 ⁴.

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 maintains the WG2 website with related publications and sensor relative links, actively working on the ConGAS book project, and enlarging the dissemination and publicity activities.

⁴<http://www.icsrim.org.uk/gims>

5.3 WG3 “Integrated Applications”

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

The activity of the WG 3 focuses 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** 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:

1. 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.
2. Stella Pashalidou’s STSM
3. Workshop day in Leeds (hosted by Kia Ng, UK delegate, and WG2 chairman)
See sec. 6.2 on page 36.

2004-2005: WG 3 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 is just being published, led by WG3 members. Strong links are being made 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:

1. Meeting and Events organized:

- 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 ⁵.

- May 18th-20th, 2005, MC meeting and International Gesture Workshop, 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.

- 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–ConGAS**⁶.

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.

⁵http://www-users.york.ac.uk/adh2/PD_WG3.html

⁶See details on <http://www.idc.ul.ie/icad2005/>

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

The second Workshop on Interactive Sonification is 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)

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

- a) The current WG Layout defines some broad thematic areas which tend to be interesting for most delegates;
- b) As a result, all delegates participate to more than one Working Group (some of them taking part to all three);
- c) While this situation tends to provide very positive scientific exchanges and is indeed capable of fulfilling the scientific scope of the action, it does 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 are supposed to be small task forces (i.e. 3-5 people) of highly committed individuals spanning all regular WGs and fulfilling specific objectives. TWGs may be featuring the contribution of specialists outside the MC. The MC decided to promote the creation of two TWGs as follows:

No.	TWG	Task Description
TWG1	Book	The Book TWG is devoted to the design and the organization of a book dedicated specifically to Cost287–ConGAS objectives; while this book will probably be issued after the end of the action, its conception and design will start very early on through this TWG

No.	TWG	Task Description
TWG2	Website	The Cost287–ConGAS website needs active maintenance and constant update; while it has already been set up and filled in with usual information, it needs to be kept a lively source of information with constant work: this TWG will be responsible for this work;

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 is composed by:

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

The TWG2-Web site is composed by:

- Sandra Pauletto (TWG Chairperson)
- Thomas Hermann
- Mikael Fernström
- Nicola Bernardini

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 can be evaluated by analyzing the Table of Contents of the upcoming **Cost287–ConGAS** Book (cf. Sec. A on page 42) (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 [61, 56, 21, 59, 6, 15, 47, 34, 60] are related to joint work by several **Cost287–ConGAS** delegates and related colleagues (cf. Sec. 6.1.2). References [56, 60] are full-blown presentations of the **Cost287–ConGAS** Action. References [43, 42, 36, 32, 44, 12, 22] are directly related to work performed during STSM missions.

6.1.2 Papers and individual publications of participants

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- [8] A. Camurri, G. Castellano, M. Ricchetti, and G. Volpe. Subject interfaces: Measuring bodily activation during an emotional experience of music. In Gibet et al. [21], pages 268–279.
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6.1.3 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 FUSE-LEEDS2006 (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 a 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 advertise 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

During its current research activities in the context of Gestural Audio Control WG3 started a contact with a motion capture company named Lukotronic ⁷. 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.

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

⁷www.lukotronic.com

novel auditory sports game “Blindminton”). These techniques have been tested with blind sportsmen from the paralympic discipline “goalball” in 2006.

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

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 Cost287–ConGAS (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 Cost287–ConGAS :	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

		COST OFFICE Avenue Louise 149 B-1050 Brussels, Belgium Tel +32 2 53338 00	
COST GRANT AGREEMENT			
		Preliminary Financial Report	
		Final Financial Report	
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			
I. INCOME			
COST GRANT AGREEMENT		73.576.86 €	
(1) First Downpayment	Date :	36.797.50 €	
(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 €	
II. EXPENDITURE			
A. Science Expenditure (Specify on corresponding sheets)			
(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 €	
Total Science Expenditure (sum 1 to 6)		64.245.13 €	
B. Secretarial support (maximum 15% of A.)		9.636.77 €	
C. Total expenditure (= A + B)		73.881.90 €	
III. OUTSTANDING BALANCE			
-1,960.56 €			
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 : 		

A The Cost287–ConGAS Book: Table of Contents

What follows is a revised overview of the **Cost287–ConGAS** book as of February 7 2007. To avoid confusion at this stage, the initial numbering of chapters 1 to 7 of the “original” Book 1 is retained here, but the chapters will of course be renumbered later on.

1	The editors	Introduction
2	Jensenius/Wanderley	Sound-gesture definitions
3	Arfib et al.	Acoustics of sound-gestures
4	Gibet	Gesture generation
5A	Moeslund	Visual gesture recognition
5B	Godøy	Gestural affordances of musical sound
6A	Leman	Music, gesture, and meaning formation
6B	Schneider	Historical overview
7	Dahl et al.	Gestures in performance
8	Johannsen/Marrin Nakra	Conductors’ Gestures & their Mapping to Sound Synthesis
9A	Jorda/Couturier	Gesture capture and sensory feedback
9B	Barbosa	Delayed musical performance (latency issues)
10	Hermann et al.	Tangible Interaction
11	Kessous	Alternate instruments
12	Jensen/Hebelin	Speech and other expressive interfaces
13	Graugaard/Jensen	Issues in Live Interactive Performance in Multi- media
14	Hoener et. al.	Aiding Movement

Table 2: **Cost287–ConGAS** Book Table of Content