# humaine

# D8d

# Proposal for exemplars and work towards them:

# Communication and Emotions

*Workpackage 8 Deliverable*

**Date: 30th November 2005**

| IST project contract no. | 507422 |
|---|---|
| Project title | **HUMAINE**<br>**Human-Machine Interaction Network on Emotions** |
| Contractual date of delivery | *November 30, 2005* |
| Actual date of delivery | *November 30, 2005* |
| Deliverable number | D8d |
| Deliverable title | Proposal for exemplars and work towards them:<br><br>Communication and Emotions |
| Type | Report |
| Number of pages | 29 |
| WP contributing to the deliverable | WP 8 |
| Task leader | ITC-Irst |
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# 1    The place of this report within HUMAINE

The HUMAINE Technical Annex identifies a common pattern that is followed by most of the project's workpackages

> The measure of success will be the ability to generate a piece of work in each of the areas which exemplifies how a key problem in the area can be solved in a principled way; and which also demonstrates how work focused on that area can integrate with work focused on the other areas. We call these pieces of work *exemplars*. The exact form of an exemplar is not prespecified: it may be a working system, but it might also be a well-developed design, or a representational system, or a method for user-centred design. (p 4)

> To that end, each thematic group will work out a proposal for common action, embodied in one or more exemplars to be built during the second half of the funding period (p.16)

> The process will begin with production by each thematic group of a review of key concepts achievements and problems in its thematic area; and drawn from the review, an assessment of the key development goals in the area. This review and assessment will be circulated to the whole network for discussion and comment, aimed both at building understanding of basic issues across areas, and at identifying the choices of goal that would be most likely let the different groups achieve complementary developments. That consultation phase will provide the basis for deliverables in month 11, which describe in some detail a few alternatives that might realistically be chosen as exemplars in each area, and their linkages to issues in other thematic areas. A decision and planning period will follow, involving consultation within and between thematic areas, leading to presentations at the second plenary conference, which will describe a single exemplar that has been chosen for development in each area, and the way work on the exemplar will be divided across institutions. The remainder of the project will be absorbed in developing the chosen exemplar. (p. 21)

The consultation phase has now ended. Near-final plans were presented to the whole network at the Plenary in May 2005, and adjustments have been made accordingly.

This deliverable reports the plans that have now been set out for the remaining 25 months of the project. They are necessarily provisional, because they will be subject to two reviews (in 2006 and 2007) before they are completed.

Work has begun on several aspects of the planned programme. It is also reported.

Ethical issues affect the whole of HUMAINE, but rather than repeating essentially similar points in multiple deliverables, they will be handled coherently in a single document, D0o (Science and Society).

The following persons have contributed to the work reported in the deliverable:

Oliviero Stock, Marco Guerini, Carlo Strapparava, Alessandro Valitutti, Benoît Morel, Shlomo Hareli, Shay Tzafrir, Aaron Ben-Ze'ev, Fiorella de Rosis, Irene Mazzotta, Giuseppe Clarizio, Enzo Silvestri, Ruth Aylett, MeiYii Lim, Elisabeth André, Matthias Rehm, Elisabetta Bevacqua, Christopher Peters, Catherine Pelachaud, Christina Anagnostopoulou, Ian O'Neill, Maria Miceli, Isabella Poggi, Fiorella DeRosis

The institutions that have contributed are:

*QUB, ISTC, ITC-irst, Paris 8, UA, DI-BARI, HU, Cantoche, HWU, UTWENTE.*

# 2    Brief overview of Workpackage 8 and the exemplar proposal

## 2.1  The field covered by Workpackage 8

The Workpackage has a specific computational aspect. Its aims are to help understand some of the critical issues for building persuasive, or otherwise emotion-inducing computational, systems; to develop environments that help to experiment with specific concepts; and to test limited realizations that can be demonstrated as proofs of concepts for a novel class of systems.

WP8 is mainly concerned with output in the sense of inducing emotions in the audience. Yet, on the dimension general/specific there is clear consensus that our work cannot be one that accommodates or models all forms of emotional communication. Rather we shall focus on particular areas with the potential to have an impact on concrete application scenarios.

The original specification of HUMAINE lacks an explicit focus on language processing. In WP8, though, we are engaged in lot of activity that covers emotion and language processing. NLP techniques are needed for several of the areas covered by persuasive and creative communication. For that reason, we are adding an explicit element of research concerned with emotion and NLP.

## 2.2  The research objectives

1. Set the grounds to advance the state of the art

2. Develop emotion-sensitive approaches to basic issues in persuasive communication

3. Develop approaches to emotion and communication issues in creative applications

4. Develop techniques for emotive language processing

5. Develop approaches to the use of emotive music in persuasive communication

6. Develop and investigate specific evaluation methodologies (in collaboration with WP9)

7. Analyse the ethical issues surrounding emotion-related social influence (in collaboration with WP 10)

The work will be developed in the context of a common applied scenario, concerned with promoting a concept which is of social value.

### 2.2.1  Main elements of the exemplar

Following the consultation period, the exemplar proposed for WP8 is titled **Persuasive Communication Environment**
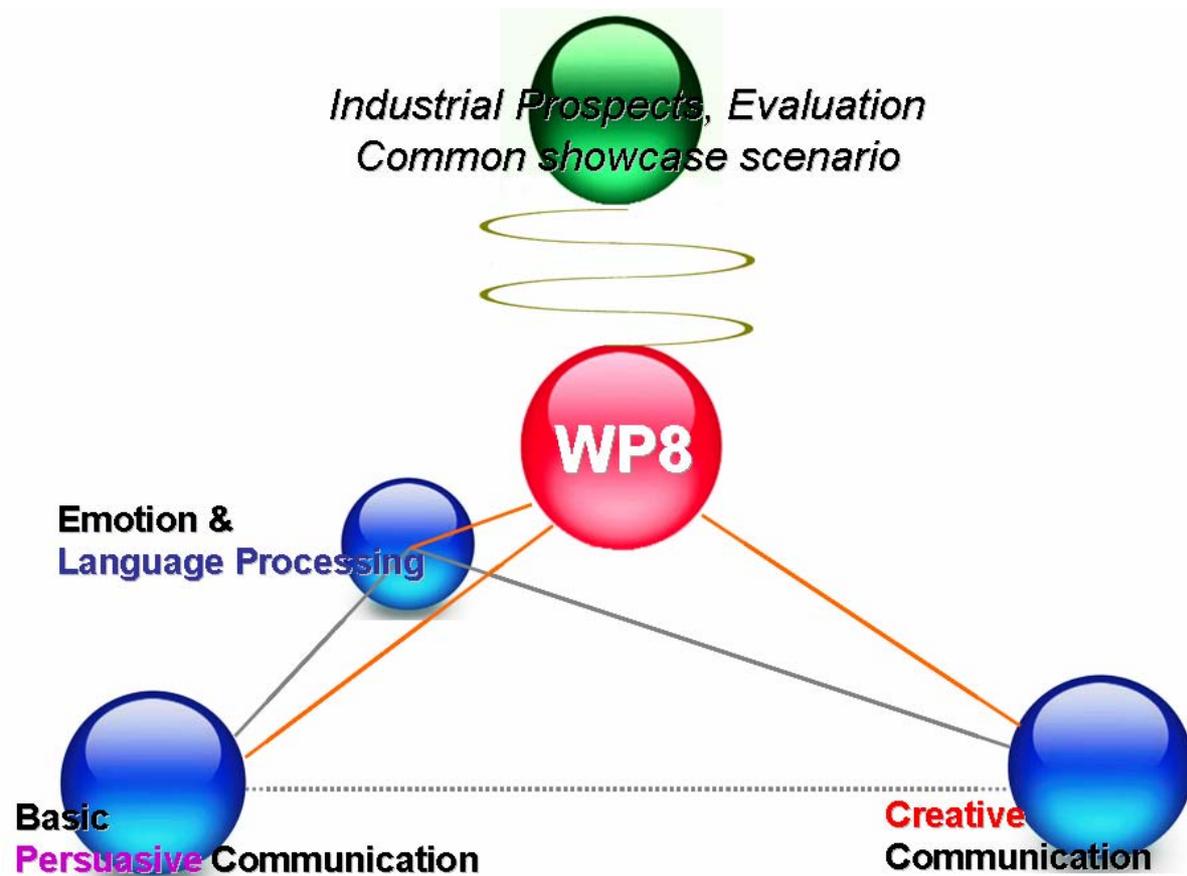
This title has been chosen to stress various ideas:

a) there are a whole set of means for realizing a persuasive communicative goal, and they contribute to defining our existing landscape;

b) we are talking about computational environments;

c) we emphasize the realization of experimental settings, where some aspects are not yet under full control of a system, but shared with a human that may still have to accept the system suggestions or adapt them.

The exemplar is unified by **one common theme**, whose role is to demonstrate the practical potential of the area of emotions in persuasive and creative communication, to define an overall scenario for anchoring activities to a concrete challenge, and to define methodologies for evaluation in agreement with WP9 and perform resulting user and evaluation studies.

We propose to design a promotion campaign framework, for any concept of social value, to be realised through a number of different technologies which are the object of current research within HUMAINE. The idea is that the campaign exploits various means, broadcasting-oriented, individual-oriented, interactive and so on. The campaign could be on various socially-oriented themes, and components may indeed explore one or the other specific concrete scenarios.

Table 1 describes the contributions of WP8 partners along some **dimensions** that characterize technologies in the campaign. Numbers (ranging from 0 to 3) indicate the relevance of the theme for the specific WP8 participant's work.

| | Interaction Typology | | | Target | | | Message Modality | | | Validation and implications | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Monological | Dialogical | Multiparty | Individual | Group | Broadcast | Mainly Verbal | ECA | Other Modalities | Ethical Issues | Evaluation methodologies |
| ITC-Irst | 3 | 0 | 2 | 3 | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| Univ. of Bari | 1 | 3 | 0 | 3 | 0 | 1 | 3 | 3 | 0 | 1 | 2 |
| ISTC Roma | 3 | 2 | 0 | 3 | 1 | 1 | 2 | 3 | 3 | 2 | 1 |
| Univ. of Augsburg | 1 | 3 | 2 | 3 | 1 | 0 | 1 | 3 | 2 | 2 | 2 |
| Heriott-Watt Univ. | 3 | 1 | 0 | 3 | 2 | 1 | 3 | 3 | 1 | 2 | 2 |
| University of Paris 8: | 0 | 3 | 1 | 3 | 1 | 0 | 0 | 3 | 0 | 0 | 2 |
| Queen's University of Belfast: | 1 | 3 | 0 | 3 | 1 | 0 | 3 | 2 | 2 | 1 | 3 |
| University of Haifa | 2 | 0 | 0 | 3 | 0 | 0 | 1 | 3 | 1 | 1 | 3 |
| Univ. of Twente | 0 | 3 | 1 | 3 | 1 | 0 | 0 | 3 | 0 | 0 | 2 |

*Table 1*

The development activity incorporates three elements.

Element 1: **Basic persuasive communication**, including: Persuasion Models, Integrated model of emotion and politeness, A mobile persuasive storytelling guide, Gaze and eyes for persuasion

Element 2: **Creativity for communication**, including: Creative verbal humour, False emotions in true lies, Music for persuasion

Element 3: **Emotion and Language Processing**: a theme that is essential for building communication systems and specifically for persuasive and creative communication systems. This element includes work on: a) building computational resources for dealing with evaluative or otherwise emotion-related language; for instance specific lexical knowledge bases, and corpora; b) taking care of natural language generation methods and narration; c) perform some specific research on emotion-related text processing, as far as useful for the

purposes of the other two elements in WP8; d) develop technology for dialogue management useful for the interactive version of persuasion system.

Research activity specifically on spoken language processing is out of the scope of WP8.

## 2.2.2 How the subtasks link to each other

The cohesion among subtasks is guaranteed by the following aspects:

1) the common applied scenario: together with the industrial partner of WP 8, Cantoche, we will make the design of the promotion campaign more detailed.

The applied scenario provides a concrete challenge that motivates a large part of WP8. As said above, the idea is to have a promotion campaign for a concept of social value, realised through a variety of different technology-based means.

Many components have required a time-consuming work on domain description and this makes it practically impossible to have all work converging on one single domain. Work on the exemplar realised in one domain will nonetheless have to demonstrate the possibility of being ported to a different domain.

A campaign of the sort we propose could be focused on the idea of attracting people to vote in public elections, a problem made evident by recent poor shows in several recent European elections. In particular the aim would be to attract people to on-line voting. If so, the campaign would argue about the value and responsibility of voting in general, the possibility for the elector of influencing decisions on important topics, and the possibility of considering multiple viewpoints, and perhaps connect to recent news.

A similar campaign could be launched for attracting people to visit a new or renewed cultural site, such as a large museum or an exhibition. We could have a campaign with new themes every day over a week for instance, leaving space for various approaches, and perhaps to connect to the real world, for instance finding inspiration in common sense expressions or even in news headlines. In the case of the cultural scenario also, audience profiles could be made available so that the promotion at least in some cases is person-oriented.

As said above, the campaigns could exploit various forms of technology: broadcasting-oriented, individual-oriented, interactive and so on. Of course we do not mean that we end up with products nor with a set of complete prototypes, but with various non homogeneous levels of realizations, to explore and validate the main concepts of WP 8 research.

2) Contributions from the two central elements: persuasive communication and creative communication. Subtasks are complementary.

3) Emotion and Language processing is at the basis of various activity: for instance monological persuasion, interactive persuasion, story telling, creative language and humour environment etc.

## 2.2.3 How the subtasks link to other aspects of HUMAINE

"IMP" means imported to WP 8, "EXP" means exported from WP 8.

- WP 3

IMP Is it possible to provide analysis of the functions of emotion in persuasion, covering the process of emotion induction and its role in inducing action (WP3 will see if it can provide input)?

IMP Is it possible to provide analysis of the way emotion impacts personality and humor (WP3 will see if it can provide input)?

IMP Is it possible to provide data and theories about the way collective emotions can be induced through mass communication?

IMP/EXP Both WP's have an interest in developing analyses of the mapping between the meanings of words and explicit messages and emotional content.

IMP Is it possible to provide analysis of the relationship between dispositional (long term) and episodic (short term) emotions?

EXP We can offer work on affective the way a lexical knowledge base can be relevant and receive input.

- WP 4

IMP Is it possible to provide evidence of the way gaze operates as an indicator of emotion?

EXP We can offer information about emotion recognition from linguistic (text) analysis.

IMP Is it possible to have a plug-in tool for analyzing prosody, gestures and facial expression in recordings of persuasive outputs?

IMP/EXP Is it possible to collaborate on developing methods of registering "Signals of engagement", which are central to assessing emotional effectiveness, as well as signals of emotion *per se*?

- WP 5

EXP We can provide corpus material on polite interactions

EXP We can provide a corpus on interactions with an ECA attempting to persuade

IMP We would appreciate a corpus on Human/Human persuasive interactions

IMP We would appreciate a corpus of successful & unsuccessful persuasive interaction

EXP We can provide databases of linguistic expressions of emotions

- WP 6

IMP We need information on what ECA's can and cannot do.

IMP/EXP We should be involved in the specification of a representation language because of its implications for humour and persuasion.

- WP 7

IMP We could benefit from models of emotion activation and emotional decision making

- WP 9

IMP/EXP We need to have appropriate evaluation criteria for persuasive and creative messages, and should be involved in their development.

IMP/EXP We need to have appropriate evaluation methods for evaluation based on research coming from relevant fields such as social psychology, and should be involved in their development.

- WP 10

IMP/EXP We need to have appropriate input on ethical issues in persuasion by an artificial agent (individual and mass communication), and particularly from the empirical study of this issue; and should be involved in relevant research.

EXP We can offer evidence about the necessity of emotion in computer/human communication.

In addition, various activities at specific sites involve interaction between their roles in WP8 and roles in other workpackages. They are as follows.

**University of Bari**:

Relation with WP7: cognitive models of emotions which are being developed in the scope of that WP will be integrated with the dialog simulator, to model both activation and interpretation of emotional states.

Relation with WP9: the Wizard of Oz tool we built in the scope of WP9 provided the data on which our dialogs will be designed; new methods for evaluating the impact of emotional vs purely rational persuasion strategies will be studied.

**Heriott-Watt University:**

Participation in WP7 workgroup 3 'Bridging the Levels' in which relationship between neuro-physiological models of emotion used in WP7 action selection and appraisal-based models used in WP8 is being investigated. Use of Bamberg PSI model in the HWU Affective Guide work as a specific example of such bridging.

**ISTC Roma:**

Our work relates to

WP6, by providing theoretical background, data analysis, and multi-modal repertoires of backchannel;

WP7: development of BDI&E models and critical reflection on their possible role in human-technology communication;

WP10: contribution to the development of a broader and deeper model of ethically aware persuasive agents.

# 3     The planned program of research

## 3.1  Element 1: basic persuasive communication

### 3.1.1  Main participants

**ITC-Irst**: Oliviero Stock, Marco Guerini, Massimo Zancanaro

**Univ. of Bari**: Fiorella de Rosis, Irene Mazzotta, Giuseppe Clarizio, Enzo Silvestri

**ISTC Roma**: Cristiano Castelfranchi, Maria Miceli, Isabella Poggi. Giorgio Merola, Francesca Giardini

**University of Augsburg**: Elisabeth André, Matthias Rehm

**Heriott-Watt University**: Ruth Aylett, MeiYii Lim, Shachindra Nack

**University of Paris 8**: Elisabetta Bevacqua, Christopher Peters, Catherine Pelachaud

**Queen's University of Belfast**:  Ian O'Neill

**University of Haifa**: Shlomo Hareli, Shay Tzafrir, Aaron Ben-Ze'ev

**Cantoche:** Benoît Morel

### 3.1.2  Main steps planned towards producing element

All the following subtasks are meant to be carried out in parallel, by the various partners of WP8

| Subtask | Carried out by | Start / end dates |
|---|---|---|
| **Persuasion Models** | ITC-Irst, Univ. of Bari, ISTC Roma | 19/48 |
| **Integrated model of emotion and politeness** | University of Augsburg | 19/48 |
| **A mobile persuasive storytelling guide** | Heriott-Watt University | 19/48 |
| **Gaze and eyes for persuasion** | University of Paris 8, Univ of Twente | 19/48 |
| **Persuasive systems** | ITC-Irst, Univ. of Bari, Queen's University of Belfast, HU | 19/48 |

| Evaluation of Persuasive systems | ITC-Irst, University of Haifa, Cantoche | 19/48 |
|---|---|---|
| Ethics and social influence | ITC-Irst, ISTC Roma, OEFAI, HU | 19/48 |

**Itc-Irst**:

For *Persuasion models* we plan to: (a) enlarge the number of persuasive strategies covered by our model (e.g. investigating in more depth the use of irony and promises/threats) and (b) to refine the model by investigating not only high level content planning for the generation of persuasive messages, but also emotion oriented lexical choice . Work will also be performed in collaboration with University of Bari.

For *Persuasive systems* we will continue the development of the *Promoter* prototype and we will experiment, among other things, realizations with different output modalities (e.g. Kinetic Typography) to test emotion expression alternatives. We shall adapt the prototype to the applied scenario.

For *Evaluation of Persuasive systems*, the work will keep on in collaboration with University of Haifa. After the running of the pivotal experiment and the analysis of the results we will decide how to run/modify a larger evaluation experiment. The product of this work will be a working framework for evaluation studies of automated persuasion systems.

For *Ethics and social influence* joint activity with ISTC Roma to develop a broader and deeper model of ethically aware persuasive agents

**ISTC-Roma**:

For *Persuasion models*, in collaboration with Univ. of Bari, we plan to enrich our model of persuasion strategies by (a) further examining the differences between emotional and non-emotional strategies, and their possible interaction and integration; and (b) refining our language for formalizing persuasion strategies: while extending the classical BDI approach to also include emotions, we aim to account for possible inconsistencies between subjects' sets of beliefs and their emotional states, and to analyze the persuader's exploitation of such inconsistencies.

**Uni-Bari**:

For *Persuasion models* we plan to: (a) check whether and how the formalism we defined for representing 'classical' argumentation schemes (à la Walton and Reed) may be revised to represent a-rational persuasion strategies and (b) verify how persuasion knowledge represented with this formalism may be employed not only to select an 'appropriate' persuasion strategy in a given context, but also to answer 'critical questions' by the receiver.

For *Persuasive systems* we will continue the development of a prototype of PORTIA, the persuasive dialog simulation system. This work will (probably) be done in cooperation with the Queen's University of Belfast.

For *Evaluation of Persuasive systems*, we will contrast the impact of 'rational' vs 'emotional' strategies, by employing our double-agent platform. This work is beingperformed incooperation with ISTC Roma.

For the *exemplar:* we will cooperate to formulating a-rational persuasion strategies for the scenarios proposed by Cantoche and evaluation criteria for that exemplar.

**Queen's University of Belfast:**

In collaboration with the University of Bari, QUB will facilitate experimentation with persuasive models insofar as this can be accommodated within the Queen's Communicator dialogue model.

**University of Paris 8**:

*Gaze and eyes for persuasion***:** In this work, we will consider reactive backchannels through attention and interest, as signalled through the gaze behaviour of a virtual listener, in order to define a speaker that alters its own gaze behaviours during discourse for the purposes of persuasion. This work has its emphasis on persuasion and is part of a larger body of work, bridging WP6 and WP8, on modelling backchannels and engagement. For this work, we concentrate on one aspect of the model based on signal analysis – semantic and cognitive aspects are left for future work

In our future work we aim to implement an interpretation module, based primarily on the perceptual input of the listener's gaze, but also including a highly simplified language planning scheme. The planner will make use of hard-coded tags in the input APML providing semantic information related to that utterance (e.g the importance the speaker attaches to each utterance). It will make a selection for the speaker at each stage in the dialogue between multiple choices. The choice will be based on its interpretation of the perceived behaviour of the listener during the previous utterance and how this compares with the importance of the utterance.

For the former, the listeners behaviour will be augmented with backchannelling. In relation with WP6, we aim to extend our system to produce a more realistic listener backchannel, triggered not only by speaker's gestural behaviour, but also by the semantic of the speaker's discourse. A detailed description of the model can be found in Del 6d.

In terms of the latter, a curve representing the importance of conversation through time will be coded into APML as tags corresponding to speech segments, in order to allow the speaker to obtain a better idea of the effectiveness of conversation, and a theory of the interaction goal of the listener (e.g. maintain or finish conversation).

**University of Haifa**:

One of the goals of WP8 is to develop automated persuasion models. The effectiveness of these models needs to be evaluated. Our approach in evaluating these models is to apply research methodologies developed in studies of persuasion in social psychology. Based on this approach, a preliminary study evaluating the persuasive effectiveness of an automated persuasion system in HCI is underway. In this study participants are exposed to a persuasion message emitted by the *Promoter* Prototype, developed at Irst. The goal of the persuasion message is to persuade participants to visit the Hect Museum at the University of Haifa. The *Promoter* uses a simple Content Ordering Meta-Strategies (COMS) in which a message is composed of positive pieces of information describing attractive elements of the museum. In three conditions of the experiment, different participant are exposed to the same message accompanied by a different emotional expression. The main assumption to be tested is that an emotional expression that fits the valance of the message is more persuasive than the same

message accompanied by a neutral expression or a non fitting valanced expression. This assumption is based on the fitting principle that suggests that messages emitted in two separate communication channels (e.g., verbal and non-verbal) are perceived as more reliable when their valance is in fit. Given that one goal of the *Promoter* is to create personal persuasive messages, namely, messages specifically tailored to fit certain characteristics of the persuadee, a pre- message transmission personality questionnaire will be used. The transmitted message will be preceded by a note indicating that the message was tailored according to the characteristics of the participants. Effectiveness (i.e., persuasion) is assessed on multiple levels including cognitive (e.g., memory) emotional (attitude) and behaviour (i.e., actual visit to the museum). Overall, this approach of evaluation captures important aspects of HCI assessed at multiple potential levels of influence. The plan is to use the preliminary study as a jumpstart for further development and assessment of this approach in different system of persuasion as well as further use of the Promoter employing other principles of persuasion.

**University of Augsburg**:

*Integrated Model of emotion and politeness*: Brown and Levinson's (1987) work on politeness lacks situational factors like the emotion of the addressee which might influence the selection of a strategy. Starting from an operationalization of Brown and Levinson's mechanism of selecting appropriate politeness strategies which relies on the weight of the face threat, we have developed a prototype which integrates a dimensional model of emotions into the selection mechanism. As Johnson et al (2004) have pointed out, selecting a strategy might be driven by knowledge about the task or the interaction context. In a tutoring scenario e.g., the tutor could opt for primarily considering negative face aspects, i.e., the student's desire to decide autonomously on his actions. In this case the purely weight driven selection mechanism has to be supplemented by a knowledge driven one. Thus, the prototype will be augmented by a flexible mechanism that takes contextual or task knowledge into account if applicable and will otherwise fall back to the weight driven selection.

To evaluate the politeness model different measurements will be tested.

Apart from the questionnaire developed by Haifa, we will opt for behavioural measures like reaction time of the user as well as for physiological measurements to capture more subconscious reactions to a polite system.

**Heriot-Watt University**:

Parallel with the aim of the campaign scenario, we would like to contribute by proposing a design for a mobile persuasive storytelling guide attracting people to visit a new or renewed cultural site. The guide would be a virtual guide in a virtual heritage on the web that can be accessed anywhere around the world. It can also be broadcast through large screen in front or along the corridor of the site, appearing when visitors approach or leave the screen, on television for advertising purposes or on PDA.

Here, we are proposing a communication of the heritage through the use of a familiar figure. The guide agent will possess a personality that reflects its role in a particular ancient myth or historical event. The guide will be telling its own life story, at the same time relating them to the real artefacts or the site of interest with the main aim of encouraging the visitors to visit the site and see for themselves the real situation and artefacts presented in the story.

Story represents a fundamental structuring of human experience, both individual and collective (Young, 2001). Autobiographical memory (Bruner, 1987) – the internalisation of our own past experience - can be partly thought of as stories about the self, while myth and

legend - both story-forms - predated science and history as explanations for the state of the natural world.  Furthermore, all deep learning takes the form of a story.

Therefore, storytelling is a form of persuasion where the guide draws the visitor into the world of story leading to affective engagement.   It attempts to persuade the visitor to look at a particular subject or event from its own point of view, challenging or changing his/her existing beliefs and structuring his/her mental picture of the natural world.  It does so by invoking empathy in the visitor, that is, by putting the visitor in its own shoes.  Different guides can provide the visitor with different perspectives about the same subject leading to deeper understanding of a subject that contribute to a greater appreciation of the cultural site. The guide will have a set of emotional memories about its past from which the stories are retrieved and generated.

The design of the guide will be based on the Emergent Affective and Personality model designed for the creation of a Guide with Attitude.  For further details about this model, please refer to (Lim *et al.*, 2005)  Collaboration with University of Paris 8 and University of Twente might also be possible, where the use of gaze and eyes for persuasion may be applied.

**Cantoche**:

For *evaluation of persuasive systems* we suggest evaluating a system based on an existing application using an ECA to persuade people to vote on line. With the help of other participants of the WP8, we would like to test different kind of scenarios (using or expressing several emotions) to promote elections. After persuading the user to vote on line, the user has the possibility to choose a scenario and to send this scenario to a friend to invite him to go to vote.

## 3.2  Element 2: creativity for persuasive communication

### 3.2.1  Main participants

**ITC-Irst**: Oliviero Stock, Carlo Strapparava, Alessandro Valitutti

**University of Augsburg**: Elisabeth André, Matthias Rehm

**Queen's University of Belfast**: Christina Anagnostopoulou

**ISTC Roma**: Cristiano Castelfranchi, Emanuela Magno Caldognetto, Isabella Poggi, Federica Cavicchio (to be included)

### 3.2.2  Main steps planned towards producing element 2

All the following subtask are meant to be carried out in parallel, by the various partners of the WP8.

| Subtask | Carried out by | Start / end dates |
|---|---|---|
| **Creative verbal humour environment** | ITC-Irst; University of Twente, ISTC Roma: | 19-48 |
| **False emotions in true lies** | University of Augsburg | 19-48 |
| **Music for communication and persuasion** | Queen's University of Belfast | 19-48 |

**Itc-Irst**:

Integration of kinetic typography with affective lexicon, taking into consideration mechanism of semantic similarity.

Development of more refined resources for computational humor.

Integration of the evaluative language production, into a creative language environment through the semantic similarity functionality.

Development of resources and their integration for a creative humor environment: annotated idiomatic expressions, clichè and common sense expressions.

Development of strategies for humorous alteration and stereotype disrupting of generic expressions, based on lexical, semantic and commonsensical reasoning.

The system will have computational humour capabilities and will have the purpose to be an environment for the creative production of catchy advertisement expressions and funny headlines.

**ISTC-Roma:**

The persuasive use of irony, humour, and ridicule will be studied in different contexts, among which political, judicial, and educational settings. Differential definitions of these devices will be provided and their multimodal cues will be singled out also in view of their simulation in persuasive agents.

**University of Augsburg**:

Emotions are the number one topic people lie about (DePaulo, 1996). But according to Ekman (1992) we are not able to conceal a felt emotion completely. E.g., masking disgust by a smile may result in a mixed facial expression. We will develop strategies to decide on (i) when to convey the felt emotion (ii) when to convey a false emotion, and (iii) when to let the original emotion leak through to allow the the user to interpret the agent's behaviour appropriately. Integration and test of methods will take place in the Gamble system.

**Queen's University of Belfast**:

Music and emotion has always been an area of interest in aesthetic and philosophical studies of music. As a research area of music psychology there has been relatively very little research to date (Juslin and Sloboda, 2001). This study will look at the perceived emotional content in pop songs and how this is related to the songs' musical content. Musical content can be described in terms of musical properties, attributes and patterns that are encountered and repeated within a piece of music. The study will be carried out in three stages:

The first stage will contain experiments using the FeelTrace device (Cowie et al., 2000; McMahon and Cowie) to record the perceived emotional content on a two-dimensional representation, activation and evaluation. The songs used will be selected from the pop music database developed by the Music Technology Group, Pompeu-Fabra University, as part of the SIMAC European project (semanticaudio.org). A small set of songs will be initially chosen, and experiments will be run, testing two categories of subjects, musicians and non-musicians, at Queen's University Belfast, University of Athens, and Pompeu-Fabra University.

On the second stage, the emotional content described by the subjects will be correlated with descriptions of the songs' musical content. We have tools that can extract musical information on two levels: The audio level (Gomez and Herrera, 2004; Streich and Herrera, 2005) and the symbolic level, which uses the MIDI format as a starting point (Conklin and Anagnostopoulou, 2001). We will look at musical attributes such as timbre, tonality, danceability and register, as well as higher-level descriptors such as melodic and rhythmic intervals and contours, and repeated musical patterns.

On a third level, it is envisaged that a computational system will be built to reflect the results, check the validity of the model, and make predictions for the emotional content of new songs.

Applications of the above study could be useful for a number of purposes, including music communication and persuasion. For example, depending on the emotional character of a particular message, a computational system can recommend the appropriate type of music to accompany the message.

## 3.3 Element 3: Emotion and Natural language processing

### 3.3.1 Main participants

**ITC-Irst**: Oliviero Stock, Marco Guerini, Carlo Strapparava and Alessandro Valitutti

**Univ. of Bari**: Fiorella de Rosis, Irene Mazzotta, Giuseppe Clarizio, Enzo Silvestri

**University of Augsburg**: Elisabeth André, Matthias Rehm

**Heriott-Watt University**: Ruth Aylett, MeiYii Lim, Shachindra Nack

**Queen's University of Belfast**: Ian O'Neill

**ISTC-Roma:** Emanuela Magno Caldognetto, Isabella Poggi, Federica Cavicchio (to be included)

**University of Twente**

## 3.3.2 Main steps planned towards producing element 3

All the following subtask are meant to be carried out in parallel, by the various partners of the WP8.

| Subtask | Carried out by | Start / end dates |
|---|---|---|
| **Computational emotive language resources** | ITC-Irst | 19/36 |
| **Natural language generation and narration techniques** | ITC-irst, University of Bari, Heriott-Watt University | 19/48 |
| **Emotive textual expression processing** | ITC-irst | 19/42 |
| **Emotive dialogue management** | Univ. of Bari, Queen's University of Belfast | 19/36 |

**ITC-irst:**

Further development of an affective lexical knowledge base

Development of a semantic similarity mechanism, tuned and acquired automatically from unlabeled large corpus, for measuring and producing evaluative (affective) Noun Phrases, related to a general input concept (e.g. given "university" -> "encouraging teaching")

**Uni-Bari:**

*Natural language generation and narration techniques*:  we will complete our research on recognizing 'interpersonal stance' between an ECA and its user from a combination of parsing and integration of results of this analysis with knowledge about the context.  We will begin to study how the agent may  reciprocate manifestation of 'warm' attitude by the user in its move's style.

*Emotive dialogue management*:  we will continue our work on how the *information state* approach to dialogue simulation suits to management of affective persuasion dialogues.

**Queen's University of Belfast:**

On-going adaptation of the Queen's Communicator dialogue system to explore ways in which affective states can be generated with, and adjusted to complement, dialogue acts – some of which may be persuasive or dissuasive in nature.

**University of Augsburg**:

Development of machine learning techniques for automatic generation of emotional text based on large corpora. The learning process will inform a statistical model of language generation.

**ISTC-Roma:**

Analysis of emotional and evaluative words, nonverbal and graphical expressions (interjections, emoticons, exclamation mark, and other punctuation devices) in speech, e-mail, e-learning, forum, and chat.

## 3.4  Steps to ensure co-ordination

- Scenario based programming of the activity and promotion campaign

- Exchanges and joint subsubtasks

- Uni-Bari  with QUB for all items mentioned

- Meetings of subgroups on specific tasks:

- Uni-Bari  with ISTC for all items mentioned

- University of Haifa and ITC-Irst for analysis and conclusion of preliminary results of evaluation studies under way and further development and assessment of evaluation paradigm.

- Series of conference calls

- Workshop on Emotion and Language at month 35.

## 3.5  Steps to ensure dissemination

Publications of results, specifically promotion of the HUMAINE concepts in various different communities. Participation in relevant program committees of conferences. Interviews with the press and popularization.

# 4 Research achievements to date

## 4.1 Achievement 1

### 4.1.1 Participants

**ITC-Irst**: Oliviero Stock, Marco Guerini, Massimo Zancanaro

**ISTC-Roma**: Cristiano Castelfranchi, Maria Miceli, Isabella Poggi, Giorgio Merola, Francesca Giardini

**Univ. of Bari**: Fiorella de Rosis, Irene Mazzotta, Giuseppe Clarizio, Enzo Silvestri

**University of Augsburg**: Elisabeth André, Matthias Rehm

**Heriot-Watt University**: Ruth Aylett, MeiYii Lim, Shachindra Nack

**University of Paris 8**: Elisabetta Bevacqua, Christopher Peters, Catherine Pelachaud

**Queen's University of Belfast**: Ian O'Neill

**University of Haifa**: Shlomo Hareli, Shay Tzafrir, Aaron Ben-Ze'ev

**OEFAI:**

### 4.1.2 Publications

- Guerini M., Stock O. & Zancanaro, M. 'Persuasive Strategies and Rhetorical Relation Selection' *Proc. of the ECAI 2004 Workshop on Natural Argumentation*, Valencia, 2004.

- Guerini M., Stock O. & Zancanaro, M. 'Computational Modelling of Persuasive Communication' *Book of Abstracts of the 9th International Pragmatics Conference, International Pragmatics Association*, Riva del Garda, 2005.

- Guerini M. & Stock O 'Toward ethical persuasive agents' in *Proceedings of the IJCAI Workshop on Computational Models of Natural Argument*, Edimburh, July 2005.

- Stock O., Guerini M. & Zancanaro, M. 'Interface Design and Persuasive Intelligent User Interfaces'. In S. Bagnara and G. Crampton Smith (eds.) *The Foundations of Interaction Design*, Lawrence Erlbaum Publishing Co., Hillsdale, in press.

- M. Miceli, F. de Rosis and I. Poggi: 'Emotional and non emotional persuasion' in press on Applied Artificial Intelligence: an International Journal".

- V. Carofiglio, F.de Rosis, and N. Novielli: Dynamic User Modeling In Health Promotion Dialogs. In J.Tao, T.Tan and R.W.Picard (Eds): Affective Computing and Intelligent Interfaces. Springer LNCS 3784, 723-730,2005.

- Cavalluzzi, F.de Rosis, I. Mazzotta and N. Novielli: 'Modeling the user attitude towards an ECA'. *UM'05 Workshop on Adapting the interaction style to affective factors*. Edinburgh, July 2005.

- V.Carofiglio: 'Modelling argumentation with belief networks'. *Workshop on "Computational Models of Natural Arguments" (CMNA'04).* Valencia, August 2004

- F. de Rosis: 'Persuadere emotivamente: conviene?' In press in a Book on *Emotional Communication*: I. Poggi (Ed).

- Cavalluzzi, G.Clarizio, B. De Carolis and F. de Rosis: 'A Persona is not a Person: Designing dialogues with ECAs after Wizard of Oz studies'. *HUMAINE Workshop on "Emotion and Interaction"*. Paris, March 2005.

- A.Cavalluzzi, V.Carofiglio and F.de Rosis: Affective Advice Giving dialogues. In E. Andre, L. Dybkjaer, W. Minker and P. Heisterkamp: "Affective Dialogue Systems". Springer LNAI3068, 2004, 77-88

- F. de Rosis, N. Novielli, V. Carofiglio, A. Cavalluzzi and B. De Carolis. User modeling and adaptation in health promotion dialogues with an animated character. In press in 'International Journal of Biomedical Systems".

- Poggi, I. (2005). 'The goals of persuasion'. Pragmatics and Cognition, 13(2), 297-336.

- Poggi, I. (in press). 'Induction of emotion'. Proceedings of ISGS Conference (Lyon, France, June 2005).

- Elisabeth Andre, Matthias Rehm, Wolfgang Minker and Dirk Bühler, "Endowing Spoken Language Dialogue System with Emotional Intelligence", *Affective Dialogue Systems*. Elisabeth Andre, Laila Dybkjaer, Wolfgang Minker and Paul Heisterkamp(ed.), 178-187, Springer, 2004

- Matthias Rehm and Elisabeth Andre. 'Informing the Design of Embodied Conversational Agents by Analyzing Multimodal Politeness Behaviors in Human-Human Communication'. In: *AISB Symposium for Conversational Informatics*, 2005.

- Lewis Johnson, Richard Mayer, Elisabeth Andre, and Matthias Rehm. 'Cross-Cultural Evaluation of Politeness in Tactics for Pedagogical Agents'. *Proceedings of the 12th Int. Conf. on Artificial Intelligence in Education (AIED)*, 2005.

- Mei Yii Lim, Ruth Aylett & Christian Martyn Jones, *Affective Guide with Attitude,* 1st International Conference on Affective Computing and Intelligent Interaction, Beijing, October 22-24, 2005

- Mei Yii Lim, Ruth Aylett & Christian Martyn Jones, *Emergent Affective and Personality Model,* The 5th International Working Conference on Intelligent Virtual Agents (IVA'05), LNAI 3661, Kos, Greece, September 12-14, 2005, ISSN 0302-9743

- Mei Yii Lim, Ruth Aylett & Christian Martyn Jones, *Emotive Tour Guide System*, Doctoral Consortium, The 19th British HCI Group Annual Conference, Edinburgh, UK, September 5-9, 2005, ISBN 1-902505-69-7

- Mei Yii Lim, Ruth Aylett & Christian Martyn Jones, *Empathic Interaction with a Virtual Guide*, Proceedings of the Joint Symposium on Virtual Social Agents, pp. 122-129, AISB 2005 Convention, April 12-15, 2005, ISBN 1-902956-49-2

- Mei Yii Lim, Ruth Aylett & Christian Martyn Jones, *Empathic Virtual Tour Guide*, Seventh Annual Parliamentary Reception for Younger Researchers in Science, Engineering, Medicine and Technology, House of Common, London, March 14, 2005

- C. Peters, *Direction of Attention Perception for Conversation Initiation in Virtual Environments*, IVA'05 International Working Conference on Intelligent Virtual Agents, September 2005, Greece.

- C. Peters, *Towards Direction of Attention Detection for Conversation Initiation in Social Agents*, Proceedings of the AISB '05 Symposium on Virtual Social Agents: Social Presence Cues for Virtual Humanoids, Hatfield, England, April 2005.

- C. Peters, C. Pelachaud, M. Mancini, E. Bevacqua, I. Poggi, *A model of attention and interest using gaze behavior*, IVA'05 International Working Conference on Intelligent Virtual Agents, September 2005, Greece.

- C. Peters, C. Pelachaud, E. Bevacqua, M. Mancini, *Engagement Capabilities for ECAs}*, workshop "Creating bonds with ECAs", workshop at Fourth International Joint Conf. on Autonomous Agents & Multi-Agent Systems, AAMAS'05, Utretch, July 2005.

### 4.1.3  Other output (demonstrations, resources, etc)

1) Theories about persuasion and related concepts. E.g.:

   a. Persuasion and emotions **[ISTC-Roma, ITC-Irst]**

   b. Persuasion and argumentation  **[University of Bari]**

   c. Persuasion and Irony, Humour, Ridicule, **[ISTC-Roma]**

   d. Development and assessment of evaluation paradigm for automated persuasion

   systems **[Haifa University, ITC-Irst]**

2) An initial prototype experimenting persuasion. in a monological setting (multimodal Computer Human Communication: the Promoter prototype. **[ITC-Irst]**

3) Persuasion in dialogical settings: The development of a dialog simulator for the selection of the appropriate persuasion strategy and for the reaction to critical questions. **[University of Bari]**

4) A systematic corpus on examples of daily life interactions has been collected to root the range of envisaged strategies (of the previous point) on concrete data. **[University of Bari]**

5) Storytelling: component design of the Affective Guide System, a context-aware system, including an 'intelligent emotional guide with attitude', to offer the user with a multi-modal interaction interface. **[HWU]**

6) Models of gaze of listener for persuasive success: a model based on signal analysis **[University of Paris 8, University of Twente, ISTC-Roma]**

7) The SEMMEL corpus (Strategy Extraction for MultiModal Eca controL): a collection of non-verbal polite interactions for a model of Emotion-based selection of politeness strategies. **[UA]**

8) Implementation of a mechanism for generating verbal and non-verbal polite behaviour by taking a neutral utterance and transfers it into a polite form **[UA]**

9) Evaluation experiments (currently carried out) on emotional communication in persuasion. **[University of Haifa**, **ITC-Irst]**

10) Preliminary concepts about ethical aware persuasive systems and about emotion-related social influence **[ITC-Irst, ISTC Roma]**

11) Demonstration of live transaction-based, mixed-initiative dialogue system integrated with emotion-enabled avatar. **[University of Bari, QUB]**

## 4.1.4 Follow-up in progress

a) components for prototypes;

b) evaluation of persuasive approaches; development and assessment of evaluation paradigm

c) contributions to volume by all major involved groups

Submitted publications:

- Stock O., Guerini M. & Zancanaro, M. "A Taxonomy of Strategies for Multimodal Persuasive Message Generation"

- Poggi, I. 'Rhetorical figures in gestures'. *Proceedings of IPRA 9th International Pragmatics Conference* (Riva del Garda, July 10-15, 2005).

## 4.2 Achievement 2

### 4.2.1 Participants

**ITC-Irst**: Oliviero Stock, Carlo Strapparava, Alessandro Valitutti

**University of Augsburg**: Elisabeth André, Matthias Rehm

**Queen's University of Belfast**: Christina Anagnostopoulou

**ISTC-Roma**: Cristiano Castelfranchi, Emanuela Magno Caldognetto, Isabella Poggi

## 4.2.2 Publications

- O. Stock & C. Strapparava 'Resources for "Computational On-line Meditative Intelligence for Computers"' *Proceedings LREC Workshop on Language Resources for Linguistic Creativity*, Lisbon, 2004.

- Valitutti, C. Strapparava & O. Stock 'Developing Affective Lexical Resources' *Psychology,* (ISSN 1720-7525) Vol. 2, n.1, pp 61-83, 2004

- O. Stock and C. Strapparava 'The Act of Creating Humorous Acronyms' *Applied Artificial Intelligence, An International Journal* Vol. 19, n.2, pp. 137-152, 2005

- A.Valitutti C.Strapparava & O. Stock 'Lexical Resources and Semantic Similarity for Affective Evaluative Expressions Generation' in J. Tao, T. Tan, R. Picard (eds) *Affective Computing and Intelligent Interaction Proceedings of ACII-2005 - First International Conference on Affective Computing and Intelligent Interaction*, Beijing, LNCS 3784, Springer, 2005

- O. Stock, C. Strapparava 'Automatic Creation of Humorous Acronyms' in *Proc. of INTETAIN 05*, Springer LNAI 3814, demo papers section, Madonna di Campiglio, 2005

- R. Mihalcea and C. Strapparava, Computational Laughing: Automatic Recognition of Humorous One-liners, in *Proceedings of the Cognitive Science Conference (CogSci)*, Stresa, Italy, July 2005.

- Matthias Rehm and Elisabeth Andre. Catch Me If You Can -- Exploring Lying Agents in Social Settings. In: Proc. of the Int. Conf. on Autonomous Agents and Multiagent Systems, pages 937-944, 2005.

- Matthias Rehm and Michael Wissner. Gamble - A Multiuser Game with an Embodied Conversational Agent. In: Entertainment Computing - ICEC 2005: 4th International Conference, pages 180--191, Springer, 2005.

- Matthias Rehm and Elisabeth Andre. From chatterbots to natural interaction - Face to face communication with Embodied Conversational Agents. IEICE Transactions on Information and Systems, Special Issue on Life-Like Agents and Communication, 2005.

- Cavicchio, F., Magno Caldognetto, E., & Poggi, I. (in press). 'Functions and cues of irony, humour, and ridicule in a political trial'. *Proceedings of IPRA 9th International Pragmatics Conference* (Riva del Garda, July 10-15, 2005).

- Castelfranchi, C., & Poggi, I. (in press). 'Prosocial deception and the lies of doctors, nurses, and patients'. *Proceedings of IPRA 9th International Pragmatics Conference* (Riva del Garda, July 10-15, 2005).

### 4.2.3 Other output (demonstrations, resources, etc)

1) Steps toward verbal Humour environment

   Module:Evaluative Terms Production.We produced a first module that, given a term in input and a valence indication, produces a list of terms, related to the input according to some particular emotion. **[ITC-Irst]**

   Resource: Annotation of idiomatic expressions with senses (in term of WordNet synsets) to be used in for humorous production. The resource was annotated, taking into account the possible double meanings and/or sense shifting **[ITC-Irst]**

2) AAMAS Demo: AAMAS-Convivio Award for Best interacting system Matthias Rehm, Elisabeth Andre, and Michael Wissner. Gamble v2.0 - Social interactions with multiple users. In: Proc. of the Int. Conf. on Autonomous Agents and Multiagent Systems (AAMAS), 2005. **[UA]**

### 4.2.4 Follow-up in progress

a) components for prototypes;

b) evaluation of persuasive approaches;

c) contributions to volume by all major involved groups

Submitted publications:

# 5    Conclusion

## 5.1  Obstacles encountered or foreseen

HUMAINE lacks expertise on Theory of  Psychology of Mass Communication. It could have come useful for this work package.

## 5.2  Relation to the state of the art

## 5.3  Evidence of esteem

INTETAIN-2005 International Conference on Intelligent technologies for Interactive Entertainment, Madonna di Campiglio, November 2005. Oliviero Stock Program co-chair with Mark Maybury and Wolfgang Wahlster.

I. Poggi: Fellow of the *Embodied Communication ZIF Project*, 2005-2006. Participation in the Opening Conference (October 2005), with a communication on 'Body harmony: Motion, cognition, and emotion in the pianist's body'

Invited Talk at NII (National Institute of Informatics) in Tokyo

IEICE Special issue on Agents and Dialogue, invited paper (see Section 4.2.2)

Co-chair International Conference on Intelligent Virtual Agents Ruth Aylett

Invited speaker for Humaine, International Conference on Affective Computing and Intelligent Interfaces 2005  Ruth Aylett

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- Paul Ekman. Telling Lies --- Clues to Deceit in the Marketplace, Politics, and Marriage. Norton and Co. Ltd., 1992.

- W. Lewis Johnson, Paola Rizzo, Wauter Bosma, Sander Kole, Mattijs Ghijsen and Hermin van Welbergen. Generating Socially Appropriate Tutorial Dialog. Affective Dialogue Systems , Elisabeth Andr, Laila Dybkjaer, Wolfgang Minker and Paul Heisterkamp, 254--264, Springer, 2004.

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- Gomez, E. and Herrera, P. Automatic extraction of tonal metadata from polyphonic audio recordings. *Proceedings of the 25th International AES Conference*, June 2004, London, UK.

- Juslin, P.and Sloboda, R. (eds) *Emotion and meaning in music*. OUP, 2001.

- McMahon, E. and Cowie, R. *Describing the feelings that music communicates: A dimensional  approach.* Technical Report, Queen's University Belfast.

- Streich, S. and Herrera, P. Detrended Fluctuation Analysis of Music Signals: Danceability Estimation and further  semantic characterisation. Proceedings of the 118th AES Convention, Barcelona, 2005.

- SIMAC European Commission funded project www.semanticaudio.org