

humaine

D8g

Pre-completion report on exemplar

Oliviero Stock and WP8 members



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Task leader	FBK-Irst
Author(s)	Oliviero Stock and WP8 members
EC Project Officer	Philippe Gelin

Address of lead author: Oliviero Stock
 FBK-Irst
 38050 Povo, Trento, Italy

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Introduction

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 and to test limited realizations that can be demonstrated as proofs of concepts for a novel class of systems.

WP8 exemplar role is to demonstrate the practical potential of the area, and to define an overall scenario for anchoring activities to a concrete challenge, and to define methodologies for evaluation.

To this end we proposed the design a promotion campaign framework, for any concept of social value, to be realised through a number of different technologies which has been the object of research within HUMAINE.

The idea was to start from the classical design of a promotional campaign and to see how the different technologies we are developing can impact on its design and application.

This document reports briefly about research activities conducted after the release of report D8f .

Definition of the exemplar

Promotion campaign

A **promotional campaign** is the coordinated series of promotional efforts built around a single theme and designed to achieve a specific objective. The combination of these efforts can involve various activities used by the marketer over a period of time to achieve predetermined goals.

Still, even if we refer to the general framework of a promotion campaign, we focused on the specific promotion campaigns that aim at fostering concepts of social value (sometimes called **no-profit campaigns**). Even if the meant concept of social value can be seen as a “product” to be advertised, the methodologies and the focus of these campaigns are slightly different.

The promotion campaign scenario has been described in detail in the deliverable D8f with contributions of the various partners describing how their technological approach contributes to the scenario.

State of the Art in Electronic advertisement

As stated, our aim is to use new technologies to create promotion campaigns. Nowadays, the state of the art in this area is represented by electronic advertisement (not to be confused with electronic commerce). Electronic Commerce refers to transactions which are conducted over an electronic network where the buyer and merchant are not at the same physical location, while electronic advertisement refers to advertising messages delivered over an electronic network with the aim of inducing a purchase that is not necessarily electronic.

There's an enormous increase in the turnover of electronic and internet advertisement. Main instruments are:

1. **Email marketing** by means of Advertising email, Newsletter, Digital Coupon,
2. **Search Engine Marketing**, that refers to the two activities, done by means of search engines..
3. **Promotion Marketing** by means of Banner Advertising, Rich Media, Partnership
4. **Recommendation systems** are programs which attempt to predict items (movies, music, books, news, web pages) that a user may be interested in, given some information about the user's profile (explicitly or implicitly collected).

Prototypes and theories

Introduction

In nowadays systems there are still lots of features missing for a concrete technological impact on the creation/automation of promotion campaigns. Therefore we investigated intelligent systems that are also capable of:

- deep reasoning on communicative goals/strategies and on **emotions**.
- working on different (possibly mobile) devices
- using new tools (like ECAs) and combine them
- better addressing the targeted groups.

In our work we were interested in the impact of these technologies on the **cognitive system** of the receiver. That is to say: the goal structure of the campaign can be modelled on the cognitive aspect of the receiver.

1. Use of technologies to /induce emotions like surprise, fear, humor effect etc.
2. Those emotions can help in capturing attention
3. Attention can have an impact on memorization (long term effects)
4. Assessment of the time impact and measures for reinforcing at different moments may be relevant.
5. As a top goal we can have both the modification of behaviours and the induction of an immediate, or “at first occasion”, action.

Using emotion oriented technologies helps not only to decide *what to say* (like in argumentation oriented systems) but also *how* (e.g. the emotional content to be associated to the message) in deciding which communication strategies to use. Moreover they help in having targeted multi-subject campaigns. Some technologies can be used to deliver the message, other to create (or helping creating) it.

New tools (like ECA's) can help in having a richer and more natural communication with the audience, increasing the overall impact of the communication.

New technologies can give a great contribution on the *flexibility* of the communication; i.e. they can help in addressing target groups by means of built-in tools for tailoring the message. They can also help in overcoming the two problems related to target groups in classical advertising:

1. the waste is minimized because we can use “targeted” media instead of mass-media:
2. the fact that we use “targeted” media with personalized systems helps in lowering the cost of reaching small subgroups.

WP8 Elements

The role of the exemplar, unified by the common theme of the promotion campaign, was 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 proposed to design a promotion campaign framework, for any concept of social value, to be realised through a number of different technologies which were the object of research within HUMAINE. The idea was that the campaign exploits various means, broadcasting-oriented, individual-oriented, interactive and so on. The campaign has focused on various socially-oriented themes, and components explored a range of specific scenarios.

The development activity incorporated 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 included 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.

Partners' contributions (Element 1)

Persuasion models

[ITC-Irst] We enlarged the number of persuasive strategies covered by our models (e.g. various kind of promises and threats for the promotion campaign scenario), refinement of the model and emotion oriented lexical choice by using techniques of valence shifting).

[ISTC-Roma] Systematization of our work – in collaboration with University of Bari – on persuasion (extensively presented in a draft of a chapter, titled “Emotion in persuasion: A true marriage between cognition and affect” for the WP8 Handbook):

- (a) Discussion of definitory issues, aimed at placing and circumscribing persuasion in the general context of social influence: basic distinctions among mere *compliance induction* (changing others' goals and behaviors regardless of their beliefs), mere *belief induction* (changing others' beliefs independent of their impact on goals), and *persuasion* proper (changing others' beliefs in order to change their goals and behaviors).
- (b) A definition of persuasion, which specifies our notion with regard to such criteria as accidental versus intentional, communicative versus non communicative, coercive versus non coercive, manipulative versus non manipulative, and successful versus failed attempt at persuasion.
- (c) Implications of our definition in terms of the basic principles of any persuasive attempt:
 - *persuader's theory of the other's mind*: our model takes the Persuader's perspective thus focusing on P's theory of the Recipient's mind, and P's planning for influencing R (that is, for changing R's mental state so as to make her intend to do a certain action or plan);
 - *goal 'hooking'*: in order to have R intend some goal *p*, P should “hook” *p* to some other goal *q* that (P believes) R already has of her own;
 - *persuader's goal to show* (either deceitfully or not) *that the end-result of persuasion is in the interest of R*, in order to avoid R's suspicion of being manipulated (which would in turn hamper P's persuasive attempt).
- (d) Persuasion strategies, with special reference to the distinction between emotional and non emotional ones. Once outlined the basic relationships existing between emotions and goals, which are at the foundation of emotional persuasion, two general kinds of emotional strategies are presented, *persuasion through appeal to expected emotions* and *persuasion through arousal of emotions*, and the typical features of each kind are discussed, including both the advantages and the drawbacks of appealing to emotions.
- (e) Focus on *persuasion through arousal of emotions*, and analysis of the Persuader's reasoning and planning implied by this strategy, with special reference to the arousal of two “germane” emotions, both associated with sense of inferiority: envy and emulation.

- (f) Comparison of our model with the dual-process theories of persuasion – the elaboration likelihood model by Petty and Cacioppo (1981, 1986) and the heuristic-systematic model by Chaiken (1980, 1987) – and concluding remarks on the specificity of our approach, as well as on possible directions of research on persuasion.

[DI-BARI] (a) check how the formalism for representing ‘classical’ argumentation schemes can be revised to represent a-rational persuasion strategies and (b) verify how persuasion knowledge may be employed to answer ‘critical questions’ by the receiver.

Integrated model of emotion and politeness

[UA] The prototype was augmented by a flexible mechanism that takes contextual or task knowledge into account for selecting politeness strategies.

Use of different behavioural measures like reaction time of the user as well as for physiological measurements to capture more subconscious reactions to a polite system.

A mobile persuasive storytelling guide

[HWU] Design for a mobile persuasive storytelling guide attracting people to visit a new or renewed cultural site

Gaze and eyes for persuasion

[UP8, UT] Implementation of an interpretation module, based primarily on the perceptual input of the listener’s gaze, but also including a highly simplified language planning scheme.

The listeners behaviour has been augmented with backchannelling. In relation with WP6, the system has been extended to produce a more realistic listener backchannel, triggered by the semantic of the speaker’s discourse.

[ISTC-Roma] Starting from a model that highlights the differences among the persuasive strategies of *logos*, *ethos* and *pathos*, through an analysis of gestures in some fragments of political discourse it was found that their persuasive import is often due not to the very meaning of the gesture per se, but to its expressivity parameters: speed, amplitude, jerkiness of a gesture themselves bear some meaning, thus telling that the Sender is feeling some emotion, saying something important, or that he is serene or enthusiastic, relaxed, hectic, or strong. The findings of the observational work can be exploited in creating persuasive Embodied Agents. This work was carried on in collaboration with Catherine Pelachaud

A curve representing the importance of conversation through time has been coded into APMML 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).

Persuasive systems

[ITC-Irst] We continued the development of the Promoter prototype by implementing and experimenting a tool for valence shifting of the output text according to its APMML emotional tagging.

[DI-BARI] We continued the development of the PORTIA prototype, the persuasive dialog simulation system. We are working with an ECA which applies natural argumentation techniques to persuade users to improve their healthy eating behaviour. The ECA plays the role of the Persuader (P), the user the role of the Receiver (R) of the argumentation message. Observing of the user's attitude during the dialogue is crucial to select an appropriate persuasion strategy. With 'observing the user', we mean two kinds of tasks:

- (a) to prudently wait to get knowledge about the user's attitudes (values, interests, goals etc) before planning the persuasion strategy to adopt, so as to select the presumably strongest arguments in the given circumstance
- (b) to observe the user's reaction to the received suggestion, so as to understand whether and how to correct inappropriate choices and integrate the information provided with other data that might increase the user's level of persuasion.

Among the various aspects that are considered in designing an ECA, we are interested in verbal rather than nonverbal communication forms.

In 2007 we worked, in particular, at the implementation of PORTIA, a speech-based mixed-initiative dialogue system based on the Information-State architecture. The system includes a user model to represent the presumed characteristics of R that are acquired and updated during the dialogue both explicitly (that is, through direct questions) and implicitly (that is, through the interpretation of user moves). The User Model includes a specific knowledge (facts acquired during the dialogue) and a generic knowledge (criteria to infer the user's attitudes in conditions of uncertainty). These components are restricted to the aspects that are relevant for the persuasion process: behaviour and beliefs in the domain of the dialogue, goal and values of R, 'social' attitude of R towards the ECA. Both a system's 'persuasion attempt' and its subsequent replies to the user's reaction are based on a sequencing of 'reasoning' and 'planning': P first reasons on R's mind to select a promising persuasion strategy or an appropriate response to the user's reaction and then translates the selected strategy into a rhetorically coherent NL message.

(a) Generating a persuasion attempt. In the reasoning process, PORTIA simulates the presumed effect of different persuasion strategies on its image of R's mind: appeal to the consequences based on the presumed goal and values of R, appeal to cognitive dissonance to encourage R to a more consistent behaviour and others. Dynamic Bayesian Networks (implemented by Hugin's OOBN) are used to represent uncertainty and progressiveness in building and updating the image of R's mind. After reasoning on R's mind to select the attitudes on which to ground persuasion, an argument is constructed to express the selected strategy.

(b) Observing the user's reaction. In adapting its answer, the ECA should be equipped to recognize, two main aspects of the users' reaction: their social attitude towards the ECA and their reaction to its suggestion.

(b1) Social attitude displayed by the user. We referred to Andersen and Guerrero's definition of interpersonal warmth. According to their definition, users display their social attitude towards the agent through various 'signs' in the language employed, that is by introducing colloquial style, friendly greetings, farewells or humour as 'offers of sympathy', questions about the agent's 'private life' and

self-disclosure to establish a common ground, positive or negative comments as a demonstration of interest in the dialogue.

(b2) User's possible reaction to suggestion. If the dialogue is natural in its developing, users tend to not accept a-critically the system's suggestions. We found, in our WoZ corpus, several examples of perplexity, requests of more information, provision of information about their own situation, or clear objections. We grounded our analysis of the user's reaction to a persuasion attempt on Walton's argumentation schemes and their later interpretations and refinements. Argumentation schemes are common types of defeasible arguments, evaluated by a set of related critical questions. From the viewpoint of the Receiver, CQs are questions that inquire about the conditions or circumstances that tend to challenge premises of a suggestion or the suggestion itself. We started from analysis of the critical questions of these schemes to define a markup language which enables us to define a method to recognize the User's reaction to the System's suggestions.

(c) Markup language. We asked three independent raters (PhD students) to annotate dialog pairs in our Wizard of Oz corpus, after segmenting complex moves into individual communicative acts. Two markup languages were employed to annotate the subjects' moves according to the two kinds of features mentioned above.

(d) Detecting signs of social attitude. To recognize the linguistic signs of social attitude, we applied a Bayesian classifier in which an input text is categorized as 'showing a particular sign of social attitude' if it includes some word sequences belonging to semantic categories which are defined as 'salient' for the considered sign. Bayesian classification enables associating with every string (segment or full move) a value of a-posteriori probability for every sign of social attitude.

We combined language analysis with prosodic one, thanks to a cooperation with the University of Erlangen in the scope of HUMAINE: a good recognition accuracy of the social attitude of users was obtained. In this case, linguistic analysis is aimed at recognizing in a user move the signs that may be employed to adapt the next system move. At the same time, as far as the dialogue goes on, linguistic signs discovered in the dialogue history contribute to build an overall, dynamic image of the social attitude of the user towards the advice-giving ECA. We compacted, the 8x6 combinations of linguistic and acoustic labels into a lower number of categories, defined according to adaptation purposes ('negative', 'neutral' or 'warm' attitude of the user) and processed this dataset with K2 learning algorithm (k-fold cross validation, with k=number of segments with WEKA), by getting a 90.05 % of recall.

(e) Understanding the User's reaction to a System's move

This part of the research project is still ongoing. Data in our corpus are very sparse: therefore, we cannot rely only on classical machine learning techniques to automatically infer communicative acts during the dialogue but we also need to refer to the context (previous system move). Latent Semantic Analysis has been already employed to extract the semantics of students' dialogue turns and might help us in recognizing the communicative act. According to the results of our markup experiment (majority agreement among raters), the complete range of possible users' reactions will be represented in a 'documents by terms' matrix.

Evaluation of Persuasive systems

[ITC-irst; HU] The plan is to use the preliminary study carried out with the Promoter prototype as a jumpstart for further development and assessment of communicative strategies in different system of persuasion as well as further use of the Promoter employing other principles of persuasion.

Ethics and social influence

[ITC-Irst] the collaboration with the ethical committee led to the design of the ethical guidelines for persuasive systems developers. Furthermore some case studies has been collected by furnishing the questionnaire to WP8 partners.

Joint activity with ISTC Roma for a broader and deeper model of ethically aware persuasive agents

Partners' contributions (Element 2)

Creative verbal humour environment

[ITC-irst] We continued the development of the tool for producing novel humorous expressions. From an application point of view we think the world of advertisement has a great potential for the adoption of computational humor.

Our tool is meant to be used as an aiding tool in the creative process of copywriters, suggesting humorous expressions to be selected by the human agent. The result can be used for monodirectional mass communication. It can be used for advertising on the internet and if combined with an ECA or Kinetic Typography it can provide a dynamic element to stress graphically the emotional content of the message.

The tool for humorous expressions is particularly suitable for producing a high rate of potential messages, which can be targeted to specific groups, or novel situations where a rapid intervention can be useful. One specific potential case is the humorous variation on headlines, as a tool for semiautomatic but immediate production of an advertising message as a reaction to an event.

[ISTC Roma] The persuasive use of irony, humour, and ridicule 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. An investigation of irony, of its multimodal cues, and of its use in persuasive contexts. A definition of irony is provided in terms of a goal and belief model, and some aspects of its comprehension are explored. To understand that a Sender is being ironic, the Addressee must first be alerted to some contradiction between different aspects of the message, and then understand its ironic goal. Four cases are distinguished as to whether and how the Sender's communicative act provides an "irony alert":

-- no alert signal; the case in which the Addressee must understand by himself that the Sender is being ironic, since no physical aspect in the signal gives him a cue to the irony of the message;

-- Metacommunication: the use of a specific signal of irony (for example an ironic smile), that directly regards what is being said by meta-communicating: "I am being ironic", or simply: "there is something more to understand from what I say";

-- Paracommunication of irony, through contradiction between signals: the production, either simultaneously or in sequence, of another signal communicating a meaning which is incompatible with that of the communicative act performed;

-- Parody: to utter a sentence that was said or could have been said by another person while imitating his or her possible communicative multimodal behaviour (intonation, gestures, facial expression, posture and so on).

Analyses of cases of irony in everyday, judicial and political contexts carried on through the ANVIL-Score, an annotation tool with a special interest to the semantic aspects of signals, show how such a tool can help capture the contradictions within and between modalities that provide the irony alert, thus ultimately allowing the comprehension of the ironic intent.

The analysis going through all signals and their meanings can both help a deeper understanding of human sophisticated communicative behaviours and lead to a better simulation of them in Embodied Agents.

False emotions in true lies

[UA] Development of strategies for deciding on (a) when to convey the felt emotion (b) when to convey a false emotion, and (c) 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.

Music for communication and persuasion

[QUB] This study looks at the perceived emotional content in pop songs and how this is related to the songs' musical content. The study has been carried out in three stages:

The first stage contains experiments using the FeelTrace device to record the perceived emotional content on a two-dimensional representation, activation and evaluation. On the second stage, the emotional content described by the subjects is correlated with descriptions of the songs' musical content. 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.

Partners' contributions (Element 3)

Computational emotive and persuasive language resources

[ITC-Irst] The aim of our research was to explore statistical acquisition techniques for Persuasive NLG in an unrestricted domain. In order to perform statistical acquisition textual resources are needed. There is a plethora of available resources for classical NLG extraction, Still for our task, specific resources are needed. We collected texts whose aim is clearly persuasive.

(a) A Corpora of tagged Political Speeches (CORPS), as examples of long and articulated texts

- (b) A Corpora of labelled Slogan (SloGun), as examples of short, high impact, sentences
- (c) An additional resource of Ordered Vectors of Valenced Terms (OVVT), for specific tasks involving valence modification of existing texts.

(a) In collecting CORPS we relied on the hypothesis that tags (such as “applause”) are an indicator of hot-spots, where persuasion attempts succeeded (or, at least, a persuasive attempt has been recognized by the audience). By relying on this hypothesis we can perform specific analysis - and extractions – of persuasive linguistic material that is preceding the persuasive hot-spot.

At present, there are ~900 speeches in the corpus. These speeches have been collected from internet, and a semiautomatic conversion of tags - to make them homogeneous in formalism and synonymy - has been performed.

The CORPS has been used for two main purposes: Analysis and NLG. Both the tasks are based on the use of windows of terms preceding tags of different length/width w_n (where w_n is the number of token considered) and a simple word-sense disambiguation, by taking the most frequent sense for every token.

Moreover, specific analysis and generation techniques have been explored with reference to different typologies of persuasive communication. These typologies (we individuate three main groups) have been set down according to the characteristics of the reaction induced in the audience:

- **Positive-Focus:** Generally speaking, this group indicates a persuasive attempt that sets a positive focus in the audience. Tags considered: {APPLAUSE} {SPONTANEOUS-DEMONSTRATION} {CHEERING} {STANDING-OVATION} {SUSTAINED APPLAUSE}, {AUDIENCE INTERVENTION}.
- **Negative-Focus:** Indicates a persuasive attempt that sets a negative focus in the audience. It is important to note that the negative focus is set towards the object of the speech and not on the speaker herself (e.g. “Do we want more taxes?”) Tags considered: {BOOING} {AUDIENCE} No! {/AUDIENCE}.
- **Ironical:** Indicate the use of ironical devices in persuasion. Tags considered: {LAUGHTER} .

Extraction of “persuasive words” and extraction of rhetorical patterns. We extracted persuasive word by using a weighted *tf-idf* score. The *tf-idf* weight (term frequency–inverse document frequency) is a statistical measure used to evaluate how important a word is to a document in a corpus. In our approach we created a “virtual document” by unifying all the terms inside all the windows (of dimension w_n) preceding the tags, and considering the number of documents in the corpus as coincident to the number of speeches plus one (the virtual document). Obviously from the speeches we subtracted those pieces of text that were used to form the virtual documents. Four lists of words were created according to the group of tags they refer to (*positive-focus-words*, *negative-focus-words*, *ironical-words* and a *persuasive-words* list, computed by considering all tags together). Persuasive words were ranked according to the weighted *tf-idf* score and further divided into sub-lists, in line with the POS categories of noun, adverb, verb and adjective.

(b) *SloGun* is a database of slogans coming from different fields, mainly corporate advertisement, but also political, educational etc. At present there are ~1500 entries. Every entry is composed of the slogan itself, the possible product advertised, the company, the reference domain of the slogan, the year in which the slogan appeared, and a “note” field with additional pieces of information (see table 3). The domain field can have multiple entries (e.g. the Nike slogan “Just do it” refers both to sport and fashion).

(c) Further development of an affective lexical knowledge base (WordNet Affect) and merging with other similar resources (SentiWordNet) for the task of valence shifting, by creating OVVTs. The general task is text to text transformation (in this sense different from classical Opinion Mining where, if modification of opinion is performed, it is only for summarization purposes), by means of reasoning on the valence of words. The task is based on a term extraction approach: given a term in the text to be modified, the system accesses the OVVT containing that term and chose the most appropriate according to the shifting of the valence.

Two main approaches in term extraction:

- Relative: if the valence has to be “negativized”, the system chooses a term that is on the left of the entry, given that more negative terms are on the left.
- Absolute: given that the OVVTs can also contain numeric quantities for the valence (extracted by Sent-WordNet), the new term can be chosen accordingly to the numeric valence that we want to give to the text. E.g. if we want to give a valence -0.9 to the term “nice” and “awful” has a valence of -0.92 we choose that term.

Natural language generation and narration techniques

[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.

Emotive textual expression processing

[ITC-irst] We developed 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")

Emotive dialogue management

[DI-BARI] we continued our work on how the information state approach to dialogue simulation suits to management of affective persuasion dialogues.

[QUB] 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.