‘O Francesca, ma che sei grulla?’ Emotions And Irony In Persuasion Dialogues

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Abstract. In this paper we investigated the interaction between emotional and non-emotional aspects of persuasion dialogues, from the viewpoint of both the system (the Persuader), when reasoning on the persuasion attempt, and the user (the Receiver), when reacting to it. We are working on an Embodied Conversational Agent (ECA) which applies natural argumentation techniques to persuade users to improve their behaviour in the healthy eating domain. The ECA observes the user’s attitude during the dialogue, so as to select an appropriate persuasion strategy or to respond intelligently to user’s reactions to suggestions received. We grounded our work on the analysis of two corpora: a corpus of ‘natural’ persuasion examples and a corpus of user’s reactions to persuasion attempts.

1 Introduction

We are working at an Embodied Conversational Agent (ECA) which applies natural argumentation techniques to persuade users to improve their behaviour in a given domain. The observing of the user’s attitude during the dialogue is crucial to select an appropriate persuasion strategy and to respond intelligently to the user’s reactions to suggestions received. The ECA plays the role of the Persuader (P), the user the role of the Receiver (R) of the argumentation message.

With ‘natural’ argumentation, we mean integrating rational arguments with the common sense, friendly style and emotional ingredients that are used in human-human communication. 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. We therefore focus our study on both generating the natural language persuasion message (planning its content and how to render it) and recognizing and interpreting the user’s reactions.

Two aspects of the users' reaction are of particular relevance in this kind of dialogues: their level of engagement, which proved to influence considerably the success of the dialogue itself (see, e.g. Bickmore and Cassel, 2005) and the way they react to the information item or the suggestion received.

In addition to the theories about argumentation and persuasion (Walton 1992; O'Keefe, 2002; Fogg, 2002), we grounded our work on two corpora (in Italian): *a.* a corpus of 'natural' persuasion examples that we collected from subjects with various backgrounds (de Rosis et al, 2006a) and *b.* a corpus of user's reactions to the ECA's suggestions, that we collected with a Wizard of Oz (WoZ) study (de Rosis et al, 2006b)

In this paper we describe the results of the analysis of the first corpus in the light of theories about persuasion and show the role played by 'a-rational' persuasion strategies (Miceli et al, 2006). We then briefly describe how knowledge acquired with the cited theories and the experimental corpus may be represented into a knowledge base, which enables selecting the appropriate strategy in a given context. The highlight of this work is in the choice of a formalism that allows representing uncertainty and gradualness when building an image of the message Receiver, which are typical of any persuasion process. From the analysis of the second corpus, we formulated a method to recognize the level of engagement of users in the dialogue and their reaction to the information or the suggestion received. We adopt, in this case, a method which integrates Latent Semantic Analysis (Landauer, 1997) with Bayesian classification (de Rosis et al., 2007). Although the application domain we considered so far is advice-giving about healthy dietary behaviour, the methods described are domain independent.

2 Background theories

O'Keefe (2002) suggests defining persuasion as *"human communication designed to influence others by modifying their beliefs, values or attitudes"*. By influencing others, one may intend attempting to modify either their beliefs or their intentions, and may name 'argumentation' and 'persuasion' the respective communication processes. In both cases, influencing is not a direct and rough suggestion, but is supported by a careful selection of the target beliefs, values or attitudes and of the methods to activate or strengthen them. Factors related to the Receiver, the context in which the persuasion dialogue occurs and the source of information provided are considered, by O'Keefe (2002) to be of primary importance for the success of a persuasion attempt. To Fogg (2002), computer tools may increase the persuasion power by providing tailored information or by leading people through a process. In the case of ECAs, O'Keefe claims the importance of source credibility, liking and physical attractiveness: this suggest a thoughtful choice of the ECA' s aspect, of the language adopted and of its 'scientific credibility'. These requirements are achieved by demonstrating awareness of the peculiarities of the Receiver with which the ECA interacts. If not purely rational persuasion strategies are adopted, another key factor is the role the ECA pretends to play: a 'scientific' consultant or a competent but also friendly persona. However, users are not necessarily incline to establish a friendly

relationship with an artificial agent: they may rather prefer to see them as animated versions of a scientific advice-giving website. A good persuading ECA should therefore observe the user's reactions during the dialogue, to decide whether to put itself in the shoes of a traditional therapist or to recur to artifices of various kinds (such as irony, colloquial language, admitting its knowledge limits and so on) to reciprocate the social attitude of the user.

The last ten years witnessed a flourishing of contributions on how an argumentation (or persuasion) message may be formulated, given a goal to achieve. Walton reflected, in particular, on the relationship between the phases of 'reasoning' and of 'argumentation'; in the first one, P performs a what-if kind of reasoning on R's mind to select the most promising strategy to adopt; in the second one, this strategy is translated into an appropriately formulated message (Walton, 1990). The same author cooperated with other researchers to define a set of 'argumentation schemes' to formalize the structure of argumentation messages (premises that must hold for the scheme to be applied and conclusions) and the 'critical questions' (CQs) that Receivers may formulate in their attempts to argue in their turn. With some exceptions, these are schemes adopting rational arguments, such as pointing out the positive or negative consequences of (respectively) performing or omitting the suggested action. Other authors suggested an extension of these schemes, to enable formalizing, as well, a-rational aspects of persuasion (Miceli et al, 2006; Mazzotta and de Rosis, 2006). In this case, enthymemes (that is, omissions from the message of some of the premises that P considered in his reasoning: Walton, 2001) are not limited to the facts the two interlocutors are presumed to share but are aimed at hiding emotional considerations which, if expressed in the message, would compromise its efficacy.

3 Two corpora

In this Section we describe more in detail the two corpora on which we designed and tested the methods that will be outlined in the next one. In both cases, the application domain is that of advice giving about healthy eating.

3.1 Corpus 1: 'Common sense' persuasion messages

To study the strategies our ECA should apply in attempting to persuade the users to adopt a 'correct' eating behaviour, we performed a web-based experiment. Two versions of a scenario describing the situation in which the subjects involved (taking the role of P) should imagine to be, were presented randomly: one of them was formulated in a 'positive framing' (positive consequences of a diet rich in vegetables), the other one in a 'negative framing' (negative consequences of a diet poor in vegetables) (Levin et al, 1998). We collected, overall, *thirty-two messages* from Italian subjects with various backgrounds (psychologists, philosophers, computer scientists, epidemiologists, health care providers), aged between 23 and 63, of both genders (all examples in this paper will be translated into English). We factored every message into 'discourse segments', each including one or more

utterances with a given communicative goal. To test the framing effect of the scenario on the valence of arguments employed by the subjects, we categorized every discourse segment as 'negative' or 'positive'. To test the effect of the rational formulation of the scenario on the arguments employed by the subjects, we classified a discourse segment as 'emotional' when it included one of the techniques mentioned in (Miceli et al, 2006): 'appeal to the goal to feel an emotion', 'emotional activation of a goal', expression of emotion in the language style or display of some form of empathy. The following are the main findings of our experiment:

- independently of the framing scenarios, *the subjects tended to combine negative with positive arguments* but *preferred positive arguments to negative ones*.
- *Rational and a-rational arguments* were usually combined in the messages, with a *prevalence of emotional arguments*, both in the negative and the positive framing conditions. Some examples of emotional hints:
  - in the *desirability of the goal* and its *activation*: "Just think Mary, how much more beautiful and healthy you would be if you ate more fruit and vegetables!";
  - in the *proofs that conditions existed for making the activity*: "you are a really good cook!"
  - in introducing *high-order values* that the activity might contribute to achieve: "You wouldn't be hurting anyone and you'd be helping the biological farmers to live better"or "With vegetables you can prepare gorgeous, very light meals";
  - in making more or less explicit *appeal to emotions*: "Here lies the wisdom of a mature woman: you have creative intelligence on your side *(pride)*, "If you insist on not eating fruit and vegetables, you show that you don't care about yourself" *(self-esteem)*.
- The recommendation of the behaviour to follow was usually introduced at the beginning of texts which were prevalently rational, only subsequently in more emotional ones, after preparing the subject to receive the suggestion. In some cases, this section was substituted with the description of some tempting consequences of the activity. This recommendation was supported with a *combination of different strategies*: by attempting to increase the desirability of the outcome, by reminding information about activity-outcome relationship or by proving that conditions hold to make the activity. E.g.: "A meal based on vegetables can be tasty: with just a little imagination you can prepare a first-rate dinner for your friends!". Other segments were aimed specifically at evoking the *cognitive dissonance* in R's mind (Festinger, 1957).

3.2 Corpus 2: WoZ dialogues

To study the kind of response the users might display when interacting with our ECA (a female, young character implemented with a wrapper to Haptek and Loquendo: see de Rosis et al, 2006b), we performed a Wizard of Oz study. In this study, we collected *thirty* text-based and *thirty* speech-based dialogues (with 1600 moves overall) from subjects aged between 21 and 28, equidistributed by gender and background (in computer science or in humanities). The ECA's moves available to the wizard included a set of sentences responding to several communicative goals: to Assess the situation and collect information about the subject, to Provide suggestions about healthy eating, to Persuade the subject to follow these suggestions in case of

doubt, and others. The subjects were left totally free in answering to the ECA's dialogue move. A log of the dialogues was collected to analyse them subsequently: factors affecting the dialogue and the move length, level of initiative of the subject and language features (as described in Section 4.2).

4 PORTIA: a persuasion dialogue simulator

PORTIA[1] is a speech-based mixed-initiative dialogue system based on the Information-State architecture (Traum and Larsson, 2003). In this system, the ECA plays the role of the persuader, the user the role of the Receiver. 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.

4.1 Generating a persuasion attempt

In the reasoning process, PORTIA (Mazzotta et al, In press) 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 ("Just think how satisfied you would feel after adopting a correct eating pattern!"), *appeal to cognitive dissonance* to encourage R to a more consistent behaviour ("Are you silly Francesca? *('O Francesca, ma che sei grulla?')* You do sport, look after yourself with regular medical check-ups and then you almost excludes vegetables from your diet!") 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. The strategy is translated into a 'discourse plan' by combining, if necessary, fragments of different plans and pruning them out to avoid too complex messages. Message plans represent Walton's argumentation schemes as XML files. We extended these schemes to formalize a-rational aspects of persuasion (Miceli et al, 2006; Mazzotta and de Rosis, 2006).

To demonstrate the functioning of this module, let us consider the following case: R (Francesca) declared, during the dialogue, that she does sport and regular medical check-ups. At the same time, her diet seems to be poor in fruit and vegetables.

[1] From the famous character of The Merchant of Venice, who was skilled in argumentation.

PORTIA propagates in its model of Francesca the available knowledge: it infers that being in good health is probably an important goal to Francesca, selects a 'rational' persuasion strategy focused on the goal of 'being in good health' and translates it into a discourse plan (Fig. 1.). In formulating its persuasion message in natural language, various techniques are combined to express the message in positive terms, to employ a 'friendly' language, to reinforce Francesca's awareness of the positive effects of eating vegetables and finally to appeal to cognitive dissonance. The following is the message produced: "Are you silly, Francesca? You do sport, look after yourself with regular medical check-ups and then you almost excludes vegetables from your diet! Perhaps you don't know the benefits that a diet rich in vegetables can have on your health". Fig. 1 shows the complex discourse plan used to build this message: the discourse plans 'PersuasionFromConsequences' and 'ArgumentFromEvidence' are instantiated and combined to obtain the complex plan.

```
<plan name="Persuade&JustifyAboutGoodHealth" action="EatVeg"
 goal="GoodHealth">
   <RR name="Motivation">
       <RR name="Joint">
        ……..
         <RR name="Evidence">
             <RR name="Joint">
                 <c_act type="Remind" term="MakeSport(R)"/>
                 <c_act type="Remind" term="MakeCheckUps(R)"/>
              </RR>
              <c_act type="Claim" term="Like(R,g)"/>
         </RR>
     ……..
         <c_act type="Inform" term="Implies(a,g)"/>
       </RR>
       <RR name="Enablement">
           <c_act type="Suggest" term="Do(R,a)"/>
           <c_act type="Claim" term="CanDo(R,a)"/>
       </RR>
   </RR>
</plan>
```

Fig. 1. An example of complex discourse plan

4.2 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.

a. Social attitude displayed by the user

To distinguish warm from cold social attitude, we refer to Andersen and Guerrero's definition of interpersonal warmth (1998) as *"the pleasant, contented, intimate feeling that occurs during positive interactions with friends, family, colleagues and romantic partners...[and]... can be conceptualized as... a type of relational experience, and a dimension that underlines many positive experiences"*. According to this definition, users display their social attitude towards the agent through various 'signs' in the language employed (table 1), 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.

b. 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 (Verheij 2003, Gordon 2005). Argumentation schemes are common types of defeasible arguments, evaluated by a set of related critical questions (Walton and Godden, 2005). The majority of them are focused on 'persuading to believe' (Argument from Evidence, Argument from Expert Opinion, Argument From Position to Know). Among the few of them which are aimed at 'persuading to do', the most commonly applied are the Argument from Consequences and the Practical Reasoning. Critical questions can be seen as 'representing additional relevant factors that might cause an argument to default' (Walton and Reed, 2003). They are used in everyday conversational arguments '*when a user is confronted with the problem of replying to an argument or making some assessment of what the argument is worth and whether to accept it*' (Walton and Gordon, 2005). 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 (System move–User move), 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. The first language is described in Table 1: this table shows that two sets of signs were defined, to be recognized respectively from language and from prosodic features.

Although the ECA adopted, in the Wizard of Oz study, a purely rational persuasion strategy, subjects introduced various a-rational elements in their reactions. The following are some examples of subjects' responses to the following ECA's suggestion: "International research demonstrated the importance of fruits and vegetables in a correct diet. It recommends a daily assumption of a portion of row and a portion of cooked vegetables and two or three portions of fruits. Precooked food helps in controlling the portions".

U1: uhm… but I don't like fresh fruits: how may I substitute them?
U2: But I know fresh food is better than precooked products.
U3: But… a sin of gluttony is better than any healthy and balanced diet!
U4: I can't eat vegetables because I suffer of colitis
U5: Are you sure that precooked food is not dangerous for health?

Table 1: Our markup language for signs of social attitude

Linguistic signs		Recall	Precision
Friendly self-introduction: The subjects introduce themselves with a friendly attitude (e.g. by giving her name or by explaining the reasons why they are participating in the dialogue)		99.5	37.5
Colloquial style: The subject employs a current language, dialectal forms, proverbs etc		75.9	11.7
Talks about self: The subject provides more personal information about self than requested by the agent		78.5	48.9
Personal questions to the agent: The subject tries to know something about the agent preferences, lifestyle etc, or to give it suggestions in the domain.		85.2	30.9
Positive or negative comments: The subjects comment the agent behavior in the dialogue: its experience, its domain knowledge etc.	Pos	4.3	66.7
	Neg	48.4	94.9
Friendly farewell: This may consist in using a friendly farewell form or in asking to carry-on the dialogue.		99.5	38.9
Neutral: No signs of social attitude.		48.4	94.9
Humor and irony: The subjects make some kind of verbal joke in their move		-	-
Acoustic signs			
Agreement: The dialogue segment displays an intonation of agreement with the system		47.1	21.4
Friendly intonation: The dialogue segment displays a friendly intonation		24.5	20.9
Laughter: The dialogue segment displays a smile or laughter		44.7	23.8
Neutral: The dialogue segment does not display any affective intonation		32.6	58.8
Negative intonation: The dialogue segment displays a negative intonation		19.6	12.4
I'm thinking: The dialogue segment displays, in its intonation, a reflection attitude		57.5	62.4

Table 2 describes the language that we defined to annotate the subjects' reactions to a persuasion attempt: as we are still in the process of defining a recognition method for these features, we do not include recall and precision data in this table.

Table 2: Markup language for the subject's reaction to a System's suggestion

Comm. Act	Purpose	Examples
UNCERTAIN	R nods without expressing any clear opinion	mmm
ASKIF	R ask the truth value of a fact	Do you think my diet is correct?
ASKINFO	R asks for more information about some topic	How could I substitute fruits?
ASKJUSTIFY	R asks the system to justify its statement	And how do you know it?
INFORM	R provides some evidence about his/her attitudes or behaviour	I eat meat, fish, vegetables, lots of fruits…
CONFIRM	R declares to agree with the evidence provided by the system	Right, I agree
DISCONFIRM	R declares to disagree with the evidence provided by the system	No, you're wrong. I don't agree
I-REBUTTAL	R presents an exception that falsifies the system argument	I love unbridled life, with light aversion towards healthy food.
OBJECT	R argues about the truth value of a premise of the suggestion	Are you joking? So you mean I have to bring a fruit bag with me, at work?
ACCEPT	R declares to agree with the received suggestion	Understood! So I should try to do it?
COMMIT	R commits him/herself to apply the received suggestion	Ok, I will do it
CHALLENGE	R declares to not be persuaded by the suggestion	So many portions of fruits? I've heard contrary theories on this topic
REJECT	R refuses the suggestion	But… a sin of gluttony is better than any healthy and balanced diet!
S-REBUTTAL	R presents an exception that falsifies the suggestion	I don't want to avoid sweets at all

5 User move recognition methods

Several studies investigated how to recognize emotions from written or spoken language, by combining prosodic information with language features (Litman and Forbes-Riley, 2003; Devillers and Vidrascu, 2006. By working on WoZ data, Batliner et al (2003) demonstrated that the combination of prosodic with linguistic and conversational data yielded better results than the use of prosody only, for recognizing the beginning of emotionally critical phases in a dialogue. To our knowledge, our work is the first one in the domain of recognition of social attitude from language. All the mentioned methods show some common steps: *a.* defining a markup language and tagging of the corpus by independent raters; *b*. evaluating the markup language and classifying units of annotation to create a training dataset; *c.* applying learning methods to the training corpus, to subsequently verify the method's accuracy by applying it to a test database.

5.1 Detecting signs of social attitude

To recognize the linguistic signs of social attitude listed in Table 1, 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 (de Rosis et al., in press)

The last two columns of Table 1 show the level of accuracy of the method in terms of recall and precision. We did not attempt to recognize irony, because of the low frequency of moves displaying this sign. The table shows that Positive and Negative comments are the most difficult signs to recognize, while the recall for the other signs is quite good. Selecting a cutoff point that insures a good compromise between recall and precision is not an easy task: by changing the cutoff values, and checking the effect of this change by means of ROC analysis (Zweig and Campbell, 1993) one may get a different balancing between the two measures. This decision is not a technical one, but depends on the consequences of identifying a sign which was not actually expressed in a move or missing a sign that was expressed. In the maximize recall strategy, the ECA will risk to respond with a 'warm' social attitude to a 'neutral' or 'cold' behaviour of the user. In the maximize precision strategy, the inverse will occur. A 'good for all cases' solution does not exist but depends on the application domain and the goals one aims to achieve: we therefore applied the cutoff points suggested by ROC analysis in order to build a 'reasonably social' ECA (not too cold but not too warm either). More details about the method and its results may be found in (de Rosis et al., in press).

When language analysis is integrated with prosodic one (a work we are performing in cooperation with the University of Erlangen), a good recognition accuracy of the social attitude of users is 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 (de Rosis et al, 2006b). *Acoustic analysis* is aimed at enriching the linguistic connotation of moves with information about their intonation. When the segment corresponds to an entire move, acoustic parameters just refine the linguistic description. When several acoustically different segments are isolated in a single move, the variation of prosody within a move may help in interpreting its meaning and reducing the risk of errors. In table 4, the 8x6 combinations of linguistic and acoustic labels are compacted into a lower number of categories, defined according to adaptation purposes ('negative', 'neutral' or 'warm' attitude of the user). We processed this dataset with K2 learning algorithm (k-fold cross validation, with k=number of segments with WEKA) and got a 90.05 % of recall.

Table 4: confusion matrix for the combination of acoustic and linguistic features

	Negative	Neutral	Light-warm	Warm	Recall	Precision
Negative	232 (94 %)	11 (4 %)	1 (.5 %)	4 (1.5 %)	.94	.94
Neutral	2 (1 %)	174 (95 %)	8 (4 %)	0	.95	.84
Light-warm	10 (3 %)	23 (6 %)	317 (85 %)	21 (6 %)	.85	.92
Warm	3 (1 %)	0	19 (9 %)	201 (90 %)	.90	.89

5.2 Understanding the User's reaction to a System' s move

As we said, 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 (Landauer and Dumais, 1997) has been already employed to extract the semantics of students' dialogue turns (Graesser et al., 2000) 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. In this multidimensional representation, documents are the single communicative acts while the choice of features to include as 'terms' is still an open problem. A possibility is to build a lexicon based on the language used in the database of user's reactions. In general, a simple word based approach demonstrated to be not powerful enough (de Rosis and Novielli, 2007) and the accuracy of text-based methods may be improved by introducing rules based on the observation of context based-features, such as the target of the communicative act or the contextual role of words.

6 Conclusion

In this paper we investigated the interaction between emotional and non-emotional aspects of persuasion, from the viewpoint of both the system, when reasoning on the persuasion attempt, and the user, when reacting to it. We grounded our work on the analysis of two corpora: a corpus of 'natural' persuasion examples and a corpus of

dialogues with an ECA. With analysis of the first one, we singled out the a-rational persuasion strategies adopted by our subjects; from the analysis of the second corpus, we formulated a set of criteria and a method to recognize the users' level of engagement and their reaction to the received suggestion. The preliminary results of our study proved that purely rational strategies were employed very infrequently and that emotional elements could be found everywhere and in various forms (first corpus). Similarly, in the second corpus we could find several forms of rational but also a-rational user's reactions, which go beyond the formalization of critical questions proposed by Walton. We are working at the speech-based, mixed initiative dialogue system PORTIA which applies 'natural' argumentation techniques to persuade users to improve their behavior in the health promotion domain. According to the analysis exposed so far, PORTIA should be equipped to recognize the user's reaction in terms of social attitude and level of acceptance of the suggestion received. We defined a Bayesian classifier which analyses the users moves linguistically to extract a social attitude value. Future work will focus on implementing a module which combines LSA with decision rules based on context to recognize the users' reaction.

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