Emotional And Non Emotional Persuasion Strength

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Abstract. Emotional argumentation is the result of a rational form of reasoning by the Persuader, subsequently translated into messages by applying some variants of the 'classical' argumentation schemes. In this paper, we discuss which may be assumed to be the relative strength of emotional vs. rational persuasion strategies and how this has been represented in a dialogic persuasion testbed.

1 INTRODUCTION

In a dialog perspective, argumentation, rather then a predefined, integrated set of propositions, is seen as a sequence of moves in which two parties (a Persuader and a Receiver) are reasoning together on some argument. The dialogue may be more or less symmetrical, as far as the initiative in persuasion and argumentation is concerned: therefore the role of Persuader and Receiver may be fixed, or may alternate during interaction. The theory of argumentation dialogues originates from research about expert systems, that were aimed at suggesting the appropriate therapy in a given situation [1]. A key function of these systems was to support their suggestion with explanations and clarifications after requests of various kinds from the user, including critiques to the suggested plan: they therefore set the framework for subsequent developments to the problem of criticizing argumentation attempts [2]. In the multiagent system domain, this kind of dialogues were subsequently employed, by agents, to distribute and contract roles and tasks [3].

Dialogic persuasion is not restricted to dialogues in which two parties are trying to resolve a conflict of opinions or attempt to influence another participant's behaviour. Some argumentative exchanges may occur in almost any kind of context: one of the most recent examples is the case of *Online Dispute Resolution*, in which an arbitration environment supports communication and discussion in web-based groups [4, 5].

While monologic persuasion is characterized by the three steps of planning, plan revision and surface realisation that are common to any NLP task, in the 'pure' persuasion dialogues that we consider in this paper the sequence of exchanges includes some typical phases, and forms of reasoning, by the Persuader:

1. *Make a proposal*: after reasoning on the Receivers' mind (system of belies, values, goals, etc), propose some action or some claim, by giving reasons as grounds for supporting the proposal,
2. *Observe the Receivers' reaction*: what does he or she say, or express differently,
3. *Classify it* (is it a request of justification, an objection, with or without counter-argumentation, a refusal, …),
4. *Reason* (again) *on the Receivers' mind* to interpret the Receiver's reaction by placing it into her presumed set of attitudes: this requires a belief-desire-intention model of mind and reasoning [3], eventually enhanced with emotions in a BDI&E model [6],
5. *Justify it* or *defend the own proposal* if possible; *retract it* if needed, *find an alternative* and *relate new argumentation to the previous one*.

A proposal may be criticized by the Receiver in several ways: i) by questioning the goal premises, ii) by attacking them with counter-arguments alleging that one or more of them is false; iii) by undercutting the inferential link between premises and conclusion with critical questions; iv) by rebutting the practical reasoning inference with counter-arguments asserting that the conclusion is false or v) by putting forward a proposal arguing for a different action, and contending that the arguments for this opposed proposal are stronger. [2]. The Persuader must be able to respond appropriately to all these situations.

Walton's distinguishes, in the argumentation process, a first phase of 'reasoning' from a phase of 'argumentation' [7]: in the first one, the persuader reasons on the Receiver's mind to select an appropriate strategy, while in the second one this strategy is translated into a coherent message. The complexity of this process increases when argumentation becomes dialogic. At every dialogue step, the Persuader must decide which part of its reasoning to make explicit in generating the argument and which one to hide or to postpone. In addition, a refined ability to 'observe the Receiver's reaction', interpret it and reason on the consequences of this reaction on the persuasion plan must be added to the system. This new reasoning ability becomes quite complex when context, personality and emotional factors are considered: research about consumers' behaviours and attitudes contributed considerably to increasing knowledge in this domain. It is well known that determinants of effectiveness of a persuasion attempt are not only the message features, but also the source and the Receiver's features [8]. Source features are not absolute, but relative to the Receiver: a source may be more or less 'credible', 'likable', similar, 'attractive' to different Receivers. According to the Persuasion Knowledge Model, consumers recognize and evaluate persuasion attempts (and select best responses during interactions) based on the perceived effectiveness and appropriateness of the persuasion tactics rather than using product knowledge [9]. On the other hand (and maybe also because of this) Receivers may be biased towards a persuasion attempt, being skeptical, defensive or hostile, either in general or towards a particular Persuader [10]. This kind of 'resistance' to persuasion influences the Receiver's response to persuasion attempts, which may include, in the three cases, different mixtures of rational and emotional components [11].

More in general, evaluation of persuasion attempts by Receivers may be influenced by affective factors. Some of these factors are stable (like personality traits: self-esteem, self-monitoring, sensation-seeking etc), others are more or less

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transient. For instance, positive mood seems to reduce systematic processing of information, whereas negative mood would enhance it [12]; positive feelings lead to more positive evaluation of information received, while the opposite seems to hold for negative feelings [13]. And finally, if a persuasion move aims at influencing the Receiver's attitude, it has been demonstrated that the Persuader's attitudes are influenced, in their turn, by the success or failure of their persuasion attempts [14].

2 RELATED WORK

Although, as we have seen, theoretical aspects of dialogic persuasion have been extensively investigated in the philosophical and the marketing studies domains, examples of dialogical persuasion prototype systems are few and quite recent. NAG (Nice Argument Generator) is a precursor of argumentation systems: it includes not only a generation component [15] but also a module aimed at interpreting the Receivers' reaction [16]. DAPHNE was the first system in which adaptation of arguments to the Receiver's 'values' was considered [17]. In ASD, Reed and Walton [18] use the language of formal dialectics to define a dialectical system in terms of *Locution rules (*statements, withdrawals, questions, challenges and critical attacks), *Commitment rules* (effects of locution rules on the two interlocutor's knowledge) and *Dialogue rules (*sequencing of communicative acts). By seeing monologues as 'inner-dialogues', Kibble [19] studied the kinds of communicative acts that are employed in persuasion dialogues and how they may be represented in rhetorical structures. Magtalo (Multiagent Argumentation, Logic, and Opinion) is a prototype environment for debate. It supports flexible intuitive interaction with data in complex debate domains to facilitate understanding, assimilation and structured knowledge elicitation. [20].

3 PORTIA

This persuasion dialogue toolbox was built after Miceli et al's [21] theory of emotional persuasion, to enable testing this theory and the methods it requires to be applied in specific domains. The prototype implements Walton's idea of separation between a 'reasoning' and an 'argumentation' phase [7], by representing with bayesian networks (BNs) the uncertainty inherent in this form of reasoning. Argumentation schemes are associated with bayesian networks in the form of xml files: they are chained-back to translate the selected strategy into Recipient-adapted messages. Answers to the user reactions to persuasion attempts are produced after reasoning on the same knowledge base.

While we refer to other papers for a description of the principles behind this prototype [22], in this paper we wish to discuss, in particular, the following aspects:

- how hypotheses about the effectiveness of alternative persuasion strategies (from psychological theories and from results of experiments) reflect, in particular, into assignment of parameters to the model;
- how knowledge representation enables comparing the effectiveness of alternative persuasion strategies (either rational, or emotional, or mixed) in a particular context, by reasoning in a *"what-if" mode;*
- how the same knowledge representation enables, as well, reacting to various kinds of users' reactions to persuasion attempts.

Although this prototype tool is domain-independent, all examples in the following sections will be taken from the healthy eating domain, which is the application area we considered so far, both in the preliminary experiments and in the theory formulation and in the building of the knowledge base on which the system was tested.

3.1 Preliminary notations

Let us introduce the following notations (synthesized in Table 1):

- a is a variable denoting an action (e.g.: 'to eat vegetables'); e_i, e_j, ... are variables denoting emotions (e.g. 'shame', 'pride', 'good mood', ...); g_i, g_j, g_h,... are formulae denoting states of the world - in particular, of R - (e.g.: 'R is in good health', 'R is in shape', 'R is overweight', but also 'R saves face', ...); the formula Feel (R,e) denotes, in particular, the affective state 'R feels the emotion e'.

- Bel, Int, A-Goal, V-Goal are modal operators that denote the various aspects of the mental state of R which are relevant in the persuasion process: that is, respectively, beliefs, intentions, active-goals and valued-goals. The first term of these operators denotes an agent, the second one is a formula. In particular:

- (V-Goal R g_i) stands for "g_i is a valued goal to R"; (A-Goal R g_i) for "R's goal g_i is active"; (Bel R (Do(R,a)→g_i)) for "R believes that doing a implies g_i in a more or less near future"; (Bel R CanDo(R,a)) for "R believes that conditions hold for him to do a"; (Int R Do(R,a)) for "R intends to do a".

- The symbol '→?' denotes an 'uncertain implication' and is represented in the BN with oriented arcs linking premises to conclusions. In the bayesian formalism, rule (A1∧A2 ∧...∧ An) →? B is interpreted as a conditional probability expression P(B|A1,A2,..,An) =m. This uncertain implication is specified with a table of the probabilities that B is true, conditional on all combinations of values for A1, A2, ..., An. It enables assigning to the premises different weights in establishing the truth value of the consequence.

- The generic strategy of *induction of intentions* is represented by the following relation:

$$[(\text{V-Goal R } g_i) \wedge (\text{A-Goal R } g_i) \wedge (\text{Bel R } (\text{Do(R,a)} \rightarrow g_i)) \wedge (\text{Bel R CanDo(R,a)})] \rightarrow ? \text{ (Int R Do(R,a))} \quad [i]$$

Formula	Meaning
(V-Goal R g_i)	g_i is a valued goal to R
(A-Goal R g_i)	g_i is an active goal to R
(Bel R (Do(R,a)→g_i))	R believe that performing a implies achieving g
(Bel R CanDo(R,a))	R believes that he or she is in the condition to perform a
(Int R Do(R,a))	R intends to perform a
Feel(R,e_i)	R feels the emotion e_i

Table 1. Some notations

3.2 Persuasion strategies

According to Miceli et al [21], persuasion may employ a combination of 'rational' and 'emotional' arguments (see Table 2). In particular, emotions may be introduced in the persuasion process in two forms:

- by selecting an 'emotional goal' g_j (*appeal to the goal to feel an emotion* e_j *):* g_j =Feel (R,e_j). For example "To feel in good mood" and
- by activating, through the activation of an emotion e_j, an 'intermediate' goal' g_h which is instrumental to the final one g_i (*emotional activation of goals)*:

  (Bel R g_j) → ? Feel (R,e_j) [ii]

  Feel (R,e_j) → ? (A-Goal R g_h) [iii]

  [(A-Goal R g_h) ∧ (Bel R (g_i → g_h))] → ? (A-Goal R g_i) [iv]

  For example: "*You look so overweight! Too bad...*"; e_j = shame; g_h = to save face; g_i to be in shape.

Selecting an appropriate strategy (either rational, or emotional, or a combination of the two) in a given context is a 'rational' planning task, based on some information about the Receivers. In PORTIA this information (the Receivers model) is inferred, with some level of uncertainty, from knowledge of their personality traits and living habits.

For example: *Extraverts tend to enjoy being with people, to be skilled in handling social situations and make friends easily*:

Extraverted(R) →? [EnjoyWithPeople(R) ∧ SkilledInSocialSituations(R) ∧ MakesFriendsEasily(R)]

Making friends is likely to be important to these subjects:

Extraverted(R) →? (V-Goal R MakeFriends(R))

Goals can be inferred as well, from knowledge of the user habits. An example:

[MakeSport(R) ∧ MakeCheckUps(R) ∧ LookAtTv(R)] →? (V-Goal R GoodHealth(R))

Individuals who make sport regularly, undergo regular check-ups and are interested in medical TV programs are probably interested in being in good health.

[(V-Goal R g_j) ∧ (A-Goal R g_j) ∧ (Bel R (Do(R,a)→g_i)) ∧ (Bel R CanDo(R,a))] →? (Int R Do(R,a))	
Rational strategies	
g_j is a 'rational' goal; it may be activated either emotionally (see below) or rationally, by inducing some belief that activates it.	
Emotional strategies	
Appeal to the goal to feel an emotion	g_j is an emotional goal
Emotional goal activation	an emotion e_j is activated, which in its turn activates an 'intermediate' goal' g_h which is instrumental to the final one g_j

Table 2. Rational and emotional persuasion strategies

3.3 Knowledge representation

Persuasion strategies are represented as belief networks: every uncertain implication introduced in the previous Section, instantiated with appropriate values of a, g, e_j, corresponds to an 'elementary' belief network (EBN). Other EBNs represent inferences the system is able to make about (Bel R (Do(R,a)→g_i)) or (Bel R CanDo(R,a)).

For example:

[HasFreeTime(R) ∧ LikesCooking(R) ∧ AvailableVegs(R)] →? (Bel R CanDo(R,EatVeg)) represents the statement:

Individuals who have some time free during the day, like cooking and live in a place in which good vegetables are available are probably in the condition to eat vegetables.

An *elementary argumentation plan* is associated with every EBN: this represents how that fragment of persuasion strategy can be translated into a natural language message.

In this knowledge representation, two problems occur: how to assign parameters to the EBNs and which part of that knowledge to represent in the associated argumentation plan. Let us briefly discuss the two problems.

a. Assigning parameters to belief networks

The problem of how to estimate parameters when building probabilistic models is a matter of discussion. BN parameters can be estimated by learning them from a corpus of data (frequentist approach) or according to subjective experience or common sense (neo-bayesian approach). In PORTIA, we adopted a neo-bayesian approach, by extracting knowledge on one hand from psychological theories and on the other hand from the results of our preliminary experiments [23]. In particular, in the representation of persuasion strategies and user models, the following questions are risen:

1. Which is (in [i]) *the relative impact of the various components* ((V-Goal R g_j), (A-Goal R g_j), (Bel R (Do(R,a)→g_i)) and (Bel CanDo(R,a)), with their combination of truth values) *on the intention* to perform the action? Does this impact depend on the particular type of goal? Our hypothesis is that, given a probability distribution of values for the variables in its premises, the probability of the intention-node (Int R Do(R,a)) does not depend on the goal involved, at least in the considered application domain; therefore, parameters in the EBNs that represent instances of [i] are all the same.
2. *Which are the prior – posterior probabilities of the various goals for a given user*? That is: what can we presume to be the weight of these goals in absence of any evidence, and how does this weight change, when some evidence about the user is available? As far as *goal or needs hierarchy* is concerned, we referred to [24] (see figure 1):
   - *Physiological* needs are the need to breathe, to regulate body temperature, the need for water, for sleep, the need to eat and to dispose of bodily wastes. Sexual activity is also placed in this category, as well as bodily comfort, activity, exercise etc.
   - *Safety* needs include security of employment, of revenues and resources, physical security, moral and physiological security, familiar security and health.

- *Love/belonging* needs involve emotionally-based relationships in general, such as friendship, sexual intimacy, and having a family.
- *Status* needs are the need to be respected, to self-respect and to respect others.
- *Being* needs include *self-actualization* (personal potential, self-fulfillment, seeking personal growth and peak experiences) and *self-transcendence* (helping others to achieve self-actualisation as a way of providing a route to achieve personal growth, integration, and fulfillment.

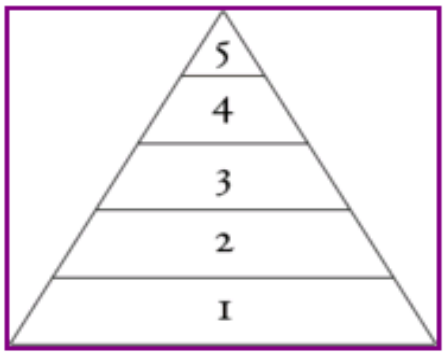

Diagram of Maslow's hierarchy of needs.
5. Actualization
4. Status (esteem)
3. Love/belonging
2. Safety
1. Physiological (biological needs)

Figure 1: Hierarchy of needs, accordingto Maslow [24]

By following this theory, we associated with higher level goals higher prior probabilities. For example: the goal of being in good health (safety in Maslow's hierarchy) has the highest weight, followed by making friends (love-belonging in the hierarchy) and having a good appearance (status-esteem). The weight of emotional goals or values, like 'to be in good mood', 'to enjoy tasting new foods' (instrumental to making friends) or 'to support farmers' (instrumental to status) are lower. Clearly, this hierarchy is only a default image of presumed goal strengths in the population: it is not identical to all individuals but can change according to specific situations. In addition, it is well known that individuals do not always behave consistently with their goals [25]: and the process of persuasion aims at re-establishing some consistency between scale of values and actual behaviour.

3. *which are the relative strengths of emotional and rational goal activation strategies*? Parameters in the EBNs representing A-goals were assigned so as to make strategies of emotional goal activation stronger than the rational ones. This was a results of our preliminary test, in which emotional strategies were considered to be more effective than rational ones and 'appeal to positive consequences' more effective than 'appeal to negative consequences' [23].
4. which are the relative strengths of alternative strategies arguing on the action-goal relation, such as Appeal to Expert Opinion or Appeal to Popular Opinion, or others? Does this strength depend on the context in which strategies are used? We suspect that the Recipient's characteristics influence the strength of strategies arguing on the action-goal relationship. For instance: 'rational' people are probably more easily persuaded by an Appeal to Expert Opinion, while very 'socialised' people might be more easily persuaded by an Appeal to a Friend's Personal Experience, ... etc. However, to our knowledge no theory or experiments supporting this hypothesis are available.

b. Building argumentation plans

Elementary argumentation plans (EAP) associated with every EBN represent how argumentation schemes [18] may be translated into message plans. Two new elements are added in this component of PORTIA's knowledge base: on one hand, hypotheses about *which items of emotional argumentation schemes should be said, and which ones should be omitted* (an instantiation of the concept of enthymeme, that is omissions of some premises that P considered in his reasoning [26]; on the other hand, definition of the rhetorical relations associated with every argumentation scheme:

- While all the components of the elementary EBNs corresponding to rational strategies are represented in the EAP, the nodes representing affective features of the Recipients (their personality traits or their emotional state) are omitted. For example, in the EAP associated with [ii, iii, iv] the activated emotion Feel(R,e_j), the instrumental goal (A-Goal R g_h) and the implication (Bel R ($g_i \rightarrow g_h$)) will not appear in the EAP.
- The following *rhetorical relations* are associated with argumentation schemes:
  (Argument from Consequences → Motivation);
  (Argument from problem to solution → Solutionhood);
  (Argument from Position To Do→ Enablement);
  (Argument from Expert Opinion or Popular Opinion or others → Evidence).

4. PORTIA AT WORK

This system is thought to be a toolbox to be used by Persuaders to receive a support in performing the tasks 1 to 5 listed in the Introduction. Although, as we said, the tool is domain-independent, to illustrate the tasks it can perform we will make some examples about healthy eating, that we selected as the application domain in this paper.

a. Selecting a 'promising' strategy by inferring the presumed strength of goals.

In this phase, the Persuader exploits its information about the Receiver to infer the presumed weight of her goals. Two kinds of information about the Receiver may be introduced into PORTIA: 'facts' about her life style (in the left side window in Figure 2) and hypotheses about her personality traits (central window). The reasoning component of PORTIA propagates this evidence into its belief networks to compute the posterior probability of the various -rational and emotional- goals (bottom window).

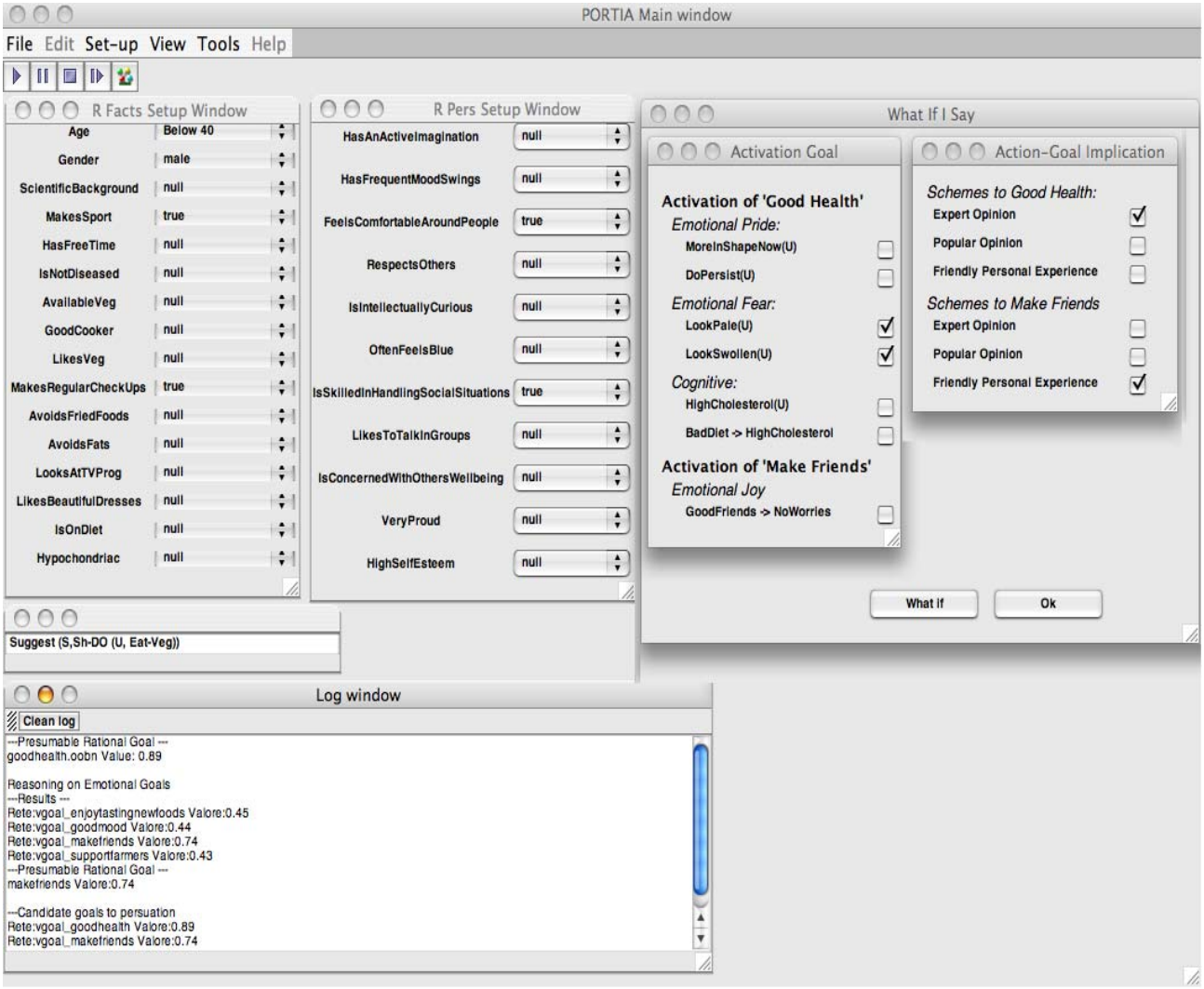

Figure 2: The interface of PORTIA for inferring the presumed goal

In the example in Figure 2, R is a man below 40 years of age who regularly makes sport and medical check-ups; he is presumed to be an *extraverted* person, as he reported to feel comfortable around people and to be skilled in handling social situations (Myers-Briggs typology questionnaire[2]). PORTIA infers, from this data, that the two candidate goals on which to support a promising persuasion strategy are *to be in good health* (rational: p=89) and *to make friends* (emotional: p=.75).

b. Selecting an appropriate goal-activation and action-goal argumentation strategy

In this phase, rather than automatically making a choice, PORTIA reasons in a 'what-if mode', to suggest alternative ways to strengthen the persuasion power of the selected strategy. Again, two types of information, expressed as sentences, may be used to influence R's attitudes: goal activation sentences and action-goal implication sentences. The first ones are focused on the (A-Goal R g), the second ones on the (Bel R (Do(R,a)→g_i)) components of implication [i]. Again according to [21], there are different ways to activate a given goal, either cognitively (by influencing beliefs which activate, in their turn, the goal) or emotionally, for instance by acting on *Pride*, *Shame*, *Emulation:* this will require instantiating appropriately the implications [ii], [iii] and [iv]. There are, as well, different ways to argue on the action–goal implication (Walton and Reed's schemes and further revisions, available at[3]): *Appeal To Expert Opinion*, *Appeal To Popular Opinion*, *Appeal To Friendly Personal Experience*, etc.

[2] http://www.humanmetrics.com/cgi-win/JTypes2.asp

[3] http://araucaria.computing.dundee.ac.uk/schemesets/walton.scm
http://araucaria.computing.dundee.ac.uk/schemesets/pollock.scm
http://araucaria.computing.dundee.ac.uk/schemesets/katzav-reed.scm

Every strategy may be triggered by one or more sentences: however, their effect depends on the Receiver's characteristics and on the context, in a way that, to our knowledge, is not yet psychologically clear. Due to this lack of background knowledge, rather than making an automatic choice on this point, alternative strategies are displayed in the 'What If I Say' window (right side of figure 2). The user (acting as a Persuader) can test the effect of alternative strategies on R's mind but is left free to make the final choice.

c. Building a dialogue plan

The dialogue plan is built by chaining-back the EAPs associated with every selected EBN. Intermediate nodes in this plan are rhetorical relations (in italic), while leaf nodes are communicative acts. Figure 3 shows an example of dialogue plan tailored to the Receiver described in Figure 2. Here, the EAP corresponding to the activation of the goal 'to be in good health' is linked with a *Solutionhood* to the rest of the plan. This includes a Suggestion, linked with a *Motivation* to the arguments in support of it. Two motivations for the suggestion are considered at the same time (and therefore in *Joint* between them): the first one is represented by a subplan for the 'rational' goal of being in good health, the second one by a subplan for the 'emotional' goal of making friends. A relation of *Evidence* links communicative acts of Inform or Remind to the claim they support. Reminds are used to mention facts that were communicated by the Receiver; Inform are used to mention facts presumed or known by the System. A relation of *Enablement* links the described part of the plan to the final subplan arguing in favour of the CanDo. The correspondence between node names inthe BN and leaf nodes in the dialogue plan is described in Table 3.

BN node name	Communicative act in the dialogue plan
(V-Goal R g_i)	Claim Like(R, g_i)
(Bel R (Do(R,a)→g_i))	Claim Implies(a, g_i)
(Bel R CanDo(R,a))	Claim CanDo(R,a)
(Int R Do(R,a))	Suggest ShDo(R,a)
Property(R)	Remind *Property*(R) or Inform *Property*(R)

Table 3. Correspondence between BN node names and communicative acts in the dialogue plan

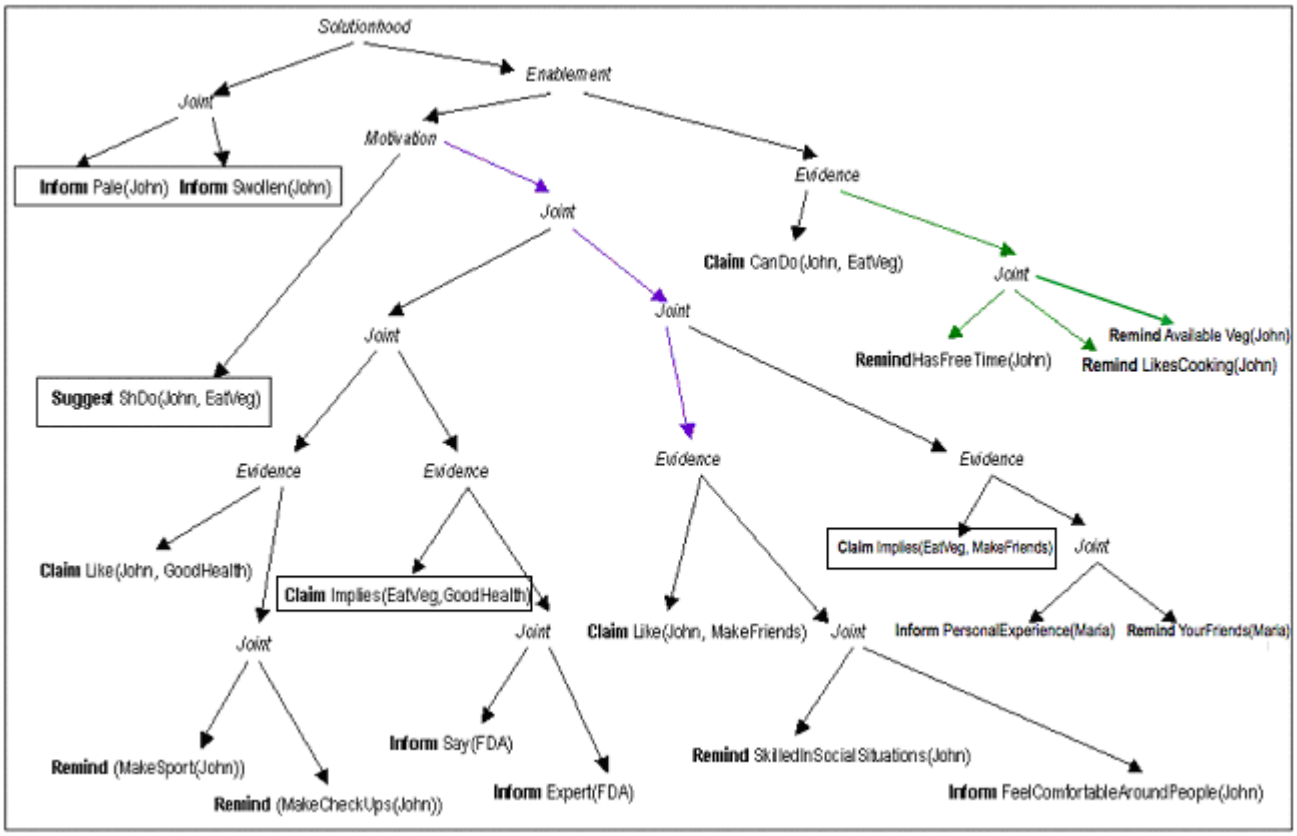

Figure 3: A dialogue plan for the example in figure 2.

d. Generating the first move

The first dialogue move is a system's Suggestion, possibly integrated with some enhancing form like an '*appeal to cognitive inconsistency*' or with a goal activation, as in the previous example. Of course, the plan in Figure 3 may be used to generate two type of Suggestion: either an enriched message in a monologic viewpoint or a simple sentence in a dialogic viewpoint.

The following system's suggestion (monologic viewpoint) can be generated from the plan in Figure 3*:*

"You look a bit pale and swollen lately, John! You should eat more fruit and vegetables, which are very good for health. In addition, a dinner rich in fresh fruit and vegetables is superb, to spend good time with friends!".

This message includes only what is considered to be the 'main' part of the plan (the framed leaf nodes in Figure 3). Other parts are omitted with the intent to avoid including too many details: therefore, the selected 'Claims' are not supported and the 'CanDo' subtree is pruned out.The last type of omissions (typical of enthymemes) regard items that are presumed to correspond to 'shared knowledge': this is the case of 'Remind' nodes which (as we said) denote information provided by the Receiver in previous phases of the dialogue, but also of subtrees arguing about the Receiver's goals (Claim-Like type of nodes and their brothers).

The plan in Figure 3 can be used, as well, to simulate a follow-up dialogue, as we will see in the next paragraphs.

e. Recognizing the Receiver's reaction

We consider two types of reactions: 'non destructive' and 'destructive' ones.

- We call '*non-destructive*' the reactions which do not involve a failure of the persuasion attempt and therefore do not require a re-planning phase. Non destructive reactions that PORTIA is able to recognize are a similar to those proposed in [19]: *RequestToJustify*, involving questioning the premises of a statement, and *Object*, alleging that a system statement is false.
- On the contrary, we call '*destructive*' the reactions that involve a failure of the attempt: these may be temporary, like a *Deny* (to deny that a goal is important to self) or permanent, like a *Rebuttal* (to claim that R is not able to perform the suggested action). permanent, like a *Rebuttal* (to claim that R is not able to perform the suggested action).

Although this is only a subset of the types of moves that can occur in persuasion dialogues, they are a good start for asymmetric dialogues, like those we are considering in PORTIA. A recognition method of the reaction type based on Latent Semantic Analysis, on which we worked with other colleagues, is sketched elsewhere [27].

f. Responding to the Receiver's reaction

A simple algorithm of exploration of the dialogue plan is applied to respond to 'non-destructive' reactions. *RequestToJustify* moves require exploring the plan tree from the identified question node, by first going to its parent -rhetorical relation node. and then down to the evidence(s) that prove it. *Object* moves require a similar plan exploration, with different kinds of answers. On the contrary, a *Deny* move is interpreted as a failure in the choice of the goal on which the persuasion strategy was focused: it requires a new reasoning and planning activity, focused on the next goal that was identified as 'promising' in the phase of *Selecting a promising strategy*; it requires, as well, a revision of the argumentation plan accordingly. Finally, a *Rebuttal* move produces a failure that cannot be repaired.

The following is an example of persuasion dialogue that can be generated from the plan in Figure 3 after the Receiver reacts in a 'non- destructive way':

S: *You look a bit pale and swollen lately, John! You should eat more fruit and vegetables.*
(Suggest ShDo (John, EatVeg))

U: *Why?*
(RequestToJustify ShDo(John, EatVeg))

S: *Because their are very good for health.*
(Claim Implies (EatVeg, GoodHealth))

U: *Yes, I know. But cooking vegetables is boring and I rather prefer spending my time with people and making new friends.*

(Object Like (John, GoodHealth)).

S: *You are right: but don't forget that a dinner rich in fresh fruit and vegetables is superb, to spend good time with friends!*

(Claim Implies(EatVeg, MakeFrieds)).

This is an ongoing part of our research.

5. CONCLUSIONS & FUTURE WORK

In this paper we described PORTIA, a persuasion dialogue toolbox based on Miceli et al's [21] theory of emotional persuasion and on Walton's idea of separation between a 'reasoning' and an 'argumentation' phase [7]. This tool enables testing this theory and the methods the theory requires to be applied in specific domains. We consider probability theory and

PORTIA is not thought to be a 'Persuader' but a *Persuasion support toolbox* for simulating persuasion dialogues. It might be used by a Persuader to compare the strength of alternative persuasion strategies, or to select the argumentation plan to follow in order to induce an *intention to change* a habit or a behaviour in a Receiver with - partially known - characteristics. For example, in the healthy eating domain PORTIA might support the Persuader to induce in the Receiver's mind the intention to contact a nutritionist, without suggesting any particular kind of diet.

PORTIA has not yet got all the potentialities of the method described in this paper. Emotional persuasion is a new research domain: the main difficulty in progressing with our work is therefore to find psychological theories on which to ground PORTIA's knowledge base. We plan to evaluate the effectiveness of our method in a near future, when PORTIA will have been completedin all its potential.

So far, we applied this tool in a domain in which we had some past experience: however, the domain-independence of PORTIA make it potentially useful in different fields, ranging from *sensitization campaigns* on medical and social aspects (like family planning or stop smoking) to *online distribution of products and e-commerce*. For example, PORTIA may be used to support interactive advertising in online shopping or telephone marketing (to subscribe telephone, energy, gas and

other contracts). In the first case, it might be integrated into an online shopping server in order to increase the user propensity towards the offered products and the communication effectiveness. In the second one, PORTIA might support the call-center operators by suggesting them a persuasive strategy to employ in their telephone work. In a far future, PORTIA might become part an embodied training agent for new call-sell operators in a virtual environment. But this is only a perspective!

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