



Interacting with the Reader: Politeness Strategies in Engineering Research Article Discussions

LUZ GIL-SALOM & CARMEN SOLER-MONREAL¹
UNIVERSIDAD POLITÉCNICA DE VALENCIA

ABSTRACT

The writer's strategy to combine the exposition of factual information with personal judgement and interaction with the reader has been analysed in a number of studies (Hunston, 1994; Hyland, 1998a, 1998b; Latour and Woolgar, 1979; Skelton, 1997). Myers' studies (1989, 1992) on the pragmatics of politeness in scientific articles analyse politeness strategies in regularities of scientific style that are usually explained in terms of conventions. In the context of scientific communication, the researcher performs two basic tasks: presenting a claim and contradicting former theories or beliefs. Both actions could be interpreted as impolite behaviours and constitute what Brown and Levinson (1987) call *face threatening acts (FTAs)*. In this study we explore the presence of face-redressive politeness strategies in the discussion sections of engineering research articles. The data are drawn from a corpus of 46 discussion sections in the fields of computing, telecommunications, nanotechnology and robotics.

KEYWORDS: academic writing, research article, discussion section, interaction, face threatening act, politeness.

RESUMEN

La estrategia del escritor de combinar la exposición de información factual a la vez que expresa sus opiniones personales y mantiene la interacción con el lector ya ha sido objeto de análisis (Hunston, 1994; Hyland, 1998a, 1998b; Latour y Woolgar, 1979; Skelton, 1997). Los estudios de Myers (1989, 1992), enfocados a la pragmática de la cortesía en artículos científicos, analizan las estrategias de cortesía presentes en las regularidades del discurso científico, que tienden a ser consideradas como convenciones del género. En el contexto de la comunicación científica, el investigador realiza dos tareas básicas: presentar una hipótesis o afirmación científica y contradecir teorías u opiniones asumidas por la comunidad científica. Ambas acciones son susceptibles de ser consideradas descorteses y constituyen lo

¹ *Address for correspondence:* Luz Gil-Salom / Carmen Soler-Monreal¹. Universidad Politécnica de Valencia. Departamento de Lingüística Aplicada. Camino de Vera, 14. 46022 Valencia. SPAIN. E-mail: mlgil@idm.upv.es

que Brown y Levinson (1987) denominan ‘actos de amenaza de la imagen pública’ (*face threatening acts* en su denominación inglesa). En este estudio se describen las estrategias de cortesía destinadas a preservar la imagen en las secciones de discusión de 46 artículos científicos pertenecientes a los campos de la informática, las telecomunicaciones, la nanotecnología y la robótica.

PALABRAS CLAVE: discurso académico, artículo de investigación, discusión, interacción, acto de amenaza de la imagen, cortesía

I. INTRODUCTION

The research article is a rhetorically sophisticated artifact which displays a careful balance of factual information and social interaction (Bazerman, 1988; Swales, 1990). The writer’s strategy to combine the exposition of factual information with personal judgement and interaction with the intended reader has been analysed by a number of authors (e.g. Hunston, 1994; Hyland, 1998a, 1998b; Latour & Woolgar, 1979; Skelton, 1997). In their view, the writer, besides transmitting information, has to consider the reader and her/his possible reaction to the text. As Hyland (1994: 240) points out “rather than being factual and impersonal, effective academic writing actually depends on interactional elements which supplement propositional information in the text and alerts readers to the writer’s opinion”. Moreover, this interaction will depend on a number of contextual factors external to linguistic discourse.

Few analyses (Garcés-Conejos, 1998; Hyland, 2005; Kuo, 1999; Myers, 1989, 1992) have applied politeness theory in studies of written language and language for specific purposes. Myers’ studies (1989, 1992) on the pragmatics of politeness in scientific articles analyse politeness strategies in regularities of scientific style that are usually explained in terms of conventions. A description of scientific discourse should take into account these strategies to maintain the social interaction between the writer and the reader, i.e. politeness strategies. In the context of scientific communication, the researcher performs two basic tasks: presenting a claim and contradicting former theories or beliefs. Both actions are liable to be interpreted as impolite behaviours and constitute what Brown and Levinson (1987) call *face threatening acts (FTAs)*, i.e. acts that threaten the public self-image or *face*. Face refers to the “public self-image that every member of a society wants to claim for himself” (Brown & Levinson, 1987: 66). To maintain the other’s face is to recognise and respect the claim members of society make with respect to each other in interaction. The act of communicating such an acknowledgement is politeness. According to Brown and Levinson (1987), face consists of both positive and negative face. Positive face refers to the positive self-image of the interactant, including the desire that this self-image be appreciated and approved of by others. Negative face represents the basic territorial claim of the individual and her/his “freedom of action and freedom from imposition” (Brown & Levinson, 1987: 66). Certain acts, such as orders, requests, disagreement and advice are intrinsically face-

threatening and thus require strategic redress. The possible strategies for performing *FTAs* can be classified as *off record*, *bald on record* without redress and *on record* with redress, encompassing a range of different degrees of politeness. *Off record* strategies involve ambiguous intentions (Garcés-Conejos & Sánchez-Macarro 1998: 175). Performing an act *on record*, but (baldly) without redress, entails doing it in the most clear, unambiguous way in circumstances where there is no fear of retribution from the addressee. *On record* strategies with redress imply using politeness to counteract the potential face damage of the *FTA*. The weightiness (*W*) of a *FTA*, i.e. the seriousness of the estimate of risk of face-loss of a *FTA*, is calculated considering a number of factors which Brown and Levinson have reduced to a formula. For their formula, they postulate three independent variables that have a systematic effect on the choice of politeness strategies: the social distance (*D*) of the speaker and hearer (a symmetric relation), the relative power (*P*) between them (an asymmetric relation), and the absolute ranking (*R*) of impositions in the particular culture.

In scientific writing *FTAs* are unavoidable and different politeness strategies are required so as to minimise the effect of the potentially threatening acts. Apart from making a claim, other necessary acts such as criticism, naming things, speculating or asserting one's priority, also threaten face (Myers, 1989).

Politeness strategies try to repair or compensate in some way the threat to positive and negative public self-image when performing a specific act. Scollon and Scollon (1995) distinguish between a solidarity politeness system and a deference politeness system. A solidarity face system (*positive politeness* in Brown and Levinson's terms) is one in which participants feel or express closeness to each other. There is no feeling of either a power difference or distance between participants. A deference politeness system (*negative politeness* in Brown and Levinson's terms) is one in which participants are considered to be equals or near equals but treat each other at a distance. Positive politeness strategies are based on the sharing of the audience's wants and show "the writer's acceptance of the wants of rival researchers, or of the scientific community as a whole" (Myers 1989: 7). Negative politeness, on the other hand, is realised through strategies assuring the reader that the writer avoids impositions on her/his wants and her/his freedom to act. The function of negative politeness devices is that of softening the commitment of the writer to the truth of the proposition being stated. As Myers points out, most of the features that are considered conventional in scientific discourse, such as hedging or impersonal constructions, can be reinterpreted as negative politeness devices when they reflect the appropriate attitude for offering a claim to the community. Such devices mark claims, or other statements, "as being provisional, pending acceptance in the literature, acceptance by the community, in other words, acceptance by the readers" (Myers, 1989:12). The writer contributes to the development of a writer-reader relationship in gaining reader ratification.

Our interest in this study was to explore the interaction between the writer and reader, in which the former, in order to win approval from her/his audience, mitigates certain

FTAs. We believed that the choice of certain positive and negative politeness strategies in engineering research articles would reveal how writers interact with readers and with the discourse community they belong to. Scientists need to integrate their research findings and results into the whole discipline. As a writer, therefore, the scientist must claim the significance and contribution of her/his research to the discipline on the one hand but, on the other, appeal modestly to expected readers –her/his peer researchers– seeking their approval and acceptance. So, there is motivation for being polite and maintaining face through the use of politeness strategies.

The purpose of this paper is to describe positive and negative politeness strategies in the discussion sections of engineering texts, taking into account the context in which the *FTA* occurs. The main communicative purpose of the discussion section in research articles is to persuade the academic community of the validity of the research presented and the convenience of accepting new knowledge claims. In this section writers comment on the data presented in the results section and make their own views on the study and the findings explicit. Their aim is to create reliability and acceptability conditions for their claims so as to become accepted members of the scientific community. This results in a number of writer-oriented and reader-oriented linguistic realisations of personal commitment to the facts related to the research and of involvement and cooperation with the audience.

II. CORPUS AND METHOD

The corpus consists of 46 discussion sections drawn from a set of scientific journal research articles in four engineering fields: computing, telecommunications, nanotechnology and robotics. The articles were randomly taken among those published in 18 specialised leading journals in the period 2000-2003.

It was assumed that in discussion sections of research articles a writer makes the highest level of claims, and the act of presenting one's findings threatens negative and positive face. The pragmatic framework offered by Brown and Levinson (1987) served as a reference to study the presence of face-redressive politeness strategies in the corpus. We focused on some positive politeness strategies that show the writer's identification with the scientific community as a whole, and on some negative politeness strategies reflecting an attitude of deference to the community when offering claims. In the following sections examples taken from the sampled discussions will illustrate how the face-redressive politeness strategies operate.

III. ANALYSIS OF RESULTS

III.1. Positive politeness strategies: Showing solidarity and involvement with the reader

Positive politeness devices show solidarity with peer researchers and the scientific community as a whole. Solidarity is found when writers claim common ground, i.e. the providing of basic information on the research topic. The writer can identify one's work with that of the whole field by assuming everyone shares either the idea behind one's claim or the experience behind what might be taken as criticism (1 and 2).

- (1) Meshing friction in gear pairs *has been defined in earlier works as a force along the off line-of-action direction that two paired teeth exert against each other while they match. As this force takes place once a pair of teeth comes together, it generates a periodic waveform friction with the frequency with which the two teeth match. For that reason it has been always considered position-dependent friction.* (Robotics)
- (2) *It is well known that the – curve of a laser diode is a nonlinear exponential function.* (Telecommunications)

In (3) a speculative claim is introduced. By treating the *assumption as frequent*, the writer considers the reader as potentially capable of making this claim, minimising her/his original contribution to the field:

- (3) Since intradomain multicast routing is often available, *a frequent assumption is that the AGCS is only used between sites, not within a site. A representative in each site locally multicasts the traffic received. Doing so increases global scalability since all the local members are hidden behind their representative.* (Telecommunications)

Writers show their solidarity with the members of the community by displaying personal attitude to research results. The human side of researchers emerges when emphasising aspects related to the interpretation of unexpected research results. Stance adjectives and adverbs and intensifiers are efficient resources that convey feelings and attitudes (4 to 7):

- (4) Regarding sulfur, *its presence as FeS highlighted by HRTEM is surprising* since the studied alloy contains manganese and titanium which present a high affinity for sulfur compared to iron and form very stable compounds MnS and TiS with it. (Nanotechnology)
- (5) *Unfortunately, none of these strategies appear to have been entirely satisfactory.* (Computing)
- (6) *Interestingly*, the curves for BPHT in Figs. 7 and 8 indicate that with an appropriate wavelength granularity, BPHT performs the best in terms of both and, and can achieve more than 50% savings on the number of ports when using MG-OXCs instead of ordinary-OXCs. (Telecommunications)
- (7) The redundancy problem is *particularly severe* when there are many shared links and the receivers are highly heterogeneous. Such situations are *unfortunately* common in a large-scale IP multicast network. (Telecommunications)

Explicit devices, such as certainty adjectives, appeal to shared background knowledge in their claims. Their communicative purpose is to make readers recognise something as generally known or accepted by the members of the community. By asking readers to identify with particular views, writers assign them a role in following the argument (8 and 9):

- (8) Several proposals [28, 29] suggest using an active networking approach to provide an AGCS. *It is clear that* if an active networking service is available in each potential node, because of the flexibility it offers, deploying an AGCS becomes an easy task. (Telecommunications)
- (9) The most *obvious* approach is binding the analyte (preferably a biocomponent) to the cluster and making the presence or absence of the clusters in the SEA set-up dependent on a biorecognition process. (Nanotechnology)

In discussion sections writers evaluate the study carried out as a whole. In this context, the author is the first to indicate existing limitations and difficulties of various types encountered during the research process. Explicit acknowledgement of limitations can be interpreted as strategic hedging to weaken the effect of criticism (10 and 11):

- (10) *Another limitation* is the sizes of datasets used in our experiments. While larger datasets *would have been preferable*, the current findings *appear* reliable. They are confirmed with statistical tests wherever possible and are consistent across two independent databases. (Computing)
- (11) The relationship between Internet attitudes and Internet use was *more complex than expected*. (Computing)

A group of positive politeness strategies looks for a direct involvement with the reader. Readers are brought explicitly into the text through the use of inclusive *we* (Hyland 2008: 9). They are considered as participants in the discussion of results (12):

- (12) *We assume that* the two operands are the same and both are pyramids. Each has n number of vertices, $2n - 2$ number of edges, and n number of faces. (Computing)

In the following discussion extracts we find *we* and *one* that include both the writer and the reader. The reader is involved in the reasoning when reporting and interpreting results (13 to 15):

- (13) In order to escape this singularity of type III, *one* must move onto the singularity surface in the joint space (Figure 3) and then use an external force to move the platform out of the singular configuration. (Robotics)

(14) It is also interesting to study the weights that carry the decomposition of the reduction in information divergence. In particular, *we might ask* if the monotonicity is the true property defining the structure of these weights. (Robotics)

- (15) In case the probabilities are hard to obtain, *one* can replace a behavior with multiple potential consequences by multiple behaviors, each with a certain consequence. (Robotics)

Exemplifying, accounting for results, clarifying and reformulating are other ways of getting the reader involved and making her/him participate (16 to 18):

- (16) The path following algorithm not only achieves tight manoeuvring but also achieves handling many DOFs *as it is clear from the examples given. One reason for this* is that the path following algorithm decouples links, determines each link movement individually and organises the relationship between all active *Another reason is that* each active link uses only one curve or line equation to follow. Whenever necessary, a manipulator link switches simply from one curve or line equation to another. (Robotics)
- (17) *To see more explicitly* the relation between the uncertainty coefficients and the depth of the points used to compute VZ, Fig. 6 plots these uncertainty coefficients when a sphere is moved from 2.5 to 5m with the same motion conditions. (Robotics)
- (18) *In other words*, *l* is not a fixed parameter but it depends on the microstructure of the metal. (Nanotechnology)

Writers interact with readers in conversational mode making them feel closer to the research. Through imperatives writers explicitly instruct readers in how to interpret an argument, by requesting them to perform some act (19, 20 and 21) or directing them to another part of the text (22 and 23):

- (19) *Note that* this stepping is only of concern when the tool is entering or exiting a cut where the chip thickness is significant. (Computing)
- (20) With reference to Fig. 16, *consider* the X-direction climb cut case. (Computing)
- (21) *Recall* that all the execution times are obtained using a P664 PC with 256MB RAM. (Robotics)
- (22) *Please refer* to [1] for a detailed description of the comparative cost analysis. (Telecommunications)
- (23) *Observe* from the Table I that for the exponential holding time distribution, the estimated capacities based on the approximation method are close to the exact solutions. (Telecommunications)

Through the asking of rhetorical questions, the writer involves the reader in the discourse guiding him to particular interpretations. The writer's claim is presented as a question but no response is expected, in fact writers answer the question immediately (24 and 25):

- (24) *How can seemingly less trusting attitudes about the Internet be related to greater rather than less Internet use? One possibility is that less trusting attitudes are better construed as more informed attitudes about the Internet, and more informed attitudes predict greater Internet use.* (Computing)
- (25) *How can multi-q structures be experimentally verified? Neutron scattering (NS) is a very direct method of determining the reciprocal space picture of a magnetic structure. In particular structures which may be incommensurate with the lattice.* (Nanotechnology)

III.2. Negative politeness strategies: Showing deference to the reader

Negative politeness strategies are found in the linguistic choices for the presentation of facts and claims related to the specific research activity. They consist of mitigating mechanisms based on the avoidance of impositions on the reader.

In discussions writers seek to highlight findings and situate them in the context of a wider body of knowledge by relating results to the work of others. Negative politeness strategies pointing to vagueness and hedging reduce the writer's commitment to claims and so redress FTAs. Uncertain and indeterminate expressions allow degrees of doubt about alternative interpretations by the reader. These expressions include mainly varied realisations of epistemic modality (26 to 32):

- (26) In that case a behavior *could be* said to be more powerful if it has a logically weaker stimulus that needs to be true with a lower probability. A behavior *could also* be said to be more powerful if it results in a logically stronger consequence that holds with a higher probability. (Robotics)
- (27) Those coefficients increase with a high power (between 2 and 4) of the depth coordinate, so farther objects have much higher uncertainty *which suggests* that the VZ is more accurate when closer points are used. (Robotics)
- (28) The present study *may* therefore provide a conservative estimate of the extent to which asymmetry metrics can contribute to face recognition. (Computing)
- (29) However, *it is likely that* in many real applications the head will undergo 3D motions resulting in changes to the spatial domain of the facial eigenspaces. (Computing)
- (30) *This question could potentially* be answered by extending the reverse reduction of Section 6 from a positive weight function on sets of a fixed number of vertices, to any monotone weight function. (Robotics)
- (31) *This is likely due* to the clipped-induced impulse noise and nonlinear distortion within the QAM band, which was generated by AM-VSB channels. (Telecommunications)
- (32) However, the general conclusion from *our* experiments is that the Bethe approximation *probably* breaks down before any significant difference between the two methods shows up. (Robotics)

One way of minimising the *FTA* and weaken criticism to the achievements of other researchers doing similar work is to use modals, adverbials, partial negations and non-personal constructions (32 to 35):

- (32) *Previous tests demonstrate* the tendon design meets performance requirements while minimizing the weight and volume penalties (Klute, Czerniecki and Hannaford 2000a). The performance of this design could be improved, *but only* at the cost of additional springs. *Another approach*, using lightweight polymer springs with non-linear elastic properties, *might better mimic* the biological stress-strain curve while reducing weight. (Robotics)
- (33) *Other transformations*, derived by direct reasoning based on the kinematics of point *G*, *could have been used as well*. One of the simplest and classical transformations is discussed below. It is shown that its use introduces additional complexity especially when obstacle avoidance is considered. Therefore, although one could in principle derive an alternative transformation very easily, *this does not necessarily result in* an easy to implement obstacle avoidance technique. (Robotics)
- (34) Such hardness *was suspected, but not proved*, by Höffgen [9]. (Robotics)
- (35) *These findings*, for both red and blue links, *do* therefore *partly support* guidelines that state that menu items should be placed vertically (Tullis, 1997) and research that found search time was shorter for vertical menus (Wolf, 1986; Backs et al., 1987; Nygren, 1996). They therefore *partly contradict the findings of* Scott and Findlay (1990) that horizontal menus are searched more quickly than vertical ones. (Computing)

In fact, depersonalisation is one of the most common negative politeness strategies and serves different purposes. Several kinds of non-personal constructions are used when stating results. This responds to a double purpose: it allows the writer's self-protection before potential criticism and it propitiates the writer's self-effacement, which permits the reader to feel free for interpreting the writer's claims. In scientific discourse it is the results that are important not the people that bring them about. This explains the high number of nominalisations (36 and 37) and sentences with non-human actors (38, 39 and 40):

- (36) *Degradations in CSO and CTB performances* result from the use of directly modulated transmitter carrying the RF signals over the MMF link [7]. *Nonlinear distortions* occur due to FM-AM conversion of mode-selective connector or splice accompanied with direct modulation of a laser diode in the MMF link. (Telecommunications)
- (37) *The measured AM-VSB CNR, CSO and CTB values for the lightwave link with and without (back-to-back) two in-line EDFAs* are shown in Figs. 2 and 3, respectively. (Telecommunications)
- (38) *Spectral analyses show* an exponential decrease of the meshing friction force as joint speed increases. (Robotics)
- (39) *The results presented demonstrate* the feasibility of the general approach of active 3-D tremor compensation in a handheld microsurgical instrument using inertial sensing,

piezoelectric actuation, and adaptive tremor canceling based on the WFLC algorithm. (Robotics)

(40) As can be seen, *the improved 3D-MSSD algorithm provides* between one and two orders of magnitude improvement over existing methods. (Computing)

Visuals are particularly useful in engineering contexts for proving the writer's claims while remaining objective, impartial and face-redressive (examples 41 and 42):

(41) *As seen from the simulations, configurations show* a regular pattern. (Robotics)

(42) *Fig. 2 shows* the measured downstream CNR values for AM-VSB CATV under NTSC channel number (CH2 CH41) over a 4-km MMF transport. (Telecommunications)

Another common strategy for the description of a fact and the statement of a claim is to use passive sentences without an agent (43 to 46):

(43) When Asymmetry Faces are explicitly included with existing face identification methods, obvious improvements on classification rates *are observed*. (Computing)

(44) With the proposed speed-error controlled interpolation, although the machining time increases because of the reduced feed rate, better machining quality and precision *are achieved* even under high speed machining. (Computing)

(45) Throughout the paper, a multisine approach for trajectory optimization *has been developed and applied* to a nonholonomic WMR. (Robotics)

(46) The improvements *are attributed* to the low accumulated link dispersion and the low crosstalk level from AM-VSB and 256-QAM to OC-48 channel. (Telecommunications)

Impersonal *it* is also a recurrent means of distancing the writer from the process and results of the research under discussion (47, 48 and 49):

(47) In the research presented here, *it was experimentally found* that meshing friction differs from position-dependent friction. (Robotics)

(48) Once the haptic system was built, experiments were run to measure its capabilities. First, its kinematic workspace *was found* by driving the mechanism to its limits. *It was found that* the spherical joint achieves rotations of 270 about the axis, 90 about the axis, and 270 about the axis. (Robotics)

(49) *It has been shown that* the generated trajectories are smooth, always obeying the position constraints at the starting and goal configurations. (Robotics)

Evidential verbs, such as *show, find, demonstrate* and *prove* typically follow these and the other depersonalising constructions. However, speculative expressions can be found when the writer's presence is made explicit (50):

(50) *Our* results, especially those shown in Fig. 5(a), *suggest that* the end mill does not necessarily drill faster with increasing rotation speed, indicating that the end mill does not necessarily need to rotate continuously. (Robotics)

Depersonalising and impersonal constructions are also found when indicating limitations and recommending further research, thus achieving the writer's inhibition (examples 51 to 54):

(51) The main assumption of this study is that the traffic sources generated packets whose fixed-size was equal to the length of a slot. While *this had been assumed* in order to simplify the theoretical analysis and the complexity of the simulations, *it does not correspond to real networking conditions* where the packet size is variable. (Telecommunications)

(52) *There is*, however, a caveat in this scheme. (Telecommunications)

(53) *It would be worth* exploring alternative actuation mechanisms such as piezoelectric, ferroelectric, etc. (Robotics)

(54) *It would be interesting* to extend this work also to scoring functions that are appropriate for model selection. (Robotics)

Paradoxically, personalisation is another common negative politeness strategy. The use of first personal pronouns and possessives can act as a mitigating device when presenting the writer's findings and activities involved in the research. Personal subjects followed by performative verbs attribute all responsibility for the research procedures and the results to the writer and save the reader's independence (55 and 56):

(55) *We defined* five such criteria to evaluate and compare behaviour sets. They are power, usefulness, modularity, reliability, and, flexibility. *We reported* the results of relations between behavior sets using these criteria. *We also defined* four types of conflicts that can occur among behaviors. *We showed* how computations needed for applying the criteria can be carried out. *We also reported* on guidelines to improve a behavior set with respect to the various criteria. *Our* work can be extended in several directions in the future. Robotics

(56) In this work *we concentrated* on finding maximum likelihood models. Robotics

Personal opinion is particularly usual when interpreting research outcome and evaluating the study. The effect is to show respect for the reader's alternative opinion (57 to 61):

(57) Once again, *our interpretation of these findings is that* more informed attitudes about the Internet, albeit skeptical attitudes, lead to greater Internet use. (Computing)

(58) However, relative to energy-filtered image processing, *we believe that* in addition to wurtzite structure N-K exploitation, the ideal way to discriminate between the varieties is to proceed to the ratio of energy-filtered images resulting from windows judiciously selected on ELNES spectra. (Nanotechnology)

- (59) *We conclude that*, for the DCCE method, both in the differential and in the discrete formulations, the critical factor is the disparity (Coef1 disp _ Coef1vel and Coef3 disp _ Coef3vel). The uncertainty coefficients increase as the uncertainty in the disparity itself increase. (Robotics)
- (60) *We therefore believe* that those types of redundancy have helped on-demand protocols to have a better performance. (Telecommunications)
- (61) *We can conjecture that it should* improve the accuracy of our current model. (Telecommunications)

The writer's voice is also heard when s/he accepts limitations, anticipates criticism and suggests future research (62, 63 and 64):

- (62) *Our approach aims at applications where enough freedom of motion is available*. It is suitable for large indoor and outdoor environments. *No considerable gain will be reached in very constrained environments*, such as very narrow corridors or very cluttered environments. *The fewer constraints there are, the more effective the approach is*. (Robotics)
- (63) Although *we* opted for a passive bending mechanism for use with our device, an active bending mechanism within the cancellous bone *might* prove effective in other applications, such as orthopedic surgery. (Robotics)
- (64) Use of *our* device in combination with other methods, such as perfusion in the iliac bone, *might* prove more effective [17]. (Robotics)

III. 3. Accumulation of politeness strategies

In the corpus analysed, a variety of strategies are usually combined in a sentence or a segment of text. It is this cumulative procedure that confers the text its appropriate interactive tone.

Different positive politeness mechanisms help the reader feel closer to the research. In examples (65) and (66) direct address to the reader by means of questions and imperatives, the expression of the writer's personal attitude, the use of *we* and *us* referring to members of the same community, and the examples and clarifications contribute to creating a climate of intimacy and cooperation:

- (65) *An interesting open question concerns* efficient PAC learnability of Markov networks of bounded tree-width, when the target distribution is guaranteed to be such a Markov network (*this is sometimes referred to as proper PAC learnability*). The general hardness result discussed above should not deter *us* from seeking efficient algorithms when the target distribution is guaranteed to be inside the concept class. *For example*, even though probably approximately projecting a distribution onto Markov networks of bounded path-width is hard in general (*as can be shown* by a similar reverse reduction from the Hamiltonian path problem), it can be done in polynomial time when the target distribution is guaranteed to be in the concept class [9]. ... *Note* that if a constant-factor

approximation algorithm on the information divergence itself is found, it can also be used for this PAC learning task. (Robotics)

(66) *It is also interesting to study the weights that carry the decomposition of the reduction in information divergence. In particular, we might ask if the monotonicity is the true property defining the structure of these weights. That is, is any monotone weight function realizable by some distribution?* (Robotics)

The accumulation of negative politeness devices, on the other hand, permits the writer's and reader's distancing from the results. The combination of depersonalising, speculative and hedging devices contributes to the writer's effacement (67):

(67) *The phantom harvesting experiment showed that the new method has the capacity to generate stronger and longer negative pressure by the actuator, suggesting that the manipulator may have the potential to harvest graft from a wider area.* (Robotics)

Personalisation, together with impersonalising strategies and speculation allow alternative interpretations by the reader (68):

(68) *We conclude that, for the DCCE method, both in the differential and in the discrete formulations, the critical factor is the disparity (Coef1 disp _ Coef1vel and Coef3 disp _ Coef3vel). The uncertainty coefficients increase as the uncertainty in the disparity itself increase. [...]. It was also observed that the 3D point depth relative to the cameras is very important to the uncertainty coefficients. Those coefficients increase with a high power (between 2 and 4) of the depth coordinate, so farther objects have much higher uncertainty which suggests that the VZ is more accurate when closer points are used.* (Robotics)

No imposition on the reader is also made clear through the repetition of epistemic modality (69):

(69) *This may not always be the case. For example, the consequence of picking a block up may not maintain the fact that the block is gripped since the block may slip and fall down.* (Robotics)

The alternation of negative and positive politeness strategies points to (1) deference to the reader, i.e. the non-avoidance of personal responsibility, and (2) solidarity with the reader, i.e. the desire to involve the community in the facts and claims. In example (70), *we* stands for the writer in the first three sentences. But in the last two occurrences it includes both the writer and the reader, that is, the scientific community, whose active cooperation is assumed:

(70) *In this section, we focus on simulation to compare WBS algorithms based on the ILP model, WBO-RWA, BPHT and its variation BTMH. We will first present the results for ILP, WBO-RWA, and BPHT for a random six-node network, as our experiments show that the optimal WBS based on ILP formulation is feasible only for such a small network. We then compare the heuristic algorithms BPHT, BTMH, and WBO-RWA only, for larger networks such as the NSF network. From the table, we see that the performance of BPHT is close to that of the ILP model (optimal WBS) and much better than that of*

WBO-RWA. *We note that* the average saving when using WBS is 53% for optimal WBS and 49% for BPHT (comparing with the total ports required when using ordinary-OXCs). (Telecommunications)

Another combination of positive and negative politeness strategies is found in example (71). *We* and *us* in the first sentence and the conversational sounding expression *teaches us a lesson* are positive politeness devices addressed to the scientific community as whole. However, the use of modals, the acceptance of limitations and *we* in the last sentence are negative politeness strategies which make reference to individual and particular research:

(71) In this experiment, *we* also find a few system parameters that may change the normal behavior heavily. One of them is the mobility level – if the model is classified using values from another mobility level, the alarm rate can be much higher. This *can* be solved by randomizing the mobility level in the experiment. However, the current ns-2 code *does not yet support* this feature. *It nevertheless teaches us an important lesson* that a good anomaly detection model should collect all possible value combinations and normal scenarios. *We* plan to develop schemes to cluster and classify the normal scenarios so that we can build specific anomaly detection models for each type of normal scenarios. (Telecommunications)

IV. CONCLUSION

The present study has explored politeness strategies in the discussion sections of engineering texts in the fields of computing, telecommunications, nanotechnology and robotics. Interaction between the writer and the reader is maintained along the discussions with a range of devices aiming at creating reliability and acceptability conditions and avoiding *FTAs*.

The analysis demonstrates that both positive and negative politeness strategies are present in the samples of the corpus, where we observe the writer's preferences for the appropriate phrasing when redressing *FTAs*. Our findings show that in the discussion sections of engineering texts the reader is actively present in the text. With positive politeness strategies the writer seeks to emphasise the solidarity and involvement with the scientific community. With negative politeness strategies the stress is on the individual reader's independence. Positive politeness strategies include claiming common ground and the sharing of feelings, emotions, limitations and difficulties. Solidarity is present when authors address to readers directly inviting them to participate in the acceptance of claims. Negative politeness strategies of vagueness and depersonalisation reduce the writer's commitment to claims. The strategy of personalising, on the other hand, helps to save the reader's independence by attributing all responsibility for claims and denials to the writer, thus respecting the reader's alternative opinion.

The analysis also reveals that the alternation and the combination of both positive and negative politeness strategies result in a cumulative effect. It will be interesting to gain a deeper insight into the network of relationships which is established in a text in engineering

contexts. This approach will contribute to stressing the dynamic and interactive nature of scientific discourse.

REFERENCES

- Bazerman, C. (1988). *Shaping written knowledge*. Wisconsin: University of Wisconsin Press.
- Brown, P. & Levinson, S. C. (1987). *Politeness: Some universals in language usage*. Cambridge: Cambridge University Press.
- Coulthard, M. (Ed.) (1994). *Advances in written text analysis*. London: Routledge.
- Garcés-Conejos, P. & Sánchez-Macarro, A. (1998). Scientific discourse as interaction: Scientific articles vs. popularizations. In A. Sánchez-Macarro & R. Carter (Eds.), *Linguistic choice across genres*, pp. 173-190.
- Hunston, S. (1994). Evaluation and organisation in a sample of written academic discourse. In M. Coulthard (Ed.), *Advances in written text analysis*. London: Routledge, pp. 191-218.
- Hyland, K. (1998a). Persuasion and context: The pragmatics of academic metadiscourse. *Journal of Pragmatics*, 30:4, 437-455.
- Hyland, K. (1998b). Boosting, hedging and the negotiation of academic knowledge. *Text*, 18:3, 349-382.
- Hyland, K. (2005). Prudence, precision, and politeness: hedges in academic writing. In M.A. Olivares Pardo & F. Suau Jiménez (Eds.). *Las lenguas de especialidad: Nuevas perspectivas de investigación* (Quaderns de Filologia. Estudis Linguistics 10). Valencia: Universitat de València, pp. 99-112.
- Kuo, Ch. (1999). The use of personal pronouns: Role relationships in scientific journal articles. *English for Specific Purposes*, 18:2, 121-138.
- Latour, P. & Woolgar, S. (1979). *Laboratory life: The construction of scientific facts*. Princeton: Princeton University Press.
- Myers, G. (1989). The pragmatics of politeness in scientific articles, *Applied Linguistics*, 10:1, 1-35.
- Myers, G. (1992). 'In this paper we report...' Speech acts and scientific facts. *Journal of Pragmatics*, 17:4, 295-313.
- Olivares Pardo, M.A. & Suau Jiménez, F. (Eds.) (2005). *Las lenguas de especialidad: Nuevas perspectivas de investigación* (Quaderns de Filologia. Estudis Linguistics 10). Valencia. Universitat de València.
- Sánchez-Macarro, A. & Carter, R. (Eds.) (1998). *Linguistic choice across genres*. Amsterdam/Philadelphia: John Benjamins Publishing Company.
- Scollon, R. & Scollon, S.W. (1995). *Intercultural communication: A discourse approach*. Oxford: Blackwell.
- Skelton, J. (1997). The representation of truth in academic medical writing. *Applied Linguistics*, 18:2, 121-140.
- Swales, J.M. (1990). *Genre analysis: English in academic and research settings*. Cambridge: Cambridge University Press.