Proceedings of the Second European Conference on Computer-Supported Cooperative Work
Bannon, L., Robinson, M. & Schmidt, K. (Editors)
September 25-27, 1991, Amsterdam, The Netherlands

Participation frameworks for computer mediated communication

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This paper is concerned with the development of a more complex view of the analysis of social interactions in CMC systems. There is an apparent paradox in findings of previous studies of text-based CMC which may be due to the nature of this type of communication for it requires users to orient to two models: conversation and text. This is illustrated by showing the detailed analysis of instances of interactions on a particular CMC system. By utilising the notion of feedback and exploring its function in conversation, we emphasize the need for a more refined view of the relationship between speaker, hearer and feedback. We draw on Goffman's analysis of social encounters and offer a preliminary view of the contributions that participation frameworks and production formats can make to CSCW.

> "Feedback - sending back to the user information about what action has actually been done, what result has been accomplished - is a well known concept in the science of control and information theory. Imagine trying to talk to someone when you cannot even hear your own voice, or trying to draw a picture with a pencil that leaves no mark: there would be no feedback."
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> Norman 1988 p 27

Introduction

The concept of 'feedback' is recognized as an important feature in the design of interactions between computer systems and their users. In a range of interfaces, from those based on natural language to those that manipulate objects on the screen, efforts have been made to ensure that users' actions have an immediate and obvious effect. At the natural language end of this range, Hayes and Reddy (1983) examine

human conversations in order to outline the requirements for graceful spoken and text-based interaction between users and computer systems. One component they identify is 'robust communication' - 'the set of strategies needed to ensure that a listener receives a speaker's utterance and interprets it correctly' (p 233). Hayes and Reddy list three problems of robust communication. First, the listener may not receive the message. Second, the listener may receive the message but may not be able to interpret all or part of it. Third, the listener may receive the message but interpret the message incorrectly. From examining conversations, Hayes and Reddy identify five strategies which could be expressed as forms of feedback - implicit confirmation, implicit acknowledgement, explicit indications of incomprehension, echoing and fragmentary recognition. Natural language systems should conform to one or more of these strategies if interactions with them are to be 'graceful'.

In direct manipulation systems, feedback is displayed through changes in the behaviour of objects (Hutchins, Hollan and Norman 1986). This supports the 'feeling of acting on the objects themselves' and allows for 'the modification of actions even as they are being executed'. By continually showing the state of the system, users feel they are directly acting on the object on the screen and the computer, as an intermediary, is removed from perception.

The aspects of feedback described above relate to design principles derived from studying single users interacting with a computer. There must also be equivalent notions of feedback in multi-user situations. However, the notion of feedback at once becomes more complex as users now not only require feedback from their own computers, but also from other systems on the network and other users. An analogous issue is feedback in conversation. This is often performed through turn-taking, where an interaction emerges in a turn-by-turn manner, each party displaying an understanding of the other's prior utterance. Feedback in conversation is also displayed through the use of 'backchannelling' procedures, that is 'ums', 'uh huh's' and nods intended to convey to the speaker that the listener is attending to what is being said (Duncan and Fiske, 1977). Verbal and non-verbal responses have been termed collectively as back-channel behaviours (Yngve, 1970)

In text based computer-mediated communication (CMC)[1] there seems to be an assumption that the interaction is similar to a conversation. Recently several researchers have examined different forms of CMC. Most of these have concentrated on the way that users give and take turns. Bowers and Churcher (1989) review previous work on electronic mail and computer conferencing and show that there are apparently contradictory claims for these types of communication. Severinson Eklundh (1986) suggests that electronic mail is based

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1 Bannon (1986) reviews a range of computer systems that could be considered to support communication which includes single computer systems, shared file systems and electronic mail. In this paper we will be begin by concentrating on a system that is primarily intended to support text-based synchronous communication.

around a three-part turn structure while Hiltz (1977) claims that turn-taking has little influence on computer conferencing. Bowers and Churcher (1989) show that in fact two-part turns appear to predominate in computer-mediated conversations, yet the nature of turn-taking is different in this medium to that of conversation. Although computer-mediated conversations may be locally managed, Bowers and Churcher state that not all computer-mediated communication is conversational. Instead, CMC consists of a mixture of local and global structure with conversation-like turns occurring within globally managed episodes.

McCarthy et al (1990) explore a 'minimal' synchronous electronic conferencing system. They suggest there are four generic communication tasks to be supported by any communication system: synchronising communication, maintaining conversational coherence, repairing conversational breakdown and maintaining shared focus. They take various approaches to discourse and conversation from the social sciences to show problems encountered by the users of their system. In particular, they suggest that 'users abandon a strict turn system' and some interactions are 'different from well-ordered, turn-based, conversation'.

In his examination of CMC, McIlvenny (1990) sets up a framework based on Suchman (1987) whereby he records pairs of users at each end of a communication link. He introduces notions of transience, permanence, turn-construction, monitoring and 'double dialogues'.

In common with McCarthy et al. and McIlvenny, we focus on a synchronous CMC system. However, our system was intended for facilitating private interaction between sub-groups of users. All users were linked into a conferencing telephone system, but because anything they said over the telephone was audible to everyone, private, person to person interactions had to be communicated through a text-based medium on the computer screens. By examining details of instances of interactions on this system, we develop the notion of feedback in terms of the nature of the participation of the users. From this we offer some recommendations for the design of this type of application and for CSCW systems in general.

The Paradox in the Nature of CMC

The work mentioned above appears to suggest a paradox in the nature of computer-mediated communication. When the participants are both geographically dispersed and their communication is asynchronous, their conversational interaction is 'locally managed and structured around adjacency pairs' (Bowers and Churcher 1989). However when their communication is synchronous, 'users abandon a strict turn system' and 'interleave adjacency pair parts in an apparently unconventional way' (McCarthy et al. 1990). These results seem surprising as it would be expected that the synchronous nature of a computer-mediated interaction would increase its similarity to 'conversation'. This paradox may be due to the way these studies have compared CMC to conversation using 'findings' of Conversation Analysis such as 'adjacency-pairs' and yet have overlooked some of the basic assumptions from

which they were derived. For example, McCarthy et al. compare an interaction with question-answer adjacency pairs and yet attempt to describe these questions and answers in terms of 'illocutionary force', a notion from Speech Act theory (Austin 1962, Searle 1969, but c.f. Levinson 1983).

In this paper we will begin to show some of the complexities of applying the notion of 'feedback' taken from studies of other types of communication systems to CMC. It is too simplistic to view the interaction as switching between speaker and hearer, with one participant responsible for providing 'feedback' to the other. It is also necessary to decompose the nature of the rôles of speaker and hearer in a social encounter. By drawing on Goffman's analysis of social encounters we will offer a preliminary view of the contributions that participation frameworks and production formats can make to CSCW.

An Example of Text-Based CMC

In order to explore the paradox mentioned above, we will describe and explicate details of instances of synchronous CMC. The data for this investigation consist of logs and recordings of groups using a networked program. Users were given the task of playing several campaigns of a networked version of DIPLOMACY. (Hewitt, Wilbur and Gilbert 1991). DIPLOMACY is a game of skill normally played on a board on which is drawn a schematic political map of Europe as it was in 1901. Each player acts the part of a country and aims to conquer the rest of Europe. The merit of this particular game is that players are unlikely to win if they act on their own; to conquer other countries they need to form alliances. A computerised version of this game must be able to support the dynamic formation and dissolution of groups of players.

A prototype networked version of DIPLOMACY has been implemented using SUPERCARD[2] and HYPERAPPLETALK[3]. In the networked application, there are several windows available to players: a map of 1901 Europe which represents the current state of play; a window to set up negotiations, that is, to select countries with whom to negotiate; a text window in which to communicate privately with other allies; a trial map for members of a negotiating group to display possible moves; and a text field in which to type movement orders at the end of a campaign.

Players have several channels of communication open to them; all players are connected by an audio link conference call, subgroups of players can communicate through a text field which is private to the subgroup, and subgroups also interact through the trial map. This analysis will concentrate on audio recordings of the telephone link and logs of the contributions to the text field.

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2 SUPERCARD is a personal software toolkit produced by Silicon Beach Software.

3 HYPERAPPLETALK is a local area networking library that is produced by the Apple Corporation

Conversational Organisation of CMC

As Bowers and Churcher (1989) and McCarthy (1990) suggest, CMC does appear to possess similar interactional features to conversation. In the following instance, two parties France (F) and England (E) begin a negotiation in the text field.[4]

(1) England :12:07:17 pm Sun, Aug 19, 1990

((F selects England on negotiate card
and then presses the talk button))
((E selects 'Yes' on the dialogue box))
F : How about forming an alliance
E : Yes
F : You could head up north and north central
europe and I could go for south and south
central europe
E: OK - so which countries exactly would
you require my support for?
F: As germany and italy are neutralshould
be easy to take them

France's "How about forming an alliance" (line 4) both initiates a topic and makes an offer to England. In accepting, England's "Yes" (line 5) appears to recognise the previous utterance as an offer. Similarly, France's next statement (lines 6-8) displays a recognition of England's acceptance. At the same time, France offers a suggestion for a possible strategy. Again, England's "OK" recognises and accepts France's suggestion (lines 9). Following this, England asks a question (lines 9-10) which France answers (lines 11-12).

The interaction, therefore, appears to proceed in a turn-by-turn manner, each participant displaying their understanding of the other's prior statement and advancing the context for the next statement. The parties are 'locally managing' the interaction.

In Hayes and Reddy's (1983) terms, the turns in fragment (1) are instances of graceful and robust communication. A listener implicitly confirms and acknowledges that he has received and interpreted the speaker's utterance. However, it is important to note that this confirmation and acknowledgement occurs in and through the next 'message'. As in conversation, the participant's roles within this type of interaction do not simply switch between 'speaker' and 'listener' (see Levinson 1988) nor is one participant solely responsible for 'feedback' to the other's utterances. Instead, it is through the turn-by-turn character of interaction

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4 The data are an exact replication of what the users typed into the text field. Each new contribution appears in the recipient's text field only when a user presses the return key. This is shown in the transcripts by prefacing each contribution by the first letter of the country the user is playing. It is possible for one player to send consecutive contributions.

that the participants display their understandings of the state of the interaction (cf. Heritage 1984).

Further examination of instances of data reveal other similarities between the organization of talk and the organization of CMC, particularly in the way interactions commence (cf. openings, Schegloff and Sacks 1973) and topics within the interaction change (cf. preclosings, Schegloff and Sacks 1973, Button 1987).

Textual Organisation of CMC

In the preceding section we outlined the ways in which it appears that a structure based on turn taking emerges from the negotiation. However, this assumed a similarity between turns of talk and typed utterances. Sacks, Schegloff and Jefferson (1974) formulate an ordered set of rules for the allocation of the next turn in a conversation. These are applied at transition-relevance places (TRP) within a turn. If at a TRP the current speaker does not select a next speaker and no hearer self selects, the current speaker may continue. Thus, in broad terms, participants in a conversation have to monitor continually the production of a turn for possible points of completion. In the following fragment France and England are negotiating[5].

(2)

1	E:	France - I'm still here, but considering	
2		your offer. I'm not sure that you might	
3		gain all the advantage by taking	
4		Germany (the black bit, whatever that	E: It's a problem remembering
5		is!) But as long as I can be assured of your	what countries are
6		support going into Russia and down into	F: Press on the main map to
7		the grey and orange bit beneath (I'm not	find out what the names
8		too good at Geography!)	are
9	E:	OK, I just had a look at the map again.	
10		Your strategy seems ok.	
11	F:	the grey and orange bit is austria so be	
12		careful as Mary is austria	

If we want to maintain the idea that turns in this interaction are similar to turns of talk, then there are TRPs at line 8 where England continues her turn and at line 10 where France self selects. Yet, France's turn does not appear to relate to what is immediately prior, for it refers back to the first part of England's turn (lines 7-8).

It does seem to be the case that France is orienting (lines 11-12) to a TRP after line 8, but both the size of England's contribution (lines 1-8) and the time it takes to construct, delay a response from France. In fact, England's contribution does not appear to be designed as an interactional component. Although speakers in a

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5 In this instance, the text the users type appears in the left hand column and their conversations on the telephone conference call appear in the right.

conversation can hold the floor for a long time, they tend either to preface packages of talk with some sort of initiator or the turn emerges through several TRPs. Neither of these appear in lines 1 to 8; rather England's contribution appears as a recognisable piece of text (e.g. she brackets part of the text).

Because of the design of the system, France is unable to monitor England's turn as it is produced. More pertinently, close coordination of speaker turns in conversation relies on speakers positioning the start of their turn immediately after the prior turn. France's failure to do this results in England continuing her turn. This is due to the nature of this type of text based CMC. Neither participant is able to monitor the production of the other's utterances and therefore cannot fully coordinate the production of their own.

One way of characterising this passage is in terms of two models of interaction, text and conversation. The users are combining devices from each model in the course of the activity. This has implications for design of CMC systems. For example, McCarthy et al (1990) have proposed 'quick response mechanisms' that might be useful in coordinating the interaction, such as 'I agree' or 'OK' buttons. Although these devices may be useful for 'receivers' of messages, they assume that users are orienting to the interaction as a conversation. But if users are constructing their messages as pieces of text, even if, as McCarthy et al suggest it appears as it is typed, coordination of the use of these devices with the text might still be problematic.

In conversation, it may seem that 'feedback' is performed as each turn displays an understanding of the prior. This relies on participants monitoring talk as it is produced and tying in talk into another's turn. In text-based CMC these activities are more difficult; monitoring is performed by reading, and coordination is by tying one's typing to another's both spatially and temporally. Furthermore, any analysis also rests on a rather crude characterisation of 'interaction' as individuals intermittently switching rôles of speaker and hearer.

Participant Framework and Production Format

Goffman (1981) criticises a view commonly held of the simple dyadic relationship of speaker to hearer in a conversation. In this view, only two individuals are involved and the rôles of speaker and hearer are interchanged as they pass turns back and forth to one another. He argues that this is insufficient for the analysis of social encounters. He goes on to decompose first the notion of 'hearer' and then of 'speaker' by examining the status of participants in a social encounter[6]. First, there

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6 Goffman (1972) describes an encounter as involving, for participants 'a single visual and cognitive focus of attention; a mutual and preferential openness to verbal communication; a heightened mutual relevance of acts; an eye-to-eye ecological huddle that maximises each participant's opportunity to perceive the other participants' monitoring of him' (p.19)

is the official status of a *ratified participant.* Ratified participants can either be *addressed* or *unaddressed.* In two party interaction, one of the parties will be addressed and in multi-party interaction it will often be the case, at least in periods of the encounter, that one party is addressed leaving others unaddressed. *Unofficial participants* to an interaction can still be listening: either as *overhearers* or as *eavesdroppers.* As Goffman puts it, "a ratified participant may not be listening, and someone listening may not be a ratified participant". He then continues by outlining the relations between these rôles, examining the interaction at the time that one party is speaking. He argues that one can describe the rôle and function of all the other members in the social gathering in relation to the speaker. On an individual level, the relation of each member to the speaker's utterance is that member's *participation status.* At the level of a gathering, the relation of all the members to the speaker's utterance is the *participation framework.*

When considering the notion of speaker, Goffman suggests three further categories. First, the *animator*, a category similar in kind to that of recipient, someone who produces the utterances. Second, the *author*, someone who selects 'the sentiments that are being expressed and the words in which they are encoded'. Third, the *principal*, someone who is actually committed to the words that are spoken. Commonly, the term 'speaker' implies the case where all three categories are taken together. However, individuals can recite other people's words and can speak 'for someone else'. They can also switch between these rôles even during the course of producing an utterance. The *production format* of an utterance is its relationship as it is produced to these three categories. Levinson (1988) attempts further clarification of both 'reception rôles' (cf. participation framework) and 'production rôles' (cf. production format), by introducing further categories with finer distinctions. Also, Goodwin (1981, 1984) has revealed the ways that in face-to-face interactions participants display and manage their differing participant statuses to one another through their gestures, gaze and talk.

Goffman's production formats and participation frameworks and related, recent developments by Levinson and Goodwin have direct implications for CSCW systems. In determining the requirements of a CSCW system, the notion of production formats and participation frameworks can be useful for examining the practices of people working in real world environments. For example, Heath and Luff (1991a), using this as an analytical device, have revealed the details of the nature of communication and collaboration in a complex technological environment. In a London Underground Control Room, a controller talks to an operator of a train (an addressed recipient) while his talk is also available for public announcers (unaddressed recipients) to monitor. In a study of a similar type of operations room, Goodwin (1991) develops the notions of 'overhearers' and ratified participants in an environment where operators use a range of technologies and monitor each others' talk and activities, yet sit 'back-to-back' rather than 'face-to-face'.

In addition, there are implications for the design of CSCW systems. A 'speaker' may expect a different nature of 'feedback' from a ratified addressed participant than from an unaddressed one. Meanwhile, both addressed and unaddressed participants may provide feedback, changing their respective statuses. Thus, CSCW systems that aim to be sensitive to the range of user rôles in an interaction must provide facilities for users to monitor others' activities, to display that monitoring to others and to allow for shifts in the participation status of users in that interaction.

Multi-party CMC

In previous sections we have analysed instances of synchronous CMC where communication takes place between two participants. We concluded that although there may be similarities between the organisation of talk and the organisation of CMC, problems with this view arise when the notion of feedback as monitoring and coordination is incorporated. We have emphasised that feedback is more difficult to give when monitoring can only be performed by reading and coordination can only be performed by typing. In multi-party CMC, as might be expected, monitoring and coordination become even more complicated. In the following excerpt Turkey, Austria and Russia are still negotiating[7]. Just prior to this fragment, Austria has selected Russia and Turkey to negotiate with.

(3)

1 R: Turkey what do you suggest?
2 T: austria to italy, turkey to bulgaria, russia to
3 germany, ok?
4 A: Fred do you think it wise to give Russia all
5 that power, I'll take Germany, probably Italy is
6 less strategic Russia to take Scandinavia and
7 Turkey to come through Rumania to Italy
8 T: ok by me
9 A: Do you want to try moves
10 R: Yes, show me some moves baby!!!

All the users appear to be full participants in the interaction and, as in (1), the interaction appears to be organised in a turn-by-turn fashion, each turn displaying an understanding of the prior. Nevertheless, such an interaction would be unusual in a conversation as the participants select the next contributors by identifying them by name; Russia in line 1 and Austria in line 4. By selecting 'Turkey' as the next, Russia not only addresses Turkey but also explicitly does not address Austria. Similarly, when Austria identifies 'Fred', Turkey is addressed and Russia is not. Although all users are participants in the interaction, they do not each have the same status in it.

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7 Turkey is played by Fred.

When Austria selects Russia and Turkey for negotiation both Russia and Turkey become ratified and addressed participants in a three party interaction. The other players, France and Germany, become unratified participants. By identifying Turkey, Russia selects Turkey as the next speaker and also transforms the participation framework (line 1). Turkey becomes the addressed participant and Austria the unaddressed participant. At this point, Russia's message is available for monitoring by both ratified participants. As an addressed participant, Turkey responds to Russia's question with a suggestion for next possible moves (line 2). Again, there is a shift in the participation framework. Austria remains an unaddressed participant, but Russia now becomes the addressed participant. By Austria contributing (line 3) she moves from being an unaddressed participant and by selecting Fred (Turkey) as the next speaker at the beginning of the turn, the participation framework changes once more, Russia becoming the unaddressed participant. Turkey responds to Austria's statement and there is yet another shift in participation statuses. By examining the contributions to the communication in fragment (3), we can see the way that a participation framework can be transformed throughout an interaction. The interaction is sensitive to these changes, and shifts are displayed not only after a contribution has been made but also within a contribution.

In instances 1, 2 and 3 participants gained a ratified status because their negotiations were carried out within a shared but 'private' communications window. However telephone links connecting all players on a conference call allowed participants to have a different status, that of 'overhearers'. In fragment (4), France is carrying out a negotiation with England, while Austria, Russia and Turkey are carrying out another, separate negotiation.[8]

(4)

1		F: Got to go into the sea first
2	A: If france is talking about moving the fleet we	
3	must defend Italy, over to you Steve	
4	R: Why?	

In this instance, Austria appears to overhear the talk between France and England on the telephone, an encounter in which she is not a ratified participant. She then displays her overhearing to the participants on her encounter, also selecting (Russia) as the next speaker.

Viewing CMC as a participation framework appears to be a useful way of describing the details of the moment-to-moment interaction as it unfolds from the point of view of each user. Further work is necessary to apply Goffman's analysis to CSCW, but it should provide a better starting point than characterising interactions between users as speakers and hearers 'switching' control of the floor between them. It will also be necessary to utilise recent theoretical and empirical

8 The contributions in the shared window are transcribed in the left column and talk on the telephone conference call is transcribed on the right.

developments to Goffman's framework (e.g. Goodwin 1984, Levinson 1988). Although this type of analysis appears to apply most to systems where users collaborate through text or speech, it could also apply to systems that involve direct manipulation of objects. In these it is also necessary to identify the various participating rôles of the users and the ways their actions can change format through their production.

Conclusion

We have shown an apparent paradox in the findings of previous studies of text-based CMC. Users appeared to have problems orienting to turn-taking in synchronous communication whereas asynchronous communication was found to be structured around turns. This paper suggests that this paradox may be due to the nature of this type of communication for it requires users to orient to two models. We have shown that users do indeed design contributions as interactional units and that other participants appear to display an understanding of these as such. However, we have also shown that users design contributions as pieces of text. The confusion of these two tasks appears to lead to interactional difficulties.

The notions of participation framework and production format have also begun to inform the design of systems to support collaborative work. Heath and Luff (1991b) in their study of video-mediated interaction reveal some of the interactional asymmetries of the medium. They suggest that these asymmetries, by rendering nonverbal behaviour relatively ineffective, can allow users to remain insensitive to the demands of others in an office environment. As users may have to cope simultaneously with the demands of being an addressed participant in an interaction and having to use a range of technology, the insensitivity of the medium may facilitate rather than undermine collaborative work. Furthermore, they suggest that developments in multi-media technology could be towards letting users control their own visual availability and the accessibility of the co-participant. In other words, allowing users more control over their participation status and allowing this to change throughout an interaction. Other developments in CSCW appear to be directly related to issues in participation frameworks and production formats. For example, Greenberg (1990) describes an interface that gives feedback on whether users have control of the floor, want control of the floor or are just observing. This could easily be developed to take into account other participation statuses. But more importantly, devices must be designed which take into account the way a participation framework emerges turn by turn and the way a production format transforms within a turn.[9]

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9 It may be interesting to consider electronic mail and other forms of CMC in terms of a production format. For example, changes in category from author to animator (or 'forwarder') may be marked in contributions to electronic mail.

We have begun to show some of the complexities of applying the notion of 'feedback' taken from studies of other types of communication systems to CMC. It is too simplistic to view the interaction as switching between speaker and hearer, with one participant responsible for providing 'feedback' to the other. It is also necessary to decompose the nature of the rôles of speaker and hearer in a social encounter. By drawing on Goffman's analysis of social encounters we have offered a preliminary view of the contributions that participation frameworks and production formats can make to CSCW. These include: the analysis of the requirements for systems to support collaborative work, the analysis of users interacting through these systems and ultimately the design of systems which support different participation rôles within an interaction.

Acknowledgements

We would like to express thanks to members of the TMPI project; those at Queen Mary and Westfield College, Betty Hewitt and Sylvia Wilbur and from British Telecom Research Laboratories, Alastair Rogers and Keith Dickerson. We would particularly like to thank Christian Heath for his support and advice. And last but not least many thanks to all the people who came to play DIPLOMACY.

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