



European Science Foundation - SCH<sup>1</sup> Exploratory Workshop:  
**Face-to-face communication over the Internet:  
Emotions in a web of culture, language and technology**  
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# Final Report

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<sup>1</sup> ESF Standing Committee for the Humanities (SCH) - Web site: <http://www.esf.org/sch>

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## Preface<sup>2</sup>

Human communication is a multi-channel process that usually involves verbal content but also non-verbal behavior, such as facial actions, paralinguistic features of the voice, posture, gestures, gaze direction and the relative position of the interactants. Modern society has increasingly come to rely on means of communicating over long distances using written media, telephone and, more recently, video-based means, such as picture-phones, dedicated video conferencing systems, or the Internet. As much of communication involves affective contents there has been a long interest in how emotions and other mental states are communicated in interaction. The use of video-mediated communication raises new questions concerning the influence of the medium on the process and outcome of such interactions. Furthermore, there are questions regarding the influence such types of communications have over time as far as relational networks and working conditions are concerned. Lastly, the global nature of the Internet raises issues relating to intercultural exchanges.

Arvid Kappas (The University of Hull) convened this exploratory workshop, funded by the Standing Committee for the Humanities of the European Science Foundation, inviting eleven researchers from nine European countries to identify the issues involved in face-to-face communication over the Internet. All are specialists in research on emotions and non-verbal behavior and set out to elucidate 1) the basic issues as they relate to cognition and perception in the specific constraints of web-cams and video conferencing, 2) how the communication of emotions and person perception is affected by this means of communication, 3) how differences in cultures and languages interact and at times interfere with communication in this mode, 4) to what degree the national and cultural context in Europe imposes differences on the use and the meaning of such media.

The aim of the workshop was to serve specifically the following functions: 1) Identify the issues linked to face-to-face communications with a special emphasis on the communication of emotions and attitudes in a European context, 2) Limit the issues that should be studied in a consorted fashion by a group of European researchers, 3) Develop a sequential strategy for the empirical study of these issues - starting from observation and the development of the paradigms, selection of relevant measures, and the creation of stimuli, up to the implementation of a series of international collaborative studies. The structure of the workshop involved formal presentations by each of the participants, discussion rounds, and the development of the outline of the projects to be proposed. In addition to the originally invited researchers Nicole Krämer (University of Cologne) and the representing the SCH Arto Mustajoki (University of Helsinki) attended the meeting. Agneta Fischer (University of Amsterdam)

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<sup>2</sup> We are grateful for the help we received from Philippa Rowe at the ESF, Eva Krumhuber who managed part of the organisation and provided support at the meeting, Dimitrios Xenias and Malathy Rengamani who generously provided their time and support during the meeting, as well as Dr Anna Pecchinenda and Dr Naz Derakshan who joined the discussions on Saturday evening.

could not physically attend the meeting but sent her contribution, which was presented at the workshop.

This final report summarizes the outcomes of the workshop. We intend to collect the formal presentations and produce a proceedings volume that could identify the core issues of face-to-face communication of emotions over the Internet in a European context (see section *Outcomes*).

## **Presentations**

**Arvid Kappas (University of Hull)**

### **Face-to-face communication over the Internet: Emotions in a web of culture, language and technology**

A workshop on the communication of emotions over the Internet seems a timely enterprise. The use of the Internet for communication, both private and in professional contexts, “exploded” in the last few years. The Internet is now a commonplace tool for many users, all over the world, not only for obtaining information, but also for telecommunication. While email had already been accepted during the last decade as a moderately fast medium for professional and informal exchanges, there is an increasing use of more immediate means of text based computer mediated communication (CMC) using special programs that allow real-time text based exchanges, be they person-to-person (e.g., ICQ, Messenger) or in groups, such as in chat rooms.

However, while real-time text-based exchanges have become routine for many years, there is also a rapid increase in video mediated communication (VMC; e.g., web cams, video conferencing) as network bandwidths increase and faster communication speeds become more widely available. While expensive dedicated video conferencing systems have been available for years, they have been expensive and their use has been typically restricted to larger corporations or some educational institutions. Previous attempts at marketing dedicated videophone systems targeted for home use have largely failed. Yet, the rapid growth of the Internet has allowed Internet based point-to-point VMC solutions to challenge expensive dedicated systems. Web cams can be bought for little money and free software, such as NetMeeting allows easy face-to-face communication in a variety of contexts, such as business, consulting, education, media/information, medical, and of course the private sphere. The added value of seeing the person “on the other end” is likely to affect profoundly *what* is being communicated and *how* in any of these circumstances.

Obviously, acceptance of these new media has not been universal, there are practical considerations, such as cost, the availability of hardware and infrastructure, limitations of the medium, such as quality (e.g., image, sound, synchrony). Also, not all types of face-to-face interactions can be replaced by telecommunication for example due to real or perceived privacy issues. Surprisingly, it might be that adding nonverbal communication does not necessarily increase the quality of interaction compared to a text-based communication. There is much need for research that analyzes the actual

interactions, their differences as a function of the medium and the associated limitations.

Furthermore, little is known regarding the social and psychological impact of using these media. It can be assumed that a trend towards home offices and virtual offices has long-ranging effects on the structure of the work place and for families. Yet, it is likely that extended use of these new media has also far-reaching effects for the individual, such as a long-term influence on interpersonal relations, the size and structure of the relational network and changes in types of relations. Such effects can be positive, such as in increasing support for physically isolated individuals, but for others it might mean an increase in isolation and a significant and detrimental change of activity patterns.

Acceptance of these media differs likely as a function of age, education, and socioeconomic status, but it also differs as a function of the national, geographical, or cultural areas. Factors that play a particular role here are differences in cost and availability in different regions as well as cultural heterogeneity within such regions. Potentially, VMC could play an important role for European integration but of course, as compared to areas such as the US, language and paralanguage differences are pronounced. Potentially, there are questions regarding international exchanges, be they professional or private, that are particularly evident in a European context because of the large heterogeneity present.

Research in this area needs to anticipate certain technological developments. On the one hand it is obvious that quality of the transmission will increase, together with increases in the ease of use and a comparative drop in prices. However, it would be wrong to assume that the development of facilitating face-to-face communication will end here. Just like in the early days of audio-based telecommunications, means have been devised to cope with the restrictions in and cost of bandwidth. Instead of sending a broadband facsimile of the audio or video signal, information can be sent that will drive a synthesizer on the other end to recreate the original message. In the context of email, users have long used emoticons, little symbolic faces and gestures to augment the text-based message. The development of *avatars* has increased this trend. Avatars can be static pictures or drawings, they can move at different degrees of realism. It is here that completely new uses of video-based communication become evident. The option of using an avatar that does not resemble the sender gives self-presentation a whole new meaning. Advanced devices, such as hand-held video mobile phones, are arguably more likely in the future to use realistic resynthesized images than real images. This can solve the problem of appearing in a calm environment with a clearly visible face when actually a person might be sitting in a busy train. This is a good example where a study of these processes will be able to elucidate some basic issues (such as self-presentation) while being very relevant for the specific applied issues as well.

**Antony S.R. Manstead (Cambridge University)**

**Social (and other) constraints on computer-mediated communication of emotion**

This paper begins by briefly reviewing what we know about emotional communication without reference to the Internet. It is argued that this literature points to several conclusions. First, the psychological (rather than physical) presence of others plays a key role in shaping facial displays. Second, although these facial behaviors are affective, it would be wrong simply to characterise them as expressive (or not expressive) of emotion. Third, these facial behaviors can be (and often are) regulated for social purposes. The paper goes on to consider ways in which adding video might affect computer-mediated communication of emotion. Four constraints on such communication are identified: a social constraint, a serial processing constraint, a disembodiment constraint, and a bandwidth constraint.

**Agneta Fischer (University of Amsterdam)**

**Gender and emotions on the internet: Towards equality or stereotyping**

Amazingly, there are only a few studies on the way emotions are communicated in computer-mediated communication (CMC). These focus on “flaming”, the use of graphic accents, emoticons, and on sexual attraction. However, these studies are not very systematic and often do not focus explicitly on emotions, so there is a need for empirical data in this area. There are even less studies on computer mediated Face-to-Face (FtF) communication. Emotions obviously are expressed differently in CMC than in FtF communication. These differences may lead to misunderstandings in social interaction, or to the unjustified use of social power, or to stereotyping of certain social groups. Consequently, I argue that there is a need for systematic research to identify differences between emotion expression and recognition in CMC and FtF and to examine its consequences for further social interaction. Main differences between both modes of communication regard anonymity versus identifiability of the participants, features of text-based versus multi-channel communication, as well as issues regarding asynchronous versus synchronous communication.

These differences are likely to have implications for emotion communication in general, and especially for gender differences. Specifically, emotion expression in CMC is assumed to be more stereotypical than FtF, when gender cues are more salient than other – individual – cues. Furthermore, emotion expression and recognition in CMC is assumed to be more similar for men and women, when emotion expression via text appears to be less ambiguous than FtF. I propose a series of studies that manipulate visibility and anonymity of the interactants, the type of emotion that is to be communicated, and the gender of the interactions in a variety of computer mediated tasks.

**Virtual interaction and real emotion: Culture, communication and nonverbal behavior via the Internet**  
**José-Miguel Fernández-Dols, Pilar Carrera, & Jorge Mochales**  
**(Universidad Autónoma de Madrid)**

In what ways can the study of nonverbal behavior contribute to the improvement and understanding of face-to-face communication via the Internet? A first way of approaching this question is to study nonverbal behavior in communication in the Internet. A second, and probably less obvious way, of approaching this question consists in studying nonverbal behavior as communication in the Internet, i.e., studying nonverbal behavior as a metaphor for developing new theoretical models and applied projects around Internet communication. If computers became the most pervasive metaphor of the human mind in Cognitive Psychology thirty years ago, nonverbal behavior could constitute an “inverse” but equally pervasive metaphor for interaction between computers and human beings today.

In our report we have applied this second approach, using the study of facial expression as a source of metaphors for the study of page design in Internet. Facial expression is a natural resource that human beings use for fostering social links. Facial behavior aimed at others is a way of satisfying our motives by making our interactions trustworthy and readable. In other words, facial behavior is a tool for becoming more “domestic” to others, i.e., more predictable, oriented to a social structure; facial behavior is an economic way of negotiating our demands, and of showing that we are capable of reproduction and are peaceful, and not too unstable.

This approach to facial behavior has interesting consequences for the design of Internet pages. If we approach the computer screen as a human face, we can design a set of rules about the ideal traits of a trustworthy and readable screen. In this way, we have developed a model of “screens as facial expressions” that is corroborated by current literature on design principles for websites and some preliminary pilot studies carried out in our laboratory. For example, as facial expressions, screens should be freestanding (not too demanding for the user), be connected to networks of pages (easy negotiation on content), have direct access (easy reproduction), be based on repetition in design (predictable), be complex but consistent (peaceful, reliable personality) and be designed for guaranteeing the visibility of links (social structure oriented). This parallelism has interesting consequences for design as well as for the study of the functions of Internet in everyday social encounters.

**Pio Enrico Ricci Bitti (University of Bologna)**

**Nonverbal communication and cultural differences: Issues for face-to-face communication over the Internet.**

1. Intercultural communication is an area where many people feel more comfortable dealing face-to-face. One reason for this is that there is less redundancy in encounters where either or both parties are unfamiliar with the social rules for conversation. In these uncertain situations, people often feel a need to have all the information they

can get, and the verbal behavior on its own leaves them in doubt about what the other person “really” thinks. In general, the more sources of communication in a relationship, the easier is to detect misunderstanding and miscommunication, and to correct them.

2. Language is accompanied by a continuous flow of nonverbal communication, which involves not only different voice modulations, but also facial expression, gaze direction, gestures, posture and other spatial configuration of behavior. Misunderstanding based on differences in nonverbal behaviors is produced or received outside of complete conscious awareness. Nonverbal behavior functions largely to express emotion, mood, identity and attitude in conversation.
3. At present the face-to-face interaction via Internet is not yet a completely adequate substitute of face-to-face encounters. It is interesting to realise that as a paradox the teleconference increased the need of real encounters instead of decreasing it. The opportunity to have real face-to-face encounters, in fact, provides the possibility of informal interactions, that facilitate the transmission of important information and the decision making processes that seems not yet possible via teleconference. Many observations show, for example, that only real face-to-face encounters can facilitate complex and conflicting negotiation.
4. Some problems concerning face-to-face communication via the Internet can increase some typical difficulties people meet during interaction with members of different cultures.
  - a. Gaze direction. In face-to-face communication mediated by a computer, because of technical reasons, it is difficult to use effectively gaze direction; the necessity to look contemporarily both at the screen and at the web-camera can cause a loss of important information and a desynchronization of interaction that can disturb or interrupt the communication flow.
  - b. The feedback signals. During the face-to-face interaction via computer both to send and to receive feedback signals is more difficult; and we observe an increase of verbal and vocal feedback signals as a substitute of kinetic feedback information, usually provided by facial expressions (i.e. micro-expressions), head movements, gestures....
  - c. Turn-taking. The face-to-face interaction via computer needs more time to regulate the synchronization among the two interactants than the real face-to-face encounters; and for this reason the negotiation of turn-taking results to be more difficult.
  - d. Gestures. During face-to-face interaction via computer hand and body movements accompanying speech can be limited, causing negative effects both for the speaker and for the receiver: they are important, in fact, not only as additional information for the



receiver, but they play an important role also in the planning of discourse, and allow increased fluency. Another possible problem concerning gestures is technical in nature, and consists in a speed discrepancy between vocal and visual information; this effect results in an impression of not being “natural” and negatively affects the attentional processes of the receiver.

- e. A final technical problem that can interfere with non-verbal communication in face-to-face interaction via computer could be mentioned. If the size of the windows on the computer screen, where the interlocutors appear, are too small, many nonverbal signals lose their communicative functions.

**Brian Parkinson (Oxford University)**

### **Video-Linked Affect: Transmission Delay Disrupts Interpersonal Co-ordination in Computer-Mediated Communication**

How does video mediation influence communication of affective information?

The present study specifically investigated the effects of transmission delay on the co-ordination of affect in interpersonal interaction. Twenty-one pairs of participants discussed liked and disliked celebrities via a desktop video-conferencing system under conditions of minimal and normal transmission delay. Dependent measures included evaluative ratings of the celebrities and of the other party in the conversation and video-cued momentary codings of the interaction. Participants rated the extent of communication difficulties as greater in the normal than in the minimal delay condition, but did not specifically focus on delay itself as the source of the problem. Minimal delay pairs showed greater similarity and correlation in momentary ratings of attunement and involvement over the course of the conversation. Further, there was greater convergence of affect when participants discussed mutually disliked celebrities, but greater divergence of affect when they were talking about celebrities liked by one party to the conversation, but disliked by the other. These results are consistent with the view that the immediate interpersonal feedback provided by facial expressions facilitates the development of mutual rapport when attitudes are convergent. It is argued that the emotional consequences of using video-mediated communication merit further research attention in order to complement the predominantly cognitive and performance-based focus of most previous studies in this area.

**Karl Grammer (Ludwig-Boltzmann-Institute for Urban ethology, Vienna/Austria)**

### **Emotions and Personality in Embodied Systems**

Most computers and software applications are not comprehensive towards potential needs and problems of users. In the book "The Media Equation" (1996), Nass and Reeves present a body of research which indicates that people treat computers as if they were real people. This, in return, also means that people prefer to be treated by computers in ways that are fundamentally social.

Social interaction between humans and computers requires communication between them which exceeds today's human-computer interaction in the form of rigid pop-up alert windows on the part of the computer. However, in order to become friendly and intelligent companions, computers need to be able to recognize such emotions as interest, distress, and pleasure. Coupled with comprehensive, friendly, and personalized feedback, which is based on the software's knowledge of the user, this is known as "affective computing". Thus embodied systems should be endowed with sensory systems and the respective feedback tools.

The input systems for computers introduced here works with a simple movement monitoring algorithm coupled to time-delayed neural networks, which have learnt to decide reliably which feelings, emotions and personality the user has. This information then can be used by the computer to specifically react to each user and drive the output system.

The output system is an embodied high-resolution agent who is able to show correct emotions. The emotional capabilities and respective facial movements of the agent are implemented on a muscular basis derived from the *Facial Action Coding System*.

Both systems together enable us to carry out experiments on human-computer interactions and even grasp completely new research tasks and applications like cross-cultural communication.

### **Harald G. Wallbott (University of Salzburg)**

#### **Physical constraints on nonverbal communication via the Internet**

In a number of studies it was tested whether distortion of several aspects of pictorial quality had an impact on emotion recognition from facial (and bodily) expression of emotions. Due to the fact that in internet based video conferencing pictorial quality is still restricted to some degree it seems of importance to test whether one of the purposes to send video pictures of a speaker, namely to allow interaction partners access to nonverbal communication stimuli like facial expression, can be fulfilled even under conditions of poor pictorial quality. In two studies either still photographs of facial expressions or short video clips of actors depicting emotions both facially and in bodily expression were degraded systematically with respect to spatial resolution, contrast resolution, picture size, and (in the cases of the video clips) temporal resolution. Results indicate that valid recognition of emotions is still possible even with highly degraded stimuli. Thus, the system of emotion recognition does seem to function effectively even under poor transmission conditions. As pictorial quality of course is only one aspect of acceptance of video conferencing systems some further social-psychological aspects of "being on camera" like privacy regulation were discussed.

**Gary Bente & Nicole C. Krämer (University of Cologne)**

**Moving characters: Person Perception in computer-mediated/generated communication**

The paper focuses social psychological questions related to the use of so called 'avatars' in computer-mediated communication (CMC). The term 'avatar' is used for computer generated and real-time animated anthropomorphic characters that serve as surrogates of the interaction partners in CMC. The use of avatars is thought as a possibility to include nonverbal channels like gaze, gestures, body movements and facial activities into CMC and thus to render the communication process more natural and more satisfying. In contrast to the use of webcams in net-based video-conferences avatar-based systems however bare some features that require special scientific attention with respect to process and outcome of CMC: (1) avatar-systems construct a virtual reality, i.e. an artificial meeting and/or working space that is psychologically remote to both locations of the interlocutors. Due to the common object reference in the virtual space it might be possible to produce higher degrees of so called social presence (see Biocca et al., 2001) and (2) avatar representations can transmit nonverbal information without disclosing the identity of the communicators or even leaving the choice of the physical appearance to him or her. Both aspects can have specific consequences for the socio-emotional processes involved in CMC, like impression management, mutual person perception, regulation of emotions, social facilitation, etc. Some relevant theoretical models are examined in this paper. The focus however lies on the discussion of methodological preconditions for the systematic analysis of avatar-based communication. An avatar-based communication platform is introduced that allows for the real time transmission of gaze, head movements and gestures in net-communication. Different research paradigms are discussed that can lead to a deeper understanding of the function of nonverbal cues in CMC and the improvement of avatar-conference systems as well.

**Monique De Bonis (CNRS, Paris)**

**Emotional impact of self-image perception: From basic research to video-conference applications**

The issue of self-image has received relatively little attention in the field of new technologies of face to face communication via multimedia. The present review examines the relevant literature pertaining to the question of emotional impact of seeing one's own face on mirrors, TV screens and also more sophisticated devices. Our survey on developmental, comparative, normal and abnormal adults reactions to self-face lead to the conclusion that human and non human primates show evidence of strong emotional reactions in facing one's own face. The strength of these reactions varies according to the technical devices used eye contact, contingent movements and the co-presence of others are critical factors. The discovery of the self in the human species corresponds to a developmental emotional sequence in which, positive emotions precede negative emotions. In non human primates, the initial instinctive responses are followed by a large repertory of expression of emotions, as indicated by the self-

recognition ethogram. Investigations in normal adults show that self-face perception elicits psychophysiological arousal, and recent advances in neuroimaging studies suggest that specific neural substrates, linked to the emotion circuitry are involved in the perception of self-face as compared to more or less familiar faces or others' faces. We also showed that impaired self-image perception (such as nothing, a stranger or a double in the mirror) of are a source of emotional disturbances.

In conclusion, we suggested that the rapid development of new image technologies, which makes at our disposal natural and artificial mirrors, will soon modify the way in which we perceive our own identity. In our post-modern societies a new concept: the media-self is emerging. Further research is needed to prospect how the diffusion of our own face will shape the process of selfing.

**Veikko Surakka (Tampere Unit for Computer-Human Interaction,  
Department of Information and Computer Sciences and Tampere  
University Hospital, Department of Clinical Neurophysiology)  
The effects of facial emotional information on early auditory processing  
in the human brain**

There are two well-grounded frequently used event related potential (ERP) measures of relatively early auditory processing. N100 is a negative deflection that peaks at about 100 ms from the onset of an auditory stimulus. N100 reflects the onset of an auditory stimulus, and it has been suggested to act as an internal attention trigger. Mismatch negativity (MMN) reflects automatic detection of change in continuous auditory stimulus stream. When a deviant infrequent tone is detected in a stream of two simple beeps it causes a negative deflection in electroencephalograph peaking at about 100-300 ms from the stimulus onset. MMN is automatic in a sense that it is also elicited by changes in unattended stimuli (Näätänen, 1992). Our earlier findings have suggested that MMN attenuates significantly during viewing of dimensional emotionally positive slides (e.g. pleasant sceneries) as compared to MMN while viewing emotionally negative or neutral slides (Surakka et al, 1998). The present aim was to explore what happens to early auditory processing while viewing facial emotional expressions. More specifically, we wanted to study what happens to the processing of exactly the same auditory stimulus while facial expression is varied. The interesting questions were: 1) Is N100 to the same auditory stimulus affected in any way by different facial expression? 2) Can auditory MMN be elicited by creating standard and deviant stimulus combinations with the change of facial information only? Six female subjects were shown a neutral face and facial expression of fear of one actor from the series of facial expressions by Ekman and Friesen (1976). Auditory stimulus was a 100 ms long, 40 dB, 1 kHz tone presented to both ears. 1000 stimulus combinations were presented to each subject. A standard stimulus (prob. 0.8) consisted of the neutral face presented with the auditory stimulus. A deviant stimulus (prob. 0.2) consisted of the fear face presented with the auditory stimulus. Continuous EEG was recorded from the vertex. The results showed that N100 was clearly elicited to auditory stimuli

during both neutral and fear expressions. The results also showed that the N100 was clearly accentuated while viewing fear expressions. After subtracting the auditory ERPs during fear expressions from those during neutral expressions a MMN type negative deflection could be observed. Thus, it seems that facial emotional displays changed the early processing of physically identical auditory stimuli. It is noted that this observation may not be limited to emotional stimulation but may reflect the operation of a more generalized processing of audiovisually integrated information. However, the results reflect the fact that facial information has profound effects into the processing of auditory information. Thus, facial emotional information can be argued to have a significant role also in face-to-face communication over the Internet, in videoconferencing, and in computer mediated communication.

**Pierre Philippot (Université de Louvain)**

**Impact of social anxiety on the processing of emotional information in video mediated interaction**

Internet communication via email has provided a powerful mean for fast transmission of information all over the world. However, this statement mostly applied to “technical” or factual information. It seems uncertain that such a positive judgment could also apply to information related to interpersonal and/or affective matters. For interpersonal and emotional information, email seems to be a rather poor communication medium and a potential source of misunderstanding. This lack of capacity to transmit emotional and interpersonal information via Internet has even been related to deterioration of mental health. For instance, a well controlled study has shown that members of household to which an access to internet had been provided report more depression and feelings of loneliness in the following months, compared to members of comparable households to which no access to internet was provided.

This limitation in capacity to convey interpersonal and affective information via the Internet can very likely be attributed to the fact that Internet communication has mostly relied on the linguistic, written channel. Indeed, it is well documented that emotional and interpersonal information is mostly conveyed by the nonverbal channel (Patterson, 1999). In this perspective, the addition of a video channel in internet communication, transmitting non verbal information about facial expression, posture and body movements, constitutes a great improvement and opens the possibility of truly interpersonal communication on the Internet.

However, there might be another side to the coin. Indeed, providing interpersonal and affective information in an unfamiliar setting might be anxiety provoking for many people, especially if this is associated with a perceived lack of control over what information is transmitted. New technologies, as they may be associated with a feeling a uncontrollability and unpredictability, are anxiety provoking for many individuals. This situation was counter-balanced by the anonymity of Internet. And indeed, Internet “written” communication has been used as a mean to communicate without exposing oneself to others by many

social phobics. However, when providing on life video image of communication partners, anonymity disappears and what was seen by socially anxious individuals as a safe communication medium is very likely to become strongly threatening.

I propose that, in Internet communication, the nonverbal emotional information conveyed by the video channel constitutes a source of difficulties for socially anxious individuals. The literature on social anxiety suggests that socially anxious individuals misinterpret others' attitudes and feelings expressed by nonverbal behavior, as reflecting rejection (Mogg & Bradley, 1998). Such a bias increases their social anxiety and often results in avoidance of the anxiety provoking situation (Clark, 1999). This problem actually concerns a significant number of people, as social anxiety is a prevalent condition (Barlow, 2001) and internet video communication features a conjunction of many anxiety provoking factors (e.g. being filmed, being in an unfamiliar environment, being directly confronted to nonverbal message of the partner, etc...; Heimberg, Mueller, Holt, Hope, & Liebowitz, 1992).

The literature on social anxiety provides evidence of an attentional bias for threatening information in anxious individuals (Fox, 1996; Mathews & MacLeod, 1994). For instance, using the dot prime paradigm, we have shown that anxious individuals very quickly focus their attention on anger facial expressions when exposed simultaneously to a neutral and an angry expression (Philippot, Mogg, Bradley & Chrisochos, 1999). However, at longer duration (over one second), this bias is not maintained by anxious individuals, while then non anxious seem to focus and willfully analyze the potentially threatening information.

Two competing models can be found in the literature to account for this bias. On the one hand, the mood bias model (Clark, 1998) poses that socially anxious individuals are characterized by a chronic activation of an anxiety schema which results in a chronic anxious mood. This negative mood that would initially bias attention allocation toward mood congruent information. Then, because of the aversive nature of such information, anxious individuals would turn away from it. On the other hand, the evaluation bias model (Mogg & Bradley, 1998) postulates that all individuals are constantly scanning their environment to detect potential threat. The detection of a threat would activate a danger mode that in turn, would automatically direct attention toward the threatening stimulus. Anxious individuals would differ from non anxious in that that they would present an interpretation bias, this is, for them some stimuli would be associated with threat, or more threat, than for non anxious.

Interestingly, very little research has been conducted on interpretation biases. Most practitioners and researchers assume that socially anxious individuals interpret social information differently than non anxious individuals, but this postulate, although central for etiological models of social anxiety, has still not be properly investigated. Merkelbach, Van Hout & Mersch (1989) have compared nine social phobics from a clinical population to nine match controls on their interpretation of angry faces and found no differences. Similarly,

Douilliez and Philippot (2002) have compared 25 socially anxious students to 24 non anxious students. They found no difference in the evaluation of angry faces but a (small) difference in the evaluation of threatening words.

It might be concluded that many questions regarding how socially anxious individuals process nonverbal emotional information remain open, both at the theoretical and applied level. At the theoretical level, it should be clarified to what extent, state or trait social anxiety modulate the evaluation of, and the allocation of attention to, emotional or neutral facial expressions. At the applied level, the question of the efficacy of remediation program is also unanswered. Can an evaluation or an attentional bias for threatening facial expression be corrected?

We believe that such questions are of importance if one wants to maximize the efficacy of Internet multi-media communication, and to make it available and functional for anyone who could benefit from it.

## **A structural framework for the study of face-to-face communication over the Internet**

A major part of the second day of the workshop consisted of the presentation and discussion of possible specific studies to address the issues outlined in the individual talks of the first day. Each participant presented a series of suggestions that corresponded to their specific interests and others that would span the interests and expertise of several participants. Based on these initial suggestions a structural framework was elaborated that lists in the shape of a *mapping sentence* the relevant *facets* (e.g., Borg, 1981) for a systematic study of these issues (see figure 1).

Four classes of variables or facets were identified: The *type of task* that *participants* are engaged in over a specific *medium* and the combined impact of the first three at *processes at different levels of organization*.

### **Task type**

There was agreement that effects studied would differ according to whether two or more participants would be engaged in solving of a task or in socio-emotional exchanges, such as gossiping, or social sharing of personal experiences. It is quite possible that medium-specific effects or differences between media would depend to a large degree on the type of task. This is not to say that a further specification might not be useful or that the two aspects are mutually exclusive. However, there was a strong sense that this dichotomy is a useful one for a more systematic analysis of the literature on the comparison of communication over different media and for the planning of future studies.

### **Participant variables**

Participant variables are likely to play a role in the processes we discussed. At different levels of resolution one might take into consideration the culture and

sub-culture the individuals belong to as well as interindividual differences (“personality”; clinical pathologies, such as social anxieties). In addition to these properties of the interactants, that are stable over time, there are transient effects, such as mood or specific goals that are activated at the time of the interaction.

It is obvious, that these stable and transient variables cannot be seen as simply additive. The interaction between specific patterns of these variables will create specific conditions. For example, independent of gender differences overall, such as the use of nonverbal cues, there are certain properties of same-sex and mixed sex interactions. Relationships can imply friends, partners, co-workers, strangers but it can also imply dynamic aspects of the state a specific relationship is in. For example, a new member of a multi-national working group joining a video conference with several superiors present.

### **Medium properties**

Much of the previous related research has dealt with differences between text-based computer mediated communication (CMC) and in-person face-to-face interactions. In fact, the number of possible comparisons of different modes of communication is staggering. In addition to those mentioned, there are not only relevant comparisons with audio only (as in a telephone conversation) or computer mediated video-based communication, but recent advances in the field of avatars open new possibilities as well as new issues for different types of interactions. Avatars come in many “flavors” and differ in regard to whether they are simply a static image (real or symbolic), a dynamic image (real or symbolic) and the latter can contain a subset of nonverbal channels (e.g., gestures, but no facial expressions) or a full complement. While previous research has dealt with the properties of these different channels as a combination of dimensions of anonymity and richness of nonverbal content, there are now options that add new dimensions, such as the possibility to change selected elements of identity. It is foreseeable that some of these developments will rapidly be integrated into the mainstream of interpersonal communication. For example, it is likely that the use of portable video-communication devices (video cell phones) will be adopted more rapidly when the image on the screen is a resynthesized image that shows a clear picture of the interactant under optimal conditions, rather than the skewed view in difficult lighting conditions provided by the camera in a hand-held device. It is because of this that the inclusions of such developments should form an important part in any systematic research program on remote face-to-face communication. Two presentations demonstrated some of the possibilities in this area and related initial research.

Each of these media is characterized by certain properties, or limitations, as far as temporal or spatial resolution are concerned, as well as other factors such as angles of regard/perspective, the amount of information that can be transmitted, as well as the relationship of different communication channels to each other (e.g., synchrony of channels, such as audio and video, delays, etc.). It would be misleading to compare media without taking specific properties into account. For example, the relative economic failure of the picture phone might have been not only due to practical issues, such as the price of the devices and



the scarcity of potential interaction partners, but also its poor resolution. Systematic research in this area is bound to provide guidelines for minimal/optimal characteristics of each medium in view of specific tasks to be achieved.

### **Process variables**

Effects of type of interaction, characteristics and states of interactants, and medium of communication are manifold, and can be measured by looking at outcomes (e.g., was the task solved) or interaction variables (e.g., were there problems arriving at a solution; synchrony; attunement; resonance). A phone conversation with a delay might not lead to an impossibility of reaching a solution to a problem, but it might impact how much each participant contributes to that solution. According to the basic ideas of social neuroscience (e.g., Cacioppo & Berntson, 1992) it is useful to study behaviors or psychological processes at different levels of organization and the current topic is no exception. While one could focus on the impact of the individual of a specific circumstance of communication there are issues such as the impact on the self, on groups or societies, as well as at a more microscopic level an understanding of the basic processes, such as brain activity. Different levels of analysis were presented at the workshop and there was a large consensus that it is useful to study remote face-to-face communication at different levels, and to understand how these levels interact with each other.

### **Applied issues**

In addition to the elaboration of the mapping sentence – which essentially is a means to develop a consistent theoretical context, different applied outcomes of a research program on the study of emotional communication in face-to-face communication over the Internet were discussed. Two issues seem specifically relevant: 1) analyses of usability of media for specific purposes and 2) guidelines for training.

### **Outcomes**

- The immediate outcome of the workshop is a declaration of interest of the participants to form a research group/network to pursue the topics discussed on a theoretical level and on an empirical level. Within the next months we will agree on a name for this new entity as well as a loose definition of the scope of common research projects. The excitement at the workshop was tangible – this is a very focused yet heterogeneous collection of specialists that shares relevant interests but contributes very different expertise.
- There is the firm intention to publish a book based on the workshop. All of the participants will contribute chapters. The contributions will be based on the presentation and other relevant material to define the current state-of-the-art regarding the topic of telecommunication of emotion with a specific focus on future investigations of the communication of emotions over the Internet. Contact with prospective publishers has been initiated we are currently waiting for specific

statements of interest. Depending on the delays in finding a publisher we hope to have a first set of chapters for review at the end of the year.

- A first step in a common research strategy will be the acquisition of standardized workstations for each member of the group, consisting of a PC, a camera, specific software and network connection. This will allow running standardized studies in the different member countries of the group as well as studies that span different countries. These studies shall serve as pilots for common grant proposals. We have started to look into fast-track funding for these workstations, including the private sector. We are very confident that the “extra-value” provided by the current group will help us in moving forward on this matter – not only are the group members from different European countries, but possess unique knowledge that will be of particular interest in a European context.
- We intend to apply for a grant from the ESF once 1) the research group has been formally established and 2) we have pilot studies that demonstrate the advantage of a large network of multilateral partners. We will also look to extend the membership in two directions: 1) inclusion of more computer science partners and 2) potentially inclusion of at least one other non-psychology social scientist, such as a sociologist. We found the presentation and the availability of Arto Mustajoki, the representant of the SCH very helpful in our discussions in this context.

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class	task type	participant variables (individual, dyadic)	medium properties vs. type (subtype)	process scope vs level of organization
instance	Socio-emotional Problem solving	Culture Subculture Individual differences Transient Differences  Relationship	<i>Characteristics</i> <i>Spatial resolution</i> <i>Temporal resolution</i> <i>Angles</i> <i>Perspective</i> <i>Delay/Synchrony</i> <i>Physical context</i> Face-to-face CMC Audio Video Avatar static image dynamic image resynthesized dynamics [dimensions, realism representational]	<i>Interaction variables</i> <i>Outcome variables</i> Organ System Individual Dyad Group Social Culture
example	conflict resolution	influence of culture in a business context males, females  between strangers same-sex and mixed dyads	in CMC vs Video	impact on achieving result and attitude vs the other person

Figure 1. Mapping sentence containing facets/classes, instances and examples for the systematic study of face-to-face interaction over the Internet

# FINAL PROGRAMME

## Friday 5 April 2002

ARRIVAL OF PARTICIPANTS

## Saturday 6 April 2002

08:45 *Coffee/Tea*

09:00 **Welcome**

09:20 **Opening address**

- **Arvid Kappas** (Convenor, University of Hull, United Kingdom)  
*Face-to-face communication over the internet: Emotions in a web of culture, language and technology*

09:45 **Presentations Session I**

- **Tony Manstead** (Cambridge University, United Kingdom)  
*Social constraints on computer-mediated communication of emotions*
- **Agneta Fischer** (University of Amsterdam, The Netherlands)  
*The influence of gender differences in appearance and nonverbal behavior during emotional interactions via the Internet*
- **José-Miguel Fernández-Dols** (Universidad Autonoma de Madrid, Spain)  
*Virtual interaction and real emotion: Culture, communication and non-verbal behavior via the Internet*

10:45 *Coffee/Tea*

- **Pio Ricci-Bitti** (University of Bologna, Italy)  
*Cultural differences in nonverbal communication: Issues for face-to-face communication over the Internet*
- **Brian Parkinson** (Oxford University, United Kingdom)  
*Affect co-ordination in video-mediated communication*
- **Karl Grammer** (University of Vienna, Austria)  
*Emotions and personality in embodied systems: Interactions with virtual humans*

12h00 *Lunch at the Dennison Centre*

**Saturday 6 April**

*(continued):*

13:45

*Group photo in front of the Dennison Centre*

14:00

**Presentations Session II**

- **Harald Wallbott** (University of Salzburg, Austria)  
*Physical constraints on nonverbal communication via the Internet*
- **Gary Bente** (University of Cologne, Germany)  
*Person perception in computer mediated communication*
- **Monique De Bonis** (CNRS, Paris, France)  
*Emotional impact of self-image perception on internet based video conferences*
- **Veikko Surakka** (Tampere University, Finland)  
*The effects of facial emotional information on early auditory processing in the human brain*
- **Pierre Philippot** (Catholic University Louvain, Belgium)  
*Potential impact of interindividual differences in information processing on affect communication in video mediated interaction*

16.00

*Coffee break*

16.30

**Presentation of relevant collaborative funding information**

- **Arto Mustajoki, ESF/SCH delegate** (University of Helsinki, Finland)  
*The European Science Foundation and the ESF Standing Committee for the Humanities (SCH)*

17.00

**Discussion concerning research strategies**

19.00

*Dinner at the Raj Pavillion*

## Sunday 7 April 2002

- 09:00 **Round Table Discussion I**  
*Goals, challenges and limitations for basic and applied research on emotions and non-verbal communication in the context of Internet and computer mediated communication in a European perspective*
- 10:45 *Coffee/Tea*
- 11:00 **Planning session for networked research strategies**
- 13:00 **Planning session for publication of workshop proceedings**
- 13h30 *Lunch at the Dennison Centre*
- 15:00 **Round Table Discussion II**  
*Future directions of communication and research: Virtual humans, video cell phones, automatic translations, avatars, etc.*
- 17h00 *End of workshop, followed by dinner at the Old Grey Mare*

## Monday 8 April 2002

DEPARTURE OF PARTICIPANTS

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