

Sharing 3D Spaces: A summary of motion capture case studies showing the use of 3D shared spaces in face to face interaction

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1 Introduction

Intuitively, when considering forms of technologically mediated communication, access to the visual channel makes interactional techniques available which are comparable to those used in face to face interaction. However, a common finding in the literature on mediated communication is that, whilst it has proved simple to demonstrate the advantages of face to face interaction when compared to interaction over an audio only link, the same is not true when comparing audio visual technologically mediated communication (we shall refer to this from now on as Video Mediated Communication, or VMC) with an audio only link (Anderson et al, 1997; Heath & Luff, 1997). Further to this, studies have identified that there are significant differences between VMC interaction and face to face interaction (Whittaker, 2003; Heath & Luff, 1991; Vertegaal, 1997), and that crucially this is not due to technical issues; it is not the quality of the visual channel that is the cause for these differences (Whittaker & O'Conail, 1993). We hypothesise that the lack of access to a mutually accessible 3D shared space which we inhabit during face to face interaction contributes significantly when accounting for these differences. By using motion capture techniques available in the Augmented Human Interaction laboratory at Queen Mary, we are able to capture the precise three dimensional coordinates of participants' bodies. This enables us to study these 3D shared spaces in much more detail than by using approximations from video cameras (see Battersby et al, 2008 for more detail). In this paper we will present motion capture data from pilot studies to show examples which demonstrate the fundamental use of shared spaces in face to face interaction.

2 What is lost in video mediated communication?

When interacting over a video channel, (Whittaker & O'Conail, 1993) identified that users found much more difficulty in generating backchannels (e.g. head nods, etc), clarifications and interruptions. It was also seen that speaker hand overs were much more formal, and a later study confirmed this by finding that speakers found it much harder to spontaneously take the floor (Whittaker, 2003); speakers had to explicitly hand over to another speaker more often, when this would be very natural and efficient in the face to face context. The final finding of these studies was that speakers had higher turn sizes, measured in words per turn, in the mediated context.

(Heath & Luff, 1991) studied the use of a video mediated communication system between two research laboratories. The result of this study found that gestures appeared mutated, possibly via some different form of production or due to the technical system (different sized screens for example) and exaggerated from their original forms.

3 Shared Spaces

We hypothesise that a significant reason for these differences is the lack of access to the shared space which is present in face to face interaction. (Kendon, 1990) discussed the concept of an f-formation, which is claimed to

be the ‘spatial and orientational organization of participants’. Figure 1 shows an example of this. We see that the participants are arranged such that the areas in front of their bodies (the *transactional segments*) overlap to form an *o-space*. This is the shared interactional space to which the participants have mutually exclusive access. During interaction the participants dynamically re-arrange themselves to ensure that mutual access to this shared space is preserved. It is within this space that activities such as gesture occur.

If we focus in on this shared space, we can find that the choices of spatial locations within it for the deployment of gestures are not arbitrary ones. This has been studied in the Sign Language literature (Emmorey, 2002) where we see that signers form spatial topologies in their signing space. This can be seen with the use of timelines, where the actual empty space around the signer can be pointed at to refer to points on the timeline. It has been seen that speakers of verbal languages can gesturally place items of conversation into their gesture spaces, which can be pointed at referentially later in conversation too (McNeil et al, 1993).

We will demonstrate with motion capture data that gesturers in face to face interaction make use of the shared spaces in front of them to deploy gestures, that the choice of their spatial deployment is not arbitrary and finally that this is not because the gestures are intrinsically spatial.

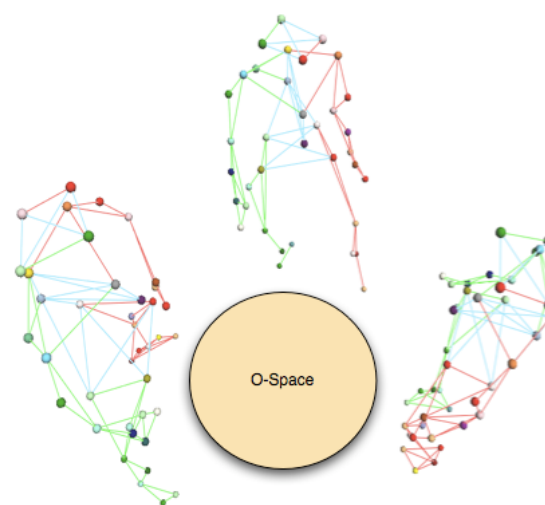


Fig. 1. A diagrammatic representation of a multiparty formation using motion capture data showing the creation of a mutually accessible 3D shared space. Modified from (Kendon, 1990).

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