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Description	

DISPLACEMENT IN COMMUNICATION

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Displacement, the ability to refer to things that are spatially and temporally remote, is one of the important features of human language. In order to clarify what is truly unique to human language, we consider displacement in the context of communication. Various situations involving displacement are classified and examined. It is suggested that displaced understanding, which is not based on direct experience is unique to human beings. An experimental framework to investigate the cognitive mechanism of displacement in communication is introduced. The result of a preliminary experiment leads to a hypothesis that feature extraction is one of the mechanisms that enables displacement in communication.

1. Introduction

Displacement, the ability to refer to things that are remote in space or time (or both) from where the talking goes on, is one of the features of human language (Hockett, 1960). By virtue of this characteristic, human beings can refer not only to presently existing things but also to past or future events and imaginary objects or states. By contrast, most symbolic communication in animals—for example in the alarm calls of vervet monkeys (Seyfarth et al., 1980)—refer to present stimuli, such as predators and cannot convey information on absent objects.

Displacement is a concept that defines this difference between human beings and animals, and the understanding of displacement is thought to contribute to the study of the origin and evolution of human language. On the other hand, the conventional definition of Hockett (1960) includes the waggle dance of honeybees (Frisch, 1967) as an example of displacement. Thus, given his perspective, it is not clear which aspect of displacement is unique to

human beings. Here we attempt to understand displacement as something unique to human language by focusing on the displacement that takes place between a speaker and a listener. In order to achieve this objective, we propose an experimental setup and develop a hypothesis.

2. Displacement on the Listener Side and Displacement Not Based on Direct Experience

Displacement has been studied as “displaced reference” or “displaced speech” in the fields of cognitive and language development (Hurford, 2007; Liszkowski et al., 2009; Morford & Goldin-Meadow, 1997). Studies have focused on the ability in human speech to make reference to absent objects. However, it is difficult to distinguish the displacement that is said to occur in the waggle dance from that of human beings, as long as we focus only on displaced reference, displacement on the speaker’s side.

Human language is usually used to communicate intentions and knowledge to others so that these may be held in common¹. In this way, a listener can obtain a knowledge that only a speaker has. An understanding of the displaced references of the speaker requires a consideration of the displacement that takes place on the listener’s side. In addition, we will need to examine displacement by considering the interaction of the speaker and the listener. Thus, we regard displacement on the listener’s side as “displaced understanding,” treating it in terms of communication that includes not only displaced reference but also displaced understanding.

Problematically, previous research also does not separate displacement issues from those of memory. For example, Liszkowski et al. (2009) investigate whether prelinguistic infants and chimpanzees are able to refer to absent objects by pointing gestures. They demonstrate that prelinguistic infants are capable of engaging in such pointing, while chimpanzees are scarcely able to do so. However, these researchers do not clearly indicate if this divergence in behavior with absent objects stems from a difference in memory or in displacement ability. If the latter, it appears that some ability associated with displacement exists separate from memory. To specify this distinction, we regard communication

¹ Note that we do not argue that human language has evolved for communication.

about absent objects based on what the speaker and/or listener have experienced in advance as “displacement based on memory.”

3. The Classification of Displacement

In order to make the displacement unique to human beings clear, we classify displacement in communication. Based on the points raised above, we set two axes:

1. The distinction of the speaker and the listener
2. The distinction of displacement based on memory and that *not* based on direct experience

Table 1 shows the classification of displacement for the speaker and the listener according to two axes. The columns represent distinctions of three states: that where the referent presently exists (present), that where it does not presently exist but exists in memory (memorized), and that where it does not presently exist and is not present in memory (unexperienced).

Table 1. Classification of displacement in communication

	<i>Speaker</i>			<i>Listener</i>		
	present	memorized	unexperienced	present	memorized	unexperienced
1	○			○		
2		○		○		
3			○	○		
4	○				○	
5		○			○	
6			○		○	
7	○					○
8		○				○
9			○			○

Rows 3, 6, and 9 of Table 1 are the cases where the speaker refers to an object that he or she has not experienced before. They are similar to a situation where the speaker is producing a referent, and thus creativity is strongly present. We exclude these cases because they do not fit with the purpose of this inquiry, which focuses on displacement.

Row 1 in Table 1 is not a state with displacement, since the referents exist in the present for both the speaker and the listener. Row 2 is the state where the referent exists for the listener but not for the speaker, who knows it in advance. For example, consider a situation where the speaker and the listener are talking on the

phone, and the speaker refer to a building that he or she has seen before and that the listener actually stands before. Displaced reference but not displaced understanding works here, since the listener can understand the speaker's reference based on the present object. Focusing only on displaced reference, we cannot distinguish 2 from 5 or 8 and cannot make a clarifying statement about displacement that is unique to human beings.

In addition, we should especially focus on the difference between rows 4 and 5 and rows 7 and 8 in Table 1. The latter two seem possible only when displacement is unique to human linguistic communication, while the former can also be seen in the symbolic communication of animals. The distinction between the rows 4 and 5 and rows 7 and 8 is explained below.

Row 4 of Table 1 is the state where the referent presently exists for the speaker but not for the listener, who understand the speaker's reference based on prior memory. This state corresponds to the alarm calls of the vervet monkey (Seyfarth et al., 1980). For example, a speaker monkey makes an alarm call that refers to a situation with a predator. Another individual who hears the alarm call can take a corresponding avoidance behavior to the specific predator based on memory before encountering the real predator. Although displaced reference does not work here, displaced understanding of the speaker's reference based on memory is present.

Row 5 of Table 1 is the state where the referent is not present for both the speaker and the listener. They refer to and understand the referent based on memories. This state is thought to correspond to the waggle dance of honeybees. When a speaker bee conveys information on the location of absent honey, displaced reference and displaced understanding based on memory seem to be present. The state covered by Row 5 has been regarded as an example of the conventional definition of displacement (Hockett, 1960). If we focus only on the speaker, these nonhuman communications are also included in the cases of displacement. However, the displacement of the waggle dance of honeybees can be clearly distinguished from the displacement that is unique to human communication.

Displacement that is unique to human linguistic communication is covered by rows 7 and 8 of Table 1. Row 7 is the state where the referent is present for the speaker, but not for the listener, who has not experienced it before. For example, in a phone conversa-

tion, the speaker talks about a building in front of him or her, and the listener has not seen or heard about the building. This case does not meet the conventional definition in that the displaced reference does not work here. The listener, however, understands to what the speaker refers, which is neither a present object nor a memory. This state is seen daily in human but not animal communication.

Row 8 of Table 1 is the state where the referent does not presently exist for both the speaker and the listener. Based on his or her memory, the speaker refers to an object that the listener has not seen or heard about. This state corresponds, for instance, to a situation in which the speaker talks about a building he or she has seen, and the listener has neither seen nor heard about it. Here both displaced reference based on memory and displaced understanding *not* based on direct experience are realized. This situation involves displacement unique to human beings.

Based the above observations, we claim that displaced understanding *not* based on direct experience is the key factor in realizing displacement unique to human beings. Furthermore, we think it is effective to consider the utterances of the speaker that make displaced understanding possible for the listener.

4. Experimental Framework to Investigate Displacement in Communication

To investigate displacement in communication and especially displaced understanding *not* based on direct experience, we construct an experimental framework. We aim at understanding the cognitive mechanisms of displacement unique to human beings by extracting those properties involved in communicative displacement.

Human beings use natural language as a medium for the realization of displacement so naturally and without any trouble. For this reason, natural language is not suitable to extract those properties and to analyze the mechanism of displacement. This makes us adopt an experimental approach that restricts the media for communication. An artificial symbol system is often used as a communication medium in such an approach (Scott-Phillips & Kirby, 2010); however, its range of expression is too tight to enable the speaker to engage in free displaced reference. We need to investigate how the speaker makes displaced understanding possi-

ble for the listener. Thus we think that the use of drawing as a symbolic mechanism is reasonable for our purpose. As drawing is not a common medium for communication, we expect that drawing requires some devices to achieve displacement and that we can analyze them.

Fay et al. (2003) use drawing as a medium in this experimental approach to communication. Their experiment assumes two roles, each corresponding to the speaker and the listener: a “director,” who expresses assigned objects by drawing, and a “matcher,” who identifies the references of director’s drawings. Two subjects are paired, and they draw pictures of the same objects, exchanging the two roles in turn. Fay et al. (2003) confirm that the transition from icon to symbol in graphical expressions occurs through the interaction between subjects.

We examine displacement in communication with a focus on displaced understanding by redesigning the experiment of Fay et al. (2003). We modify it in two ways:

First, the drawing tasks given in their experiment are objects that both the speaker and the listener know in advance (e.g. Robert De Niro). These tasks correspond to the situation, that of Row 5 of Table 1, in which displacement is based on memory. We change these tasks to cover entities that the listener has not directly seen or heard.

Second, in Fay et al.’s experiment, subjects are asked to identify an object from finite choices. However, in giving the listener finite options, the condition that the entity referred to by the speaker should not be experienced beforehand by the listener is not fulfilled. For this reason, we let listeners freely indicate what the speaker intends, instead of preparing finite options.

In order to investigate how the speaker composes expressions that make displaced understanding possible for the listener, we observe the way in which the speaker devises his or her expressions so that the listener will deduce the entity. Therefore, we feed back the listener’s answer to the speaker and let he or she redraw a picture to make the next answer close to the correct one.

Subjects communicate using electric drawing pads and computer displays in separate rooms and not through the usual communicative media, such as verbal exchange or eye contact. They can use only black lines for drawing. The use of linguistic characters,

such as alphabet or kana, and the use of meaningful symbols, such as algebraic signs, is prohibited.

By virtue of these modifications, we can inquire into the cognitive mechanisms required for displacement in communication that are depicted in the Row 8 of Table 1.

5. Feature Extraction as a Cognitive Mechanism for Displacement

We conducted a preliminary experiment based on the framework proposed in the previous section. We observed that subjects made drawings in which two or more graphical expressions were combined for absent objects. Extracting a partial feature of each drawing permits the representation of a feature of an object. Figure 1 shows an example. A subject expressed the task “sour boot” by drawing pictures of “lemon” and “boot” in combination. In this example, the subject, who drew “lemon,” inferred that “boot” had the feature “sour,” the same possessed by “lemon.”

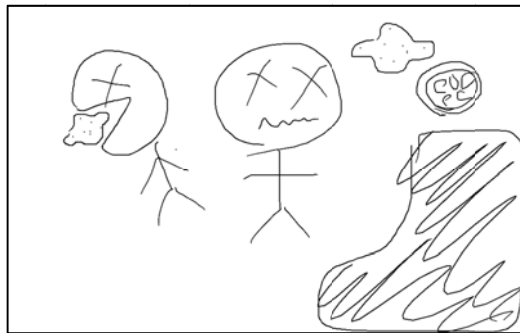


Figure 1. An example of drawing expressing the task “sour boot”

When a speaker relates what a listener has not directly experienced, he or she may express the features of the object by using another object that has the same features. We name this mechanism “feature extraction.” We hypothesize that “feature extraction” permits displacement in communication.

Along with this mechanism, subjects drew pictures that represent the experiences when we typically experience the features that a speaker is trying to convey. In the example of Figure 1, the

subject tried to draw a picture of eating a lemon, when we typically feel sour. This kind of expressions is viewed as a way to make a listener realize the feature, based on what they have experienced.

However, these expressions also cause misunderstandings. Listeners tend to understand speakers' drawings based on their own experiences. When a speaker tells what a listener has not experienced, this tendency hinders the understanding. As in the example above, the other subject who saw Figure 1 understood that the "lemon" is "sour", but could not combine the feature "sour" with "boot." In another example, although a subject expressed the task "bitter fire" by drawing a picture of eating fire, the other subject saw the picture as "burn injury."

In order to understand the speaker's expression, the listener needs to guess the feature that the speaker attempts to convey. The situations of rows 5 and 8 of Table 1 differ in that the listener in one remembers an object and in the other has not experienced it. For example, the situation of row 5 corresponds to the task "sour lemon," and that of row 8 corresponds to "sour boot." Turning to these, we can demonstrate the tendencies of human feature extraction and clarify one of the cognitive mechanisms enabling displaced understanding by the listener.

In addition to feature extraction, analogical inferences also seem to work as mechanisms that realize displacement, as well as feature extraction. We assume two types of analogical inferences; one is cognitive analogy and the other is linguistic analogy. Cognitive analogy is an analogical inference based on similarity. It arises when the listener understands the referent that he or she has not directly experienced through the comparison of it with an object that has similar features. This analogy is thought to be based on the cognitive common ground of the speaker and listener. Linguistic analogy is an analogical inference based on construction rules (Hashimoto, Nakatsuka and Konno, 2010). It combines the forms that represent objects and helps to express the referent by uniting objects that are hard to be combined from a cognitive viewpoint.

We hypothesize that these three mechanisms, feature extraction, cognitive analogy, and linguistic analogy, enable displacement in human communication.

6. Summary and Conclusion

We consider that in order to understand the characteristics of displacement unique to human beings, it is critical to consider displacement in the context of communication and not just displaced reference or speech. We examined the characteristics of displacement by classifying it according to two axes: the distinction of speaker and listener, and the distinction of displacement based on memory and *not* direct experience. From our findings, we claim that displaced understanding *not* based on direct experience is the key factor to realize the displacement unique to human beings. We introduce an experimental framework to study cognitive mechanisms that achieve displacement in communication. From this preliminary experiment, we propose the hypothesis that feature extraction operates as a mechanism that enables displacement in communication.

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