

# Modeling of Physical Interaction by the Dyadic Communication Needs for the Recognition and the Expression

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## ABSTRACT

The communication is started by a consignor proving the signal of the communication needs and a receiver recognizing it. The communication is one of elements for the construction of the relations with others. The expression by the language is effective to begin communication for others.

However, this expression may produce social risk. Because the expression by the language that is an explicit signal ignores the communication needs of the receiver. For example, fatigue caused by social networking is one of this social risk. This risk obstructs the construction of amicable relations. On the other hand, people communicate by the nonverbal expression. This expression is vague information, but can reduce a risk such as the above. In this study, our purpose is to analyze a physical interaction based on each other's communication needs and build a model. This model contributes to building more sustained relations.

## Author Keywords

Interaction; communication needs;

## ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI):

## INTRODUCTION

The communication is started by a consignor proving the signal of the communication needs and a receiver recognizing it. Next, it is entrusted to the receiver whether receiver responds to communication needs of consignor or not.

Not only language information but also non-language information is a clue of interaction for starts of such communication. The signal expressing a communication

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needs becomes explicit in the case of the interaction using the language. In brief, this signal shows the communication needs to the partner uniquely. On the other hand, it is difficult to show explicit signal such as the language in the case of the interaction using the non-verbal language expect for encoded physical expression, and the possibility that it is recognized in comparison with a language is generally low. Furthermore, it is necessary to use verbal information for confirming expression based on the communication of the partner even if was recognized it. When both sides use a nonverbal signal, expression and the recognition of each other's communication desires are vague.

Therefore, expression using by the language is effective to begin communication with others. However, these expressions may provide social or psychological load. Because, without the relations of the communication needs of the partner, there is it whether you show a communication desire of oneself. In brief, it means that communication is begun one-sidedly. For example, the representatives include the tired of social networking [6]. The reasons are as follows: pressure that must reply " Like " to the contribution of other, the uneasiness that others don't reply to the one's contribution, etc. In other words, ignoring the explicit signal give the psychological load for either consignor or receiver.

On the other hand, the nonverbal signal is vaguer than a verbal signal although can reduce a risk such as the above. The reason is to adjust each other's communication needs, namely, if two persons estimate communication needs for oneself of the partner is low through observation of each other's physical behavior, they refrain the relations formation with the partner without a considerable reason. Persons evade a social risk by a verbal signal and It is refrained from one-sided communication being started with what is started near at hand by doing it in this way. In other words, it is suspected that people can realize perceiving the existence of others and interesting through a physical interaction equivalent to the persuasion by the language.

The implicit negotiations that such a physical interaction create the changes of various aspects. For example, between a salesclerk and the customer in the meeting sale scene as follows.

- A) Communication needs of salesclerk (HIGH) and the communication needs of customer (HIGH),

Communication about sales activities such as explanation, the price negotiation of the product, etc is carried out positively.

- B) Communication needs of salesclerk (LOW) and the communication needs of customer (HIGH)

The customer does not demand the approach from a salesclerk and calls a salesclerk from oneself, if necessary. Salesclerks always stand by for such situation. The salesclerk reduces the pressure to a visitor on this occasion by feigning low communication needs state.

- C) Communication needs of salesclerk (HIGH) and the communication needs of customer (LOW)

The customer demands the explanation about the product from a salesclerk. However, the salesclerk is in condition not notice the existence of the customer or not to notice the trend of the customer. In addition, the salesclerk may refuse the sale of the product to the costumer daringly by ignoring the approach of the costumer.

- D) Communication needs of salesclerk (LOW) and the communication needs of customer (LOW)

In the state that is non-interference in each other as for the salesclerk and the customer, the customer does shopping freely, and the salesclerk can conceal an intention to want to sell a product to a customer.

To clarify the ties of each communication needs and each behavior contribute to realizing the maintenance of the formation and the relations of relations of low social risk of relationships. Therefore, in this study, our purpose is to model the physical interaction with the nonverbal signal which is at low risk of social based on each communication desire of a salesclerk and the visitor in the environment that abstracted a meeting sale scene.

**BACKGRAMD**

**Motivate of communication**

The motive for people communication taking up eight sides from the viewpoint called the communication desire by Dimpleby & Burton [2]. As for eight as follows:

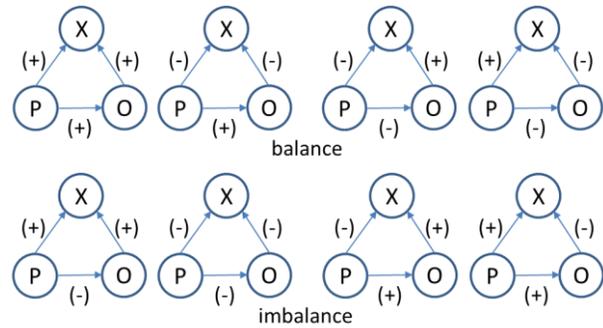
- Survival
- Co-operation
- Personal
- Social
- Practical
- Economic
- Information

- Play

These motives imitated Maslow's Hierarchy of Needs. In other words, it is suspected that communication is tool to satisfy a desire. Further the communicating object person has the purpose that was similar to achieve it, and it is necessary that there is profit each other.

**balance theory**

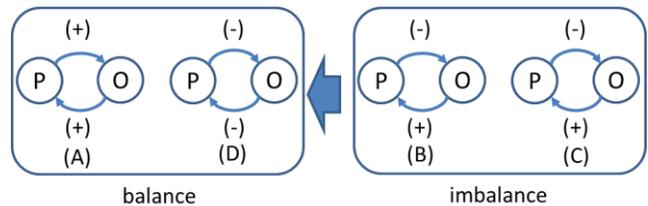
Some models to assume the relations with the person a good state are suggested. One has a balance theory. The person describes the tripartite relations by a theory proposed by Haider[4] . If oneself and a partner are favorable for an object, oneself builds the relations that are favorable for a partner (Figure. 1). When oneself and a partner have a different impression in an object, the maintenance of favorable relations is difficult. Further person becomes the antagonism relation to save balance. In other words, relation evade the state that is not balanced such as the cognitive dissonance state by the balance theory.



**Figure 1. Balance theory.**

It is thought that such a balance theory applies to this communication needs (Figure 2). In other words, it is thought that communication needs is high or low each other maintains a balanced state as stated already in introduction. On the contrary, when communication is started in state varying in each other's communication needs, a person gives a partner discomfort.

As a result, are good with a state varying in each other's communication desires.



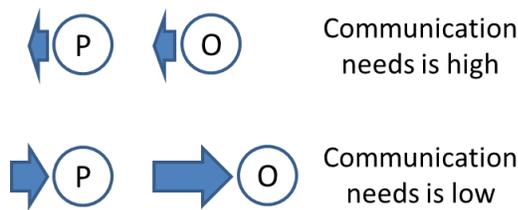
**Figure 2. Applying communication needs to balance theory**

**Affinity conflict theory**

According to the affinity conflict theory, the person regulates an affinity desire and the evasion desire of the interacting personal interval constantly to maintain a comfortable level of the interpersonal intimacy [1]. For example, each other's physical distance becomes near in the elevator, however evade the

state that approaches it psychologically too much by exposing eyes to the floor indication, and missing the eyes each other. As for this, it is thought that a similar action is seen when each other's communication needs states are different. When a state of (B) and (C) occurs, and either is going to keep the state that a communication desire is low, it is thought that people shown a rejective reaction for an act turning an approach and eyes to act based on an affinity desire to. On the contrary, it is thought that affinity acts for an evasion action to miss the eyes to get out when either keeps the state that a communication desire is high in.

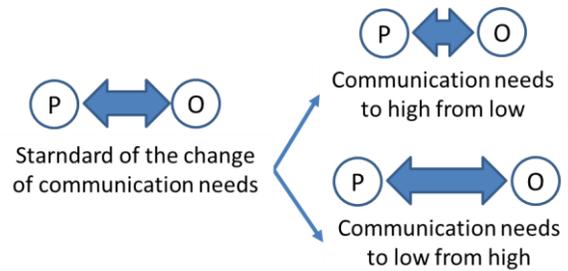
It can be a judgment element for an action to maintain a level in the closeness-related time when we judge the communication desire of the partner from these things to distinguish it. It is thought about how you judge it for the change of the communication desire in the next knob from the viewpoint of awakening model of the affinity.



**Figure 3. State of communication needs by affinity conflict theory**

**Arousal model of interpersonal intimacy**

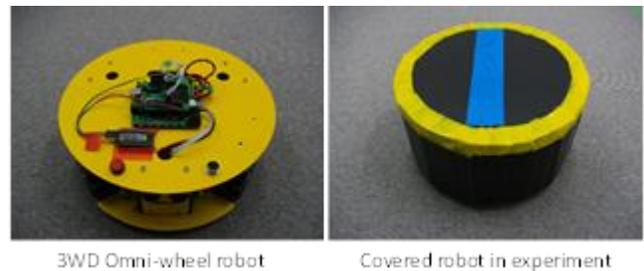
For a change of the intimacy, the arousal model show that it is a result affected by arousal- reversion process to deal by a unique method [5]. For example, awakening is promoted when a person accesses knows. When, it is labelled fear negatively, as a result, people turn face away and do it and show rejection. People make decision that it is in state that it is high whether the communication desire of the partner is in a low state from B and a C-shaped state to make the standard of the state of A and D from the above-mentioned affinity conflict theory. And a constant psychological sense of distance occurs. In addition, it is thought that it is revised from an intimacy equilibrium model by some channels. In other words, the change of the state of the communication desire thinks that this constant mental distance interval greatly acts. Therefore, it becomes clear whether those approach changed into an affinity action from an evasion action from what changed for an evasion action from an affinity action for one's evasion action or one's affinity action. The side that person want to bring into the state of (A) makes a state of this (B) or (C), and it is thought that people inspect whether a reciprocation-like act produces it for its behavior. On the contrary, it is thought that rejection is weak the case that is felt (the rejection that is too stronger than the last time comes off) for some proximity action to some extent even if people are persuaded. In this case it is thought that the frequency of the affinity action increases.



**Figure 4. Change of state of communication needs by arousal model.**

**Nonverbal behavior**

As for the non-language information, the appearance is had an expression, a gesture, space placement, a contact action again, too. The impression formation and a judgment of the character are carried out by a partner by appearance. For example, a fat person is sociable and has an impression that it is tolerant. In addition, symbolic expression and a factor and the expression that is explicit to some extent because it is to estimate the internal state of the partner are enabled when there are a gesture and an expression. Appearance uses a simple robot that it is thought that the factors increase more when the information by the non-language is abundant and lowers information from this and others more and, from this and others, shows the robot to the figure 5.



**Figure 5. Robot used in experiment.**

**Nonverbal behavior**

Of a certain uniformity recognized between 2 people with the approach characteristics is physical, and is psychological intimacy. It is shown to a proximal action at frequency of distance and the eye contact of the partner and time, good appearance, frequency of the contact. The proximal action gives friendly feeling to a partner and promotes communication. In other words, it is thought that it is one signal it shows a communication desire that a proximity action occurs or to hope for it. On the contrary, it is thought that the non-proximity action becomes the action indicating there not being a desire for the communication that a communication desire is low.

We do it by this experiment if targeted for observation.

**Process based on the communication needs**

It is thought that person estimate a communication needs by a process model such as figure 6 from these theories. We observe this process by the experiment.

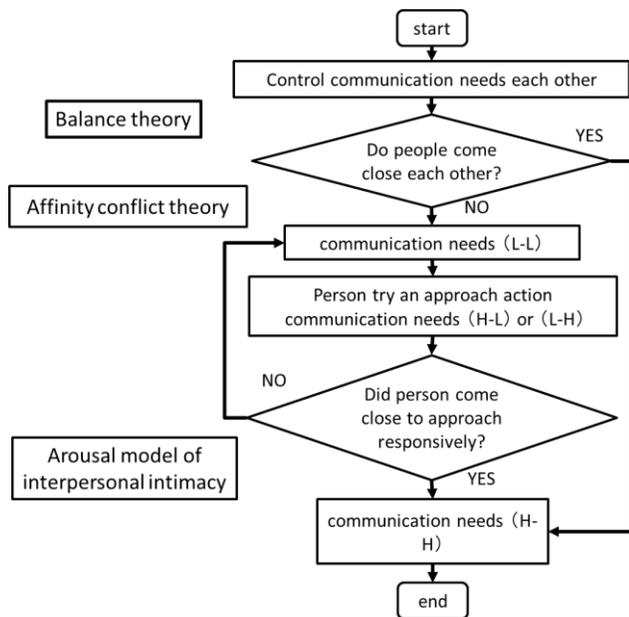


Figure 6. Process based on the communication needs.

## EXPERIMENT

### Purpose and hypothesis

It is intended to observe the physical interaction at the time of the start of the interaction by this experiment. We make the situation to judge whether people act to give favor to determine whether a partner is reliable in the experiment and observe what kind of process you transmit each other's information.

### Experiment task and environment

The experiment environment becomes like a figure 7 and guides two participants to the separate rooms. A robot shows a position and the direction of the participant who is in the other room, and a robot moves in total when one participant moves. Participant A performs an experiment to perform a story device by this experiment. It is instructed "Please talk for participant A if you seem to want you to talk".

It seems to be as follows, and it is instructed what in participant B by conditions.

- Please derive it so that a partner talks. (conditions1)
- Please accept it if you seem to talk. (conditions2)
- Please act so that it is not talked. (conditions3)

Participants perform it for three minutes and observe it what kind of action each takes and inspect whether you act according to each theory.

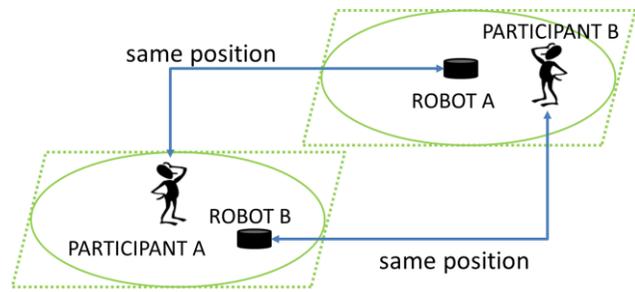


Figure 7. Experiment image.

## CONCLUSION

Our purpose is to analyze a physical interaction and to build a model in this study. By the construction of this model, people constitute low social risk of relationships, and it is suspected that people contribute to what sustained relations of the realization of both maintain.

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