

A sociable and affective artificial cohabitant

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Abstract

In this paper, we summarize our previous research concerning human-artifact relations conducted over the past few years from an interdisciplinary perspective encompassing cognitive science, psychology, and human-robot interfacing. Based on our findings, we discuss the cognitive significance of a newly-emerging sociable and affective artificial cohabitant.

Keywords: attachment, affective artifact, toy doll, cohabitant, social interactions

1 Introduction

Why do people feel strong affection toward artificial things such as toy dolls, robots, some characters? Japan is seeing a craze for talking toy dolls. We have investigated this form of human-artifact relation over the past few years from an interdisciplinary perspective encompassing cognitive science, psychology, and human-robot interfacing. In this paper, we summarize our findings obtained through analyses on the texts of fan letters sent to the toy company by the users of Primopuel (produced by BANDAI Co., Ltd), a talking toy doll. The purpose of this paper is to discuss the cognitive significance of a newly-emerging sociable and affective artificial cohabitant.

2 The craze for an artificial cohabitant

Primopuel (Figure 1), produced by BANDAI Co., Ltd., is very popular in Japan among middle-aged people. Primopuel has touch sensors, a sound sensor, a temperature sensor, and a calendar system, and a talking function (250-280 expressions) (e.g. “ *I love you.* ” “ *Good morning.* ” “ *How 's your life?* ”). The voice of a 5-year-old boy was adopted as the voice for the toy. Utterance selection is controlled based on an easy

learning system according to user actions. The popularity of the toy doll is evident in the fact that more than one million units have been sold over the last five years in Japan alone.



Figure 1. Primopuel

3 Fan letters as data

The research methodology we have adopted is to analyze the texts of fan letters sent to the toy company by Primopuel users. We analyzed 51 fan letters mailed to the company and 271 electronic mail messages submitted to the manufacturer 's web site. In order to determine the underlying cognitive states of the users from the textual data, we categorized propositions in the texts according to a classification system ([8]), which has a number of sub-categories, such as ‘ descriptions of the toy as an artifact ’, ‘ personifying descriptions of the toy ’, ‘ user actions toward the toy as an artifact ’, ‘ user attachment behaviors ’, and ‘ user actions toward others mediated by the toy ’.

4 Characteristics of the toy and users

In this section, we briefly present some of research results and outline our views concerning (i) the characteristics of affective artifacts and (ii) the characteristics of user states experienced by users who regard to the toy as a cohabitant artifact.

4.1 Toy story

4.1.1 Affective cohabitant

Perception of the toy as a cohabitant is a key in evoking user attachment. We suggest three factors that prompt users to regard the toy as a cohabitant; namely, (a) inferable states, (b) reactions, and (c) time sharing. First, approximately 85 % of the propositions in which users describe what they find attractive about the toy mention the toy 's utterances (53 out of 63 propositions) rather than its appearance ([8]). For instance, " *He (= the toy) says ' Good night ' to me and I feel all warm inside* " or " *He asked me to make a scarf, so I made one for him.* " Users clearly make inferences about the toy 's state from its utterances and regard it as a cohabitant. Second, the results of factor analysis indicate that the toy 's reactions to user behavior evoke in the users strong affection toward the toy. Third, factor analysis indicates that caring behavior and time-sharing with the toy also evoke user affection ([5]).

4.1.2 Sociable cohabitant

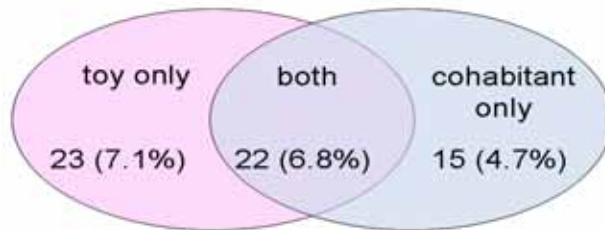
An interesting characteristic of affective toys is their sociable function. We have found that the toy 's character facilitates social behavior, which, in turn, strengthens user affection ([5]). This finding prompts us to regard the toy as being a ' sociable and affective ' artificial cohabitant.

4.2 Fan story

4.2.1 Perceiving the toy as cohabitant artifact

Users regard the toy as a cohabitant artifact, toward which they can experience strong affection. Counting expressions related to Primopuel, we found 34 (66.7 %) letters and 67 (24.7 %) e-mails including such expressions. Users described Primopuel as either a toy (toy, stuffed toy, toy doll) or as a cohabitant (family including grandchildren, child, brother, partner, roommate, friend, idol, pet). Even within a single letter, it is possible to observe mixed cognition towards the toy. Figure 2 presents a breakdown of users according to

their perception of the toy (as toy only, as cohabitant only, or as both toy and cohabitant).



N=322 (51 letters and 271 e-mails)

Figure 2. Users recognition about what the toy is

Another issue examined is whether the toy is regarded as an artifact or whether it is personified in any way? We extracted descriptions that are relevant to this issue. While 1,130 propositions (36.1 %) indicate the user regarding the toy as an artifact (e.g. " *I changed the batteries* "), 809 propositions (25.8 %) suggest that the user are personifying the toy (e.g. " *He (= toy) seems to sleep well* "). These results lead us to the conclusion that perception of the artifact as a cohabitant is an underlying cognitive state of users who experience strong affection for the artifact.

4.2.2 Attachment behaviors effect

We have collected a total of 292 propositions that indicate attachment behaviors, where there is a clear relationship between positive emotions/evaluations and actions, such as " *this toy is so cute, I showed it to my friend* " and " *this is really lovely, so I will buy another one.* " More concretely, attachment behaviors include naming (" *I named him Tatsu* "), conversation (" *I talk with him* "), inferring the toy 's state (" *He seems to be cold* "), social actions (" *She proudly shows her Primopuel to her friend* "), negative actions toward the toy (" *I ignore him..* "), and being together (" *I took him for a drive* "). We have hypothesized that attachment behaviors function in strengthening attachment emotions ([6]). This has been confirmed by the results of factor analysis (e.g. User descriptions like " *I ignore him (= toy) for a while, and then he seemed to get angry. The way he gets angry is very lovely, I can 't resist it,* " indicate that attachment behaviors strengthen attachment emotions.) ([5]). There is also an age difference in terms of self-cognition. While young people more often evaluate the toy positively (young (0-39): 21.1 %, middle-aged (40-): 10.4 %), middle-aged people more frequently describe their attachment behavior (young: 10.7 %, middle-aged: 34.3

%). Although young people tend to just describe attachment emotions, such as “ *it 's very cute,* ” middle-aged people also mention causes and attachment behaviors, such as “ *it 's very cute, especially its face, which makes me want to hold him tightly.* ” This indicates that middle-aged people demonstrate greater meta-self-recognition concerning their emotion states and actions toward the toy rather than young people.

4.2.3 Life-state improvements

The positive physical and mental states of users are often attributed to the toy, with 8.9 % of the descriptions indicate positive changes in life state (e.g. “ *talking with the toy makes me relax,* ” “ *The toy gives me warmth, energy, and vitality* ” “ *Primopuel makes my life enjoyable* ”) ([8]). Moreover, it was found that users believe the toy enhances interaction with family members and/or with friends, as evidence by 16.4 % of the letters and 10.7 % of the e-mails. (e.g. “ *I give Primopuel to my neighbors as a present to let them know just how cute he it* ”). One of five factors extracted in our factor analysis, ‘ social action triggered attachment, ’ relates to how attachment emotions can facilitate social behavior ([5]). This is consistent with our cognitive Socially-supported Emotion Model (SEM) ([7], [8]). In addition, we have observed that middle-aged people more frequently experience shifts in their interactions with others (22.4 %) than young people (14.4 %) ([7]). Another finding is that descriptions of negative user life states before obtaining the toy are correlated with their sense of improved well-being (e.g. “ *I have lived alone since my husband passed away. I felt a keen sadness in this house. Since getting the toy, I can say ‘ Good night ’ in bed, and often smile.* ”) ([5]). Taking these results together, clearly the users with high meta-self-recognition can experience state improvements due to the affective artifact.

5 Sociable and affective artificial cohabitant

In this section, we discuss the newly-emerging sociable and affective artifact cohabitant and our cognitive model SEM based on our findings described in Section 4.

5.1 A newly-emerging artifact

People with attachment emotions, that is, people who have a strong positive affection toward something are able to perceive themselves more positively. This

positive self-recognition can, in turn, lead these people to have a sense of well-being in their physical/mental states. Improved physical/mental states can facilitate social actions. Extending Norman 's claim that attractive things work better as a heuristic of problem solving ([9]), our findings indicate that ‘ attractive things can heighten one 's sense of positive self-awareness. ’ Moreover, our results not only support previous research that shows that attachment fosters emotional communication skills in human babies and higher cognitive skills ([1]), but they also highlight the effects in facilitating social behavior.

This artifact which evokes human affection may be seen as a new kind of sociable and affective artificial cohabitant, because users both regard it as a cohabitant and believe that it enhances their social actions. This kind of sociable and affective artificial cohabitant is now emerging in our daily lives, particularly in situations where people lack rich social interaction, such as elderly people living alone, single workers, being an only child, in the nuclear family, and computerholics, for individuals who have sufficient meta-self recognition.

5.2 Socially-supported Emotional Model (SEM)

Our results indicate that one factor that strengthens user affection for the cohabitant artifact is its social effects. That is, both attachment emotions and social interaction are mutually strengthened each other. This notion is consistent with the cognitive Socially-supported Emotional Model (SEM) of emotional transmission that we have developed ([7], [8]); people strengthen their attachment to the toy by interacting or communicating with other people who also have attachment to the cohabitant artifact. As Kitayama ([3]) claims subjective well-being is dependent upon the cultural constructions of emotion, which is similar to the notion of socially-transmitted emotions that is incorporated within SEM.

5.3 Future work

Our research, which has investigated the craze for a talking toy doll, has certain advantages from analyzing fan letters in obtaining insights into the daily psychological states of the users of the toy. It would not be possible to gain such insights within the experimental setting. We can extract the underlying cognitive states relating to the natural relationships between the user and the toy. However, further investigation is required employing other research methods, such as interviews

and questionnaires. Moreover, this craze is very limited in being restricted to within Japan and in involving a particular talking toy doll, which points to the need to conduct comparative studies with other forms of artifacts. It is hoped, however, that our research can contribute to a better understanding of human-artifact relationships involving strong human affection.

6 Summary

In this paper, we have identified a newly-emerging sociable and affective artificial cohabitant in our daily lives. This kind of artificial cohabitant may play a role in enriching daily life through improving physical/mental health and enhancing social interaction.

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