Cues for Sociable PC: Coordinate and Synchronize Its Cues based on User Attention and Activities on Display

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Abstract—A sociable PC (SPC) is capable of engaging and interacting with social cues while users use it. SPC is a kind of artifact which is capable of coordinating and synchronizing its behaviors based on user attention and information on a display. In particular, SPC can exhibit behaviors to induce a trust through social rapport with the user while responding to the user's behaviors and activities on a PC. We used the concept of a minimalism designing mechanism to invent the SPC. The SPC appearance is much like soft "Tofu," so the user can touch and sense it. The SPC can also provide feedback to the user using attractive social cues such as shaking its body, displaying an attractive motion and joint attention with the user, etc. In this paper, we describe the designing concept of SPC and evaluate its salient social cues used to establish social rapport with users.

I. INTRODUCTION

A recent study by [1] explore the concept that interactive technology (e.g., computer, television, etc.) is treated as social actors, and people engage with the same social practice as they engage with people in their everyday lives. The appearance of these technologies has not had any relevance to humans since even their functional capabilities (cognitive) are unable to cope at the human level. The question is, why do humans still engage with social cues when they respond to interactive technologies? Dennett [2] defines the "intentional stance" as the disposition to treat an entity as a rational agent, possessing particular beliefs, desires, and intentions in order to interpret and predict its behaviors. In this sense, an entity can be considered as a rational agent (social actor) when a human can predict their particular behaviors. As is already known, a human is already an expert in social interactions, and they use own their social model to predict other's behaviors. This implies that interactive technologies, artifacts or robot behaviors (function or engagement) should be directed to inherit the attributes of a human social model.

A sociable robot is a newly emerged field which endeavors to invent sociable artifacts or creatures to be used in various human-centered applications. A RoCo [3] sociable robotic computer ability moves its monitor to encourage its own users to change their postural states. The encouragement helps to reduce the back pain of users when they work and interact with a computer during long periods of time. This interaction aims to have persistent reciprocal physical movement of humans and computers. Indeed, it is important to understand how these social interfaces are beneficial to establishing a better environment for users to execute their goals.

We developed a sociable PC which is capable of engaging and interacting with social cues while being used by users (Figure 1). An SPC is willing to establish social rapport with a user by coordinating and synchronizing its behaviors based on the user's attention and information on the display. Engagement is incited by creating a positive reciprocity with the user to become a social partner while they use the PC.

II. ARCHITECTURE FOR SPC

We used the concept of a minimalism designing mechanism to invent the SPC (Figure 2). SPC appearance is similar to soft "Tofu," and the user can touch and sense it. The SPC has a main CPU board which is as affordable as a basic personal computer. As excess, a microcomputer (SH2 Tiny) is connected to control five motors, an acceleration sensor, distance sensors, and full-color LEDs. The SPC is capable of
moving (shaking and tilting its body) the upper part of its body using servo motors, and its whole body can also move back-and-forth or turn by using its servo motors. Distance sensors are utilized to avoid obstacle and to also detect user distances.

A. SPC as a Social Companion

The physical appearances of creatures, artifacts, etc, are not essential for becoming a social partner within the daily lives of humans. We believe that a creature’s (artifacts) social cues and behavioral feedback (based on user behavior) are a most indispensable component to inherit their social roles. Our SPC was invented as a social companion for users to create a more enjoyable environment through its verbal and non-verbal cues, for example, shaking its body, displaying an attractive motion and joint attention with the user, etc. SPC is capable of tracing a user’s attention and environmental variants (information on the display) to interact and respond toward attraction to the smooth motions and behavioral adjustments of the SPC was based on their cues and information on the display.

III. Performances of SPC

We produced six video clips from which we categorized the SPC social cues which respond to user behaviors or environment information (information on display): (V1) no motion, (V2) random motion, (V3) rough motion based on information on display, (V4) smooth motion based on information on display, (V5) smooth motion based on both human attention and information on display, and (V6) smooth motion based on both human attention, information display, and when the SPC interacts with extra behaviors. In particular, it is interesting to explore the necessary SPC social behaviors that are dependent on user behaviors, or a variation of the environment, or both user and environmental differences. We conduct a questionnaire-based psychological experiment with 21 users’ preferences to evaluate the effectiveness of the SPC salient cues. The questionnaire is comprised of six questions: (Q1- SPC has a goal, Q2- some SPC cues based on the variation of the environment, Q3- SPC cues based on context, Q4- SPC behavior as a social companion, Q5- SPC is willing to communicate, and Q6- likes to communicate with the SPC). The response scale was from 1 to 5 (with 1 as the lowest rating and 5 as the highest rating).

Table I shows the mean values of the subjective ratings from each of the videos that were categorized based on the five questions. An ANOVA revealed that the mean value of subjective rating showed a significant disparity with the video categorization (based on the six questions). The results revealed that each of the SPC social cues acquired a different rating (beliefs or attractions) from each of the subjects. The above result motivated us to attempt to examine what was the most attraction video clip (SPC social cue and behavioral feedback) based on the subjective ratings. A Tukey test showed that V6 video clip obtained a significantly higher subjective rating (refer Table I). The results revealed that users’ impression and attraction to the smooth motions and behavioral adjustments of the SPC was based on their cues and information on the display.

IV. Conclusion & Future Works

The subjective ratings disclosed that to endure as a social companion, the SPC should effectively respond to users (with smooth social cues) based on their behaviors (attention) and information on the display. In the future, we plan to decipher the eye gaze behaviors of users in order to discern their attention. The above behavioral interactions have facilitated us in conceiving SPC as a social companion with the rapport necessary to establish a more delightful environment for users.

ACKNOWLEDGMENTS

This research has been supported by both Grant-in-Aid for scientific research of KIBAN-B(21300083) and HOUGA (19650044) from the Japan Society for the Promotion of science (JSPS).

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