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It Loves Me... It Loves Me Not: Towards Implementing Artificial Love in Companion Robots

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Abstract

We describe our prototype implementation of Chapman's theory about the five love languages into a humanoid robot. This implementation has the objective of fostering a relationship that nurtures love, and that could lead to the human feeling loved by the robot. This special bond could potentially serve as a non-pharmacological intervention to aid in patients' treatment or wellbeing during prolonged hospitalizations. At the same time, the robot could monitor the patient in case abnormal behaviour is detected such as anxiety or depression.

Keywords: Artificial Love, Love Languages, Companion Robots.

1. Introduction

As described by Jin and Kim (2019), a nurse would expect that the robot become friends with the child patient, and encourage the child to cooperate with the caregivers. The robot can also help reduce the child's fear of hospitals and caregivers. We speculate that a robot featuring artificial love could contribute to such expectations. We use the five love languages theory of Chapman (Chapman, 2009). Chapman claims that humans have five ways to express love to another human: acts of service, physical touch, words of affirmation, quality time, and gift-giving. Our project consists of building a prototype and a methodology to implement these languages into a robot; in our case, the Asus Zenbo robot (see Figure 1). We have chosen this robot because, as described in (Roland, 2021), Zenbo is one third human and two thirds machine, so the child can feel that they are interacting with a machine that is capable of love, and understand them like a human, although fully aware that it is not a real human and the love in it is only artificial. The robot comes with built-in artificial intelligence functions, including natural language processing, which we use to make our prototype able to speak and understand the five love languages in a natural (as possible) exchange with a human.

2. Related Works

We have chosen to make a loving robot, because as the research of Payne (2006) points out, when someone is loved, their wounds are going to heal 60% faster. And if the child heals faster, they are likely to spend less time in the hospital. Also, in their study, Sanson and Lobefalo (2021) claim that if we can bring love into the hospital, especially into the intensive care unit, we would be able to drastically improve the patient's experience. To implement that, we have chosen to use Chapman's (Chapman 2009) love languages, which have drawn the attention of researchers and readers in general since their first appearance back in 1992. Chapman built a model with five love languages: "act of services", "quality time", "physical touch", "words of affirmations" and "gift-giving".

Figure 1: Zenbo Robot

Two decades after, Nicole Egbert and Denise Polk (2006) conducted a study with 110 participants to try to validate Chapman's model. They compared three models, one with the five love languages, another one with only four combining the language's word of affirmation and time together. The third language had only three languages, as they combined together words of affirmation and quality time in one part and receiving gift and physical touch in another part. They concluded that Chapman's model was the best of the three models. A similar research with 410 participants was made in Indonesia by Surijah and Septiarly (2016) who came up with the same conclusion. Salas (2009) also validated Chapman's languages of love through a study involving couples in Spain.

Our choice to use the Zenbo robot was inspired by the work of Valle, Martin and Horsburgh (2021) who aimed at developing artificial empathy using Zenbo, as well as the work of Ritvik, Martin and Kritika (2022) who suggested an emotion recognition framework for the same robot.

3. Prototype

For our project, we used two development environments: the Dialogue Development Environment (DDE) Editor and the Zenbo App Builder. Both are tools provided by Asus to build applications that work on the robot.

3.1 Dialogue Development Environment Editor

The DDE Editor was used for the dialogue part, as depicted in Figure 2. The human sentence is categorized as an intent. The intent is a collection of sentences that convey the same idea. For instance, "yes" and "that would be lovely" can be in the same acceptation intent. This intent is going to trigger the plan that is linked to an action depending on the robot's state, thus determining the robot's response. For example, if the robot's state indicates that the robot has asked before if the human wants a joke, and the human says something that is in the acceptation intent, the robot will tell a joke to the human. For the same sentence, if the robot state indicates that the robot has asked before if it can tell a story to the human, it will then tell a story.

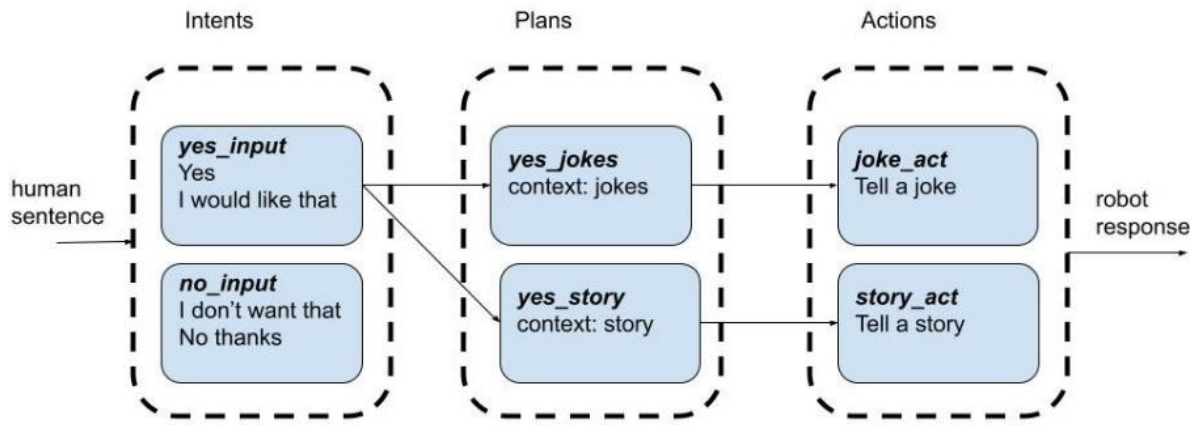

Figure 2: DDE Methodology

We used this structure to allow the robot to speak the language of "words of affirmations". This language unites the abilities to give accurate compliments and recognize when the interlocutor gives compliments. We began our work by creating a dataset of compliments by coding a compliment's generator based on the compliment syntax formulas of (Iwashita & Katagami) (see Figure 3). Which is based on the research of Holmes (1986) in which the author listed words and expressions that we can use to compliment someone.

We also enriched our dataset with sentences from the TV shows Friends and The Simpsons. These datasets consist of 39,000 sentences for Friends and 150,000 sentences for The Simpsons. We filtered the compliments using text blob, which is a Python package that can extract the general feeling of a sentence based on the feeling carried by the words of the sentence. We have only kept the sentences that carry a positive feeling. Then we selected the complimenting sentence containing at least one intensifier from our list.

The second part of our project was to make the robot say these compliments at the right time using the DDE Editor.

The quality time language is the act of giving someone our undivided attention. We implemented that by making the robot able to tell jokes, stories, or perform some dance show with its body movement and illuminated wheels. The robot can also listen and react if the human wants to tell a joke, a story, or just talk about anything. The goal was to make the human feel that the robot is happy to share a moment with them and giving them all its attention.

3.2 Zenbo App Builder

Because the DDE Editor allowed us to only managing what the robot says, we needed the Zenbo App Builder to make the robot move or else show different facial expressions on its screen. Fortunately, we can make the two environments communicate, so that a plan in the DDE Editor can link to an intent and add a context to perform an action within the Zenbo App Builder. For example, if we had asked the human if they wanted the robot to dance, we were into the dancing context. Thus, if the robot hears a sentence that is categorized into the "yes" intent of the DDE Editor, it would trigger the software routine that makes the robot dance in the Zenbo App Builder. All these features were used to implement the three remaining love languages.

1. NP BE (LOOKING) (INT) ADJ
2. I (INT) LIKE/LOVE NP
3. PRO BE (a) (INT) ADJ NP
4. What (a) (ADJ) NP!
5. (INT) ADJ NP
6. You (V) (a) really ADJ NP
7. You (V) (a) really ADJ
8. ADJ NP!
9. Isn't NP ADJ ?

Figure 3: Compliments Syntactic Patterns

(Source: Iwashita & Katagami, 2020)

The act of service is the act of making tasks for the person we love: vacuuming the house, cooking their favorite meal, etc.… This love language is harder to implement directly, because the robot doesn't have extremities and even if it had, its dexterity and the difficulty of performing these tasks would be significantly challenging. Nonetheless, the robot could control some electronic devices and give expressions to the caregivers. For example, it could play the patient's favorite show, control the room's temperature, or ask the floor chef to cook the patient's favorite meal.

As per physical touch, since the robot doesn't have extremities, it can't extend to touch the human. However, to overcome this barrier, the robot would ask the human to touch it, or hug it.

The last language we studied was gift-giving. While the robot can't offer material gifts, this language is not about the gift itself but the meaning of the action of giving. For example, showing photos of the human's loved ones, favorite landscapes, or playing the human's favorite music. To know the human's preferences and enable Zenbo to give "accurate gifts", the human would need to fill up a survey before meeting with the robot for the first time.

4. Proposed Experiments

The goal of our proposed experiment is to see if we have successfully created a bond between the robot and the human. To quantify this bond, we would use a metric such as the Lovotics Love Attitude Scale (LLAS), a 42-item questionnaire used to measure attitude towards love, proposed by Samani (2016), or relevant questions from the Rubin's Liking and Loving Scale questionnaire (Rubin 1970), or a combination of these and other relevant questionnaires available in the literature. We would recruit a number of participants to come to our Human-Machine Laboratory for a number of continuous days (e.g., for a week), and spend a certain amount of time (e.g., 30 minutes) each day interacting in private with Zenbo using our love languages implementation. We will use a control group which will interact with Zenbo through an interface other than our love languages implementation.

After each session, each participant would respond to our questionnaire (e.g., LLAS, Rubin's). We would then report if there was an increased bonding and whether this effect was a result of our love languages implementation.

5. Conclusion

We have described our prototype implementation of the five love languages in a humanoid robot, along with a suggested experiment to measure the level of the human-machine bonding formed as a result of our implementation.

It remains for us to continue developing and refining the love languages implementation, while considering potential ethical issues arising from the false impression of love a robot may project on a human. We will also investigate the development of feelings other than love such as compassion, indifference, affection, etc.

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