

Research on the Fundamental Design of an Artificial Personality System for Human-like Communication

Taishi Nemoto and Takayuki Fujimoto

Abstract—In recent years, Artificial Intelligence (AI) has been continued developing. Not only is there a confrontational structure where AI surpasses human intelligence, but also it is expected that utilizing AI will enhance human productivity and creativity. While the popularization of Large Language Models (LLMs) has drawn global attention to Generative AI, there are also opinions that it represents the limitations of AI. In most of the cases, since LLMs fit plausible words in a statistical manner, they lack reliability and have no room for a human perspective. Since the knowledge or generated results obtained by the use of ChatGPT need to be checked by humans again, it ultimately means the risk of ironically reducing human productivity. On the other hand, the Artificial Personality (AP) mentioned in this study is a model that focuses on personality, instead of replicating human intelligence or intellect. AP is a human-centered system that 'is' there for humans. It aims to indirectly support humans in their initiatives taking actions, instead of just focusing on an accurate simulation. Particularly, the fields of Nursing Care, Welfare and Terminal Care have been slow to adapt to AI introduction. The current situation is that physical labor there is clearly recognized, and mental care for care receiver captures less attention. In this paper, we propose a system that uses artificial personality to enhance human nostalgia.

Index Terms—Artificial Personality, Artificial Intelligence, Nostalgia, Terminal care, eXtended Intelligence, Dementia.

I. INTRODUCTION

In the context of an aging society, support focusing on emotions and recollections is emerging as a new issue. Mental support for not only the elderly but also terminal patients and dementia patients is important, alongside with traditional physical support. Nostalgia, recognized as a pleasurable emotion, is particularly emphasized in its importance in the care for the elderly and terminal patients. Nostalgia is defined as a sentimental feeling towards past 'places/sceneries,' 'people,' and 'objects,' and through these emotions, it can potentially provide psychological stability and a sense of happiness. In this research, we propose a "system for extending nostalgia utilizing Artificial Personality." Artificial personality (AP) is a system that imitates human personality and character, achieving various interactions, and in this study, it particularly mimics the personality of the deceased, providing an experience of nostalgia for the bereaved members. The goal of this system is to provide a means to support the emotional processing of family or friends by remembering the deceased through

"conversations" with the object of nostalgia. The generation of an AP involves learning and simulating the way by which the deceased person spoke, expressed themselves, and how they perceived things, based on various data the modeled person left behind (text messages, videos, voices, and etc.). Through interaction with the user, the system enables a "reunion with the deceased." What this system aims for is not to provide a realistic simulation with accurate reproducibility but to provide emotional comfort and support to the user. In this study, we explore ethical issues along with the potential benefits brought about by technological advancements. In addressing the question of what kind of psychological impact the AP of the deceased has on the bereaved members and whether AP use is morally permissible, this research delves deeply. Additionally, the study examines insights and application potentiality obtained through the development of AP technology.

II. BACKGROUND

The advancement of high-level technology enriches people's life and brings convenience in various situations; however, it also presents new challenges facing progressive aging of society. In particular, there is an increase in the number of the people requiring extensive care related to the care for the elderly, the dementia patients, and the terminal patients, and the needs for such cares have been diversified. While there are many initiatives that employ technology to support physical care, there are still a host of challenges for mental care, and more specifically, it means emotional care. In this context, 'nostalgia' is gaining attention in the fields of Healthcare and Elderly Care, because it is one of the means through which people feel happy and retain emotional stability, 'Nostalgia' is a sentimental re-experience based on past events, and it is said to offer individuals favorable feeling and comfort while also increasing their sense of social connectedness. In particular, emotions towards a certain 'person' can potentially induce quite a nostalgic feeling. Memories and past conversations with the deceased often serve as crucial emotional pillars for bereaved members, and how to deal with these two factors for supports in the field of 'cares' today is a significant issue. In response to the successive emergence of AI and information technology (IT), how these challenges can be addressed is under discussion.

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Recent advancements in AI have been exponential, particularly in language processing and deep learning.

On the other hand, the proposed AP (Artificial Personality) records individual's data (text, audio, video, and etc.) and recreate a certain personality. The "system to extend nostalgia using AP" in this study applies personality reproduction to the realm of mental care. Specifically, it creates an AP of the deceased and provides a nostalgic experience, aiming to support their emotions, through interaction with the bereaved members. What is important here is not merely pursuing technical reproducibility, but providing an experience through which the bereaved can obtain emotional comfort and solace..

III. PURPOSE

The purpose of this research is to propose a nostalgia-extension system using AP and to explore its applicability. Artificial personality is based on the concept of augmented intelligence. Extended intelligence means a concept where humans and AI generate new creativity and convenience through their interaction. In respect of that simulations are performed by AI and computers based on personality data, which humans have input by thorough observations, AP can be considered as one type of Extended Intelligence. AP, unlike common AI, does not focus on productivity or convenience, instead, it rather focuses on emotions and feelings. This research explores the potential applications of AP, particularly from the perspective of mental care for the elderly, terminally ill patients, and dementia sufferers. As one of Extended Intelligence, it is expected that AP enhance users' sensation of nostalgia, consequently providing mental comfort and a sense of relaxation. For that purpose, as the first step, we design the system provides users with positive emotional experiences, namely, nostalgia, representing artificially simulated personality based on past personality data of the modeled person. As the second step, we need to establish a mechanism where the interaction between an AP and a user comes into effect properly, creating genuine exchanges in emotional communication. In the final step, we examine the ways to make the AP system function effectively within ethical and moral frameworks, and incorporate appropriate subsystems that reflects considerations and supports for the user's emotions of the experience. In summary, so that AP technology can offer the new method to enhance the quality of human emotional experiences and support user's mental health, we explore: how nostalgia can be extended safely and effectively, and how nostalgia can be utilized for humane care.

IV. PRECEDENT RESEARCH

(1) Nostalgia and Mental Health

The emotional impact of nostalgia on an individual's mental health is widely recognized in the field of Psychology.

In a study by Wildschut (2006), it was reported that nostalgia enhances self-esteem, reduces feelings of loneliness, and evokes positive emotions.

How these positive effects can be applied to patients with dementia or those in terminal care, is a fundamental question to be explored in this study.

(2) ELIZA and PARRY

ELIZA (Weizenbaum, 1966) and PARRY (Colby, 1975) are early conversational agents and have been at the intersection of artificial intelligence and psychotherapy since their inception, imitating dialogue with humans.

ELIZA imitates conversations of psychological counseling based on Rogerian therapy, while PARRY simulates a character with a certain mental characteristics.

These early models work as the foundation models for examining what kind of impact they have on the development of the modern AP that deploys emotions.

The following is the conversational of the two models.

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ELIZA: Good Evening. Tell me your problems. Please terminate input with a period or
a question mark.
PARRY: People get on my nerves sometimes.
ELIZA: I am not sure I understand you fully.
PARRY: You should pay more attention.
ELIZA: Suppose you should pay more attention.
PARRY: You're entitled to your own opinion.
ELIZA: What makes you think I am entitled to my own opinion?
PARRY: It bothers me just to be around people in general.
ELIZA: Please go on.
PARRY: I went to the track at Bay Meadows a while back.
ELIZA: What does that suggest to you?
PARRY: I went to the races.
.....
ELIZA: What answer would please you most?
PARRY: It's not a matter of like or dislike.
ELIZA: What else would you like to discuss?
PARRY: I am getting tired of answering the same questions over and over.
    
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Fig1. conversation of two models

(3) Utilization of AI in Terminal Care and Dementia Care

The AI utilization in the fields related to medical and nursing care has the potential to bring about innovation in supporting patients and their families.

In particular, emotional and communication support is important for the care for terminal and dementia patients.

By Robinson's (2019) research, AI applications to support communication with dementia patients have been developed.

Also, there are initiatives where AI undertakes emotional support and communication in terminal care.

(4) Care Robots and Motorized Wheelchairs

In the field of Elderly Care, robotic technology is garnering attention as a means of physical assistance and communication.

Care robots functions as communication partners, in addition to providing physical supports such as lifting heavy objects, assisting with transferring, and helping with daily tasks.

For instance, Paro (a seal-shaped social participation robot) is used to alleviate the dementia patients' stress and their caregivers (Wada, 2005).

Furthermore, wheelchair technology has been also advanced, with appearing products that utilize AI to understand the user's intentions and support the elders' physical movements and activities.(Viswanathan, 2017).

V. THE PHENOMENON OF NOSTALGIA

Nostalgia refers to a sentimental longing or warm feelings for past memories and experiences.

This represents a sentimental value towards specific periods of time, places, people, and experiences, also bringing psychological comfort and relief. Nostalgic elements span various objects like old photos, music, and places, tightly connected with the positive feelings and recollections that each individual holds from the past. This emotion tends to idealize good old times and past experiences from when compared to the present situation. Functions of nostalgia include 'positive emotions,' 'enhancement of self-esteem,' 'strengthening social bonds,' and 'providing meaning to life.'

It is reported that feeling nostalgic induces the perception of social support and reduces feelings of loneliness. Similarly, 'retro' refers to the phenomenon of past styles and trends reviving in the present and can be seen in various cultural aspects such as fashion, design, and art. Retro is not merely a reproduction of the past but combines old elements with new ones or modern sense, to create a new style.

On the other hand, 'nostalgic' purely expresses sentimentality and longing for the past.

While 'retro' appears as an external expression in styles or trends, nostalgic is inner reflection, based on emotions and memories. Although the two seem similar, they can be distinguished in respect of their attributes: expression and emotion. Below are the nostalgia elements for each of the five senses.

- (1) Visual: Places (scenery, buildings), photos, movies/TV shows, art (paintings, sculptures), fashion (clothes, accessories), colors, books, magazines, advertisements, posters
- (2) Auditory: Music (songs, melodies), language (words, phrases, dialects), nature sounds (waves, birds, insects), human voices (ways of speaking, accents)
- (3) Olfactory: Scents, natural scents (forest, sea), human scents (perfumes, shampoo), city smells
- (4) Gustatory: Food, drinks, home-cooked dishes, cheap sweets
- (5) Tactile: Textures of objects (fabrics, materials), warmth from somebody

Elements that appeal to memory can trigger a sense of nostalgia. Particularly, retrospection related to a person is a sensation that can occur to anyone.

VI. NOSTALGIA EXTENDED BY ARTIFICIAL PERSONALITY

AP create new merits as a system that can stimulate nostalgia, namely, heartwarming recollections of the past. Nostalgia, as identified in the research of Tim Wildschut and Clay Routledge, is framed as a form of personal memory and has been recognized to have positive effects on mental health. Thereupon, the important role of AP is to draw out people's nostalgic memories through interaction with the user, and consequently, focus on enhancing his/ her self-esteem. In LLM's prompt engineering, while the user takes advantage of AI power to "gain more advanced decision-making skills," AP focuses more to the user's emotional and psychological aspects, encouraging reflective dialogues. This, in turn, is believed to alleviate the user's negative feelings such as anxiety or isolation, bringing about positive results. We devised steps for a specific mechanism: how AP takes most of the nostalgic effect. First, authors construct a "personality model" by creating a database of the modeled real person's past information and memories thorough observation and hearsay. Based on that, we develop an interaction system with the user. If the user feels positive emotions and gains self-affirmation through this process, it indicates that the phenomenon reflects the characteristics of nostalgia pointed out by Wildschut's team. This process improves the user's mental health and helps him/her exercise resilience against future difficulties and adversities. Next, we consider how this mechanism functions as extended intelligence, and what kind of impact it has, as a result of cooperation between humans and AI. Artificial personalities stimulate nostalgia, which, in return, provides a different approach to human emotions and feelings and potentially enriches human's mental health and welfare eventually. The final goal is to provide support for users and patients to enjoy a spiritually-rich, more fulfilling life, and thereby enhance Quality of Life (QOL). The following indicates AP concept.



Fig.2 concept image.

VII. PROPOSAL

A. Novelty Point

As a novelty of this research, we propose a ‘nostalgia design’ utilizing Artificial Personality (AP). By combining an AP using three-layer personality data, extension of the user's nostalgic sensation, and human feedback to function as extended intelligence, the user's emotional wellbeing is enhanced. AP utilizing three-layer personality data has the characteristic of dynamically switching personality traits according to the depth and intimacy of involvement with each user. While traditional AI generally conducts dialogues with consistent personality, this new method combines different layer databases such as "Ghost DB," "Character DB," and "Skeleton DB" to enable multi-layered and rich personality expressions. It is believed that users can enjoy more realistic and individualized communication with AI. Next, by expanding the user's sense of nostalgia, individual users' past emotions and memories can be analyzed and visualized, creating new experiences. By grasping the user's past information and preferences and generating personalized content based on them, users can go through sensations that reflect their own past episodes and nostalgia. Furthermore, reinforcement learning by humans to be extended intelligence, incorporates human creativity/ senses and improves the system.

Although originally this mechanism in AI, feedback from users refines the system in a direction that allows AP to provide more user-friendly experiences, creating a continuous learning and evolution cycle. It becomes an essential step to incorporate human-specific sensitivities and values into the system, and this is something more challenging than normal machine learning. Upon this nostalgia design, where these elements are integrated, the system creates an experience with feeling of “deep connections” that reflects individual user's emotions, memories, and senses. This can be described as an experimental attempt to explore new relationships between machines and humans.

B. System Outline

This system is designed based on extended intelligence, where the user and the system work together interactively. It is not a system that is ready as “all in” once the development has finished; it only functions with the user interactions.

Therefore, the development flow and usage flow become complex and extended. The algorithm is shown below.

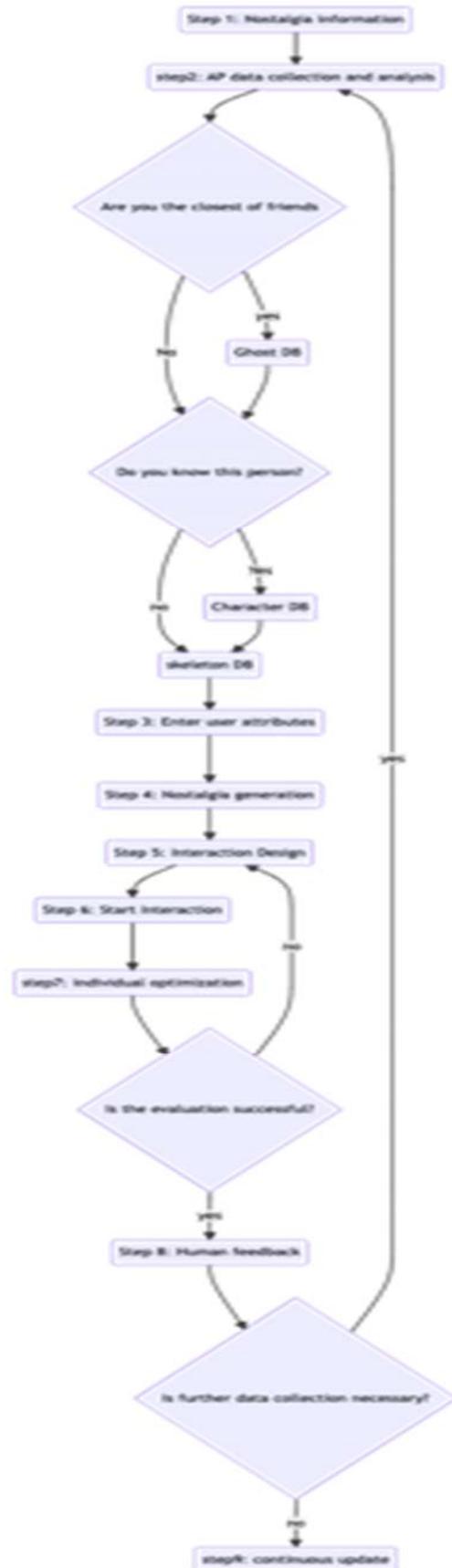


Fig.4 System Outline

C. Use Case

To begin with the Nostalgia Design System, users first convey their memories and preferences to the system through "Nostalgia Information Input." The selected "Memory DB" is linked with the user-information, and an AP within the system is customized through "Personality Adjustment." Through "Nostalgic Conversational Experience" with this personalized AP, users can immerse themselves in past recollections. Furthermore, "Emotion Analysis" is performed, and the user reactions are accumulated through "User Data Collection." Users can improve the quality of the dialogue with the system through feedback: "Feedback and Optimization." The collected data is stored in the "Personality Database," assisting the system in continuously communicating with the applied user and other users. This series of human-machine collaboration encourages users' self-reflection, intuitively deepens the user's understanding for the system, and all these can compose a richer user experience for nostalgia. The use case diagram is shown below.



Fig.3 Usecase chart

VIII. CONCLUSION

From the perspective of nostalgia, we explored whether an AP system that is created through the interactive involvement of humans and machines, can be applied to nursing care, terminal care, and care for the elderly. While researches on nostalgia is conducted in the field of Humanities, 'Nostalgia' still remains as an unexplored area in Information Science and computer-related fields.

On the other hand, even though AI has developed to a level where it can be practically used in tasks and jobs, with the times, it also becomes clear that the development does not necessarily directly connect to people's QOL (Quality of Life) and happiness. AP can be considered as one response to such AI that seeks efficiency and productivity, instead, it elicits human's emotions and feelings. Development of AP involves costs in collecting and reproducing data from a real person as a model. If the personality data sets can be obtained more efficiently and if the method can be applied to general users, AP can be said to be sufficiently beneficial in the fields of Nursing care and well-being care. Furthermore, if the conditions for nostalgia, or triggers to elicit emotions will be clarified, it can be effective not only for dementia patients but also for people with depressive tendencies or those with feelings of loneliness.

A forthcoming challenge involves the system development and subject experiments.

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