Designing Personalities of Conversational Agents

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ABSTRACT

Recent years have seen numerous attempts to imbue conversational agents with marked identities by crafting their personalities. However, the question remains as to how such personalities can be systematically designed. To address this problem, this paper proposes a conceptual framework for designing and communicating agent personalities. We conducted two design workshops with 12 designers, discovering three dimensions of an agent personality and three channels to express it. The study results revealed that an agent personality can be crafted by designing common traits shared within a service domain, distinctive traits added for a unique identity, and neutral traits left

KEYWORDS

Conversational Agent; Personality; Voice User interface; Interaction Design

Figure 1: The entire workshop process: each workshop consisted of an introduction, personality design activity sessions, and a group interview session.

intentionally undecided or user-driven. Also, such a personality can be expressed through how an agent performs services, what contents it provides, and how it speaks and appears to be. Our results suggest a renewed view of the dimensions of conversational agent personalities.

1 INTRODUCTION

Along with the wide prevalence of human-like conversational agents (CAs) such as Siri, Google, Alexa and Bixby, designing personalities of such agents has become a key research interest [2, 4]. During an interaction with a CA, users automatically assign it a personality that affects how they perceive the agent, how satisfying the interaction is, and whether they wish to interact with it again [1]. It is therefore not surprising that building a personality of a CA is receiving emphasis as a crucial part of designing a user-agent interaction.

Indeed, familiar CAs are known to be infused with particular personalities. For example, Alexa was designed to be "smart, approachable, humble, enthusiastic, helpful and friendly" while Siri was intended to be "friendly and humble, but also with an edge [3]." However, despite the designers' desire to imbue each CA with unique color, there seems to lack a clear guidance in regards to what is an appropriate way to craft agent personalities as well as what are key factors and guidelines to consider so that such personalities can be concretely designed and communicated.

In light of this issue, we investigated how designers could conceptualize and craft personalities of CAs. We conducted two designer workshops (Figure 1) where participants designed agent personalities, through which we discovered three dimensions of personality traits and three channels for expressing them. We propose these results as a conceptual framework for the initial step of designing agent personalities.

2 RELATED WORKS

Recognizing the importance of agent personalities, existing work has explored how such personalities should be designed. Studies found that users prefer agent personalities matching their own [11, 12], task contexts [6], application domain, or brand image [2]. Other studies also identified personality traits generally favored for an agent [4]. The focus of most academic research in this field leans towards accurate computational simulation or measurement of agent personalities [9], drawing upon existing human personality models such as the OCEAN model [8] that indicates five distinct factors central to human personality.

In attempts to create more natural and engaging agent personalities, bigger tech companies are adopting an approach of assigning their agents with characters or personas with sophisticated backstories that make personalities more believable and engaging. For example, the teams for building personalities for Cortana and Google Voice Assistant consists of poets, novelists, playwrights, and screenwriters [5, 10]. The importance of crafting persona details (Figure 2) has also been claimed in Google I/O 2018 [7]. However, crafting of agent personalities may not need the same know-how for creating fictional characters who go through dynamic plots and conflicts, while it remains unclear in regards to what approaches we should take then. Most recently,

Figure 2: An example agent persona presented in Google I/O 2018.

Table 1: Workshop participants.

1st Workshop (students)		
P1	male, Industrial Design Ph.D. Candidate	**Team 1** Designed for young target users
P2	female, Industrial Design Ph.D. Candidate	
P3	male, Computer Science Undergraduate (4th grade)	
P4	male, Industrial Design Ph.D. Candidate	**Team 2** Designed for senior target users
P5	male, Industrial Design Masters Candidate	
P6	male, Knowledge Service Engineering Masters Candidate	
2nd Workshop (design practitioners)		
P7	female, Industrial Design & Industrial Engineering	**Team 3** Designed for young target users
P8	female, Product Design	
P9	female, Graphic Design	
P10	female, Graphic Design	**Team 4** Designed for senior target users
P11	female, Psychology	
P12	female, Graphic Design	

Danielescue and Christian [3] discusses the design process of a multi-lingual CA, addressing components and constraints of its personality. While it has been an insightful attempt to decompose the composition of an agent personality for its diversification, its focus lies in accommodating only cultural variations in using multi-lingual CAs. In this paper, we aim to explore a more structured view point that can account for the concept and design process of clear CA personalities.

3 METHOD

We conducted two designer workshops with 12 participants (Tables 1) to explore considerations and strategies used in the process of designing agent personalities. The participants for the first workshop were 6 design or computer-science major students who had experiences in research on conversational agents. The participants for the second workshop were 6 professional design practitioners who were involved in a conversational agent design project in a big tech company.

The two-hour workshop process is shown in Figure 1. The participants were asked to design personalities of healthcare agents. We selected healthcare as a domain for this workshop activity as it was relatively familiar to most participants who have already used fitness related agent-based services and were currently interested in designing such agent services. For each workshop, three designers were assigned in a group to design for young target users (tech-savvy millennials aged between 10-30), and the other three were assigned for senior target users (baby boomers aged between 60-80) as both targets were considered as actual users of healthcare agents in the future.

Before beginning the design session, one of the authors introduced the basic service concept direction, key functions as well as the possible use scenario of the healthcare agent. Given such information, the participants were asked to creatively design personalities for their agents. In this session, each group was provided with a set of cards containing 23 components that comprise a fictional character (Figure 3) and templates to describe agent personalities (Figure 4). Not necessarily defining every component as if they were creating a fictional character, the participants used the cards as a reference material to facilitate shaping of their agents as humanized characters and ideate possible personality traits. As most CAs are multimodal, our participants were also asked to design agents with physical appearance using common modalities like sound, light, gestures and facial expressions. After designing personalities, the participants composed dialogues of the agents, as back-tracing them could also reveal which personality traits were to be portrayed and why. After all sessions, a group interview was conducted. Based on semi-structured questions (Table 2), we focused on exploring how the participants tried to design an agent personality and what they thought as important or challenging in that process.

The entire workshop activities and interviews were video and audio recorded. For the analysis, we examined the transcribed data as well as the personality templates and dialogues completed by the participants (Figure 4). Two researchers conducted an iterative open-coding analysis based on the initial research question: how should designers craft agent personalities? We developed initial open codes, iteratively analyzed the emergent themes and reached consensus on the coding as well as the personality dimensions and expression channels reported in the following section.
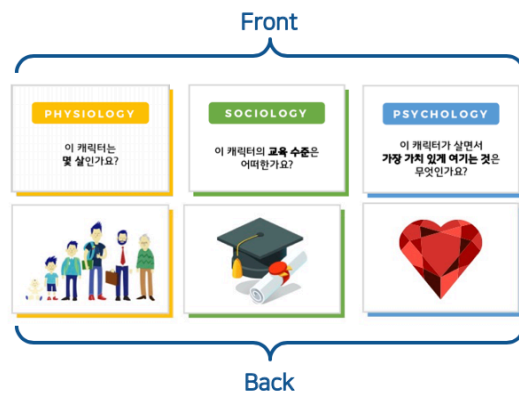
Figure 3: Examples of fictional character component cards as the workshop material: physiological (yellow, asking a character's age), sociological (green, asking a character's education level), and psychological (blue, asking what a character values most) traits of fictional characters.

Table 2: Group interview questions.

How did you use the basic concept and scenario given initially?

How did you design the character of your agent? How did you use the given cards?

How did you express your agent character on the template? Which parts represent your character well?

How did you translate character's components as agent personality traits?

How did you attempt to express agent personality in dialogues?

4 RESULTS AND DISCUSSION

We found that agent personality traits defined by designers eventually fell into three dimensions, namely *common traits*, *distinct traits*, and *neutral traits*. Also, when various personality traits were defined, they were expressed through three channels: *how an agent performs services*, *what contents it provides*, and *how it speaks and appears to be*. These findings are described as follows.

4.1 Dimensions of agent personality traits

First, all agents had several personality traits in common because they belonged to the same service domain. This dimension of *common traits* covers traits derived from characteristics of a service domain, regardless of specific target users, brand image or any other distinctive characteristics given to an agent. For instance, all four agents created from the workshops were designed as "empathizing, trustworthy, submissive, and smart-yet-modest" because their service domain was healthcare: "The healthcare agent is a supporter... so it would be very docile (P2)." Especially, this dimension of personality works as a starting point to further brainstorm what other personality traits an agent can have. P4 reported in the interview, "I think we have fundamental image of the agent, and it would be good to highlight what are the special features (of our agent) compared to that fundamental image." This implies that defining common traits can help designers set up an initial boundary of an agent personality.

The second type of traits were assigned primarily to differentiate one agent from another, falling into the dimension of *distinctive traits*. Anchored in the above common personality traits, an agent could simultaneously have a marked individuality by having its own personality traits. Team 3 discussed how their agent with the smart-yet-modest common trait could become unique: "It can be smart, precise, trustworthy... and entertaining at the same time (P8)," "Or kind-hearted (P9)," "Yes, so it can be a little... witty (P8)." They then designed an agent with both common traits as a health care provider and distinctive traits as a witty sweetheart.

Interestingly, while common and distinctive traits are determined by designers, a part of agent personality traits that fell into the dimension of *neutral traits* should intentionally remain abstract, not designed at all, or personalized to users. In the workshops, these traits stemmed from qualities related to personal preferences and social norms such as race, politics, gender, or economic level. P5 mentioned: "It can be good or bad... or it is awkward if it has those (preferences or opinions on sensitive topics) because it is not a real human being, so let's not determine at all or leave it as we don't know." Team 2 left the extroversion level of the agent as a customizable trait: "Some users might prefer extroverts, and others might like introverts more. But it's also weird we don't determine it at all... So (I would let) users customize it. Of course, it may not be always right to make the agent an extrovert if users like an extroverted personality, but anyway neither leaving it as a fixed trait nor not deciding it at all seems good (P5)." However, neutral traits were not fixed for every agent, and constantly thinking what would be or not be those traits helped develop the agent personality in-depth. For example, P1 assigned a gender to the genderless agent after defining several distinctive traits: "It was first set genderless, but after a while I thought it would
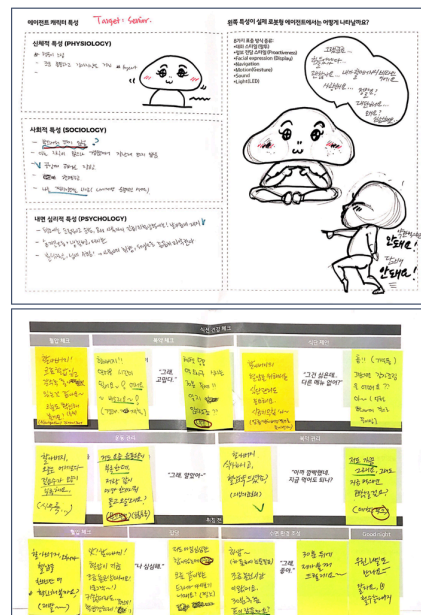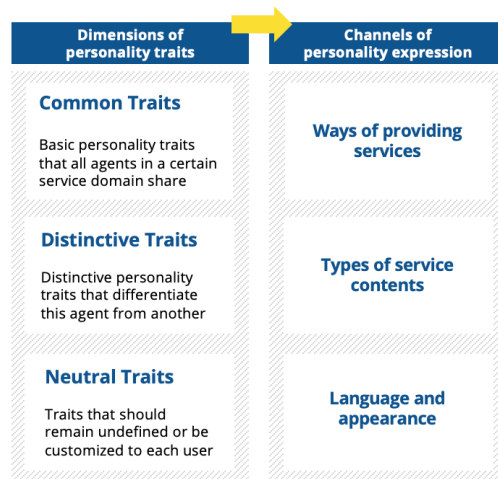
Figure 4: An example workshop outcome.

Figure 5: Framework for designing agent personality.

be better to make it a male with a low tone." The male gender was selected to strengthen the personality that their group intended.

4.2 Channels of expressing agent personality

Agent personalities were expressed by *the way the agent carry out services*. When Team 1 was writing a dialogue of notifying time for taking medicine, they tried to reflect the butler-like, loyal, and proactive personality of their agent on its behavior: "It doesn't just speak. It brings medicine for you (P1)," "Or the medicine can come out of the agent's body part, (P3)" "Brings you things. Instead of 'it's there, so take it,' it should say 'here you are.' You know, butlers usually... get things done for you. What you need (P1)." How an agent could behave or react when faced with a certain service situation could suggest its personality.

Types of contents an agent provides could also reveal its personality. For example, a trendy personality was reflected on its use of currently trending Instagram workout clips instead of old videos when it suggested users to exercise. Another agent for senior users was designed to bring up every-day small talk topics as if it was a granddaughter to express its friendliness and cheerfulness. An impression that the types of service contents give could embody the agent personality itself.

Backing up the findings from existing work, agent personalities were communicated through *language and appearance* as well. For example, when notifying users of low step count, Team 4 expressed an empathizing personality of their agent its saying "I also need to walk, so let's walk together" instead of "you need to do walk more." A reliable and confident personality of another agent was rendered using smooth body movement, restrained use of tension, relaxed earcons, and matt-black color of the agent body. It is worth note that appearance of an agent not only referred to how modalities work in every moment of conversation but also includes the overall physical embodiment of the agent.

4.3 Framework for designing agent personality

Based on the findings, a conceptual framework for initial construction of an agent personality is suggested as Figure 5. This can be used as a lens to view the dimensions of personality traits of Cas instead of simply drawing upon existing human personality assessment scales or techniques used to build fictional characters. As for design of an agent personality, designers can first shape an archetype of an agent in a certain service domain by defining *common traits*. Then, detailed *distinctive traits* can be elaborated to add unique individuality in a personality. *Neutral traits* should be constantly considered to define which conversation topics or situations to avoid conveying personalities. While having every detail clearly defined is good for fictional characters as they evolve to be more "round" characters, CAs do not have to be assigned with definite answers in regard to socio-culturally sensitive issues.

As for expression of the designed personality, *three channels* can be considered. In regards to *appearance*, visual aesthetics and personalities of an agent are usually designed separately in practice, making it difficult to inject the intended personality properly through how it looks. Our findings imply that visual design of an agent should also be a part of its personality design process.

5 CONCLUSION AND FUTURE WORK

In summary, we investigated how personalities of conversational agents should be designed in order for them to have clearly defined identities. We discovered that a personality of a conversational agent should be designed considering three dimensions: common traits, distinctive traits, and neutral traits. Also, those personality traits can be expressed through how an agent performs services, what kinds of contents it provides, and how it speaks and appears to be. This study contributes to the HCI research in that it suggested a conceptual framework useful as a starting guide for systematical crafting of agent personalities.

Several limitations lie in this study. First, the results might not be generalizable due to the small number and skewed composition of participants as a consequence of a limited pool despite our efforts to include design practitioners. Also, the framework should be confirmed in other potential applications besides healthcare such as security, education, or entertainment. Lastly, our framework has not taken into account how end users perceive agent personalities. Future work includes a user study where users experience various agent personalities designed based on the framework to gain insights on factors affecting agent personalities from a user perspective.

REFERENCES

[1] Callejas, Z., López-Cózar, R., Ábalos, N. & Griol, D., 2011. 'Affective conversational agents: The role of personality and emotion in spoken interactions', Conversational Agents and Natural Language Interaction: Techniques and Effective Practices: Techniques and Effective Practices pp. 203–223.

[2] Cohen, M. H., Giangola, J. P., & Balogh, J. 2004. Voice user interface design. Boston: Addison-Wesley, pp. 75-84.

[3] Danielescu, A. and Christian, G., 2018. A Bot is Not a Polyglot: Designing Personalities for Multi-Lingual Conversational Agents. In Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems (CHI EA '18). ACM, New York, NY, USA, Paper CS01, 9 pages. DOI: https://doi.org/10.1145/3170427.3174366

[4] Dryer, D. C. (1999). Getting personal with computers: how to design personalities for agents. Applied Artificial Intelligence 13, 3, pp. 273-295.

[5] Dwoskin, E. 2016, April 07. The next hot job in Silicon Valley is for poets. Retrieved from https://www.washingtonpost.com/news/the-switch/wp/2016/04/07/why-poets-are-flocking-to-silicon-valley/?utm_term=.72b08d650263

[6] Goetz, J., Kiesler, S., and Powers. 2003. A. Matching robot appearance and behavior to tasks to improve human robot cooperation. In Robot and Human Interactive Communication, pp. 55-60.

[7] Google Developers. 2018, May 10. Creating a persona: What does your product sound like? (Google I/O '18). Retrieved from https://www.youtube.com/watch?v=tUbB_FbIqPw

[8] John, O. P. 1990. 'The ''Big Five. Factor Taxonomy: Dimensions of Personality in the Natural Language and in Questionnaires.''In Handbook of Personality: Theory and Research, ed. Lawrence A. Pervin and Oliver P. John, 66-100.

[9] Kshirsagar, S. 2002. A multilayer personality model. In Proceedings of the 2nd international symposium on Smart graphics, pp. 107-115.

[10] McKenzie, S. 2017, April 07. Artist who worked on Pixar's Brave giving Google AI 'personality'. Retrieved from https://www.bbc.com/news/uk-scotland-highlands-islands-39513019

[11] Nass, C., and Lee, K. M. 2012. Does computer-generated speech manifest personality? An experimental test of similarity-attraction. In Proc CHI 2012, ACM Press, pp. 329-336.

[12] Tapus, A., Țăpu ș, C., and Matarić, M. J. 2008. User—robot personality matching and assistive robot behavior adaptation for post-stroke rehabilitation therapy. Intelligent Service Robotics1, 2, 169-183.