Initial Design Thinking for a Robotic Poker Dealer

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Abstract

Social interaction through games is an integral part of the human experience, but in the wake of the COVID-19 pandemic, gameplay is more likely to be restricted. To support easier gameplay facilitation in a variety of settings, we propose a novel robot that deals cards for poker and encourages social interaction among players. We are working toward the design of such a robot using design thinking. Throughout the single cycle of our design thinking process so far, we worked with a poker-playing group of undergraduate STEM students and one expert in card-dealing and comedy. We found that the users enjoyed the design overall, but had reservations mostly related to competence of and trust in the system. This work contributes to the design of future robots for social play.

Keywords

robot comedy, robot gameplay, poker, design thinking

1. Introduction

It is a uniquely human trait to create and play complex games, such as poker, that can enhance social atmospheres among peers and friends [1]. During the heights of the pandemic, playful connections of this type were more challenging to access due to restrictions on in-person gatherings. In the wake of the pandemic, this type of social setting remains difficult to facilitate among residents of long-term care facilities. For example, in a local skilled nursing facility that we collaborate with, poker games only occur in the limited windows when staff or volunteers are available to set up and deal the game. This situation led our research team to wonder if a robot could help to fill current gaps in satisfying playful human-human social needs, from compelling poker nights for young adults to more accessible gameplay for seniors in community living settings.

Past research on human-robot interaction (HRI) provides beginning inspiration for playful robots generally, as well as card-playing robots and robots in elder care specifically. For example, related studies show that people respond more warmly to robots that have humanlike traits such as humor and perceived empathy [2, 3, 4, 5]. For a robotic poker companion, these past results led us to consider humor and playful repartee for the system's interactions. In the realm of card game-playing robots, past studies show that people will play games with robots, but that humans must have some degree of trust in the robot to be willing to play games with it [6, 7]. These insights may translate to a poker-playing robot by helping to scope its role in the game to be trustworthy and not overly complex. Informative prior work in human-robot interaction shows that human-centered design processes, such as design thinking, are a prudent
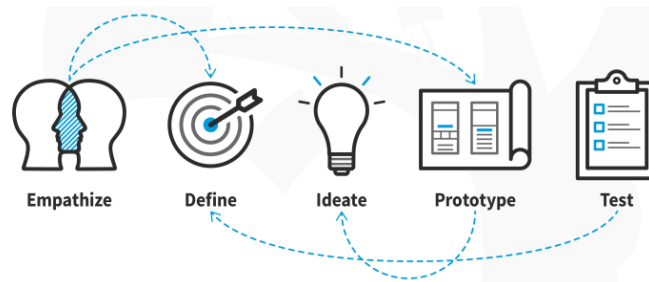
Figure 1: The design thinking flow: a cyclic five-stage process that can circle back to prior steps. ©Interaction Design Foundation [10]

approach for creating helpful robots generally [8], including robots in playful applications such as karaoke and bingo in older adult communities [9]. We drew inspiration from these past processes and robots in our poker robot design.

This paper centers on our use of the design thinking framework [10] to work toward creating a robotic poker dealer that can encourage interactions among human players. The presented work documents a first full loop through this framework. In these early design steps, we engaged with a convenience sample of card game players and one expert in card-dealing and comedy to hone the design of a snarky robotic poker dealer. In this paper, Section 2 details each step in our design thinking process, as well as the associated results. Section 3 highlights current project work, and Section 4 describes conclusions, strengths, limitations, and plans for future steps. Key contributions of this work include design insights for playful card-playing social robots, in addition to the initial prototypes and designs of a novel robotic companion.

2. Design Thinking Methods and Results

Design thinking is a non-linear, human-centered design approach focused on empathizing with users and taking time to understand actual problems they face [10]. It is a useful tool for designing robots with humans in mind, so in this work, we follow its five-step procedure (i.e., empathize, define, ideate, prototype, and test), as illustrated in Fig. 1. The following subsections describe the methods and results of our first loop through this design process.

2.1. Empathize

Process: The initial phase of design thinking is understanding and empathizing with people. For this phase, we hosted a poker night with five participants (3 men and 2 women, aged 18-20 years) who were new to Texas Hold 'Em, a card game hereafter referred to as "poker." We recruited this convenience sample from individuals in an on-campus summer research program.

The participants were familiar with one another prior to the poker night. Players were introduced to the game with rules from [11]. We took notes about when participants socialized during the hand, as well as how their play style developed as they learned to play. We ended the poker night with a semi-structured focus group to understand the social components of the game both within players and between the players and the dealer.

Results: All five participants quickly developed a playfully accusatory and competitive playing style. We noticed positive player perceptions of jokes and conversation by the dealer. Conversely,

when the dealer was silent, participants were more likely to think the dealer was cheating. In response to questions about playing with a robotic poker dealer, two participants agreed that they would enjoy it if the robot told jokes, if it was funny, or even if it was playfully rude. We noted that participants had concerns about trusting a robotic poker dealer. For example, one player mentioned that they would "have a hard time trusting that it wasn't card counting." Two participants agreed they would enjoy the robot as a dealer, but not as a competitor, as they would suspect the robot of cheating.

2.2. Define

Process: This stage of design thinking takes information gathered from a scoped observation of people in an environment and defines a common problem that we can work toward solving. The primary step in this phase is coming up with a problem statement or question. To this effect, we identified trends from the poker night pertaining to how people play poker and the qualities they want in the dealer and other players.

Results: From the poker night observations, we learned that players treat poker as a social activity and enjoy being competitive and snarky during the game. This led us to formulate our central question as: *Can we create a robotic poker dealer with a personality conducive to enjoyment of gameplay and social interaction between players?*

2.3. Ideate

Process: The ideation phase helps to hone the overall concept of the system (e.g., appearance, personality). To prepare for building a robotic poker dealer, this phase included proposals for the form factor, movement, and repartee.

Our process for this phase included brainstorming about the robot persona, creating iterative sketches of the system, and drafting proposed dialog for the robot. This process was led by the research team and included an interview with an experienced card dealer and comedian for ideas on these topics during an hour-long Zoom call.

Results: To achieve our goals of enjoyable play and social interaction among players, we kept humor, expressive modes, and banter closely in mind while brainstorming. For compatibility with the poker game environment, which usually centers on a tabletop, we decided on the general form of a tabletop robot bust. Based on basic requirements of card-dealing, the system also needed to be capable of turning its head. We decided to have the robot deal cards from its mouth for entertainment value, in addition to selecting a grizzled and aggressive masculine persona that seemed likely to be humorous in the poker context. Iterative sketches of the robot form appear in Fig. 2; we selected appearance "C" because this was the simplest to implement while preserving the sought personality. Inspired by examples of robots successfully using disparaging humor [5], we established a set of comedic phrases, some vulgar and some non-vulgar, to be spoken by the robot during different parts of the hand.

2.4. Prototype

Process: From the initial ideas about form factor, movement, and dialog, we began the first system prototype. We built a low-fidelity mechanical puppet that we could iterate on and test rapidly before adding any working circuitry or software. This technique follows past best
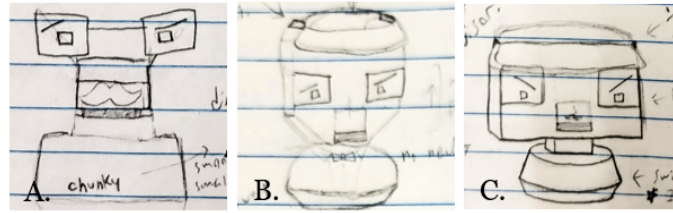
Figure 2: Iterative sketches of the robot's form.

practices in HRI design, such as those used in the puppet-based first step of the mechanical ottoman creation in [12].

Results: The mechanical puppet was made from cardboard and had interchangeable panels with tattoos and expressive eyes, as shown in Fig. 3. We could turn the puppet's head from side to side and flick cards out of its mouth. To give the robot a beginning voice, we used the Natural Reader text to speech application for iPhone at 1.06x speed, lower vocal range, and with a UK regional accent. This monotone, British, and male voice emanated from a phone placed inside the robot and served as a proposed first fit with the gruff sought personality of the system.

2.5. Test

Process: We tested the prototype shown in Fig. 3 during a follow-up poker night. The participants were the same as the earlier group, minus one woman from the first poker night. This time, the robot prototype was used as the dealer; a member of the study team puppetteered the prototype. We took notes during the game and conducted a semi-structured focus group after the game.

Results: Players in this second poker night did not take the game as seriously as during the prior poker night and seemed to spend less time trying to read each other and more time socializing. Participants noted in the interview that the robot's personality seemed gruff, snarky, and funny. One player noted that it "seemed a little helpless because [it] doesn't have any arms." Participants were split on the voice; two enjoyed the voice, while the other two wanted the voice to be higher-pitched and slower. This latter finding is consistent with related work that
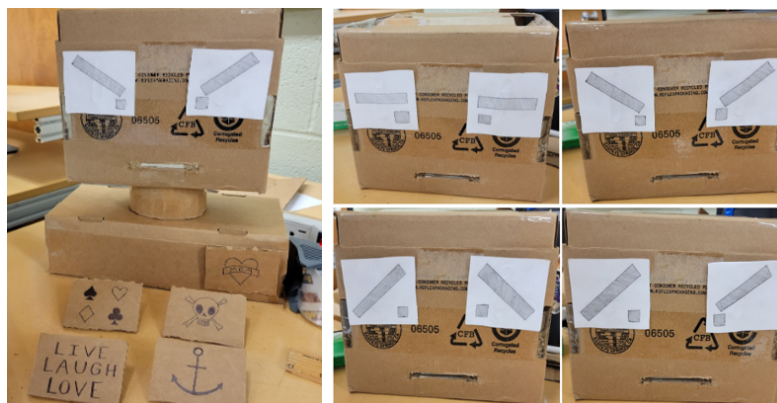

Figure 3: Low-fidelity robotic poker dealer prototype with expressive eyes that convey boredom, anger, sadness, and confusion, in addition to interchangeable tattoos.
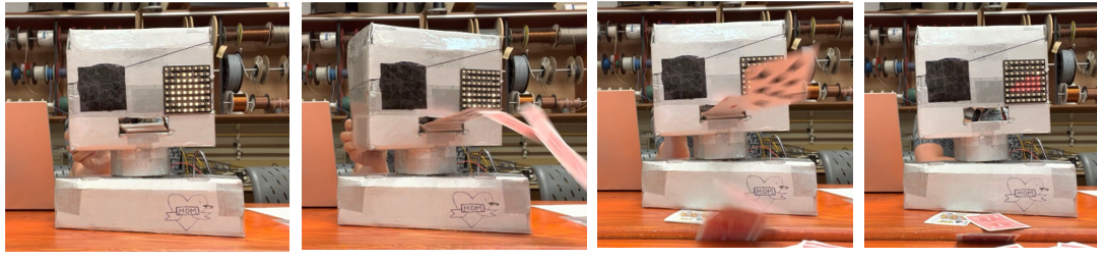
Figure 4: Frames from a video of the medium-fidelity prototype's functionality.

previously found users to perceive a robot with a higher-pitched voice to be more likeable [13]. All four participants agreed that the humor and heckling displayed by the prototype showed promise for encouraging social interaction between players.

3. Current Work: Medium-Fidelity Prototype

As a continuation of our design thinking process, we have circled back to the prototyping phase to prepare a higher-fidelity prototype for our next round of testing. In this improved prototype, we used an Arduino UNO to control head motion, card-dispensing, and eye animation. We also made cosmetic improvements such as painting the robot silver and equipping it with an eye patch. Overall, we sought to improve the quality and autonomy of the system while preserving interaction elements that past test users had enjoyed.

Frames from a video demonstration of the medium-fidelity prototype appear in Fig. 4. The Arduino UNO controls the head rotation with a stepper motor, card-dealing with a DC motor and wheel (similar to the mechanism in [14]), and eye animation with an 8×8 LED matrix. The robot's quips are still played through the aforementioned iPhone application. These updates added a new level of autonomy to the system while maintaining the functionality that participants in the first design cycle enjoyed, such as head movement and autonomous card-dealing from the mouth of the robot.

4. Discussion

Our design thinking process to date yielded insights on desirable characteristics of a robotic poker companion, such as humor and playfulness. At the same time, the role of dealer seemed more appropriate than that of competitor; concerns about robot trustworthiness and cheating were common. We created low- and medium-fidelity prototypes of our robotic poker dealer, finding positive responses to the form factor but mixed opinions about the voice so far. A strength of this work is the design input provided by an expert in both comedy and poker-dealing. One limitation of this work is the small and relatively homogeneous user group. Future steps will involve testing the medium-fidelity prototype with a broader group, including older adult users, as well as improving and assessing the robotic system in senior living contexts. This work can contribute to future designs of entertaining and helpful robotic companions.

References

[1] K. Siler, Social and psychological challenges of poker, Journal of Gambling Studies 26 (2010) 401–420.

[2] J. James, C. I. Watson, B. MacDonald, Artificial empathy in social robots: An analysis of emotions in speech, in: Proc. of the IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN), 2018, pp. 632–637.

[3] P. H. Kahn Jr, J. H. Ruckert, T. Kanda, H. Ishiguro, H. E. Gary, S. Shen, No joking aside: Using humor to establish sociality in HRI, in: Proc. of the ACM/IEEE International Conference on Human-Robot Interaction, 2014, pp. 188–189.

[4] T. Nomura, Empathy as signalling feedback between humanoid robots and humans, Humanoid Robotics: A Reference (2016) 1–10.

[5] B. T. Tay, S. C. Low, K. H. Ko, T. Park, Types of humor that robots can play, Computers in Human Behavior 60 (2016) 19–28.

[6] F. Correia, P. Alves-Oliveira, N. Maia, T. Ribeiro, S. Petisca, F. S. Melo, A. Paiva, Just follow the suit! Trust in human-robot interactions during card game playing, in: Proc. of the IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN), 2016, pp. 507–512.

[7] F. Correia, P. Alves-Oliveira, T. Ribeiro, F. S. Melo, A. Paiva, A social robot as a card game player, in: Proc. of the Artificial Intelligence and Interactive Digital Entertainment Conference, 2017.

[8] P. Alves-Oliveira, S. Petisca, F. Correia, N. Maia, A. Paiva, Social robots for older adults: Framework of activities for aging in place with robots, in: Proc. of the International Conference on Social Robotics (ICSR), Springer, 2015, pp. 11–20.

[9] C. McGinn, E. Bourke, A. Murtagh, C. Donovan, P. Lynch, M. F. Cullinan, K. Kelly, Meet Stevie: A socially assistive robot developed through application of a 'design-thinking' approach, Journal of Intelligent & Robotic Systems 98 (2020) 39–58.

[10] R. F. Dam, T. Y. Siang, What is design thinking and why is it so popular?, 2022. URL: https://www.interaction-design.org/literature/article/what-is-design-thinking-and-why-is-it-so-popular.

[11] Cornell Department of Mathematics, Texas hold'em poker, 2006. URL: http://pi.math.cornell.edu/~mec/2006-2007/Probability/Texasholdem.htm.

[12] D. Sirkin, B. Mok, S. Yang, W. Ju, Mechanical ottoman: How robotic furniture offers and withdraws support, in: Proc. of the ACM/IEEE International Conference on Human-Robot Interaction (HRI), 2015, pp. 11–18.

[13] A. Niculescu, B. van Dijk, A. Nijholt, H. Li, S. L. See, Making social robots more attractive: The effects of voice pitch, humor and empathy, International Journal of Social Robotics 5 (2013) 171–191.

[14] knb45, Instructables, Automatic card dealer, 2021. URL: https://www.instructables.com/Automatic-Card-Dealer/.