Exploring Accessibility and Empathy via Conversational Agent in Board Game Players who are Blind, or Low Vision and Sighted

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ABSTRACT

This position paper aims to initiate a dialogue about the potential of a conversational agent in improving the board gaming experience for players who are blind or low vision. We present a view that a conversational agent can achieve the goal by acting as (1) an accessible tool to communicate board game rules to players who are blind or low vision and (2) an empathy-inducing tool for players who are sighted. We summarize existing research on board game accessibility barriers faced by players who are blind or low vision, followed by the description of our project that plans on investigating the first role of a conversational agent. We also summarize prior work on empathy and prosocial behaviours and we present a view that eliciting positive and negative empathy in players who are sighted can make the learning of game rules an enjoyable experience for people who are blind and low vision. In presenting this research direction that explores the second role of a conversational agent as an empathy-inducing tool, we argue that co-design can be a good methodology and we present specific steps scholars can take to arrive at inclusive design solutions.

CCS CONCEPTS

• **Human-centered computing → Accessibility technologies**.

KEYWORDS

conversational agent, accessibility, empathy, board game, co-design

1 INTRODUCTION

Board games are popular social activity for all, including people who are blind or low vision (BLV) [20, 25]. There are numerous benefits from playing games; players can relieve stress and improve on mood [1] and they fulfill the basic human needs of autonomy and relatedness through completing quests and collaborating with friends and family [19]. Along with the social aspect, playing board games foster development of skills such as problem solving and communication and it is vital for psychological, cognitive, and social development in children [19]. However, inaccessible board game designs prevent players who are BLV from reaping these social and personal benefits [22, 49].

Accessibility refers to the design of products, services, or environments for all intended audiences, including people with and without disabilities [35]. Inaccessible board games mean individual game elements (e.g., a physical board, game pieces, and cards) along the dimensions of the text, colour, sound, and touch cannot be processed by players who are BLV [14, 25]. For instance, players who are BLV have a difficult time reading *Dungeons and Dragons* game cards because these cards use a decorative font style designed to highlight the game's fantasy theme. Board game rulebooks are also inaccessible [14]. Players who are BLV use online rulebooks, but some rulebooks are not compatible with assistive technologies that translate text to speech (e.g., an optical character recognition, a screen reader) [14] and this inaccessibility may cause frustrations even before the game begins.

Players who are BLV value their independence and they do not want to rely too much on other players who are not BLV [14, 19]. We believe a technology that can download inaccessible online rulebooks and communicate rules verbally can be one way to support the independence of players who are BLV. Can a conversational agent become such technology? This is the research question that our current project is addressing. A conversational agent (CA) is an artificial intelligence system that mimics human language through text or voice [30]. Some popular examples of voice-based CAs are Siri and Cortana. We believe CA is an attractive assisting technology in communicating rulebooks. Unlike other existing assistive technologies embedded in a mobile phone and a browser, CAs have many human-like characteristics (e.g., voice, name, the capacity to display emotions and make jokes). As such, people perceive CAs as another social actor [34] and feel as if they are socially present with another human being [40]. CAs as a rule communicator can offer companionship to players who are BLV; companionship makes any learning a positive experience [31].

The potential of CAs in a board gaming context does not stop at communicating rulebooks; it can be used to elicit empathy in other players who are sighted. It is our view that players who are BLV can enjoy the process of learning board game rules when players who are sighted show empathy while learning. Human-Computer Interaction (HCI) researchers have developed various creative technologies to elicit empathy in the designers and the public, ranging from mixed-reality game [28] to a wearable haptic device [36] and 360-degree video [4]. Our position paper challenges the HCI community by raising the exciting possibility of CAs as an accessible rule communicator and an empathy-inducing tool, with the ultimate goal of improving the board gaming experience for all player groups.

Furthermore, research on accessible digital gaming is making advances for BLV players in digital environments [7, 8]. However, efforts surrounding accessible tabletop gaming have proven to be less numerous, which serves as the main motivation for proposing two research directions in this position paper.

We specifically contribute to EmpathiCH by (1) discussing which facets of empathy should be elicited in players who are sighted (positive and negative empathy) in a board gaming context and (2) proposing co-design that researchers can use to design and develop an empathy-inducing CA, detailing how empathy can be established between different stakeholders (i.e., empathy between

the researcher and the participant and empathy between different participant groups).

2 BACKGROUND AND RELATED WORK

2.1 Inaccessiblity of Board Games

Learning game rules can be challenging, especially for novice players. One has to understand rules around managing a hand of cards, remembering the map, identifying legal and illegal moves, remembering win conditions, and constantly keeping track of the score [39]. As an example, *Gloomhaven* is currently the most popular adventure board game [2] and a player plays as one of the 6 characters to battle monsters. It has a 52-page rulebook that details rules around character ability, monster ability, attack cards, item cards, game rounds, and game scenarios.

While digital games often use interactive features such as tooltips to teach players according to their level of expertise, the rules of traditional and modern board games are not dynamic and hence they cannot adjust themselves to support or match the reader's understanding or experience of the gameplay. Moreover, people cannot begin or progress smoothly in the game if these rules are not read, taught, and understood correctly; unsmooth game experience may negatively influence the degree to which a player derives game-related benefits, including fulfilling the need for autonomy. On top of that, the design of the rulebooks does not facilitate learning or teaching of the game as they merely describe the actions and rules nor provide a systematic introduction of the game.

Inaccessible rulebooks add another layer of difficulty in learning the rules for players who are BLV because digital versions of rulebooks tend to be incompatible with screen readers [14, 20, 41]. They are often comprised of only visual information to explain the game rules that are targeted at players who are sighted and players who are BLV cannot process visual elements [20], for instance, using images of monsters and swords to show its ability statistics. Even when rulebooks are accessible, players who are BLV find it hard to search or re-read a particular paragraph in the rulebook as the screen reader starts reading everything from the beginning [41]. Having accessible rulebooks is a crucial first step in satisfying a player's need for autonomy and allowing their full participation in the game.

2.2 Use of CA in Various Contexts

Prior research has explored the usefulness of CAs with diverse user groups in various domains (e.g., learning [6, 13, 42, 48], customer support [18], psychological counseling [11, 21]). Specific to learning in general, CAs that are learning partners or virtual tutors are known as *pedagogical agents* [**?**]. Recent research has shown the effectiveness of CAs as a learning partner and tutor [42, 48]. For example, Sosnowski et al. designed a CA-based tutoring system for nursing students that simulates a patient with dementia; this CA tutor can help students to learn and allow for mistakes without incurring real-life consequences [42]. Similarly, Xu et al. presented a CA that engages children in book reading activities [48]. The results showed that children enjoyed their interaction with the CA and they found a CA good learning partner.

CAs have also been explored in the context of digital and tabletop role playing games. Allameh et al. [6] introduced Jessy, that is a CA for a digital board game known as *The Royal Game of Ur*. Jessy helps the players with game-related queries, suggests best moves, and informs them about the current state of the game through an interactive chatbox. It interacts with the players implicitly and explicitly without disturbing the game flow. Jessy has shown promising results regarding player engagement and the understandability of the game rules. Bjöörn et al. developed and evaluated an Open Legend Game Assistant (O.L.G.A) that can answer game-related questions at any point for tabletop role playing games [13]. The researchers showed that players found this CA helpful, including those players who were not familiar with the rule system or board games. In sum, researchers have taken strides in designing CAs that can be embedded in diverse learning contexts, including gaming. To the best of our knowledge, CAs have not been explored in guiding the players, specifically those who are BLV, during the traditional board gameplay and this is the gap that our current research aims to address.

3 TWO RESEARCH DIRECTIONS OF CA

3.1 CA as an Accessible Game Rule Communicator

Using CAs to communicate board game rules is the promising solution to break the accessibility barriers, presenting functional and social benefits. First, CAs empower the players to intuitively explore and request information gradually for effective learning, rather than bombarding them with game material in the beginning [6, 13]. Given this, CAs save time by removing the burden on the players from the need for scanning for specific information through the document, especially using a screen reader that comes with its own challenges. Second, research has shown that CAs are capable of serving as companions or learning partners [42**?**] and their social presence has a positive impact on the game experience of users [37]. Third, CAs can adapt and provide flexible options for communication based on users' preferences such as speech or text, making the system more inclusive. Fourth, CAs can be programmed and customized to download and access any rulebook to answer queries for that particular game. For instance, people who use Alexa can customize "skills" that make Alexa do a particular activity, and these "skills" are personalized to suit their needs.

We believe that these characteristics of CAs combined will ultimately support the independence of players who are BLV, lessening the need for getting a sighted assistance, especially from other opponents in the game that often result in unfair gameplay [14]. As such, we are currently designing a study to explore the use of CAs in learning board game rules by co-designing with players who are BLV and sighted players. Co-design involves users who are usually not trained in the design to creatively collaborate in the design development phase [38]. This will inform our development phase which will be followed by a user study to evaluate the effectiveness of the CA. Through co-designing and evaluating the CA with players who are BLV, we aim to break through the accessibility barriers by providing a solution to cater to inaccessible rulebooks for board gameplay.

3.2 CA as an Empathy-inducing Tool

Beyond their potential role as an accessible game rule communicator, we present another research area that explores the potential of CAs in eliciting empathy in players who are sighted.

3.2.1 Benefits of Evoking Empathy in Players who are Sighted. Empathy is an affective response that stems from understanding another person's emotional states and a person who shows empathy feels emotions that are congruent with the emotional states of another person [24]. Negative empathy is when people empathize with negative emotions; positive empathy is when people empathize with positive emotions [9]. Negative and positive empathy are strongly associated with prosocial behaviours, albeit in different directions. The former motivates one to *reduce* another person's distress (i.e., mitigating function); the latter motivates one to *amplify* another person's joy (i.e., amplifying function) [9]. We argue that eliciting both types of empathy in players who are sighted can make the learning of game rules less frustrating and more satisfactory for players who are BLV.

As discussed above, learning board game rules can be complex and frustrating (e.g., reading through a 52-page rulebook of *Gloomhaven*). The sheer length of a rulebook combined with the amount of content to process can be overwhelming for players who are BLV. When players who are BLV solely rely on audio input, this reliance on audio input can cause high cognitive load (i.e., excessive use of mental effort) [10] and become frustrated when they need to put an extra effort while playing a board game [14].

Based on prior work that has suggested the mitigating function of negative empathy, there is a possibility that eliciting negative empathy in players who are sighted could benefit players who are BLV; the former group can behave in ways to reduce frustrations in the latter group. For instance, players who are sighted can become motivated to offer a different explanation of a rule in a playful manner, while respecting the independence of players who are BLV.

Learning board game rules can also be straightforward, but it is still beneficial to elicit positive empathy in players who are sighted. Players who are BLV feel joy when they master a task on their own while playing a board game [19] and learning a rule via CA without getting any other assistance could result in satisfaction. In this situation, positive empathy can motivate players who are sighted to behave in ways to amplify the feeling of satisfaction in players who are BLV, for instance, by commenting on a given rule and even making innocent jokes about a rule [47].

Evoking empathy may not only benefit people who are BLV. Research has shown people who engaged in prosocial behaviours report high subjective well-being, vitality, and self-esteem [45]. To date, much effort has focused on instilling empathy in text-based CAs to offer social support to end-users [32, 50]. We know little about how CAs can be designed to elicit negative and positive empathy in a board gaming context. When evoked, empathy will subsequently make the board gaming experience more playful and interactive for all parties. Prior work on narrative, interactive video games have evoked empathy by having players role-play as a reference population facing particular plights [16, 23] and researchers have proposed design guidelines on how to design empathy-evoking video games (e.g., asking players to explicitly empathize with a character in plights) [12]. The goal of this research direction would be to develop design guidelines that provide answers to questions, including how can researchers design CAs to elicit empathy? What should CAs say? How many CA should be involved (one or more)? How can researchers design CAs to make sure they are not eliciting pity (i.e., a feeling of superiority to another person) [26].

3.2.2 Adopting Co-design and Storytelling Activity as Methodology. As in the case for the first research direction, we believe that co-design is the most ideal approach to develop an empathy-inducing CA because (1) it includes the perspectives of end-users for whom the results will have a direct impact and (2) it invites all stakeholders into one shared space where they can share their unique perspectives and experiences, thereby evoking empathy towards each other and generating inclusive design solutions. We break down co-design into three stages: (A) Exploratory Stage, (B) Design Stage, and (C) Prototype Evaluation Stage.

(A) Exploratory Stage. The creative and collaborative design process of an empathy-inducing CA begins with researchers initiating the first-time contact and developing an initial understanding of each player group. During this stage, the goal is to build **the empathetic relationship between the researcher and the participants.** It is paramount to establish this relationship for researchers to become aware of the needs of all participants [46]. Researchers can initiate the process of building this empathetic relationship in two phases.

First, they can conduct a field visit to meet each participant in a safe environment, with the goal of understanding their typical board game set-up. During the visit, we recommend that researchers ask each participant two critical questions of "how many players do you play within an average board game session?" and "how many players are BLV and how many players are sighted in a typical board game session?" These two questions can guide researchers in the later stage of developing a realistic scenario for a storytelling activity. There can be up to 11 players involved in a given board game [3] and there could be numerous possibilities of the make-up of players who are BLV and sighted (e.g., 1 player who is BLV and 3 players who are sighted or 3 players who are BLV and 1 player who is sighted in a 4-player board game). Meeting with participants in their comfortable environments is the critical first step towards building rapport [29, 33]. Second, researchers can continue to maintain an empathetic relationship by creating a supportive and trusting environment once all players who are BLV and sighted to a shared space [33, 43].

(B) Design Stage. During this stage, the goal is to build **the empathetic relationship between players who are BLV and players who are sighted.** Researchers can introduce many activities when designing with players who are BLV, including engaging participants to craft low-fidelity prototypes using tactile elements (e.g., clay, foam paper, cardboard box) [5, 27]. For this specific future direction, we propose researchers to use a storytelling activity to achieve the above goal, as prior work has done to induce perspective-taking of a reference population [43].

In this activity, participants can be presented with several fictional characters who are playing a board game. For the purpose of

demonstration, we provide a scenario with 2 BLV players and 2 players who are sighted. We chose this player make-up in this exemplar scenario because we believe this make-up would balance the voices of participants who are BLV with the voice of participants who are sighted. Prior work has used a similar balancing strategy to create a safe and trusting environment [33]. We encourage researchers to adjust our exemplar scenario and guiding questions that we present below based on their findings from an initial field visit. A storytelling activity encourages all participants to put themselves in the shoes of several fictional characters and think about what each fictional character might be feeling and thinking [43]. Taking the perspective of another, be it a fictional or real person, is the first step towards becoming empathetic [44]. We imagine researchers would present two fictional characters who are BLV and they are playing a board game with two friends who are sighted. Fictional characters are using a CA to learn about game rules while playing a game (e.g., asking a CA to replay a rule). After hearing this scenario, researchers can facilitate a conversation that centers on:

- Identify emotions and thoughts in fictional characters in a given situation.
- Identify emotions and thoughts in two friends in a given situation.
- Discuss the role of negative and positive empathy in reducing and/or amplifying emotions experienced by fictional characters.
- Ideate what a CA can do to elicit negative and positive empathy in two friends while respecting the independence of fictional characters.

These guiding questions encourage each participant to take the perspective of fictional characters who are BLV *and* their two friends who are sighted, thereby establishing the empathetic relationship between the two-player groups. Once this relationship is achieved, participants can arrive at raw design ideas for an empathy-inducing CA that considers the emotions and experiences of players who are BLV and players who are sighted.

(C) Prototype Evaluation Stage. During this stage, the goal is to design, implement, and evaluate an empathy-inducing CA ideated from the above stage. Researchers can conduct a user evaluation study in a lab or a field. Regardless of the setting, researchers must ensure the designed CA is not eliciting pity towards players who are BLV. This stage emphasizes iterative prototyping; researchers continuously collaborate with participants to improve on the proposed design of an empathy-inducing CA.

4 CONCLUSION

This position paper discusses two exciting potentials of a conversational agent in a board gaming context: (1) an accessible tool to communicate board game rules to players who are BLV and (2) an empathy-inducing tool in players who are sighted. Not only a conversational agent can be useful in a dyad interaction (i.e., a conversational agent-to-player who is BLV), it can be useful in a group interaction (i.e., a conversational agent-to-player who is BLV-to-player who is sighted). We proposed co-design and the corresponding storytelling activity as one way to address the second potential of a conversational agent and we hope our paper can inspire scholars to explore the relationship between conversational agents, accessibility, and empathy, with the goal of arriving at inclusive solutions that can make board gaming enjoyable and interactive for players who are BLV and sighted.

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