Dou Dizhu For All: An Accessible Card Game for Visually Impaired Persons in China Powered by ChatGPT's Language Model

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EXTENDED ABSTRACT

Video games have become a dominant form of entertainment in the modern world across different platforms and devices. However, people with diverse abilities often find themselves excluded from playing video games due to accessibility challenges (Yuan et al. 2010). Among people with diverse abilities, blind and visually impaired persons (BVIPs) face the significant barriers due to the visual-centric nature of video gaming. To minimise barriers and provide options for visually impaired players, various efforts have been made by companies such as Sony and Xbox, creating accessible games and providing accessibility guidelines for the industry. Additionally, scholars such as Kulik et al. (2021), Mangiron and Zhang (2016), Porter (2014) and Yuan et al. (2010) have made significant academic contributions in this field. So far in China, however, there have been no studies on game accessibility for VIPs, and the investigation into game accessibility across all domains remains uncharted.

This study introduces *Dou Dizhu For All*, also known as "Fighting the Landlord" or "Fighting the Lord", an adapted version of the traditional Chinese card game *Dou Dizhu* (no publisher), designed for both BVIPs and sighted players. This study will involve two phases: firstly, the adaptation of the game, focusing on the design of interfaces. This includes implementing accessibility features such as customised Text-to-Speech (TTS), audio cues, a voice command system powered by ChatGPT's language model, and the design of the user interface (UI). Secondly, semi-structured interviews with end-users, which is based on Immersion Experience Questionnaire (IEQ) (Jennett et al. 2008). The following outlines the design process and the methodological plan for this study.

1. Interfaces design

1.1 Gameplay

Dou Dizhu is played by three players, with one player designated as the "landlord" and the other two as "peasants". It uses a deck of 54 cards. Each player is initially dealt 17 cards, with the remaining three cards reserved for the landlord. The landlord starts the game by playing cards, followed by the other players taking turns to play cards in sequence. The first side, whether peasant or landlord, to empty their cards wins. Due to the word limit, specific rules and restrictions regarding the card play are not provided here. This game is suitable for adaptation for BVIPs due to its turn-based nature. Additionally, the popularity of this game in Mainland China, along with its compatibility for BVIPs and sighted persons playing together make it an ideal choice for inclusive gaming.

1.2 Accessibility features implementation

TTS: To avoid adaptations for different platforms, this game has developed its own TTS feature. When players tap on any area of the interface, they receive corresponding audio feedback. The TTS is similar to TalkBack in the Android system but offers more game-related content in its audio cues. For example, when tapping on the last player's avatar, it will read "Previous player Zhang San (上家张三)" instead of "Zhang San (张三)".

Audio cues: Audio cues provide comprehensive information about the game, such as the cards the player holds and board status, enabling players to understand the game context and make informed decisions.

Voice control with ChatGPT's language model: Voice control converts commands expressed in natural language into actual game commands. It allows users to speak commands, which are then converted to text. The text will be analysed by ChatGPT's language model to identify corresponding game commands. Players will then confirm the execution of the command, and once approved, the command is executed accordingly. For example, the command "I want to bid the landlord" or "Let me be the landlord" and all other synonyms are processed as "Bid the landlord." Similarly, commands such as "Rules" or "I forgot how to play" trigger the same interaction, providing game rules and instructions.

1.3 UI Design

Simplified UI design: The UI design prioritises accessibility. For instance, the registration will be eliminated to reduce the number of sub-interfaces and other actions, which will allow players to start the game in two steps: creating/joining a room, and then starting the game. This results in fewer buttons to navigate in the game, making it more accessible and intuitive for BVIPs.

Button layout consistency: Consistent button layout across interfaces ensures a more accessible interaction experience. Buttons with similar functions are positioned consistently, making navigation easier for VIPs using touch controls.

2. The semi-structured interview

Recruitment: Participants will be reached out through gaming communities, including online forums and platforms where BVIPs are active. After obtaining ethics approval, the game will be played by 8-10 BVIPs (with no gender requirement and over the age of 16). These participants encompass a range of gaming experiences, from experienced players to those with little experience. The purpose is to understand the gaming experience of this game among people with different game habits.

Playtest: Before the gameplay, accessibility facilities will be considered thoroughly to ensure participants' safety. During gameplay, researchers will assist users in getting started.

Interview: After gameplay, users will be asked to provide feedback on their experience with the game. In the semi-structured interviews, questions will be based on the IEQ (Jennett et al. 2008) scale. This scale is chosen for it measures players' experiences from both subjective and objective parameters. However, since BVIPs' gaming experiences heavily rely on accessible features, the questions will only focus on three components of the IEQ: cognitive involvement, control and challenge to better understand their experience. Interviews will be recorded with participants' consent and transcribed for analysis after obtaining ethics approval.

Data analysis: The data collected will be analysed thematically, identifying key themes such as game experiences, accessibility barriers, challenges, and interface suggestions for future card games.

It is hoped that the interface design and accessibility features of this game can serve as a reference for future accessible games for visually impaired persons in China. The user's feedback from this study can offer valuable insights for future game accessibility studies and game design. Overall, this study can be seen as the initial step in accessibility studies in China. However, for further evaluation of the game, more rigorous research should be conducted.

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