




# Augmented Adventures: Using Different Perspectives to Design Novel Tabletop Game Experiences with Augmented Reality

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**Abstract.** The proliferation of smartphones and accelerating development of Augmented Reality tools have made it possible to both research and deploy new gameplay interaction paradigms for gaming at a relatively low cost. Here we explore the design space of using Augmented Reality in Tabletop gaming. A research through design approach is followed, where 80 novel gameplay ideas have been brainstormed and subsequently categorized. From this, we found that Augmented Reality can be used to provide interesting perspectives on a game, with especially a second-person perspective opening up new avenues for having interesting gameplay experiences. We subsequently developed this second person perspective into a design exemplar called Eye of the Cyclops, a collaborative adventure game where the smartphone provides the perspective of the main antagonist. Subsequent playtests show that the game led to a significantly higher immersion, audiovisual appeal, curiosity, and meaning compared with benchmark games, even though some clear limitations remain.

**Keywords:** Augmented Reality · Tabletop Games · Games · Tangible Interaction · Second Person Perspective

## 1 Introduction

Tabletop games have already existed for centuries, but the design of new games by the industry seems to follow an iterative pattern, where new games are based off successful previous games, albeit with punctuated equilibria leading to new trends [1]. Different research endeavors found roughly 185 existing game structures, mechanics and interactions [1–3]. For most of their history, tabletop games have been confined to static, physical props, such as boards, characters, dice, cards, etc. As multimedia technologies advance and becomes cheaper however, the opportunity to create novel game mechanics

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and interactions arises. In the past, technologies such as VHS/DVD, electronic game boards [4] and digital screens as game boards [5, 6] have been introduced into tabletop games, usually to enhance interactivity and immersion [4, 5]. Recently, precipitated by the proliferation of smartphones and more advanced free toolkits, it's possible to include Augmented Reality (AR) into tabletop games as well.

Some early examples of AR in commercial tabletop games are *Eye of Judgment* and *Wonderbook: Book of Spells* by Sony Interactive Entertainment [7, 8]. In both cases, the player lays out tangible objects that are scanned by a camera, and the configuration of the physical objects controls gameplay on the screen. In these cases, the screen is a TV screen or PC monitor, but similar setups have been used in research with head mounted visors [9] and mobile phones [10]. These are more 'traditional' mixed reality games, where the tabletop layout is used as input for the gameplay on the screen. Already some research has been done on how to design these mixed-reality games to creating engaging gameplay, for instance by using tangible interaction and diegetic feedback [11], and creating compelling fantasies [12]. By introducing augmented reality, the designers can turn the tabletop game into something more of a videogame, by utilizing the dynamic audiovisual possibilities of screen-based games. The downside to this approach is that, while it might make the game more visually appealing, it does not always necessarily enhance the gameplay of the tabletop game itself. Wetzel et al. criticized *Eye of Judgment* for this in 2008, and came up with a number of guidelines for good AR game design [13]. However, ten years later Kosa and Spronck found that tabletop game players were still unenthused about the potential of AR for their hobby, because AR tabletop games felt like poor imitations of videogames to them [14]. Having most of the game play out on a screen is inimical to the qualities of a tabletop game.

While we think there is still a lot of merit to this approach for other reasons, for the purpose of this paper we therefore focus on the opposite direction: how can Augmented Reality meaningfully improve the gameplay experience of the tabletop game itself? In addition, technology has changed since some of the earlier pioneering work in AR games. Most notably the advent of smartphones with AR capabilities, which makes it feasible to have low-cost solutions for commercial applications (in the opposite direction, something like *Tilt Five* [15] provides exciting new possibilities, but requires serious investment for more casual tabletop game players, consequently we decided to limit our scope to smartphone interactions).

## 2 Process and Categorization

For this research we followed an informal Research-through-Design approach, starting with a literature review and then following up with a brainstorm session by 4 of the authors, leading to the generation of 80 new game ideas where Augmented Reality could plausibly enhance the experience. These were then reflected on, categorized, and the ideas with the most potential developed further. It should be noted that the results of this process should not be seen as authoritative or exhaustive. Rather, the purpose of the research is to find interesting new avenues for the use of AR in tabletop games, which can provide designers with tried and tested new gameplay mechanics, as well as help chart the design space of AR tabletop games.

From the literature review and the reflection on the brainstormed concepts, two things became apparent. First, AR usually enhanced the game experience by providing one or more of the following benefits: a) The ability to bring videogame mechanics into a board game (e.g. interactivity, customization, stats), b) added audiovisual appeal (or juiciness [16], c) streamlining (e.g. offloading complex mechanics, dice rolls and Non Player Character (NPC) behavior to the smartphone), and d) providing different perspectives of the game board. Since a) and b) were already mentioned in previous research and could lead to tabletop games being poor facsimiles of videogames, and c) is more supportive than innovative, we focused on d) as a way of framing our concepts and teasing out new ideas for novel gameplay experiences.

We subsequently propose a framework for categorizing perspectives in games, consisting of a first-, second-, third- and fourth-person perspective. This framework is particularly useful when designing AR games that are character-based, in a sense that different perspectives can be had on a game configuration. It can help designers frame and understand the value of their current game designs as well as iterate on existing ideas. This framework attempts to combine multiple dimensions like whose eyes you are looking through, whom you are controlling and how many characters are involved.

## 2.1 First, Third, Second and Fourth-Person Perspective

The **first-person perspective** means that the player both looks through the eyes of a character and controls the character. In video games, the player is generally the most immersed in this perspective compared to the third-person perspective [17]. The controls share a strong connection with the events on the screen. Players feel ownership over the character [17]. In AR games, the AR device camera is the eye(s) of the character. A well-known AR first-person example is Pokémon GO [18], where you control and look through the eyes of a Pokémon trainer.

The **third-person perspective** means that the player controls a character but looks at them from an external perspective. The player can see more than what they would see through the eyes of the character. However, players tend to be less immersed than in the first-person perspective [17]. The third person perspective is common in classical board games, e.g. Monopoly, Cluedo and Game of the Goose. It can be found in some video games where the external camera often follows the player in an ‘over-the-shoulder’ way. For example, adventure exploration games benefit from this extended view because you can explore better. Interestingly, not a lot of mobile AR games use this perspective. This might be because the over-the-shoulder perspective is not possible due to the player controlling the position of the camera. Some Tilt5 AR games feature this perspective.

The **second-person perspective** means that the player can look through the eyes of a character that is not the protagonist. The player might have their own different character(s) that they control, and looking through the eyes of the other character could provide a different perspective of the game they are playing. The second-person perspective character might fulfill many types of roles like a friend, competitor, neutral or enemy. Few videogames feature this perspective because of its impracticalities in the context of a video game. One exception is the racing game ‘Driver: San Francisco’ [19]. In one level, you see and control the car that you are driving from the perspective of the car that is chasing you. In serious games, the second person perspective seems to be a

good fit to stimulate empathy [20] As far as the authors are aware, no AR games feature this perspective yet.

The **fourth-person perspective** means that the player controls multiple characters at the same time and therefore looks at them from an external perspective. The controls are often less directly paired to the actions and more general. Many tabletop games like Ludo, Risk, chess and Warhammer 40,000 feature this perspective. Within tabletop games, the lines between third- and fourth-person perspective are thin, as the only difference is the number of characters controlled while the top-down view stays the same. In video games, the fourth person perspective can be found in many strategy games. Some Tilt5 AR games follow this perspective.

Some games **feature multiple perspectives at the same time**. For example, tabletop war games like Warhammer 40,000 [21] primarily play in a fourth-person perspective as the player controls an army, but occasionally requires the players to briefly switch perspective to determine line of sight from one’s own character (first person) and characters from the opposing army (second person).

### 3 Novel AR Tabletop Gameplay Ideas

Since this research produced over 80 different ideas – with numerous different themes and varying levels of detail – we only present a selection of concepts that exemplify how the different perspectives can lead to interesting new gameplay experiences in AR tabletop games. For more detailed explanations of the game ideas, we refer to the supplementary material.

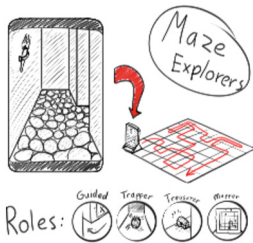


Fig. 1. Maze Explorers



Fig. 2. The Heist

#### Maze Explorers – 1<sup>st</sup> Person

The game is played on a playing board with a labelled grid (e.g. A1 – H8), and utilizes one phone and an accompanying phone stand. The maze itself can only be seen through the phone using AR and can be moved through the maze by moving the phone over the board. The goal of the game is for the players to find the maze’s exit by moving as a group (the phone) through the maze (turn-based), but they also have individual objectives. With the maze being completely virtual, its layout and number of hidden items can be randomized/customized almost infinitely. By having players take turns looking through the viewport to observe the maze they can determine, what information they want to share with the rest, all while planning out how to reach their personal objectives (Fig. 1).

### The Heist – 1<sup>st</sup>/4<sup>th</sup> Person

Players choose a role: mapper, hacker, thief or security, and are given tools to play this role. The main goal of the robbers is to retrieve the money from the vault within a given timeframe, with the security's goal being to stall them long enough for the alarm to go off, making them lose the game. Different roles can have different perspectives, i.e. top-down 4<sup>th</sup> person (mapper), and 1<sup>st</sup> person for the thief and security, opening up new ways of collaboration and competition in an AR tabletop space (Fig. 2).

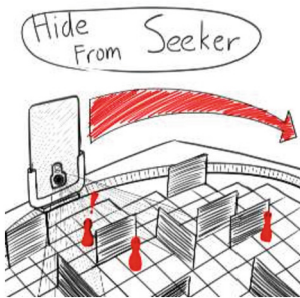


Fig. 3. Hide from Seeker

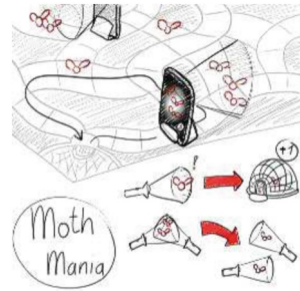


Fig. 4. Moth Mania

### Hide from Seeker – 2<sup>nd</sup>/3<sup>rd</sup> Person

This tabletop game concept has a board layout of a grid-based route with a start and finish that the players must move along, but with several small walls that are placed alongside the route. The first player to reach the end wins, but the catch is that they must do so without getting spotted by the enemy. The latter is a phone that is mounted to a circular track around the board, on which it is able to move around using a small motor (Fig. 3).

### Moth Mania – 1<sup>st</sup>/3<sup>rd</sup> Person

The players find themselves in a cave, where it is their goal to find, collect and secure as many moths as they can. Each player uses their phone as a pawn, through which they can see their character's view, holding a flashlight that illuminates the cave in front of them. Once a player spots a moth with their flashlight, it will linger in the light. At that point, the player must guide the moth to their starting point to secure it (Fig. 4).

## 4 Researching a Second-Person Perspective in Tabletop Games

### 4.1 First Iteration: Dragon Game

Some of the most interesting mechanics to arise from the above games were combined into a single design exemplar. From the Maze Explorers game, the phone as a pawn that moves across the playing board was used. From the Moth Mania game, the ability of the screen to reveal 'hidden' objects was considered interesting and multiple roles were included from the Heist games. Most importantly however, the second person perspective of the Hide from Seeker game was considered the most novel and unexplored

contribution of AR to tabletop games. This mimics design research in Virtual Reality experiences that also found the second person perspective to be a unique contribution of game technologies to traditional media [22]. In our case using a second person perspective of a single enemy also solved the more practical problem that multiple people having to take turns to look at a small screen creates a lot of inconvenience.

The game that emerged was initially called the ‘Dragon Game’, in which four players need to find treasure in a cave while avoiding being caught by a dragon. The players do not know beforehand whether a treasure chest is good or bad and looking through the camera on the phone’s screen- the eyes of the dragon- reveals if the chest is a treasure or a trap. The game ends when one player has a certain number of treasures. Players control their own pawn, and the phone represents a dragon that acts as an enemy that also moves around the board, creating a second-person perspective experience.

After internal playtest and reflection, the Dragon game showed potential with its unique approach of using the phone as a pawn on the board rather than using it just as a viewport. However, the Dragon game also demonstrated some flaws in its mechanics. Because the relationship between players is competitive, the limited angles at which the phone screen could be seen by all players worked against the benefits that the revealing mechanic should have. In a competitive nature, this concept simply did not work well. Therefore, a new version was designed that was played collaboratively.

## 4.2 Final Design: Eye of the Cyclops

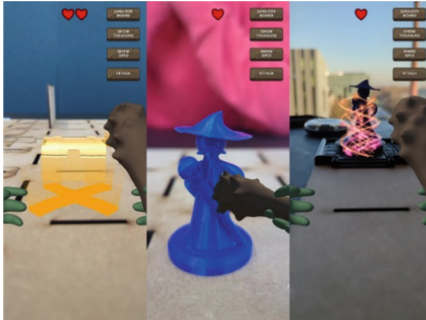
In the Eye of the Cyclops, up to four players must work together to find buried treasure in ancient ruins that are guarded by a cyclops. The cyclops is represented by the phone in the holder. Only the cyclops knows where the treasure is, but the players can cast spells to look through the eye of the cyclops—the AR camera—to see where the treasure is hidden. This game again uses the second person perspective. We refer to the Electronic Supplementary Material for the full instruction manual (Fig. 5).



**Fig. 5.** Eye of Cyclops

The game is turn-based, and to win the players must find six treasures and bring them safely back to the starting area. The players have three collective lives, a life is removed if a player gets caught by the cyclops. When no lives are left, the players lose the game. A player starts their turn by rolling the die. The number they roll determines how many

action points they can spend during that turn. These actions can be either moving their pawn, picking up treasure, casting the vision spell to reveal treasure through the AR camera, or performing a role-specific action. There are four different player roles with different abilities. These are: the Necromancer who can summon a decoy; the archer who can distract the cyclops with a burning arrow; the Voodoo Master who can move other players; and the Wizard who can place a magic barrier on the board. After each player's turn, the cyclops moves on the board. If it sees a player, it will chase it (Figs. 6 and 7).



**Fig. 6.** The cyclops reveals a treasure, fights a player or sees the player teleport to another location



**Fig. 7.** The cyclops reveals a hidden treasure chest on the board

### 4.3 Playtest

Two playtests were conducted with the Eye of the Cyclops prototype. Both tests had four participants. The participants were asked to play the game for one hour, and fill in a questionnaire about their experience. The Player Experience Inventory scale (PXI) [23] was used, as well as the social presence module from the Gameful Experience Questionnaire (GAMEFULQUEST, here abbreviated as GQ) [24]. Furthermore, observations were made about decisions the players took and thoughts the players expressed.

After the first user test, the rules of the game were adapted in a second iteration to improve the experience based on the results. The board was shortened from  $12 \times 12$  to  $11 \times 11$ , attacking was simplified and the movement of the cyclops was taken over by a player to make sure that it did not bump into walls as much. This showed the need for AR to streamline the process, as was mentioned in Sect. 2. The interactions need to be as simple as possible, as was also mentioned in [13], however streamlining might irk some players that demand clarity of rules [14].

#### 4.3.1 Results

Although there were only a few participants, with each playtest consisting of a single player group, tentatively some conclusions can be drawn from the PXI and GQ questionnaires. Most of the scores improved from the first to the second iteration, but only

Mastery  $t(6) = -2.751$ ,  $p = 0.033$ ,  $d = 0.54$  and Audiovisual Appeal  $t(6) = -2.573$ ,  $p = 0.042$ ,  $d = 0.78$ , improved significantly, both in favor of the second iteration.

The Player Experience Inventory has a dataset of other games to benchmark one's game with (<https://playerexperienceinventory.org/bdata>). In our case the closest analogue would be board games. One-sample T-tests with the player experience of our game compared with the benchmark mean scores as the test value, show that Eye of the Cyclops scores significantly better than the benchmark group on Meaning  $t(3) = 4.998$ ,  $p = 0.015$ , Curiosity  $t(3) = 6.784$ ,  $p = 0.007$ , Immersion  $t(3) = 6.168$ ,  $p = 0.009$ , and Audiovisual Appeal  $t(3) = 5.330$ ,  $p = 0.013$ . Both the mean scores for Immersion ( $M = 2.07$ ) and Audiovisual Appeal ( $M = 2.75$ ) in fact are higher than for all the board games in the database (highest values 2.0 and 2.67 respectively). In comparison with the only other AR game in the benchmark, Pokemon Go, Eye of the Cyclops scores significantly higher on Curiosity  $t(3) = 11.484$ ,  $p = 0.001$ , Immersion  $t(3) = 4.663$ ,  $p = 0.019$ , and Audiovisual Appeal  $t(3) = 6.330$ ,  $p = 0.008$ . All other comparisons are non-significant. The GQ did not improve between iterations and does not have benchmark data, so it is unclear how social presence during this game compares with similar games.

## 5 Discussion and Conclusion

Based on observations from two tests, the second-person perspective offers users a fresh and captivating gameplay experience, fostering meaning, curiosity, mastery and audiovisual appeal, as well as excitement about the Cyclops' actions. Participants e.g. expressed "I feel a lot of tension now" and "Where is it going now?". Overall, "Switching Perspectives" as a game mechanism generates heightened tension in character-based games, as users continually shift between 3<sup>rd</sup> and 2<sup>nd</sup>-person perspectives.

For curiosity, there are likely multiple game mechanics that were conducive to this higher rating. By adopting the second-person perspective (Cyclops), users gain visibility of the Cyclops' imminent actions and can wonder what that means for their own character's actions. In addition, the hidden treasures that get revealed through the AR lens themselves likely add quite a bit to a continuous feeling of curiosity. For Audiovisual Appeal it was likely the visualizations of the battle mechanics, and juiciness in terms of particle effects, that the AR added over traditional tabletop games. The higher score for Meaning is more difficult to conclusively link to a certain game mechanic, but could possibly be explained by the second person perspective stimulating a more empathetic connection between Cyclops and player [20].

Throughout, we used a grid-based system to try to anchor the tabletop game experience to that of a traditional board game, however the 360° view offered by the AR sometimes made this combination feel awkward and unintuitive. It would be interesting to see if the experience works better in a free movement style tabletop games.

We created a framework and a design exemplar that can help AR game designers ideate, categorize, and explain AR games, and to create AR tabletop games where AR is used as a meaningful mechanic instead of a novelty gimmick. It would also be interesting to see how this framework would inspire other types of games like videogames, non-augmented tabletop games and even physical games like tag and hide and seek.



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