
WEARPG: Movement-Based Tabletop Role-Playing Game with Arm-Worn Devices and an Augmented Die

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Abstract

Augmenting tabletop role-playing games (TTRPG) with computers took much attention of researchers recently. Nevertheless, these efforts mostly remained as functional augmentations. We believe that integrating new gameplay styles to this genre is still an underexplored area. Drawing upon the previous studies, we believe that wearables which support movement-based gameplay can be a good step taken in this direction as previous studies claim that wearables can strengthen the link to the imaginary worlds which is critical for TTRPG experience while the movement-based play can increase the player engagement. However, previous studies did not investigate these concepts with an implemented technology. Therefore, to get a better understanding of how wearables can alter the TTRPG experience, we designed a new RPG game system and developed the Elemental Gauntlet and the Luck Stone which enable movement-based game play in TTRPG context. Our preliminary results showed that, movement-based play and wearable props strengthen the identification feeling with the fictional character and resulted in a better immersion to the imaginary world of the game.

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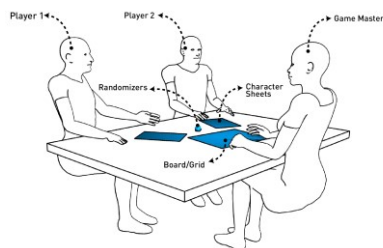


Figure 1: Setting for TTRPG

Author Keywords

Wearable Computing; Role Playing Games; Participatory Design; PnPRPG; Movement-Based Game; Exertion Games; TTRPG; Gestures; Tabletop.

ACM Classification Keywords

H.5.2 Evaluation/methodology - Input devices and strategies - Interaction styles - User Centered Design.

Introduction

Augmenting table-top games is a trending topic and table-top role-playing games (TTRPG) is among the popular table-top game forms to be augmented. There are many examples aiming at enhancing TTRPG experience in several aspects such as improved sensory feedback, speeding up uncaptivating game processes and implementing new mechanics with opportunities granted by computational power [1,10,13,15]. These improvements work towards leaving more space for role-playing by debilitating the conditions interfering with it. Moreover, empowering sensory experiences intensifies the atmosphere, again resulting in a better experience [14]. Still, previous studies do not offer any radical improvements for the gameplay of TTRPG (Figure 1). We believe that wearable devices which support movement-based gameplay can be a step forward in terms of gameplay innovation for this game genre. We believe that they would suit very well to TTRPG environment since 1) they can be designed in a way which do not directly interfere with players' concentration, 2) can increase the connectedness to imaginary worlds by perceived as costumes [11,22] and 3) let players enact their characters with their bodies by providing embodied interaction techniques [22]. Previous user studies also concluded that these properties may contribute to the TTRPG environment

[4,5], yet never tested these arguments with an implemented device.

In the direction of these arguments, we designed a new game system called WEARPG [3]. The distinctive feature of WEARPG is that it includes four arm-worn devices named as "*Elemental Gauntlet*" and an augmented die called "*Luck Stone*". These devices augment the game by encouraging players to participate in the game by using their bodies. In this sense, we also contribute to an uncharted area by testing movement-based gameplay in narrative-oriented and long-term play where character identification is very important. We tested WEARPG with 19 participants to understand if (1) arm-worn devices add to the player/character relationship and immersion by being perceived as costumes and (2) movement-based gameplay helped players to identify themselves with their fictional characters and make them feel more into the imaginary world.

Related Work

Augmenting table-top games with computers is a well-adopted practice in game design field [1]. However, we did not encounter any example which specifically proposes augmenting the TTRPG with wearable devices. Nevertheless, utilization of wearable devices is common in games which have similar characteristics. Pervasive games, physical games and live-action role playing games (LARP) were considered suitable environments for the integration of the wearable devices.

Augmented wearables were used in Live-Action Role Playing Games (LARP) which are relatives to the TTRPG. Costuming is an essential quality in LARP [8]. Therefore, we may state that *Thumin Glove* [24] and *Gauntlet* [16] are a result of this tendency. Both of

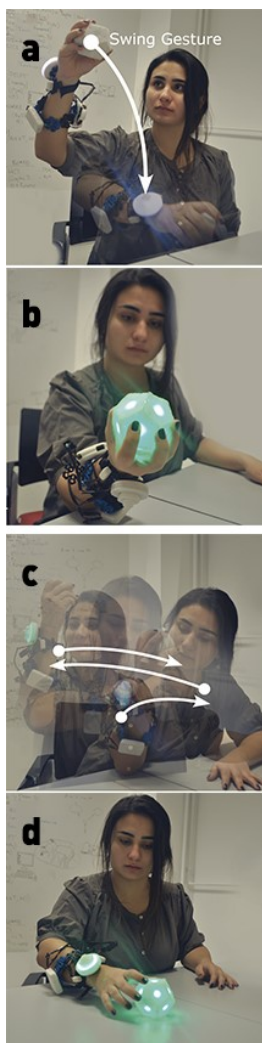


Figure 2: Power (a,b) and Reflex (c,d) Games

these devices were developed for enhancing the game experience with new game mechanics generated by the computational power of the devices. Both research draw conclusions from the user remarks, yet they were not presented in a way that can guide designers.

Lightning Bug [11] is a project which forms a sound background for our project. It investigates how wearables alter the user perception for better costumes. Isbister et.al. also defined interdependent wearables as a strong concept [12] which was also mentioned in Mueller et.al.'s definitions about social exertion games [17]. Moreover Tanenbaum et al. supports that the wearables affect the experience of being another character as it does in theater [21,22]. *Magia Transformo* [20] is another recent example of how costuming can create the feeling of transforming to another character by blending costumes into gameplay. Supported by these projects we believe that connectedness to fictional world and characters in TTRPG can be bolstered along with the immersion with the inclusion of wearables and movement-based play.

The studies mentioned in this section are indicators of how wearables may foster the gaming experience. However, these projects do not target TTRPG and did not put clear user feedback about how the utilization of wearables and movement-based gameplay affect the player/character relationship and immersion level in a tabletop setting where all of the game world is visible only in players' minds.

Game Design

There are many RPG systems which drive the different aspects forwards. For example, while D&D 3.5 [9] or Pathfinder [2] is operated on complex and detailed game rules, *Everway* [23] or *World of Darkness* [25]



Figure 3: Elemental Gauntlet and Luck Stone

follows a more simplified approach emphasizing the acting and role-playing of the character. Other than these classic systems, some systems try to include the players physical skills in the game in a way that can affect the outcomes such as in the *Dread* by the [7] *Impossible Dream*. In *Dread*, players are pulling blocks of a Jenga Tower if they want to perform critical moves.

WEARPG game system (bit.ly/wearpgchiplay17) aims to provide a more narrative-oriented experience by leaving calculation side to computers and encouraging players to act their characters with their bodies. WEARPG is based on a fictional world where five elements of water, air, earth, fire and electric grant powers to the fictional characters. Players choose two of these elements for defining the main attributes of their characters. The game play session, different from many conventional RPGs, is operated by 7 different movement-based games. Players play these games with the help of *Elemental Gauntlet* (Figure 3), which is an arm-worn device with capabilities of motion tracking, haptic and visual feedback and wireless communication. This device also supported by a



Figure 4: Concentration (a) and Precision (b,c) Games

tangible prop called Luck Stone (Figure 3), which is similar to the dice in conventional RPG systems.

Movement - Based Mini Games

Mini games refer to several movement characteristics in RPG environments. These characteristics are *power, reflex, precision and concentration*.

Power games includes two types one of which is swinging the arm as strong as possible (Figure 2 – a) while the other requires squeezing the luck stone (Figure 2 – b). This game is to be played when a character need to perform strength related tasks like hitting or attacking with sword.

Reflex games encapsulate two versions. In one of them, players need to move their device after they feel a haptic feedback (Figure 2 – c). In the other type, they had to grab the luck stone as soon as the luck stone flashes in the same color of their elements (Figure 2 – d). These games are for situations where the fictional characters had to move quickly in situations like dodging or catching.

In *Concentration* game players need to roll the luck globe in a specific pace and maintain it for a certain period of time (Figure 5 - a). This game is designed to be used in focus demanding tasks like casting spells.

Precision games also have two versions. One of these is trying to aim towards the light in the Elemental Gauntlet which can be used for ranged attacks (Figure 5 - b). The other one is used for precisely detecting a place by rotating their arms slowly (Figure 5 - c) in situations like lock picking or finding the weakest part of the foe when attacking.



Figure 5: Fire and Electric Stones are attached to Elemental Gauntlet

Elemental Gauntlet

Elemental Gauntlet (EG) is an interactive wearable device which is designed to support the game play of TTPRG in several aspects. The first advancement provided by EG is the atomization of the character creation process. The properties of fictional character are immediately transferred to GM console as the players attach their elemental stones to the EG (Figure 4). After this, most of the character traits and properties like *power, sustain, endurance, speed, influence and focus* are calculated by GM Console.

Furthermore, EG also enhances the sensory part of the game with light and haptic feedback. These feedbacks, other than indicating the success of the mini games, can be used by GM to warn players about specific cases like spell-affected areas. This functionality is especially beneficial to covertly warn players whose skills are enough to sense this kind of spell while others cannot. It also lets GM to undertake these kinds of actions without interrupting flow of the game.

During the gameplay, EG also automatize the dice calculation process. Therefore, players and GM do not have to put effort for uncaptivating processes [18].

Luck Stone

Previous research indicates that, auxiliary props are important for players and the interaction between electronic devices and these props should be considered by designers [4]. Moreover, another research indicate that dice is an important part of table-top gaming experience [6] and materiality of board games is an essential element for players [19]. Therefore, Luck Stone (LS) is designed as an auxiliary prop for complementing the EG. While each player in the game has an EG, LS is a mutual object which can be used by all players. LS is a randomizer in the shape of a dodecahedron. When a turn is one players', this player will interact with LS and roll it like dice after she/he completes the mini game. LS, aside from being used in some of the mini games, has color changing faces according to the success of the mini game. If the player is successful, amount of green sides increases, boosting the chance of getting a better result.

GM Console (Figure 6)

GM Console is a computer software. GM has power to control all the devices from this console. She/he can activate mini games, change the colors and patterns of LEDs or send vibration notifications. Moreover, GMs can create enemies for the story and observe how much damage they took from players. Other than that, during the character creation process, GMs should enter the properties of character which are age, manner, weapon, armor and skills of the players. Element selections are transmitted to GM console directly from devices. After these, GM console calculates all traits like *hit point, quickness, damage, quickness, analytic, social, intellect and instinct*.

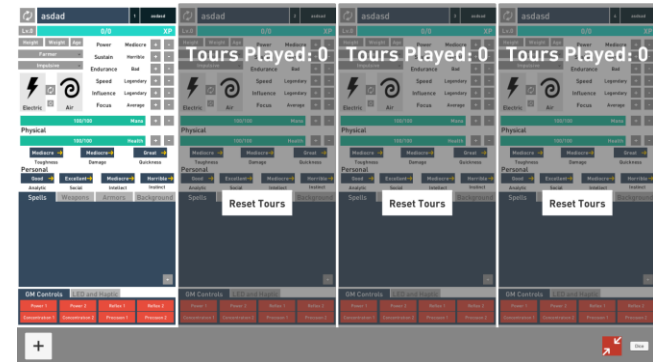


Figure 6: GM Console

MATERIALS

EG is made of 5 modules. These modules respectively include (1) main processor and sensors. (2) LED lights and the socket for elemental stones, (3) batteries and (3-4) haptic motors. As a main processor we used Arduino Lilypad. Pololu Altimu V4 was the motion sensor while the wireless communication was provided by NRF24L01+. For light feedback Adafruit Neopixel ring and strip LEDs used for their convenience in easy programming. Two generic haptic motors were used for haptic feedback. Elemental Stone ritual socket is built with a basic circuit logic. We created a circuit between analog pins of Arduino and manipulate it with different resistances. Each elemental stone has a different resistance which can be separately recognized by the device. GM console creates a mesh network with the use of RF24 mesh library for Arduino, for other all Elemental Gauntlets and Luck Stone to connect. We used an NRF24L01+ which is connected to Arduino Uno. The software of the GM Console was developed using Unity3D and it communicates with Arduino Uno over the serial port.

Table 1: Questions of the semi-structured interview

No.	Question
1	What is your overall opinion about the system?
2	How do you think EG affected the gameplay?
3	How do you think EG affected your connectedness to your fictional character?
4	How do you think EG affected your connectedness to fictional world of the game?
5	How do you think movement-based play affected the gameplay?
6	How do you think movement-based play affected your connectedness to your fictional character?
7	How do you think movement-based play affected your connectedness to fictional world of the game?
8	What's your opinions on the luck stone?
9	Which one was your favorite mini game?
10	Do you think that using and learning the devices and mini games hard?
11	What do think the main difference is before and after the EG and LS were introduced?
12	In what conditions, EG and LS can be used in other popular game systems?

Demonstration Setting

Although WEARPG is designed for long term gameplays such as 3-4 hours, jury members and visitors most probably will not have this much of time. Therefore, we will present the game to our audience with our story cards. Each card will include a speed scenario which makes players experience at least one of the mini games. We also make them choose their element cards to create their characters. We predict that each player will need 5-10 minutes to get the essence of our game.

Discussion and Conclusion

We tested WEARPG system with 19 players (16 M, 3F, $M_{age} = 26,4$, $SD_{age} = 7.14$) and made a preliminary analysis over the semi-structured interviews (Table 1) which were done after each game session with each player. We saw that our system worked in the intended way as most of the players articulated that wearable props and movement-based game play both increased their identification to character and their immersion to world. One player said, "I felt as if my arm is in another universe". They pointed out that wearing a prop which belongs to their fictional character eases their embodiment process. Moreover, some participants expressed that it is important that Elemental Gauntlet is functional in the game and not just a prop. They indicated that if it was just a prop without any interaction, then it will be no different than cosplaying.

In terms of movement-based gameplay several things increased their motivation. First, they enjoyed acting their characters not only with their mental skills but also body skills. Other thing they found positive was that they could affect the outcomes of their moves. Although, we still have the chance component, they could manipulate the chances on Luck Stone which

made them feel they are more in control. Several of them also indicated, it become more comfortable to act their character also with their bodies since this game system provided a seamless transformation to this mood by encouraging all players to bodily play.

Although many players found this new way of play positive, several players expressed concerns. One player was worried that this may weaken the game mechanics of role-playing games which is based on mental skills. He was concerned that shift towards the physical skills may hinder the required mental skills which are important for role-playing. Still, this concern is expressed only by minority of players, yet it gives a valuable lesson about balancing the mental and physical skills in such games. Another concern, which was even raised by the participants who was positive towards the new system, was the long-term engagement. Participants were not sure if movement-based play can keep its attraction in a long-campaign setting. We started to test this condition by organizing user tests which will last long for 3-game campaigns.

We believe that, WEARPG is a valuable first step to understand the effects of wearable devices and movement-based gameplay on the player/character relationship and the immersion in a tabletop setting where these two notions are quite important. Our study aims to put forth a detailed analysis of the user feedback to extract design guidelines for designing wearables and movement-based games for narrative-oriented, long-term game settings. After finishing our long-term user tests, we plan to contribute to field with a user-oriented design knowledge which can inspire the designers and developers of such games.

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