Dungeon crawl: audio game for the entertainment of visually impaired people

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Abstract

The gaming industry has experienced a significant increase in Brazil and worldwide. In Brazil, this industry increased 164% from 2014 to 2018, according to the Brazilian Digital Games Industry (Indústria Brasileira de Jogos Digitais [IBJD]) census. However, regarding accessibility in games, there is still a significant gap; more specifically, about a few games in the market concerning visual impairment. This study presents the development of an audio game for entertainment called Dungeon crawl. Its scenario is a labyrinth aimed at people with visual impairments (and, also, for those who can see), developed for a website without needing a graphical interface. Usability tests were performed, and the results are displayed in this article.

Keywords

Visual impairment, Digital games, Entertainment, Audio games

1. Introduction

Audio games are digital games that explore sound resources to indicate the scenario, mechanics and interaction of players (with or without visual impairment) with the game (Silva, 2017). Hence, audio games can be defined as digital games, usually without a visual interface, which allow interaction and understanding through sound resources, thus allowing a different experience from traditional digital games developed by the gaming industry.

On the other hand, according to the Brazilian Institute of Geography and Statistics census (Instituto Brasileiro de Geografia e Estatística [IBGE], 2010), approximately 3.4% of the Brazilian population has a high degree of visual difficulty, with 528 thousand people unable to see (total blindness) and 6 million are low vision or subnormal vision (IBGE, 2010). Worldwide there are 39 million blind and 246 million people suffering from moderate or severe loss of vision, according to the World Health Organization (OMS, 2013).

People with disabilities, for example, visual impairment, find everyday impediments to representativeness, access and inclusion in several areas: labor, political, social and leisure (Martins et al., 2019). In entertainment, there is a significant gap in the number of games accessible to people with some visual impairment, mainly by the big game companies, which have focused on the graphic quality of their games (Ávila et al., 2019).

To reduce this gap, this work aimed to present the stages of development of an audio game called Dungeon crawl. Thus, the audio game will allow playing a game without needing a graphical interface to create accessible and recreational challenges.

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2. Dungeon Crawl audio game development

This project lasted approximately a year and involved an undergraduate student in Computer Science, a researcher in the Speech Therapy field and another researcher in the Computing field. The game's proposal is a randomly generated labyrinth in a 2D matrix, where you must guide yourself, using a headset for a better experience, through the sounds that are played in all directions, simulating a 3D environment, being able to indicate directions to the left, right, front or back. The sounds have open path indicators, error indicators, hit indicators, navigation, and enemies sounds that you must sneak through.

2.1. Project requirements analysis

The requirements analysis of this audio game was based on the development of other audio games (Avila et al., 2020) and (Silva, 2017). The following functional requirements were considered: The game must have audible feedback for every action the user takes, whether the action is a movement during the game or some action in the menus; the player must be able to use an ability to facilitate his movement; the player will not be able to attack monsters to generate a higher voltage when there is a monster nearby; the size of the labyrinth and the number of monsters gradually increase as the player advances through the phases.
Non-functional requirements were considered: The application will be developed on a website; sounds should be distinct for each action within the game to make it easier to differentiate between actions; the game is dependent on an internet connection.

2.2. Design and Implementation

The map is constructed using a Prim recursive algorithm, where it recursively generates the walls of the labyrinth (Area not walkable by the player), checking if an empty gap was left (Area walkable by the player) through the entire matrix.
Based on the difficulty, several enemies in random positions in the labyrinth are added in the end; these enemies lack vision and make a lot of noise when moving. The idea is not to move and let them pass the player by, increasing the tension and challenge in paying attention to the surrounding sounds while moving through the labyrinth.
When accessing the game, the user is redirected to the initial menu (a black screen with two buttons) where he can click on the menu buttons or drag his finger over them, triggering the sound indicating which button is being pressed. When choosing the "Instructions" option, a short audio narrative explains what each sound means within the game so that the player knows what awaits him. By selecting the "Start" option, the match is started, the map is generated, entry and exit are positioned, and the player is positioned at the entrance. Some sounds indicate the start of the game, and the player is ready to play. The player can move forward by dragging their finger up or clicking and dragging the mouse up; You can turn left, right and back by dragging your finger left or clicking and dragging the mouse left, right and down, respectively. By tapping the screen with a click, you use your "sixth sense" ability, indicating the correct direction in the labyrinth.

3. Usability test and Results

The methodology used for usability tests was, firstly, a collection of information about the users who would do the test, being the information related to how familiar the person is with digital games, how often and his skill level, and how much person is familiar with audio games, how often and their skill level.
Due to the Coronavirus epidemic, a convenience sample of online people willing to participate was selected. A cell phone or computer, an internet connection, a headset and a blindfold were needed so that users without visual impairments could focus on the experience of being guided by sound. At the

end of the playing experience, some pre-written questions were asked on a form concerning the difficulty of the game, how difficult it was to be guided by sounds, if there was an interest in playing audio games and what could be done to improve these points.

Of the 32 participants who answered the questionnaire, 68,75% participants considered themselves close to the activity of playing digital games, while the remaining 31,25% considered themselves without affinity.

Of the same 32 participants, 87,50% said they had never had the experience of playing a game focused on sound experience, and 12,50% responded that they had never even heard about the topic of audio games and inclusion in games.

So, 90,6% participants answered that they are interested in experiencing an inclusive gaming experience with a focus on sound experience.

All participants were intrigued by the existence of a different experience using other senses than sight to play. They found it a fun experience, and they are interested in playing games with similar experiences.

4. Conclusions

This project aimed to show the development of an Audio game and try to bring visibility and relevance to the theme. In the development of a web application that is responsive and accessible, some different factors must be considered during this process, which can be built without much difficulty if planned. This reinforces once again the importance of visibility to the theme.

After the usability tests, it was possible to notice some development problems that could be corrected with continuous development in an application, which corroborates the idea and importance of user-centered design.

For future developments, it is interesting the continuous development and application adjustment by having contact with the end-user, the addition of new, more relevant challenges to give the game a longer lifespan and the opportunity to test the game with a broader audience, limitations that occurred because of the Coronavirus epidemic.

5. References

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