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SERIOUS VIDEO GAME TO PROMOTE EARTHQUAKE PREVENTION IN CHILDREN

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ABSTRACT

Mexico is a country where seismic events occur in a daily basis. Since 1990, the national seismological service has reported various earthquakes, in some cases they usually imperceptible, it doesn't ensure that the population cannot be injured, there for, it is important to keep the entire population informed and prepared in the event of an earthquake.
This project will present a proposal for a serious videogame with the intention of bringing the young public, between nine and twelve years old, closer to earthquake prevention in a playful way through a narrative based on children studies and official civil protection guidelines. This videogame is developed with de Godot game engine platform, using as the main source of information the research project developed by the students of the master's degree in Information Design and Communication about strategies focused on children to promote informed behavior for safety in the case of seismic related situations (Gros, 2009).
The videogame poses scenarios of elementary school, where a series of challenges are presented to the gamer as simulating real situations with the intention that the player learn how to avoid getting hurt and manage to reach to meeting point safely. This paper shows the related work in the domain of games focused to promote the information about safety during earthquakes, the design and the advances in the development the proposal.

KEYWORDS

Earthquakes, Prevention, Serious Videogame, Children

1. INTRODUCTION

Information on earthquake prevention can be quite difficult for children to understand, as most media tend to target an adult audience. Many occasions texts and images are used to communicate the message, they are not always suitable or attractive for a younger receiver.

Before society, video games have had entertainment as their main function, so many people do not believe that they can provide some learning to those who practice it because they have become popular in recent years, it is sought that from the so-called serious games, education is encouraged, the development of skills and the solution of problems are helped. Serious videogames approach allow to develop useful tools to transmit knowledge (Gros, 2009; Gree, 2004). By means of a serious videogame it is possible to design focused activities for receiving and processing information on a specific topic while increasing the player's motivation to learn. For this reason, it is relevant to develop videogames that include information to promote earthquake prevention information in children. This project, entitled "Simon Sismon: serious videogame to promote the prevention of earthquakes in children", is based on the research "Strategy to encourage the culture of prevention against earthquakes in the child population of Mexico City" carried out by (Alvarez et al., 2021) and focuses its communication premises on a younger audience: children between 9 and 12 years old. On this basis, the game design introduces recreational activities that meet the children needs identified in seismic situations, for the sake of the necessary message is transmitted properly.

Official information provided to children on earthquake prevention in schools and in mass media may be considered as insufficient and inadequate according to what was collected by students, causing the risk of a real event to increase (Alvarez et al., 2021). Serious games, as opposed to commercial games, aimed to disseminate entertainment-mediated knowledge that stimulates a memorable experience (Balmori Olea, et al, 2019). The proposal of a serious videogame aims to transform information about earthquakes into a narrative

that is attractive to children through gamification, in which critical and innovative structures can be introduced to encourage prevention of this natural phenomenon by means of the graphical and communicative resources of a videogame. Furthermore, the proposal presented here, Simon Sismon, is an interdisciplinary initiative where apart from taking social studies as basis, designers and computing profiles work together to produce a coherent product.

1.1 Related Work

This section will delve into the current state of the previous work related to the project presented here. With this, videogames and use for knowledge are better understood. Below are some videogames developed with this type of design on earthquakes and that will be used as a reference for the project. There is a limited number of videogames related to disasters caused by natural phenomena, two categories are established according to the development zone, western and eastern by the difference in language and the difficulty of obtaining information.

- **Tanah:** it is an educational game aimed at a minor audience, in which fun way information is presented about evacuation plans, home preparation, protocols for an earthquake or tsunami, as well as explanations of the function of tsunami alarms, evacuation routes, location of safe spaces, among other topics. From all this information presented, questions are asked to reinforce what has been learned within each scene.
- **Baby Panda Earthquake Safety 1**: It is a game designed for children; it is divided into two sections. The first shows what it is for to prepare a backpack of life and what objects you should carry, while describing what they are for. In the second section, they tell young children short and precise stories about how to do in the event of an earthquake to get safe. Each of these recommendations are presented in different scenarios, at home, at school, supermarket and the street, the player must follow the instructions and respond correctly to get out unscathed.
- **Stop Disasters:** Stop Disasters is an online game created by the United Nations Office for Disaster Risk Reduction. Its main objective is to help understand that the implementation of prevention measures and the reduction of vulnerability are key to saving the population and reducing the impact of disasters. The platform shows us the different types of catastrophes. The player must select some geographical area, where children will build villages and cities with the available resources, so that these are in safe areas (Playerthree and UNDRR, 2018).
- **Treme-Treme:** The Treme-Treme game was created jointly by the Department of Civil Engineering and the Department of Computer Science of the Higher Technical Institute, Dreamstudios and Flaidisaine are three of the institutions involved. It is part of the European project UPStrat-MAFA in urban disaster prevention strategies (Sousa et al., 2015). Through the character, activities will be carried out within the different levels in order to teach the concepts and prevention measures in a fun way, in such a way that the player manages to become aware to prepare for real situations of earthquakes and tsunamis.
- **地震逃生 (earthquake escape):** This videogame aims to put the main character in a safe zone inside the house when an earthquake happens before the end of the 11-second limit to safety.
- **震度6強体験シミュレーション (Seismic intensity 6 strong experience simulation):** It is a role-playing game about the preventive measures and evacuation actions that must be taken in the event of earthquake of magnitude 6 or higher on the Richter scale.
- **居家瓦斯安全小尖兵 (Home shockproof small "answer" person):** It is a game in which questions must be answered about what action to take to prevent earthquakes.
- **地震模擬 (earthquake simulation):** The game shows through a simulation how to prepare before an earthquake and what the immediate response to them should be, by organizing an emergency kit and paying attention to the indications on how to protect yourself.

Table 1 highlights the aspects of a serious game and compares them, each of which was interacted with to obtain the results.

Table 1. Videogame comparison

Videojuego	Tanah	Baby Panda Earthquake	Stop Disasters	Treme Treme	Earthquake escape	Seismic intensity six strong experience simulation	Home shock proof small "answer" person	Earthquake Simulatión	Simon Sismon
Feedback	✓	✓	✓	✓	✗	✓	✓	✓	✓
Has levels	✓	✓	✓	✓	✓	✗	✗	✓	✓
has explicit instructions	✓	✓	✗	✓	✗	✓	✓	✗	✓
clear sequence of actions	✓	✗	✗	✓	✓	✓	✗	✗	✓
controls usability	✓	✓	✓	✓	✓	✓	✓	✗	✓
advances prompt new actions	✓	✓	✗	✓	✗	✗	✗	✓	✓
distinction between positive and negative actions	✓	✓	✓	✓	✓	✓	✓	✓	✓
elf-defined as a serious videogame	✓	✗	✓	✓	✗	✗	✗	✗	✓
characteristics of video games									
Cost	Free	Free	Free	Free	Pay	Free	Free	Free	Free
Idiom									
Platform			✗		✗	✗	✗	✗	✗
Web	✗	✗	✓	✓	✓	✓	✓	✓	✓
Open source	✗	✗	✗	✗	✗	✗	✗	✗	✓

1.2 Contribution

The mastery of information about earthquakes and the safety directions allows to generate a narrative for the development of a serious videogame on prevention where the interest of children about the subject can be increased and with it, in the long term, contribute to the development of a culture of prevention. As can be seen in the previous paragraphs, there are not enough serious games proposals for Latin-American (especially Mexican) children taking care of the domain of earthquake safety guidelines promotion. furthermore, to promote an interdisciplinary work to recover social and children focused studies and apply them to design technological development is not a common practice. So, the videogame presented here is a proposal to reverse such state of affairs with a double folded contribution: social and technological relevance in the serious videogame field.

2. PROJECT DEVELOPMENT

To develop the project will be divided into four stages, which will be briefly described.

- **Initiation stage:** In the first stage, the following activities will be carried out: research of the previous work and part of the definition of the videogame. The diagram shown in figure 1 presents in a general way the behavior and conditions followed by the videogame system. When starting the game, the main menu will be displayed, when choosing the "start" option, the characters that can be chosen will be displayed on the screen and then start the game in the first level. In case the three lives provided to the player are lost, the game will return to the beginning of the level in which it remained. If in the main menu you choose "options" you will be directed to the screen where you can modify if you want to activate or deactivate the sound, and finally if you choose the option "exit" the program will end.

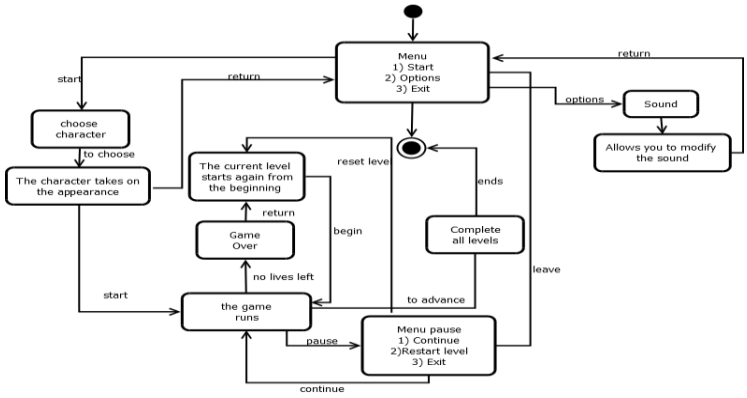

Figure 1. State diagram of the video game Simon Sismon

- **Elaboration stage:** In the second stage the basis for the development of the video game will be made. The activities that are planned in this stage are: develop the narrative, design the interaction diagrams, design the scenarios for the different levels and specify the functions of the characters.
- **Construction stage:** The implementation of the video game on the chosen platform will be developed during this same phase, with the elaboration stage the activities of the interactions between the characters and scenarios will begin. It will help create each of the levels that the game will have. In the development of the algorithm, each of the functions previously assigned to each character will be implemented, and the different parts that make up the video game will be tested.
- **Transition stage:** Finally, in the transition stage, an update of the previous work will be carried out, final tests of the video game will be carried out, in addition to the drafting of the final document. In figure 2 each of the stages mentioned above is observed to illustrate the time intervals in which each of the activities will be carried out.

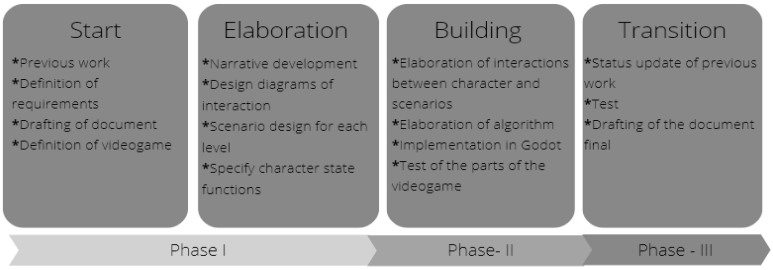

Figure 2. Stages of project development

2.1 Advances

Now it has been possible to make advances on the narrative of each level, the functions that each character will perform, the design of some levels and the design of the characters. Figure 3 shows the character and a scene within a level. On the other hand, figure 4 shows the information about the signal when it encounters it.

Figure 3. Main tutorial scene

Figure 4. Videogame signage

3. CONCLUSION

The development of a serious video game on prevention can increase children's interest in the subject and contribute to the development of a culture of prevention, considering that one of the limitations of the videogame does not address all issues related to prevention against other natural phenomena. It should be noted that in the development of this proposal, there were interdisciplinary interactions, because of the convergence of designers and technologists to adapts the game goals and design it to remain attractive for children. In addition, this game is based on a social study that exploits gamification.

However, the project is still in the process of development and there are some avenues to explore as future work: to end up implementing some features, functions and scenarios in the last two levels, to solve details about the animations of the character and control functions to play the game. Finally, the proposal should be tested with real users to recover feedback and introduce improvements.

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