Educational Game for Learning How to Survive Earthquake

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Abstract: Earthquake prediction has not yet been realized. Hence, we have to learn how to survive earthquake. However, all of us are not necessarily motivated to learn it. Educational game is very effective in such a case. This study aims to build an educational game (Android application) where foreign people or school students can learn how to survive earthquake. The game has two basic steps. In the first step the user acquires knowledge about earthquake (e.g., Drop, Cover and Hold on) and in the second step the user just applies the knowledge to practical missions in the game world.
Keyword: Game Based Education, Virtual Reality, Earthquake Evacuation

1. Motivation

Japan is a disaster prone area. Hence, disaster education is indispensable and challenging. Most of Japanese people have knowledge about disaster even children owing to regular disaster education in school. But when a disaster happens, a single person's anxious activities can confuse others in a specific place and make a situation worse. On the other hand, a person's positive activities can make the situation much better for all people. In the earthquake time, the important matter is people get a couple of seconds to make the preparation (e.g., drop, cover, and hold on). In this study, hence, we focus on educational game as an education method for teaching people how to survive earthquake, i.e., effectively control the situation and make the preparation. Traditional education methods usually stress theoretical and conceptual knowledge rather than experiential ones. We believe that instead of teaching oversimplified experiential principles, people should learn by playing the game that gives them more flexibility and independent thoughts in disaster education.

2. Fundamental Idea

It is a challenge to combine disaster education and an experiential method. In school education, for example, learning through field experiences (e.g., evacuation drill) is useful for students. For the successful learning, we attach importance to people's executing proper knowledge about disasters appropriately and immediately. In disaster education, it is occasionally difficult to provide field experiences. In other words, it is required to prepare a safe environment where people can learn in mentally relax mode.

Focusing on earthquake, we aim at educational game where people can acquire and execute knowledge about how to survive earthquake while playing safely in a stress less way. Currently we think that the game's targeted players are foreigners or school students who may have not experienced real earthquake.

3. Game Design

Virtual games have both advantages and limitations for investigating human behavior during earthquake evacuations. The design components for developing the virtual prototype for earthquake evacuation include earthquake features; building selection and representation; damage representation; agent behavior and interactions; and behavioral learning outcomes.

All possible steps in our game are shown in Fig. 1. A player starts the game by choosing a character. The game has 2 stages: training and main mission.

3.1 Training Stage

At this stage (the initial stage), the player faces a different kind of situations and learns from the provided data. Different situations refer to the position of the player at the time of the earthquake, supposing the player in a busy road, a car, a hospital, a school, etc. The provided data should be some texts and videos, or experts show what the player needs to do. After that, the player should apply the experience in a time limit. To qualify for the second steps, the player needs to achieve some total point. To achieve 150 points, for example, the player needs 6 training according to the point calculation rule shown in Table 1. However, the matter is that the number of training is 10; the player qualifies for a next level. For advantageous game play, the player needs to improve in the training stage.

3.2 Main Mission

Here the player faces some real disaster and needs to use their knowledge. When qualifying the stage as a reward, the player gains some power like: improving more Qualifying time (QT) and Punctuality (PU). However, the stage-to-stage reward is not the same.

3.3 Development Plan

The game is designed for web browser platforms—many modern browsers support the game. We use HTML5, CSS, and JavaScript (e.g., React.js). The game does not have any mufti-players support.

3.4 Related Work

There have been many educational games for disaster education [(1)-(4)]. In the previous research [(1)], they make a virtual game for the mobile platform. The game has also the two stages. In the first stage, a player sees

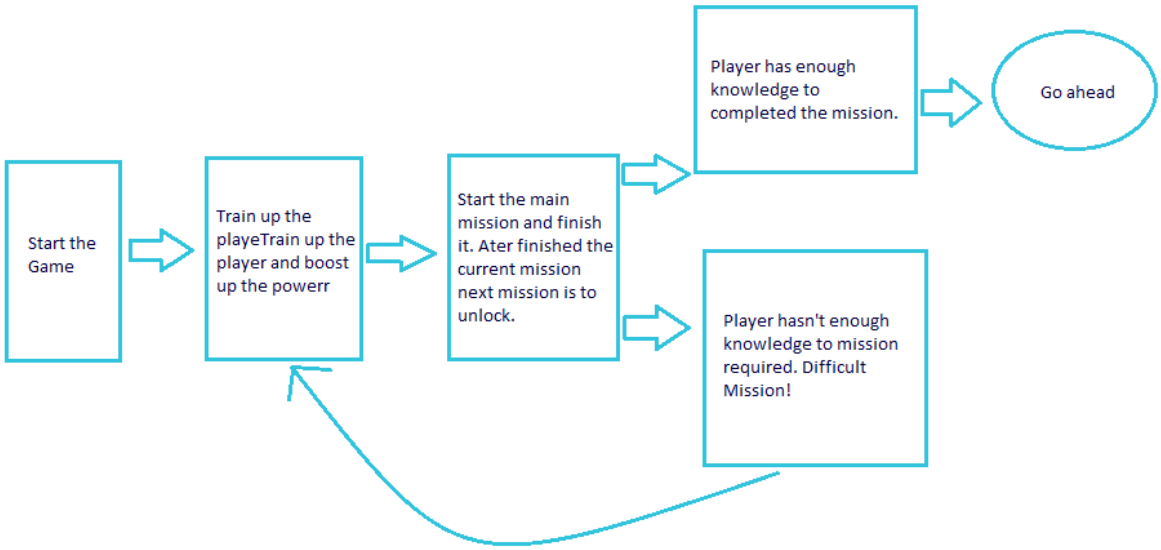

Fig.1 The game's possible steps

some video and goes to the mission directly. In such a case, however, the user does not have enough challenges for the game. In our game, the player needs to join the training stage very frequently to reduce the QT and increase the PU. Hence the player always needs to achieve the more point. The game's rules encourage players to come out of their comfort zones and explore new territories that they would not normally perform in real life situations. In such a way, out of the game, the players have interest in learning about the disaster.

4. Current Situation

This manuscript briefly described a possible design of our educational game for learning how to survive disasters. Actually, we have not fixed the design; we have been thinking about some design possibilities. We want to start to develop the game based on the fixed design as soon as possible.

Table 1 Point calculation

Users location	Qualifying time (QT)	Punctuality (PU)	Total point
In a office	8	7	14
In a car	6	8	32
In a theater	7	10	30
In a school	5	10	50
Near to ocean	13	9	Disqualify
In sleeping	6	9	36
Total			172

- Total time TT = 10 sec,
- Qualifying time QT = ?,
- Max Punctuality point MP= 10,
- Users Punctuality PU= ?,
- Total point = (TT-QT)*PU;

References

(1) Winarni, E.W., Purwandari, E.P.: "Disaster Risk Reduction for Earthquake Using Mobile Learning Application to Improve the Students Understanding in Elementary School", Mediterranean Journal of Social Sciences, Vol.9, No.2, pp.205-214 (2018)
(2) Clerveaux, V., Spence., B., and Katada, T.: "Evaluating and promoting disaster awareness among children: The disaster awareness game", Journal of Emergency Management, Vol.6, No.6, pp.17-30 (2008)
(3) Kikuchi, S., and Makanae, K.: "Development and Evaluation of an Action-based Educational Serious Game about Disaster Evacuation", Proc. of 14th International Conference on Construction Applications of Virtual Reality, pp.269-274 (2014)
(4) Tsai, M.H., Chang, Y.L., Kao, C. and Kang S.C.: "The effectiveness of a flood protection computer game for disaster education" Visualization in Engineering, Vol.3, No.9 (2015)