Proceeding Paper

Integrating Internet-of-Things (IoT) into a Cultural Game Authoring Tool: An Innovative Approach in Maker Education †

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Abstract: Recently, integrating Internet-of-Things (IoT) for an interactive learning has become a topic of interest. For cultural inclusion, young individuals need to be more aware of the culturally diverse community and embrace it. However, this is not possible without proper cultural education and awareness. With maker-based education, individuals can participate in active learning where they share their cultural heritage story. Hence, this research focuses on analyzing whether integrating IoT into a cultural game authoring tool will be an interesting and innovative approach in maker-based education for culture.

Keywords: serious games; game authoring tool; maker movement; Internet-of-Things; maker movement

1. Introduction

Recently, there has been a tremendous change throughout the world as a result of globalization and internationalization. In a diverse country, cultural heritage is a substantial aspect for its people with different ethnicities. Therefore, it is essential for people in a diverse country to be taught about cultural heritage as it is a part of their identity, subsequently increasing respect for each other's social values [1]. Museums and schools have recently been trying to find better ways to do so other than visiting sites and viewing historical artifacts [2]. With a great edutainment value, games have been known to grasp the minds of mainly young individuals [3]. However, making specific games for each museum might be time-consuming and financially expensive. This is where the importance of a game authoring tool comes in, with which any individual can make a unique experience for their fellow peers to indulge in cultural history [4]. Recently, Internet-of-Things (IoT) has been known to give an additional interactive method to further increase the edutainment value, but game designers have faced issues previously with properly integrating IoT [5,6]. This research focuses on a cultural game authoring tool that mainly is based on sharing the story of Kristang culture of Malacca in Malaysia and investigates the best way to integrate IoT into this game authoring tool. Furthermore, it also researches whether adding IoT is beneficial in this type of maker education that utilizes serious 3D game for cultural education. The aim of paper is to understand the appropriate method of integrating IoT in the form of radio-frequency identification (RFID) cards in a cultural game authoring tool to increase edutainment value.

2. Materials and Methods

The study comprised 56 participants playing a short cultural game focusing on Malacca with the use of IoT in the form of RFID cards. Figure 1 shows the adopted research methodology. The RFID cards depicted certain actions and credit in the game. Later, the

participants tried the game authoring tool to make a small game and filled up a survey as shown in Table 1 to help understand whether integrating IoT to act as a form of interaction would be a helpful addition. The survey was of a linear scale, where 5 showed the most interest and 1 showed the least interest.
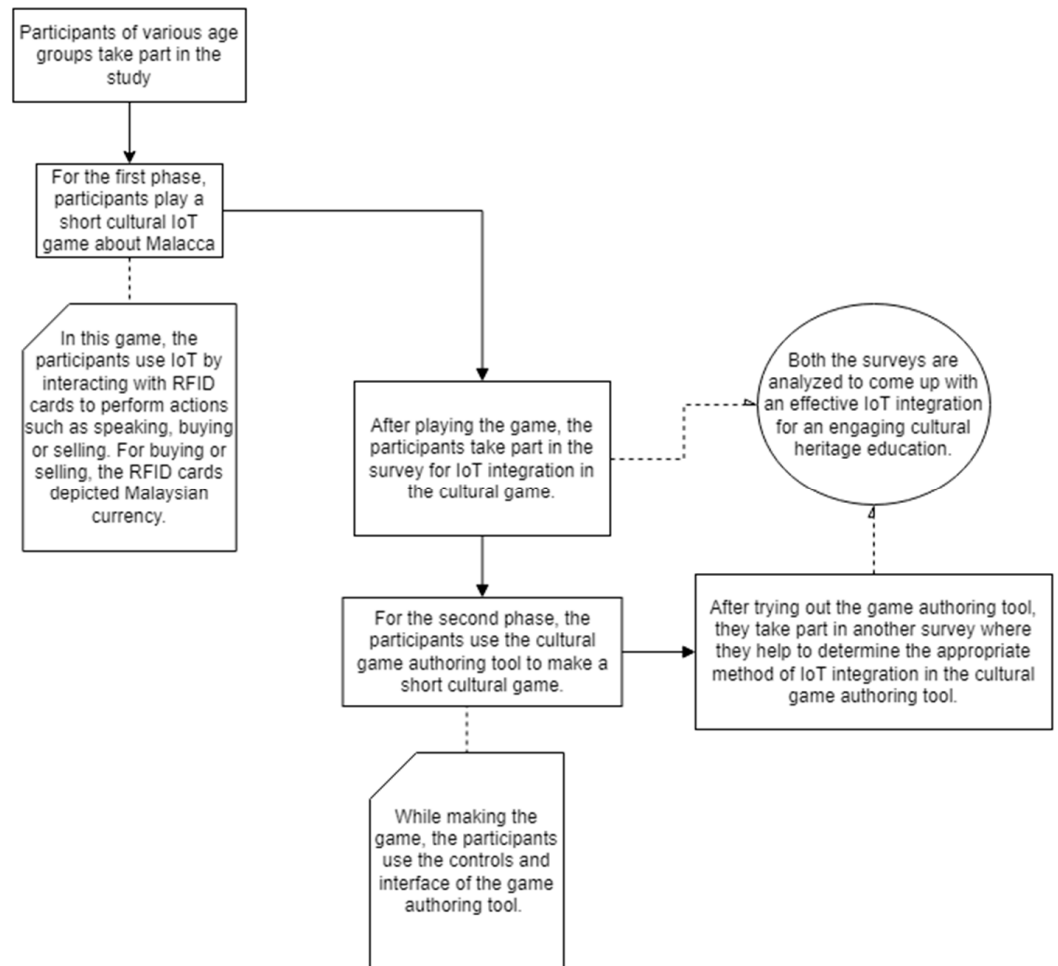

**Figure 1.** Research methodology framework.

Table 1. Survey questionnaire to evaluate the interest in IoT with the game authoring tool.

No.	Question Description
Q1	Do you think cultural game authoring tool will help people share cultural heritage in an immersive way?
Q2	Do you think integrating IoT in the form of RFID cards in this cultural game authoring tool would be engaging?
Q3	Did you enjoy making a short game scene with the game authoring tool?
Q4	Would you like to use RFID cards as a form of IoT integration in your cultural game?
Q5	Would you want to use the RFID cards for performing actions in the game?
Q6	While designing your own game scene, did you find the game authoring tool hard to use?

3. Results

The participants were from school, aged between 11 and 15 years old with an average age of 12.93 years, and involved 38 males and 18 females. Figure 2 shows the survey analysis of the study conducted. In total, 47 participants mentioned that they found cultural game authoring tool to be an effective way to share their cultural heritage in an immersive way. However, only 6 participants chose 5 as a scale regarding integration IoT in the game to be engaging, while 39 participants chose 4 as a scale. Moreover, 53 participants mentioned that they enjoyed making a short scene with the game authoring tool prototype,

and 48 participants liked the form of using RFID cards in the game, where 9 participants chose the scale of 5 and 39 chose the scale of 4. Further, 55 participants showed interest in using RFID cards as actions in the game. Lastly, 53 participants did not find the game authoring tool prototype hard to use while designing the game scene, where 38 participants chose the scale of 5 and 15 participants chose the scale of 4.
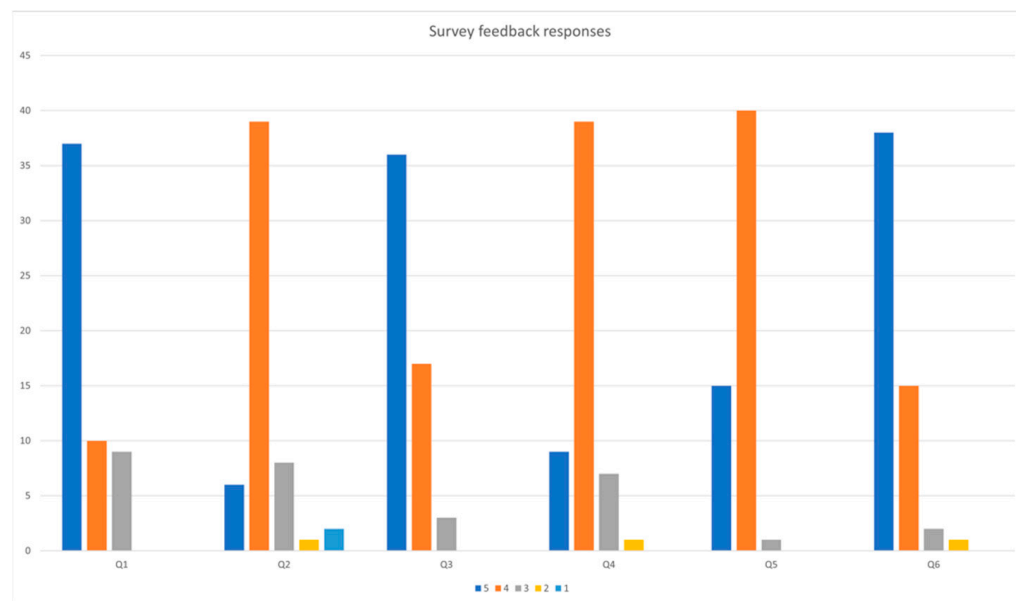
Figure 2. Survey analysis of the study to understand interest in IoT with the game tool.

4. Discussion

Younger individuals aged 11–15 years found the game authoring tool with the IoT integration as RFID cards for actions such as trading to be entertaining. It can be said that integrating IoT into the game authoring tool might not be a necessity for the cultural heritage education. However, integrating IoT in the form of RFID cards for simple interactions such as trading can improve engagement and involvement for the individuals. The reason for conducting the study with young individuals was that the purpose of the game authoring tool was to increase their interest in cultural heritage. It is to be noted that, with sharing and knowing each other's cultural story, diversity and cultural inclusion will be improved.

5. Conclusions

Integrating IoT into the cultural game authoring tool in the form of RFID cards for actions and credit for the game seems to be a fitting way to get more young individuals to be interested in cultural heritage. The participants showed more preference to RFID cards as forms of interaction. As a future development, RFID card may be depicted as a debit card to make it more engaging for young individuals. This study introduces an effective way to integrate IoT with the 3D game authoring tool directed for cultural heritage education and awareness.

OF NOTTINGHAM MALAYSIA (project code MOMA250722, Science and Engineering Ethics Committee and 09 August 2022).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are openly available in Mendeley Data titled "Survey to integrate IoT in cultural game authoring tool" at doi:10.17632/gzy6fckmb7.1, V1, 2022.

Conflicts of Interest: The authors declare no conflict of interest.

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