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An Exploration on Recycling Paper Education in Gaming Based For Integrated With Augmented Reality Technology

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Abstract

Paper is the most important thing in our lives and has been promoted in many years to recycle paper but still, the attention is lacking. Most of our daily routine will probably start using paper and end with the use of paper as well. Waste paper will grow more and cause pollution of the environment. Therefore, in this paper have proposed to use a game in educate students about the paper recycling paper method and the importance of recycling paper through Augmented Reality (AR) pop-up book games assisted by AR technology and pop-up book. AR pop-up book game is designed to create interactive and increase awareness among students about the significance of paper recycling. It also determines the needs and problem of the affective recycling of paper in the way it facilitates learning for people. It also emphasizes the importance of recycling paper and the need for this technology and how it represents the different applications of the technology in the future of technology and communication. AR can help the university improvise or learn to attract more students at university level.

Keywords: *Recycle, Waste Paper, Augmented Reality, Pop-up Book, Education Game*

1. Introduction

It is crucial becoming familiar with the importance of recycling and the effects on industrial societies and the natural habitats. Before it comes too late, it really needs to be concerned about recycling. Hence, it is important for people to be aware of reusing and understanding better the beneficial and negative effects it has on the earth. Paper recycling is the waste paper that transformed into new paper items. The extraction and recovery of enormous materials from scrap or other discarded materials is used to improve paper production. It has several important benefits other than cutting down trees. It keeps waste paper out of landfill possession and creates methane as it separates. For example, the pre-purchaser waste is the material disposed of after the purchaser uses old magazines and private blended paper. At that point, the papers are collected from the waste areas sent to the paper reuse offices. To overcome these problems, a new platform is needed to upgrade paper recycling information to make it attractive[1].

Paper production usually will cause deforestation. This activity is proven to endanger the natural habitat of many species, be it animals and even plants. However, the paper is the easiest of the simplest materials that could be recycled and is taken lightly. This leads to another major issue that involves waste disposal management [2], [3]. Through this project, an Augmented Reality (AR) Pop-up Book games will help to educate people on how to recycle the paper and to raise awareness on the importance of recycling.

In order to solve this particular problem, AR games is developed, which introduce to the student about the important information of recycling paper and interesting games of recycling paper. The application will be gives

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the user a new experience how it important of recycling paper through the pop-up book. This study seeks to explore the process of using a multimedia element in an interactive way for people, especially for the students and make them understand and attracted to discover about recycling paper. An important aspect of the games will be the content, which has to be clear and interesting for people to understand and to give interest in recycling paper.

2. Back ground

Recycling took another rent with the industrial revolution in the nineteenth century. Industrial facilities grew up around urban communities in the space of a couple of decades, manufactured items were all over the place, and urban populations grew significantly [3]. A legislative declaration in Paris in 1870 finally prevented waste storage in the city and forced all natives to acquire an individual beneficiary [4].Over the years, waste collection gathering has been updated and heightened again with the presence of the first engine vehicles [4]. Governments and businesses were slowly showing their significance, the first legitimate writings spreading rules for their training began to appear, the main recycling organizations were established and the part joined the modern age [2], [3], [5]. What's more, it has continued to be examined and improved from that point on.

According to Tobar-Muñoz *et al*., in [6] AR is one of the technology that is a good instrument for education. Therefore, AR is useful as an instrument to be used in classrooms all over the world. Some authors believe that AR has vast potential and numerous benefits for learning [7], [8]. This paper has proposed to integrate the AR technology in gaming to raise awareness of recycling because based on previous researcher AR games influence the style of student learning[6], [8], [9]. In addition, the number of research in education AR based has gradually increased. Before proposed the AR work on recycling, in this paper need to make a review on the current recycling games to study the limitation of the games that could be improve future. The next section discuss on the related work of recycling games. Figure 1 despites the history of AR growth from 1950 to 2000.

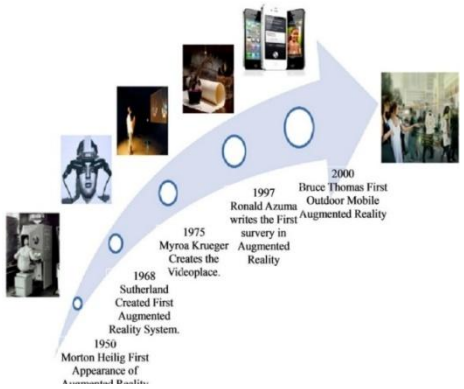

Figure 1: History of Augmented Reality [10].

3. Methodology

Recycling paper AR based game is proposed in this paper. The methodology for this research work including the analysis, design, development, implementation and evaluation. In analysis process, researcher collects and interviews individuals with the experience. Based on this analysis, researcher would like to understand how many the student knows about AR games recycle paper and researcher want to find out how the developer can deliver the understanding through the development project. In addition, in this research has analyse the previous recycle games to be enhance in the future work by propose the AR integration.

Then, the design phrase is one of the important part and the strategy should be systematic with a logical, organized method of identifying, developing and evaluating scheduled approaches aimed at achieving the objectives of the research. Another part researcher concerned with content of the element of AR games including text, graphics, animation, audio, and video. This phase refers to the one of research's objectives. Develops this project, as a guideline for producing AR games, the storyboard is needed. The developer must pay more attention to this project's interactive games. The developers are developing a recycle games 3D modelling object in this phase, using a book as an object, and the animation is pop-up around this object. The AR games will be created later using appropriate software such as 3ds Max and Unity then the output will be used together in the pop-up book as shown in Figure 2. The book used in this project will serve as a basis or stage for the games of AR.

Figure 2: Flowchart of Creating Pop-up Book ARGames

The phase develops and builds on the learning goals and performance steps produced during the design phase by fleshing out all the previous content created in the two previous phases, analysis and design, into a complete learning environment. The end result is the content learning platform, such as software, lesson outlines, performance aids, and media, which includes the educational content and activities that will help the learners in their quest for better performance. While for the implementation researcher has to consider three-step to go through this phase, which are training the instructors, preparing the learners, and organizing the learning environment. The researcher can display the course with these three steps is very creative and

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authentic ways to reach the implementation phase. The last phase is evaluation.The evaluation focuses on continuous improvement in the quality evaluation phase of the instructional system consisting of formative evaluation, summative evaluation, and operational evaluation. The primary objective of the evaluation is to boost learning by evaluating the importance of the teaching experience for the target audience, as well as students or visitors in university.

Before proposed the flowchart of model instructional recycle games, in this paper need to make an analysis on the current recycling games to study the limitation of the games that could be improve future. The next section discuss on the result of the previous recycling games.

4. Result and Discussion

In this paper research, researcher make an analysis to three recycle games. The title for the first game is Recycle Roundup [11]. This is a game summary of an AR application created for national geographic kids. All of this was supplied with an instruction, play button. The application itself was not designed for online use and weighs in at several Gigabytes in size.This application is to raise awareness of recycling for kids.

Moreover, the title of this game is Recycle City Challenge [12] have been review. This game is question-recycling game. All of this was supplied with an instruction, play button. The application itself was not designed for online use and weighs in at several Gigabytes in size. This application is to raise awareness of recycling for general user. The interactive way has been applied in this application where all the combination of multimedia elements such as sound, 2D images, text attracts the user to enjoy while discover this application. The instruction is the guide for the user to know how to play the recycle game. Besides that, it also has a level for this interactive recycle game.Actually, this game all of the question is about recycle. It teaches how to prevent and provide interactive question because it makes user will think about the recycle.

Beside there are another game named as Recycle Sorter [13]. This game is simple interactive recycling game because it uses the entire recycle element. Thus, game summary of AR application created for all age. All of this was supplied with an instruction, play button. The application itself was not designed for online use and weighs in at several Gigabytes in size.This application is to raise awareness of recycling for general user. The interactive way has been applied in this application where all the combination of multimedia elements. However, the game is currently quiet because no sound and music [13].The instruction is the guide for the user to know how to play the recycle game. Besides that, it also has a level for this interactive recycle game. All the case study in this paper have summaries in table 1. To enhance the interactivity of previous education recycle game, in this paper discuss on the proposed flowchart.

Table 1: Comparison among Three Recycling Games

Augmented Reality Game	**Advantages**	**Limitation**
Game 1: Recycle Roundup	• Proper image used • Friendly interface for the user	• 2D only • Do not apply AR technology
Game 2: Recycle Sorter	• Friendly interface for the user • The information is clear when play the game	• 2D only • Do not apply AR technology
Game 3: Recycle City Challenge	• The information from this game are clear detail • Easy to recognize the button included • The navigation structure also easy to navigate by the user	• 2D only • Do not apply AR technology • Only secondary suitable play the games because need to understand the question given.

Based on the analysis result in table 1, in this research has design the flowchart to achieve the objective which is integrate the AR in recycle game to enhance the awareness among the university student. Figure 3 shows the details of flowchart model instructional recycle game. It started with montage 3D modelling and tutorial game. The game provided four main element including show credit screen, describe the detail of game information, provide menu options and show the option screen to allow the user change the setting for volume and controller key. In menu option it allow user to choose the level of the game as illustrated in Figure 3.

The propose flowchart has designed to make sure the development and implementation process will successful. The proposed flowchart integrate with AR, which enhance the previous recycling 2D games. In the design phase for the flowchart researcher study the basic and important part for the user interface that will interact the user use the game application in their study.

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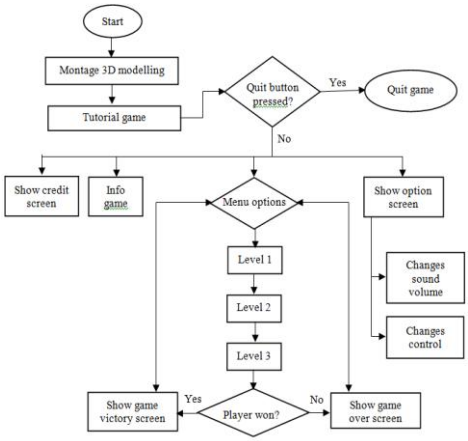

Figure 3: Flowchart of Model Instructional Recycle Games

5. Conclusion

The purposed education of recycling in gaming based in combination of multimedia elements including the text, graphic, animation, and audio in the AR games. In this game, it cover the recycling paper knowledge. The game come in only one version that is the English version. Furthermore, this research will introduce a new way of approaching public perceptions and it can make university students know how important about recycling. However, the limitation of this research is user needs to have the smartphone that runs the Android system only to download the apps. The user needs to make sure that they have a lot of free space on their phone because it will be in the large files because of the many items included in this app. For the most part hopefully, by doing and providing this research work by using the AR, people should gain interest and have an encouragement to find out more about awareness of recycling paper and at the same time the AR technology. The effective media combinations should be used to convey information, games on the AR and the android application. On the future work, will evaluate the awareness of the educational games of recycling by comparing the proposed work with the normal game.

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