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Learning and Training of Coal-Fired Energy using Augmented Reality (C-FAR)

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ABSTRACT

Renewable energy resources are something that can be reloaded or refilled by the surroundings in small times. This resources consider reliable to use because the resources usually renew so fast that until it been renewed by the time people used up. In Malaysia, both renewable and non-renewable resources were used to generate an electricity to the consumer. The use of electrical energy has been increased. Thus, all of the electrical power station required many specialist engineers in order to produce the electrical energy at optimum level. However, the learning and training method of producing specialist engineers are based on printed material. Therefore, this project has decided to design and develop an interactive learning and training of handling a machine using augmented reality approach towards the recently hired employee. The learning process involve an interactive 3D images that represents the actual machine from the real life environment. PADDIE method was used in developing the application. Because it is flexible and suitable as this project implement AR as a platform for learning and training process to occur. PADDIE model consists of six phases which are planning, analysis, design, develop, implement and evaluation. Preliminary study has been done as a starting point for this project. After complete the development of the project, evaluation is conducted to evaluate the user acceptance of the product towards the workers. Based from the result of user acceptance testing evaluation, majority of the workers strongly agree that this project can be use and adapt towards the real life working environment. As for future use, some improvement can be applied such as put more models of the machine, use a tablet instead of mobile phone and the application can be publish in other platform for example iOS.

Keywords:
Augmented reality; coal fire energy; PADDIE;user acceptance testing

1. Introduction

Renewable energy resources are something that can be reloaded or refilled by the surroundings in small times. This resources consider reliable to use because the resources usually renew so fast that until it been renewed by the time people used up. Example, solar, wind, tidal, wave, geothermal, hydrological, biomass and wood. In contrast, non-renewable resources are resources which not easily restocked by the world surroundings. Such as, coal (fossil fuel), oil, natural gas, nuclear, and biomass. The advantage of all this resources are it can generate an electricity to the consumer.

In Malaysia, both renewable and non-renewable resources were used to generate an electricity to the consumer. Hydro power, gas-fired, coal-fired, oil-fired, solar, nuclear, biomass, and hybrid are some of the examples. There are more than 30 power station that has been build based on these

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resources in order to provide an electricity to the consumer. All of these power stations are located in Melaka, Negeri Sembilan, Perak, Pahang, Terengganu, Kelantan, Johor, Sabah and Sarawak. This project only focused on non-renewable energy resources which is coal-fired energy located at Port Dickson, Negeri Sembilan.

Learning can be defined as knowledge acquired through experience, study or being taught. Training is use to teaching or developing in oneself or others. Learning and training can be taught or learn in varieties of technique and ways such as documented, printed material, verbal and non-verbal communication, experience, computers, handheld devices and lots more. In this project, coal-fired power plant requires some professional or skills workers to handle this kind of machine. Hence, this kind of machine consists of complex design and required an experience technicians for maintenance or assembly and disassembly process [6].

The approaches of using Augmented Reality (AR) may overcome this problem. In industrial learning and training field, AR is very useful assistance for workers in their highly demanding practical work [13]. The learning and training lesson which involve Three Dimensional (3D) modelling will be more interactive and interesting to the learners or workers. The AR will be included in the learning and training plan where the workers can interact with the 3D model by displaying the machine and the process of how the electricity can be generated out to the consumer. This kind of learning and training process are simple where the user only need a smartphone and point it out towards the only simple marker that printed on the paper. With the aid of this system, learning and training could become easier.

2. Research Methodology

Methodology is method used to build a systematic design. Modelling as well as framework is important part for development process of the application to ensure that the project is smooth and well manage. In this research, a method called PADDIE were used in developing the application. PADDIE model is flexible and suitable to be use with this project that implement AR as a platform for learning and training process to occur. The PADDIE model consists of six phases which are planning, analysis, design, develop, implement and evaluation. In order to ensure the smoothness and to avoid any mistakes from happening, the six phases of PADDIE need to go through step by step.

3. Findings

The evaluation is based on User Acceptance Testing (UAT) between the workers and the applications. The analysis has been collected and calculated based on the quantitative data. Before the test were conducted, the workers were explained briefly about AR and the research scope of the project. The workers are consists of android user, recently hired employees and also the manager of Jimah Ventures. After they have tested the applications, questionnaires were distributed among them in order to gain feedback from the user about the product either it can be accepted or not.

This UAT are divided into four categories which are perceived usefulness, perceived ease of use, behavioral intension to use and user experience. This categories were divided to measure how much the user understands and applied the learning process into working environment. The results below shows the analysis of the testing.

i. Perceived Usefulness

This parts contains four set of questions to measure the usefulness of C-FAR application towards the worker. The result shows that workers are strongly agree that C-FAR application improve their performance in doing practical work when handling the machine. Most of them also agree that the

application improve their acquisition and enhance their effectiveness of practical skills when handling the machine.

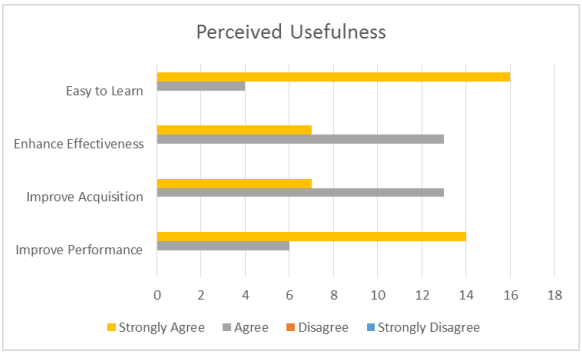

Fig. 1. Result for Perceived Usefulness

Based on the result findings above, it can be concluded that this C-FAR application are really helpful in improving the skills of the workers knowledge when handling the machine.

ii. Perceived Ease of Use

This parts contains four set of questions to measure the ease of use using C-FAR. Based on the result findings above, it can be concluded that this C-FAR application may improve the worker skills and helps in doing practical learning of handling and operating the machine.

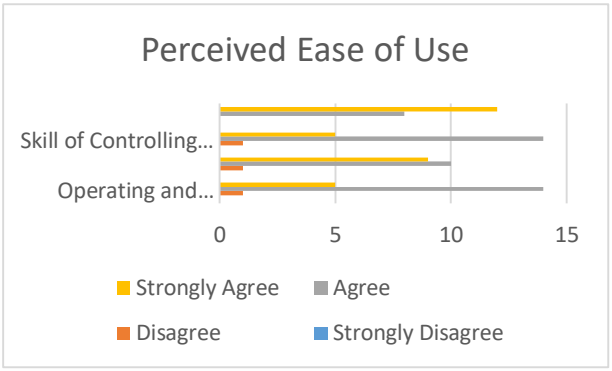

Fig. 2. Result for Perceived Ease of Use

iii. Behavioral Intension to Use

This parts only contains one set of question to measure the worker behavioral intension to use. Based on the figure below it can be concluded that this C-FAR application could be implemented in real life working environment for future lesson.

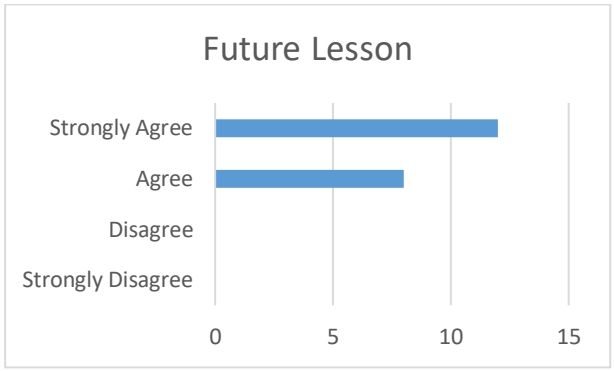

Fig. 3. Result for Behavioral Intension to Use

iv. User Experience

This parts only contains one set of question to measure either the C-FAR application is fun to be used or not. Based on the result finding below, it can be concluded that this C-FAR application are user friendly and fun to be used. This may help the learning process to be more interactive.

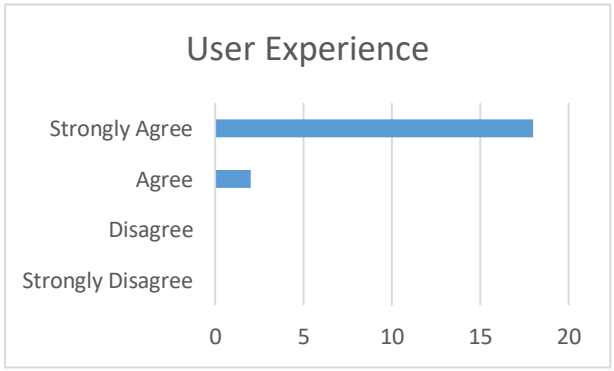

Fig. 4. Result for User Experience

4. Conclusion

As a conclusion, there are certain advantages that the workers can get from using this application for example they can reduce the cost of using printed material as the textbook instead of using AR as a learning approach. Moreover, the application provide an interaction for example the model can be rotated 360 degree of angle to be viewed by the workers. Hence, the workers are not just reading but they can have fun and enjoy the learning of handling the machine. Lastly, with the advancement of current technology all learning process could become helpful to assists the recently hired workers by using new technology. Furthermore, it also a good medium to learn on handling the machine because most of the workers now already have their own smartphone. This applications can provide workers with better understanding in learning and training of handling coal-fired machine.

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