The implementation of the depth-first search algorithm on learning computer assembly 3D simulations in vocational education

A Trinadi*, Y A Gerhana and U Syaripudin

Department of Informatics, UIN Sunan Gunung Djati Bandung Jl. A.H. Nasution 105, Bandung, Indonesia

*agit.trinadi2@gmail.com

Abstract. Games and simulations have become one of the most effective learning models. This study aims to implement the Depth-first Search Algorithm on 3D simulation learning models on computer assembly skills. The development framework uses Luther's multimedia development model. The object of this study was 40 vocational high school teachers in West Java. Technology acceptance model (TAM) is used as a framework to measure attitudes towards teacher acceptance of the learning model developed. The measurement results, Perceived Ease of Use (PEOU) has a significant effect on Perceived Usefulness (PU) of 68.2%, Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) have a significant effect on Attitude Towards Using Technology (ATUT) of 86.5% , Perceived Usefulness (PU) and Attitude Towards Using Technology (ATUT) significantly influence Behavioural Intention to Use (BITU) of 86.7%. Perceived Usefulness (PU) and Attitude Towards Using Technology (ATUT) significantly influence Behavioural Intention to Use (BITU) of 81.2%.

1. Introduction
Simulation is one of the learning models suitable for vocational education. This learning model is able to provide effective problem-solving experiences for students, before they enter the actual problem-solving situation. The simulation learning model can be presented in 3D, so students seem to enter the real world of learning objects. Experience in observing, analysing and solving problems is obtained in full by students. Depth-First Search is used in searching for answers to cases faced by students. The subjects in this 3D simulation are computer assembly learning at the Vocational School of Computer and Network Engineering, and will be tested on 40 teachers.

2. Depth-first search
Depth-First Search is a search performed on one node in each level from the far left. If at the deepest level, the solution has not been found, then the search is continued on the right-hand node. The left node can be deleted from memory. If no solution is found at the deepest level, the search is continued on the backtracking level. And so on until a solution is found [1].
3. 3D Simulation on computer assembly
The simulation learning model is a CBI (Computer Based Instructions) model that displays subject matter that is packaged in the form of learning simulations in the form of animations that explain content in an interesting, lively manner, and combine harmonious elements of text, images, audio, motion and colour alloy and harmonious. Regarding modelling and computer systems, informatics studies that support include: modelling and simulation, system theory, software engineering and computer animation graphics [2]. Equipment that can be physically seen, held or moved. So, to build a computer that is intact then the process of combining computer equipment into one unit that is interconnected and this process is called the computer assembly process [3].

4. Multimedia development process model
System development method for manufacturing simulation software using methods Luther [4]. shall be composed of:

---

**Figure 1.** Illustration of depth-first search algorithm.

**Figure 2.** Component structure of computer assembly.

**Figure 3.** Multimedia application development cycle according to Luther [4].
4.1. Concept
The concept stage is the stage to determine the goal and who is the user of the program (audience identification).

4.2. Design
Design (design) is the stage of making specifications about the program architecture, style, appearance and material / material requirements for the program.

4.3. Collecting material
Collecting material is the stage where the collection of materials that are in accordance with the needs is done.

4.4. Assembly
The assembly stage is the stage where all multimedia objects or materials are made. Application creation is based on the design stage.

4.5. Testing
Performed after the completion of the assembly phase by running the application / program and seeing whether there is an error or not.

5. Technology Acceptance Model (TAM)
TAM is adapted from the TRA (Theory of Reasoned Action) which was introduced by Davis in 1986. The purpose of TAM is more specifically to explain the behaviour of computer users (computer usage behaviour) [5].

![Diagram of TAM](image)

**Figure 4.** Model of TAM.

6. System architecture
In Figure 5 displays a system architecture that defines more specific components in a structured manner and displays how the system runs starting from the user who runs the application then the application raises existing objects.

![System architecture](image)

**Figure 5.** System architecture.

In Figure 5, it can be explained in the application architecture that this system is a simple application that does not require a combination with other systems such as a web service because this application is offline, there is one actor, the user who accesses information using a computer or laptop that has a
Windows operating system. In the Exam feature in evaluating the results of PC assemblies using the Depth-First Search algorithm.

7. Results of application development
In Figure 6, it can be explained by the system because this application is offline, there is one actor, the user who accesses information using a computer or laptop that has a Windows operating system. In the Exam feature in evaluating the results of PC assemblies using the Depth-First Search algorithm.

Figure 6. Main menu.

Figure 7 is a menu picture of a computer assembly exercise, while Figure 8 is a test menu or evaluation of learning outcomes.

Figure 7. Training menu.

Figure 8. Evaluation menu.

8. Acceptance of user against the application
TAM (Technology Acceptance Model) is used to measure the extent of user acceptance of the application. The survey was conducted on a number of respondents with a total of 40 teachers who were asked the level of agreement on the variable. Respondents were selected by purposive sampling, namely the productive teachers of vocational skills expertise (Computer and Network Engineering) of Vocational Schools in Bandung. The measurement instrument is a questionnaire, with an assessment using a Likert scale consisting of 4 scales, namely 1 = "strongly disagree", 2 = "disagree", 3 = "agree" and 4 = "strongly agree".
The measurement results show that, Perceived Ease of Use has significant effect on Perceived Usefulness about 68.2%, Perceived Ease of Use dan Perceived Usefulness has significant effect on Attitude Towards Using Technology about 86.5%, Perceived Usefulness and Attitude Towards Using Technology has significant effect on Behavioural Intention to Use about 86.7%. Perceived Usefulness and Attitude Towards Using Technology has significant effect on Behavioural Intention to Use about 81.2%.

9. Conclusion
As a result of application development, the implementation of the Depth-First Search is in accordance with the learning design that has been designed. The Depth-First Search is able to present search results according to the computer assembly scenario that has been designed. The measurement results on the application of the results of the development, as a whole the teacher provides a very good perception. However, the ease of use of the application to the benefits of the application has a smaller percentage effect.

Acknowledgement
We say many thanks Research and Publication Centre of UIN Sunan Gunung Djati Bandung Indonesia for supporting publication of our research.

References
[1] Ahmad T 2017 Pengembangan Aplikasi Iar (Iqra’ Augmented Reality) Berbasis Android Sebagai Media Belajar Makhorijul Huruf Hijaiyah Pada Mata Pelajaran Pai Di SMK Negeri 1 Magelang (Yogyakarta: Perpustakaan FT UNY)
[2] Nugraha K I S K T M I S 2014 Pemanfaatan Augmented Reality untuk Pembelajaran Pengenalan Alat Musik Piano Jurnal Teknologi dan Sistem Komputer
[3] Roedavan R 2017 Unity Tutorial Game Engine Edisi Revisi
[4] Mustika 2018 Join
[5] Zaman M D B Esensi Sumber Belajar dalam Pembelajaran Anak Usia Dini