Plagiarism Checker X Originality Report

Similarity Found: 19%

Date: Thursday, January 02, 2020
Statistics: 412 words Plagiarized / 2161 Total words
Remarks: Low Plagiarism Detected - Your Document needs Optional Improvement.

A MOBILE AUGMENTED REALITY FOR INTRODUCING THREE-DIMENSIONAL SHAPES AND ITS PROPERTIES 1Olief Ilmandira Ratu Farisi, 2Gulpi Qorik Oktagalu Pratamasunu, 3R. Abi Mayu Bie Rahman 1,2,3Department of Informatics, Sekolah Tinggi Teknologi Nurul Jadid, PP. Nurul Jadid Paiton Probolinggo-Indonesia 1olief@sttnj.ac.id, 2gulpi @sttnj.ac.id,3abiemayubierahman@gmail.com Abstract. Three- dimensishape oneof subjct hich learned about an object that has volume.

It is introduced in elementary school. To help students in imaging 3D shape in textbook which is presented as 2D, we develop a mobile augmented reality. An augmented reality turns the environment into a digital interface by placing virtual objects in the real world, in real-time. The augmented reality can be utilized to visualize the object of 3D shape.

By using it, students can imagine 3D shape and learn its properties such as face, edge, and vertex as well the formula of volume and surface area independently anywhere and anytime. Furthermore, it can create an effective and fun learning activities. Kata Kunci: mobile application, augmented reality, three-dimensional shape. INTRODUCTION Three-dimensional shape (3D shape) about an object that has height, width, and depth. A 3D shape is useful in daily life.

It can be used for interior design, for instance. Designing interior requires mathematics solution, especially 3D shape, to calculate the area and volume of an object. 3D shape is introduced in elementary s of cognitive development, a student in elementary school is classified in concrete operational stage. During this stage, they start solving problems logically, but understanding an abstract concept has not yet been completely adapted.

Therefore, they have difficulties to imagine 3D shape which is presented as 2D shape in their textbook. A model can be used to visualize the object of 3D shape. One of a model which can

be utilized is an augmented reality technology. An augmented reality turns the environment into a digital interface by placing virtual objects in the real world, in real-time.

By using augmented reality, a 3D shape which is presented as 2D shape, can be visualize in 3D objects. Hence, it is very helpful to introduce a 3D shape subject for elementary students. Related work about augmented reality is conducted by Ghaisani, et al (2012). They developed augmented reality-based learning mathematics for first-year elementary students on Android. Other research has been done by Rusnandi, et al (2016).

They implemented augmented reality on modeling 3D shape for elementary students. In other work, Larsen, et al (2011) and Owen, et al (2011) has conducted a research and concluded that augmented reality can increase students' intn learnces. In this paper, we develop a mobile augmented reality for helping students in understanding 3D shape and its properties.

By using a mobile, students can observe a 3D object and its properties anywhere and anytime independently. In addition, the use of augmented reality technology media can attract students in learning 3D shapes. THREE-DIMENSIONAL SHAPE Three- dimal shape a model an which a e. In other word, it has length, width, and depth. Some of 3D shapes are showed at Figure 1.

A box usually modeled by a cube or a cuboid, a can is presented by a cylinder, and a ball is an example of sphere. Figure 1. Some of 3D shapes A 3D shapes have some attributes such as face, edges, and vertices that is presented by Figure 2. Faces is the flat surfaces of 3D shape. The line segment where two faces meet is called an edge. A vertex is a point where three faces meet. Cube and cuboid have 6 faces, 12 edges, and 8 vertices.

Square based pyramid has 5 faces, 8 edges, and 5 vertices. Sphere only has 1 face with no vertex and edges. Figure 2. Face, edge, and vertex of 3D shape Since 3D shape has faces, we can calculate the surface area of the 3D shape. Surface area is the sum of all the areas of all the shapes that cover the surface of the object. For example, cube has 6 square faces.

So, the surface area of the cube is 6 × ?? 2 where ?? is the length of the edge. In general, to find the volume, 3D shapes can be classified into prism, pyramid, and sphere. Prism is a 3D shape with two congruent parallel faces, where any cross-section parallel to those faces is congruent to them.

Triangular prism, cube, and cuboid are an example of prism. Pyramid is a 3D shape that has a base and three or more triangular faces that meet at a point above the base (the apex). While a sphere is 3D shape where all of the points in the surface have the same distance with the center point.

Equation (1), (2), and (3) are the formula of volume of prism, pyramid, and sphere, respectively. ?? = ?? ?? ?? (1) ?? = 1 3 ?? ?? ?? (2) ?? = 4 3 ?? 3 (3) where ?? is the volume of 3D shape, ?? ?? is the area of base, ?? is the depth of 3D shape, while ?? is the radius of the sphere.

AUGMENTED REALITY Augmented Reality (AR) is the integration of digital information with the user's environment such as image, animation, voice, and smell in real time. It uses the existing environment and overlays new information on top of it. The AR adds digital imagery and data to supplement views of the real world, giving users more information about their environments.

Figure 3 showed the utilization of AR. Figure 3. The utilization of augmented reality technology The AR applications are written in special 3D programs that allow the developer to tie animation or contextual digital information in the computer program to an augmented reality "marker" in the real world.

When a computing device's AR app or browser plug-in receives digital information from a known marker, it begins to execute the marker's code and layer the correct image or images. Figure 4. The architecture of augmented reality In general, the algorithm for inserting virtual objects to augmented reality technology begins with the detection of interest point on images captured by the camera.

From the interest point, coordinates are obtained and will be used to set the position and rotation when adding a virtual object. This process is shown by Figure 4 (Liarokapis, 2002). METHOD OF MEDIA DEVELOPMENT The stages in developing a mobile augmented reality for introducing three-dimensional shapes and its properties are structured as Figure 5. First stage of this research is observing how learning activity in studying three-dimensional shapes in the school.

The problem arise is students have difficulties to imagine 3D shape in the textbook. From the problem, the second stage is planning to develop a media that can help students to understand about 3D shape. Hence, we develop a mobile augmented reality for introducing 3D shapes and its properties. Figure 5.

Stages in developing a mobile augmented reality for introducing three-dimensional shapes and its properties Define Plan Synthesize Design Implementation Testing Revise Publish Collect The next stage is collecting initial data requirements. In this development of mobile augmented reality, we collect a subject about 3D shape and some references about augmented reality.

The data will be synthesized as a basis in system design. The design of this media

development is design of interactive applications in learning 3D shapes by using augmented reality technology. The design of this system includes three important aspects: (1) making 3D objects of 3D shapes (2) designing user interface and (3) designing of AR-based system flow. The result of design system will be implemented into Unity software by combining the result of the three aspects of the design system.

Before publishing the media, it is necessary to test the program. This process 's aims to find out the errors in the presentation of subjects or other errors that can interfere the learning process. If there are some errors on the system, it is necessary to revise the program. After revising process, do testing again.

It is continuously done until the system meets the development goals. DEVELOPMENT RESULTS In the process of developing augmented reality-based learning media, it takes some software support, such as Unity and SketchUp software. Unity is used to develop augmented reality-based application. SketchUp is used to design 3D object of 3D shapes.

In addition, developing of this media used a computer with specifications Processor Intel(R) Core(TM) i7 CPU 2.20 GHz and 4.00 GB RAM. This application runs on a smartphone with minimum specification Android version 4.0. Figure 6 The design of user interface of main menu User interface is designed based on the needs of AR-based learning applications that are translated into menus which support the input, process, and output. Since this application runs on a mobile, we designed the user interface simply.

The design of user interface is shown by Figure 6. There are 5 buttons for face, edge, vertex, volume, and surface area. There are spaces for displaying the name of the shape, the augmented reality of the shape, and the formula. After design stage, we developed the user interface of main menu.

In initial appearance of main menu, there is an instruction to scan the marker as shown by Figure 7. First, to get the augmented reality of 3D shapes, we have to prepare the markers, so that the application can detect the correct 3D shape. For an example, Figure 8 show the marker of cube.

Place the smartphone right above the marker then the augmented reality of 3D shapes will appear as shown by Figure 9. We can move the smartphone slowly to observe the 3D shapes from any angles. Figure 7 The user interface of main menu In Figure 9, the application detected cube from the marker.

If the option edge and volume are selected, then the application displays all the edges of the and he a cube's volumThe aof ugmented ealiy show edges the ula cube's e also be seen at Figure 10. Figure 8 The display of the marker Figure 9. The display of the augmented reality

for showing the edges and the formula of volume of cube Figure 10.

A mobile augmented reality for 3D shape displays edges of cube Figure 11. A mobile augmented reality for 3D shape displays faces of cube Figure 10 and Figure 11 showed that the 3D shapes which presented as 2D shape in textbook can be visualized as real object. Moreover, we can explore the augmented reality for introducing the attributes of 3D shapes, such as face, edge, and vertex.

We also add some information about the formula of the volume and the surface area of the shape. It is very useful to help students in learning 3D shapes. By using this application, learning activities in class will be interesting and efficient. CONCLUSION Based on the development results, an augmented reality can be utilized in education, especially for a subject that requires the ability to imagine an object, such as three-dimensional shape. This mobile augmented reality works on a smartphone with minimum specification Android version 4.0.

can be used as media to introduced 3D shape. Teacher can create an effecti ve fun arninactiies. cbuseful, erng, can prove ents' learning motivation in studying mathematics. Students can learn 3D shape about some 3D shapes, the attributes, and related formula independently. REFERENCES Ghaisani, P.A., Sarwosri, and Hariadi, R.R. 2012. Rancang Bangun Aplikasi Pembelajaran Matematika Untuk Siswa Kelas Satu Sekolah Dasar Menggunakan Augmented Reality Berbasis Android.

Final project of Department of Informatics, Faculty of Technology and Information, Institut Teknologi Sepuluh Nopember. Liarokapis, Fotis. 2002. Multimedia Augmented Reality Interface for E-learning (MARIE). World Transactions on Engineering and Technology Education, Vol. 1. No. 2. Larsen, Yelva C., Buchholz, Hagen, and Brosda, Constantin. 2011. Evaluation of A Portable and Interactive Augmented Reality Learning System by Teachers and Students.

Augmented Reality in Education. EDEN – 2011 Open Classroom Conference. Rusnandi, E., Sujadi, H., and Fauzyah, E.F.N. 2015. Implementasi Augmented Reality (AR) pada Pengembangan Media Pembelajaran Pemodelan Bangun Ruang 3D untuk Siswa Sekolah Dasar. Infotech Journal, Vol. 1. No. 2. Owen, Martin, Owen, Sue, Barajas, Mario, dan Trifonova, Anna. 2011. Pedagogic Issues and Questions from the Science Centre to Go, Augmented Reality, Project Implementation.

Augmented Reality in Education, EDEN - 2011 Open Classroom Conference. http://www.mathopenref.com accessed at 16 July 17, 2017. http://whatis.techtarget.com/definition/augmented-reality-AR accessed at 16 July 17, 2017. BIOGRAPHY Olief Ilmandira Ratu Farisi, S.Pd., M.Si. received her Bachelor 's degree of

Mathematics Education from University of Malang in 2012. In she ceived er dein Mathematics from Institut Teknologi Sepuluh Nopember.

She works at Sekolah Tinggi Teknologi rul adid teachinmathemcs' ects. r eseai nterest on computer science, optimization, and graph theory. Gulpi Qorik Oktagalu Pratamasunu, S.Pd., M.Kom. red Bach gr Informatics Education from University of Malang in 2013 . 2015, receivhis degree in Department of Informatics, Institut Teknologi Sepuluh Nopember. He works at Sekolah Tinggi Teknologi Nurul Jadid.

His research interest on digital image processing, information retrieval, and game programming. R. Abi Mayu Bie Rahman is ng th rechis achelordegreeoflnfocs from Sekolah Tinggi Teknologi Nurul Jadid. He is interesting on game programming.

INTERNET SOURCES:

2% - https://www.digitalrhombusstudios.com/augmented-reality
<1% - https://filmora.wondershare.com/virtual-reality/what-is-augmented-reality.html
<1% - https://www.youtube.com/watch?v=zPZegz690Mg
<1% - https://www.sciencedirect.com/science/article/pii/S0167839615000436
<1% - https://iopscience.iop.org/issue/1742-6596/1185/1
<1% - http://welcome.isr.tecnico.ulisboa.pt/wp-content/uploads/2015/07/Learning-Technical-Drawing-with-Augmented-Reality-and-Holograms.pdf
<1% - https://www.researchgate.net/publication/315717351_Impacts_of_integrating_the_repertory_grid_into_an_augmented_reality-based_learning_design_on_students'_learning_achievements_cognitive_load_and_degree_of_satisfaction
<1% - https://www.researchgate.net/profile/Persefoni_Karamanoli/publication/304658971_Augmented_Reality_and_Dyslexia_A_New_Approach_in_Teaching_Students/links/577649be08aead7ba071ad61.pdf?origin=publication_list
<1% - https://www.sciencedirect.com/science/article/pii/S0360131513000535
<1% - https://www.sciencedirect.com/science/article/pii/S0360131519302635
<1% - https://en.wikipedia.org/wiki/Dimension
<1% - https://answersdrive.com/what-are-the-vertices-of-a-shape-2218882
<1% - https://www.answers.com/Q/What_3D_solid_has_5_faces_8_edges_and_5_vertices
1% - https://www.enotes.com/homework-help/how-do-u-solve-surface-area-problem-61281
<1% - https://www.answers.com/Q/If_the_surface_area_of_a_cube_is_150_in_squared_what_is_the_length_of_an_edge
<1% - https://www.mathworksheets4kids.com/volume.php

1% - https://geometrydictionaryt.weebly.com/shapes.html
1% - https://quizlet.com/251022838/voc-8-flash-cards/
<1% - https://glnmedia.s3.amazonaws.com/pdf/products/sample_pages/sample_MAT0808.pdf
1% - https://sciencing.com/center-radius-sphere-7418320.html
<1% - https://www.quora.com/What-are-the-main-advantages-of-augmented-reality
2% - https://whatis.techtarget.com/definition/augmented-reality-AR
1% - https://searcherp.techtarget.com/feature/Augmented-reality-provides-a-change-of-perspective-for-manufacturers
1% - http://cellbeanshealthcare.com/home/agumented_reality
<1% - https://pubsonline.informs.org/doi/abs/10.1287/isre.11.4.342.11872
<1% - https://www.researchgate.net/publication/269304926_Collaborative_Augmented_Reality_in_Education_A_Review
<1% - http://ieeevr.org/2019/program/postersOld.html
<1% - https://www.researchgate.net/publication/257416436_Demystifying_the_design_of_mobile_augmented_reality_applications
<1% - https://www.sciencedirect.com/science/article/pii/S0164121212001665
<1% - https://www.arcjournals.org/pdfs/ijsell/v2-i6/4.pdf
<1% - https://www.quora.com/How-can-I-develop-an-augmented-reality-app
<1% - https://files.eric.ed.gov/fulltext/EJ1125519.pdf
<1% - https://www.asu.edu/courses/mat142ej/geometry/volume_and_surface_area/volume-and-surface-area-notes.pdf
<1% - https://www.researchgate.net/publication/293328678_Rancang_Bangun_Modul_Praktikum_Teknik_Digital_Berbasis_Mobile_Augmented_Reality_AR
<1% - https://www.scribd.com/document/136698831/IJACSA-Volume-4-No-3
<1% - https://www.cni.org/full-category-display
3% - https://njca.co.id/main/index.php/njca/article/view/58
<1% - https://id.123dok.com/document/yn64p7pq-quality-improvement-of-secondary-vocatioanl-school-students-through-skill-competency-repositori-stkip-pgri-sumenep.html
<1% - http://siet2017.interconf.org/pages/abstracts1.php
<1% - https://cedar.buffalo.edu/~bouchaff/Academic_acti.html