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Nathalia Devina Widjaja

Erwin Adi

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3D Product Viewer for E-Commerce Applications

Nathalia Devina Widjaja, School of Information Systems, BINUS INTERNATIONAL UNIVERSITY – BINUS BUSINESS SCHOOL, Jakarta, Indonesia

Email: nwidjaja@binus.edu

Erwin Adi, School of Computer Science, BINUS INTERNATIONAL – BINUS UNIVERSITY, Jakarta, Indonesia

Email: eadi@binus.edu

Abstract

Despite its huge potential to promote merchandise transactions over the internet, Indonesia does not have enviable e-commerce traffic. The aim of the project is to promote the culture of online shopping in Indonesia, with the benefit of increasing the revenue for the network and content providers. Furthermore, the survey would benefit the Computer-Human Interface interests since it shows that a 3D interaction increases customer's willingness to buy.

The 3D viewer application is developed with Adobe Flash and Sandy 3D engine. The technology was chosen in such a way that it uses a ubiquitous solution. Its advantage over the currently existing solutions is that the viewer can be embedded to any web page seamlessly. The study conducted a survey and found that the 3D viewer fulfills its initial purpose and is easy enough to be used.

Introduction

Indonesia consists of 17 thousand islands, has more than 300 distinct nativity and 742 different languages and dialects [1]. Within such an environment, it could be seen that transaction over the internet would be more attractive rather than the traditional way. It is encouraging to analyze that the 10% internet penetration within the 237 million of population [2] means that Indonesia still has plenty of room to grow the internet traffic.

In some part of the world, online shopping has become an indispensable way of shopping. The concept of online shopping relates to several advantages it has, such as enabling shoppers to save time to travel and browse around the real stores, offering more complete sort of items available for purchase, as well as better prices due to searchable competition and reduced cost of the retailers by not needing to own and maintain a physical store. The concept, however, is also associated with several

disadvantages, such as the inability of the customers to try and get a feel of the things they are buying, security problems especially related to credit card payments, as well as credibility of the shop itself which may be shady. The focus of this research is on the first disadvantage as stated above, as the system to be developed is aimed at giving the customers a better feel about the products they are buying, in terms of the physical shape and appearance. It may not be a big problem in some parts of the world, in which the "30-days money-back guarantee" is a norm. In that case, the customers can always shop for an item, try it when it arrives, and have the option to return it if the items do not match with the customer's image about it, as shown in the description and pictures provided by the online shop. For everywhere else, in which no such policy exists, giving the customers the best possible image about the actual items is important in getting people to shop online.

The current online shopping experience in regard to customers' knowledge on the products is generally limited to textual description, some reviews, and some pictures about the products from a few angles. Sometimes, the provided photos may not be sufficient for the customers, as it may have been taken from certain angles which emphasize certain aspect of the product, while omitting the other perspectives which may or may not be desirable. Some of the pictures may also have been taken in an artificial lighting and shooting conditions, such that they may show up somehow better than the originals. This is a significant obstacle for the customers to actually know what they are buying, before the actual product is delivered. This research attempts to solve this particular problem by using a 3D viewer as a medium to transfer the real imagery of the object to the customers, in hope for a better understanding about the product itself, all integrated into the online shop interfaces.

3D viewing on the web is actually not a very new area, as there are already several products available to provide 3D viewing of products in web pages, the most popular of which are the QuickTime Virtual Reality (QTVR) and some viewers based on Adobe

Flash. However, such approaches have not been widely adopted due to several problems such as compatibility, cost, complexity, etc. Some of the existing products require the usage of some specialized hardware to capture a series of images at small rotation increments, known as the turn-table. Such approach, while requiring extra cost, extra time, also produces quite big definition files, which may be a problem for customers' with limited internet bandwidth. Some of the products are also limited to horizontal rotation only, such that the top and bottom of the object cannot be viewed properly. The QTVR also requires users' browsers to be equipped with the QuickTime and QTVR plugin, which is not quite commonly available by default. More of the newer products are now based on Adobe Flash, due to the widespread adoption of Flash Viewer plugins. But still, many of these products are still proprietary. In this research, the usage of open source flash 3D previewing library as well as the use of 3D vector-like images instead of array of raster images is attempted, to solve the problems associated with the existing approaches.

Proposed System

The research consists of the creation of a simple 3D viewer based on open source libraries and a test on the effectiveness of such approach in bringing better images about the products to the prospective customers of online shops. Therefore, the hypothesis, model, the Sandy 3D library, and the implementation are explained hereafter.

Research Question

The execution of this research is based on the hypothesis that 3D viewer brings a better image on the actual product to the prospective customers in their online shopping experience, compared to the traditional approach of using only static images. It is also hypothesized that by having that better image of the product to be bought, the propensity of people to shop online increases. This should be assumed that there exists no "30-days money-back guarantee" or the like in the locality where such hypothesis is being tested.

Model

The program is to be developed in adherence to the following assumption about the system model, interface model, and the user model.

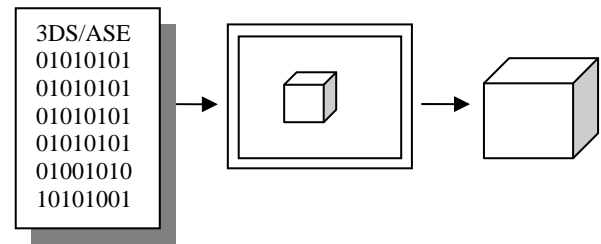


Figure 1. System, interface, and user model

The suitable system model for the 3D program, as explained before, would be to use some sort of vector-like 3D graphics, instead of raster images. This vector model describes the object by storing its coordinate points and links the points with lines and splines in such a way that it resembles the real object as close as possible. Textures may be added to the surfaces, such that the materials of the real object are well illustrated. This approach is chosen due to the limited bandwidth available to many online shoppers, since vector images can be represented in less bytes compared to the heavily redundant array of raster images necessary to generate an adequate 3D view. Due to the nature of the vector images, the 2D projection of the 3D object can therefore be generated by means of mathematical calculations in the client side, which ensures best response times and flexible viewing angles. Based on the user input concerning the object orientation, position, and zoom levels, the interface would then be able to generate a 2D projection which can be displayed on any computer screens. The following figure illustrates how the interface model looks like.

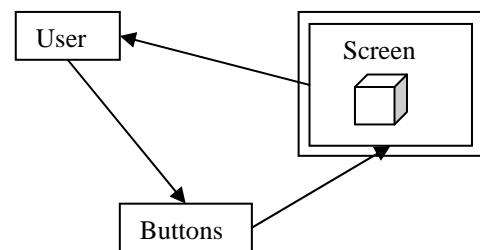


Figure 2. The interface interaction design

By having these system and interface models, it is expected that the users will be able to develop a complete 3D image about the real object in mind. The users use the viewer by simply see the displayed screen, and clicks on the buttons to modify the screen, which should update the viewable screen instantly. This process is repeated multiple times to view the object from different angle and zoom levels, until the users are satisfied with the image of the actual object in the mind. Therefore, the whole process may resemble physically viewing the object, without actually need to visit the object in person.

System Design

The design takes into account the above problem of portability and ubiquity. Hence, the project adopts Adobe Flash being the ubiquitous multimedia platform, and Sandy 3D being the simplest 3D engine to develop for the chosen platform.

Adobe Flash

Adobe Flash is a product of Adobe Systems. Formerly known as Macromedia Flash, this multimedia platform allows the creation of multimedia applications which can be compiled into the Shock Wave Flash (SWF) and be played both as a desktop application, or embedded into web pages. In both cases, the presence of the Adobe Flash Player is required. For the embedded version to work, the browsers viewing the pages containing Adobe Flash contents also needs to be equipped with the Flash Player Plugin, which basically runs the Adobe Flash Player with the application's screen attached as a part of the web pages.

According to a recent survey [3], about 99.3% of all desktop internet users have the Flash Player installed. The ubiquity of Flash makes it a perfect platform to be used for this 3D viewer project, as it means there is a very high certainty that the target online shoppers would be able to view it. The most popular adoption of Flash in the web is the Flash Video (FLV). YouTube as well as other popular games and demo applications use this format.

Adobe Flash comes with a specific scripting language branded as the ActionScript, which highly resembles the popular ECMA Script (also known as the JavaScript). This scripting language makes it possible to create custom programs with rich behaviors, including the implementation of some heavily computational 3D engine. Although such engines are significantly less performing compared to the native libraries such as OpenGL and DirectX, it is adequate for the 3D viewer project.

Sandy 3D

Sandy 3D is an open source 3D graphics library for Adobe Flash, which is written in Adobe Flash's unique ActionScript language. Sandy 3D is only one of several 3D graphics library available for the specific platform, which basically makes it possible to write 3D applications in the natively 2D Adobe Flash platform.

Although the latest version of Adobe Flash includes some sort of 3D manipulation functions, the use of a special engine is still required to create a true 3D application. According to [4], Sandy 3D ranks four out of the entire available open source 3D engine for Flash.

This project chooses Sandy 3D due to its simplicity. Its documentations are available, and its tutorials are simple and easy to follow. Another important feature of Sandy 3D that this project considers is its ability to load 3D models generated by other applications such as 3dsMax. This would allow product vendors to provide their 3D product design used in the engineering and manufacturing process to be displayed to the users as a 3D model in the viewer, and save a lot of time rather than to actually re-digitize the object itself with some costly methods. The developed 3D viewer can therefore be used for any product model in the format of 3DS or ASE files, which can be stored in the database of the online shop application itself.

Implementation

The implementation focuses on creating an application with a simple interface that can fit easily into web pages. This is important because the program is to be embedded into online shop product pages, and simplicity would lead to better chance of wider adoption.

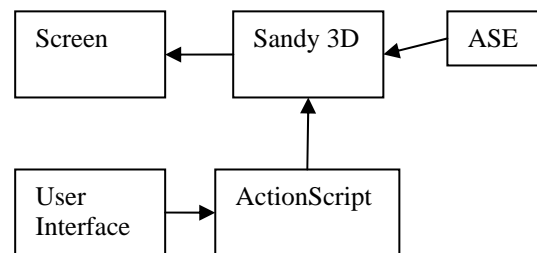


Figure 3. The program structure

Figure 3 shows the high-level view of the structure of the implemented program. This program relies on user input from the buttons placed on the viewer screen, and responds in adjusting the view pane in respect to the object accordingly. Such interaction model is necessary to enable users to view the object from any angle, as well as to zoom in on certain parts when necessary. To enhance users' experience, it is therefore important to ensure an immediate response time from the users' input actions.

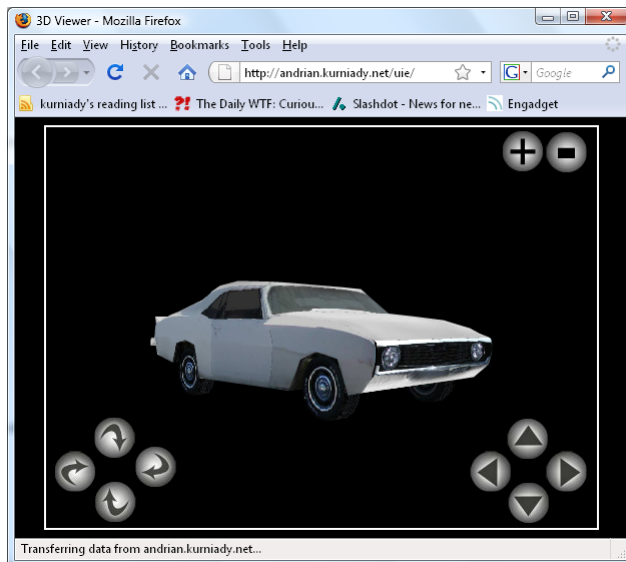


Figure 4. The implementation on a web browser

In order to provide the full functionality of viewing an object, the interface must address the ability to rotate, flip, and zoom. Figure 4 illustrates that these functionalities are represented by the three sets of input buttons. The interface also includes a view screen as the output that shows the main product. The buttons on the lower-left part of the screen is to rotate the objects to certain directions. This operation could be substituted with the mouse dragging on the screen which would rotate the object according to the direction of the dragging movement. However the current project does not implement such functionality as it aims more on simplicity of implementation rather than interactivity. The buttons on the bottom-right of the screen is used to move the camera around, which is very useful when the object has been zoomed in considerable, such that it gets bigger than the viewing screen. The last two buttons on the top-right of the screen represents the zooming movements, one out and one in.

Result

The proposed program has been tested and shown to be easily embeddable into web pages. The screen shot in Figure 5 shows the completed user interface showing a dummy product. The compiled viewer and scripts measures to just about 60KB, such that it can be loaded quickly by any users, even by those using dial-up connections. The car object with such detail needs only around 500KB, which is a measure of a complex object. Simpler objects such as cell phones or laptops will have a much smaller size. The embedding of the viewer to any HTML page is done just like embedding any other Flash content, and can be made compatible with most of the browsers including Microsoft Internet Explorer, Mozilla Firefox, Opera, and Google Chrome. The processor load associated with the use of the viewer is nearly negligible.

After the viewer has been implemented completely, a simple survey has been conducted online with the help of Google Spreadsheets with a main aim to verify the assumption and hypothesis previously posted. All of the 6 questions prompt the user to choose in a scale of 1 to 5. There are 21 respondents to the survey, mostly targeted to Indonesian college students who are proficient in using the internet. The risk of having such respondents is mainly the possible bias about the ease of use measurement, in which our respondents may find it easier to use the viewer compared to the non IT literate population. However, such bias would not change the result too far from the reality. The results are summarized in Table 1 and each questions to be discussed separately in the following paragraphs.

Question	Answer				
	1	2	3	4	5
1	6	1	1	3	0
2	2	6	6	4	3
3	1	6	6	6	2
4	0	0	2	3	6
5	0	1	4	1	5
6	1	3	7	4	6

Table 1. Summary of the survey result

The first question probes the behavior of the respondent regarding online shopping, "Do you shop online?". As predicted, the answers mostly range from never to almost never to online shopping, as shown in Figure 6.

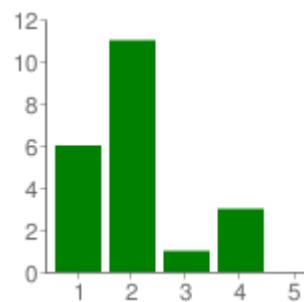


Figure 6. Survey result of Question 1

The second question asked whether the respondents are confident in online shopping, to know their thoughts about online shopping as a reliable way of shopping. The result is split between confident and worried, with slightly more respondents being quite worried about trusting online shops for their shopping.

The third question tested whether the respondents think that a set of still images can adequately describe the products in an online shop. Unfortunately there is no conclusive pattern

observed in the response to this question, as the answer is split between adequate and not adequate.

The fourth question is related to the 3D viewer that had been developed, most specifically its ability to enhance the users' understanding about the product compared to the fixed images. Shown in figure 7, most of the respondents think that 3D viewing enhances their understanding about the actual product. This result therefore verifies our first hypothesis.

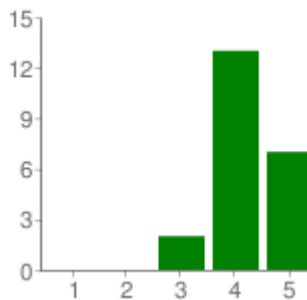


Figure 7. Survey result of Question 4

The fifth question looks to find out what the respondents think about our 3D viewer, asking them to rate the ease of use of our viewer from 1 to 5. The result was quite satisfactory, with most of them thinks that our viewer is easy to use, as shown in Figure 8.

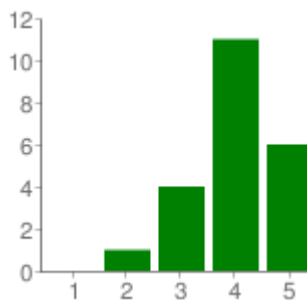


Figure 8. Survey result of Question 5

The last question in the survey tries to validate the second hypothesis, by asking the respondents about whether 3D viewing availability increases their propensity to shop online. The result as shown in Figure 9 suggests that most of the respondents are more confident in online shopping, with the presence of 3D viewing of the products.

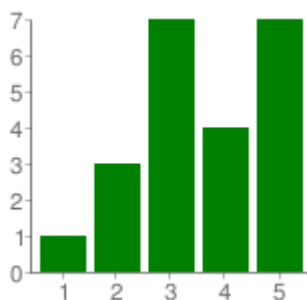


Figure 9. Survey result of Question 6

Discussion

During the survey, several things are observed, such as the limitations of online surveys as well as some possible improvements to the viewer. These observations are expected to be a valuable consideration for further researches.

While conducting the surveys, several limitations are found. Many metrics regarding users' interaction with the viewer were not quantifiable as the result. Having a remote respondent, it was not possible to time their interaction. It was also not possible to observe users' behavior such as facial expressions. In short, having it online limits our gathered data to the survey questions.

A few improvements are observed to be possible for the viewer, which is the result of our analysis apart from the survey. The movement of the objects needs to be sped up to reduce the time for going from one direction to another. An inclusion of a reset button to bring back the object to its initial view, as well as boundaries to the object's translation are thought to be beneficial for usage in a longer time period (i.e. more detailed viewing). These improvements are expected to be carried out in further version of the viewer.

Conclusion

The project focuses on a development of a 3D viewer, which is achieved by creating it as a Flash application. The Sandy 3D graphics library is chosen to bring 3D capability into Flash, with its ability to load models from the 3DS and ASE format. The viewer itself can also be embedded easily into web pages, making it available to users having any Flash-capable browser, thus making it reasonably simple to use in an existing online shop application.

After the successful implementation of the 3D viewer, a survey was conducted to verify the initial hypothesis as well as to check whether the developed 3D viewer satisfies the purpose that is associated with it. The results of the survey were satisfactory, validating both of the posted hypotheses while also suggesting that the developed 3D viewer is easy to use and fulfill the purpose leading to its development. By the availability of this 3D viewer, we can expect to enhance the culture of online shopping in Indonesia.

Acknowledgment

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