Online Tapestry Shopping System Using Geometric Transformations

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Abstract

Online shopping systems are widely spread on the World Wide Web (WWW).However, without guaranteeing that these online systems are convenient for the average user, it is difficult for the online businesses to gain the user's trust and it's also intricate for them to build a wide range of dientele. Therefore, we propose a solution, a web-based Myanmar Tapestry shopping system that provides customizable design by using geometric transformations in computer graphics for computer users to successfully achieve their online shopping goals. As a consequence of this paper, we achieved an increase in the knowledge of image transformations and Myanmar traditional handmade (Shwe Chi Doe).

1. Introduction

The increasing of the use of computers and Internet usage by the public, it is expected that computer-based shopping systems (or online shopping) will become more common means of trading Goods and Service in the future. Moreover, there are now many different shopping sites on the Internet; however, most of these sites lack a user-friendly interface design, which is essential for the success of online software as claimed by Tarje` team, an Online Shopping Applications [9]. Therefore, we believe that the interface to online shopping systems must be please to the eye, effortless to learn and easy to use. Otherwise, people in general will likely become less interested in online shopping applications.

In this paper, we present our design solution to the problems that are involved in online shopping systems especially in the traditional handmade materials. Our ultimate goal is to design a web-based system that provides 2D geometric transformation methods which can be easily customized by the average computer user (e.g., change image orientation such as translate, rotate, scale, reflect and shear). Moreover, the user will have the ability to browse different types of images, and then purchase them once he/she is satisfied with the final outlook.

The content of the paper is organized as follows. Section 2 covers the related online shopping systems and transformations. In section 3, we describe the architecture for web-based application. In section 4, we express in details about the knowledge of geometric transformations in computer graphics that can be built to support an adaptive online store by providing customized drawing design services. Section 5, we discuss the design and development process of our proposed system. In section 6, we show the additional features of our system. In section 7, we conclude the paper by describing the limitations.

2. Related work

Generally, there exist many online shopping systems. However, not every shopping system provides geometric transformations methods to customize image design. Maya Unlimited [1] permits the user to create the desired model in order for the user to fit clothes on it. Through this model, Maya software improves productivity of clothing simulation. Nevertheless, we believe that showing the user more details about the measurements of the model, makes the model very difficult for the user to manipulate, where it then becomes uneasy to use. Therefore, this over all method limits the types of target users to only serve experts users, leaving out a large range of people.

While there has not been much work on learning to encode transformations, the idea of using mapping units to encode transformations is not new and dates back at least [3], which describes architecture for modeling simple transformations of letters.

With a similar rationale, Ardissono et al. [2] proposed a knowledge-based system using for tailoring the interaction users using a shell called SETA for adaptive Web stores, where stereographical information is also used for user modeling. Our target users are most likely busy

people who cannot visit the mall; thus, following the approach of the team of Welbert O. Galitz, an essential guide to user interface design [6].

The system [8] that is similar to our system has a 3D model and it has been implemented using Flash. However, controlling the 3D model is too difficult using this system, where trying the clothes onto that model seemed like a non-trivial task. This factor became one of our main reasons that we decided to use a controlled 2D model in our current system, rather than uncontrolled 3D model. Thus, overcome the weaknesses in clothing the 3D model.

3. Web-based application

Web-based applications provide with the opportunity of save time and money, and improve the way user interacts with clients, suppliers and business partners. It also provides the power of desktop and server applications with the flexibility and accessibility of the Web [4]. Using web browsers, users can securely access applications from anywhere within the reach of the company intranet or extranet as shown in figure 1. Benefits of web-based applications are

- Existing applications can work as both a desktop and web solution.
- Employees can get data access from anywhere.
- Applications can be maintained remotely, reducing overhead costs for system upkeep.
- A web-based application can host parts of an application in different locations; multiple machines can host multiple instances of the application to prevent server overload.
- Application security can be centrally managed.

The centralized maintenance of web-based applications is another important benefit. The cost involved in coordinating the maintenance of distributed applications and distribution of costs for maintenance upgrades can often cost the initial development cost of the application. Changes made to web-based applications on the server take effect immediately for all users, eliminating issues of incompatibility due to version differences. Developer can create custom code or take advantages development tool features that address issues of multiple users concurrently modify the same data. Providing the opportunity to save time and money, and improve the way interact with clients, suppliers and business partners.
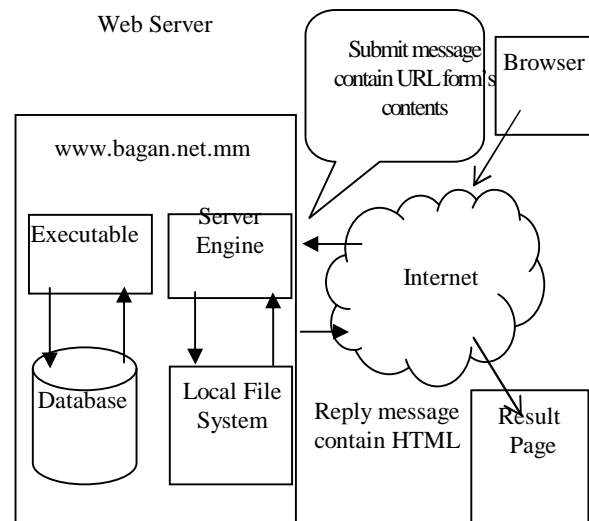
Figure 1. User interface of web-based application

3.1 Effects of online shopping

Online shopping can be defined as an activity to buy or to get information about consumer goods via the Internet [7]. Of course, both buying and obtaining information are activities that can take place via the Internet. However, online shopping also enables a spatial and temporal fragmentation and recombination of several stages in the shopping process. For example, one can obtain information about a certain product by in-store shopping and purchase the product via the Internet. It is also possible to use the Internet to obtain information about a product and then buy it in a brick-and-mortar store. Additionally, online shopping differs from other in-home shopping forms (like catalogues or television shopping channels) in interactivity and logical capability. The Internet is an interactive medium where the consumer can decide on the navigation route and thus exercise control over the content being displayed. Logical operations like sorting, comparing, and querying data are easy to make, which enlarge the capabilities of the Internet in handling information compared with other in-home shopping forms. The benefits of online shopping are

- Online shopping allows people to carry out businesses without the barriers of time or distance. One can log on to the Internet at any point of time, be it day or night and purchase or sell anything.
- The direct cost-of-sale for an order taken from a web site is lower than through traditional, as there is no human interaction

during the online electronic purchase order process.

- From the buyer's perspective also ecommerce offers a lot of tangible advantages such as reduction in buyer's sorting out time, better buyer decisions, less time is spent in resolving invoice and order discrepancies and increased opportunities for buying alternative products, etc.

4. Geometric transformations

In many applications, there is also a need for altering or manipulating displays. Design applications and facility layouts are created by arranging the orientations and sizes of the component parts of the scene. Changes in orientation, size, and shape are accomplished with geometric transformations that alter the coordinate descriptions of objects. Geometric transformations will map points in one space to points in another.

$$(x', y', z') = f(x, y, z)$$

Transformation is a general term, which covers translation, rotation, scaling, reflection and shear. All geometric transformations were affine transformations, achieved using a mapping function that related points in the original image to corresponding points in the transformed image [5]. Affine transformations can be expressed as a linear function of coordinates x and y. Affine transformations have the following general properties:

- They preserve lines, so the image of a straight line is another straight line.
- This vastly simplifies drawing transformed line segments.
- We need only compute the image of the two endpoints of the original line and then draw a straight line between them.
- Preservation of co-linearity guarantees that polygons will transform into polygons.
- Preservation of parallelism guarantees that parallelograms will transform into parallelograms.
- Preservation of proportional distances means that mid-points of lines remain mid-points.

4.1 Translation

A translation is applied to an object by repositioning it along a straight-line path from one coordinate location to another. So, a translation slides an object a fixed distance in a given direction.

The original object and its translation have the same shape and size, and they are in the same direction.

$$x_2 = x_1 + t_x$$
$$y_2 = y_1 + t_y$$

The translation distance pair (t_x, t_y) is called a translation vector or shift vector.

4.2 Rotation

Rotation moves an object from one position to another in a circular path around a specified pivot point (rotation point). So, a rotation is a transformation that turns a figure about a fixed point called the centre of rotation. An object and its rotation are the same shape and size, but the figures may be turned in different directions.

$$x' = x \cos \theta - y \sin \theta$$
$$y' = x \sin \theta + y \cos \theta$$

where (x', y') is the transformed coordinates and θ is the rotation angle.

4.3 Scaling

Scaling changes the dimensions of an object relative to a specified fixed point. This operation can be carried out for polygons by multiplying the coordinate values (x, y) of each vertex by scaling factors S_x and S_y to produce the transformed coordinates (x', y').

$$x' = x \cdot s_x$$
$$y' = y \cdot s_y$$

Scaling factor s_x scales objects in the x direction, while s_y scales in the y direction.

Any positive numeric values can be assigned to the scaling factors s_x and s_y. If the scale factor is greater than 1, the image is an enlargement. If the scale factor is between 0 and 1, the image is a reduction. When S_x and S_y are assigned the same value, a uniform scaling is produced.

4.4 Reflection

Reflection is a transformation that produces a mirror image of an object. It can be seen in water, in a mirror, in a glass, or in a shiny surface. An object and its reflection have the same shape and size, but the figure face in opposite directions. In mirror, for example, right and left are switched.

Reflection to the x axis,
$$x' = x$$
$$y' = -y$$
Reflection to the y axis,
$$x' = -x$$
$$y' = y$$

4.5 Shearing

A transformation that distorts the shape of an object such that the transformed shape of an object appears as if the object were composed of internal layers that had been caused to slide over each other is called a shear. Two common shearing transformations are those that shift coordinate x values and those that shift y values.

An x-direction shear relative to the x axis is as follows:

$x' = x + sh_x \cdot y$

$y' = y$

An y-direction shear relative to the y-axis is as follows:

$x' = x$

$y' = y + sh_y \cdot x$

Any real number can be assigned to the shear parameter sh_x and sh_y.

4.6 Composite transformations

Many graphics applications involve sequences of geometric transformations. An animation, for example, might require an object to be translated and rotated at each increment of the motion. In design and picture construction applications, there need to perform translations, rotations and scaling to fit the picture components into their proper positions. These individual transformations combine into one overall transformation is called the composite transformations, as shown in figure 2. Composite transformations are formed as multiplications of any combination of geometric transformations. Forming products of transformation matrices is often referred to as a concatenation or composite of matrices.
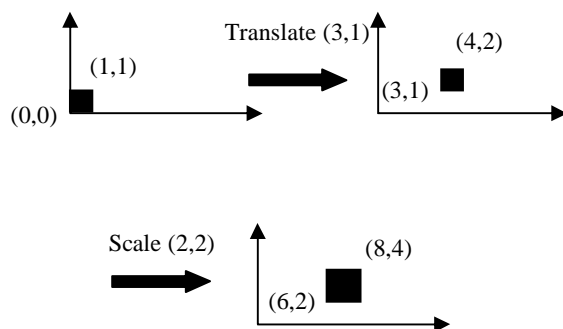

Figure 2. Translate then scale

5. Our proposed system

We decided to save our customers' time, and graphical representations of objects are thought to be more natural and easy to use by users. This system provides two facilities of chosen items from existing design and creating customized design using geometric transformations. Moreover, our system involves in two main parts: customer site for receiving items ordered by customers and administrator site for updating items managed by administrator.
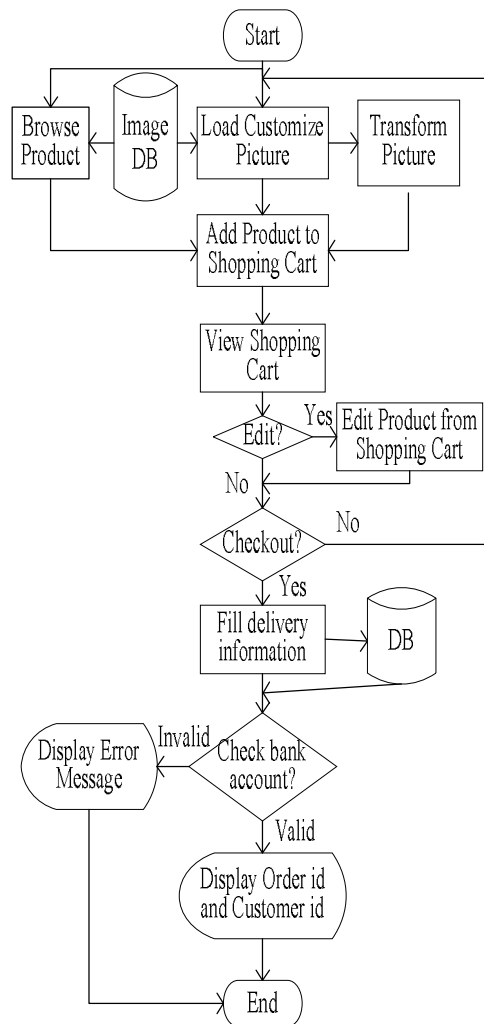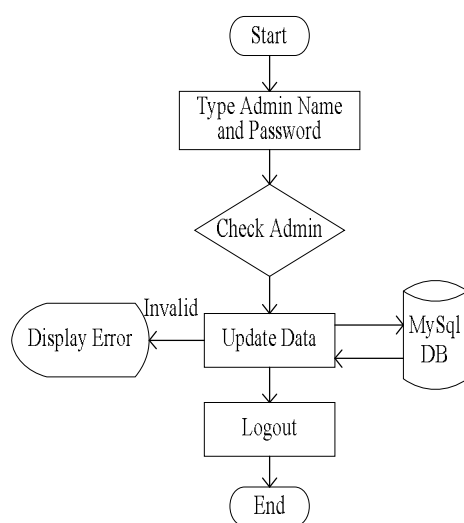

Figure 3. System flow diagram for customer site

This figure shows how the system works and all parts of the customer site. There are two different parts of customer site. One part of customer site is the selling of readymade Tapestry design. In this part, we display two categories of Tapestry called Decorative Tapestry and Souvenir Tapestry. So, the first thing to do is to look for the Tapestry product what is suitable and useful for them. The customer also requests to view the products in a product category. The system will display the product information of the selected category. When the

customer finds the products he wants, he adds them to the shopping carts. The system will store and keep track the information of the products that have been added into shopping cart.

Another part of customer site is ordering of customize design. In this part, the customer can easily choose frame and image that they desire to draw. After choosing, they can draw the Tapestry wall painting as they like. They can place the images as they like, and can modify image transformations such as translate, rotate, scale, reflect or shear. When they finish drawing process, the user must click save button to store their design, and then click add to cart button similar to readymade Tapestry buying process. The customer can request to view the contents of the shopping cart. The system will return the contents of the shopping cart to the customer; the unit price and total price will be shown. Users have a chance to remove the item or edit quantity of products in the shopping cart.

When they finish ordering process, they can click Checkout button to order. Then, the customer must fill delivery information. If the customer's bank account is invalid, error message is displayed. If the customer's bank account is valid, the system gives order ID and customer ID to review the order information at the next time. The customer can request to update their customer info. Customer information includes the relative information of customer such as username, password, address, etc. The system will display the current customer information to the customer. The customer updates the customer information and the system will store the updated customer info in the system database. After one successful purchase, the payment information is also stored in customer information.

Figure 4. System flow diagram for administrator site

This figure shows how the administrator site works. In this site, the administrator can login to the system by entering user name and password. The system will verify that the login name matches the login password. If they do not match, error message will be indicated to the administrator. Otherwise, the administrator can update products from the database. This includes the products price, description, brand, title, or number. The system will save the updated product information in the database.

The administrator can also view the customers' order lists. Categories list can be retrieved, and new category can be added if the administrator wants to insert new brand Tapestry. Due to the security of the system, logout button is needed to click when the administrator finishes data updated.

6. Additional features

An online shopping system where the user can customize product designs through the use of geometric transformations within a web-based application. It brings together existing knowledge of enterprise web application architecture, web-based application and geometric transformations in computer graphics. In the development processes, handiwork is an important role for all peoples of the world. It is required to develop online transactions for selling Myanmar Tapestry on the Internet. The user will have the ability to browse and purchase different types of Tapestries which can be easily customized. Moreover, Myanmar's cultural heritage of Tapestry can achieve appreciation high value from other abroad.

This system supports customer to be satisfied with the facilities of B2C. The advantages are discernible to website visitors and may even make it more cost effective. Also, if a customer feels lost in the system, the customer can use the help link to view the help for that page. Each page in our system has a specific help option. The rationale behind that is to make the system as clear and user friendly as possible for the user. For customers who are busy and are using our system because they do not have the time to go to the mall, we have decided to provide them with the option of listening to music in order to bring them to the mall surroundings and feel that they are really doing shopping. Besides, this feature is provided in all the system pages.

Customizing Tapestry painting is one of the important features that the system has. The user can choose the desired frames and images as well. Once the user chooses one of the shopping ways, the default readymade Tapestries will be displayed. In order to customize Tapestry painting, for example,

having rectangle frame with different backgrounds and elephants, the user has to click on the "Choose Frame" button. A small window will appear where he/she has to select "Rectangle" frame. Next, he/she has to click on the "Choose Image" button and another small window will be displayed, prompting the user: "select desire images". After choosing desire frame and images, they will be displayed in the drawing area where the user can modify the images to transform.

The user can move the image by clicking the mouse button where they want to place the image. The user can choose an angle of rotation between 0 degree and 360 degree from rotate combo box and rotate the image with counter clockwise direction. Moreover, the user can shrink or zoom the size of an image by selecting the size from the scale combo box. The user can reflect the image according to y-axis only when the user click the reflect button. According to y and x direction, the user can shear the image by selecting direction from the shear combo box. In addition, the user can also use to perform a combination of these operations at once. When the user finishes the drawing process, the user needs to click save button to order. So, the customer saves on time and travel costs to purchase desired order. This system applies consumer-friendly e-commerce technology to simplify and streamline the purchasing process.

7. Conclusion

There has been surprisingly a little work on the design of image transformations in ordering process, The aim of this paper is to draw attention of web based application and geometric transformations approach. The system does not connect real banking system and only simulate virtual banking system because system is based on computer graphics and web technology. Moreover, the system can transform the given images and does not transform other images outside the system. Indeed, a clear and user-friendly web site design can attract more customers. We have developed a suitable and adaptable system in order for us to successfully transfer to the end-user.

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