Department of Computer Science
The University of Hong Kong

CSIS0801 – Final Year Project

Project Plan
Intelligent Mirror for Augmented Fitting Room Using Kinect

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**Project Overview**

The objective of this project is to develop an intelligent mirror that can augment the image of a customer standing in front of it with different clothes fitted to his/her body. In particular, the customer can pose freely in front of the mirror, e.g., turning around to look at his/her back and side-view, and the fitted clothes will keep aligned with his/her body poses in real-time. Such an intelligent mirror can be deployed in the fitting room or advertisement of latest fashion of a garment shop, or even at the home of a customer for shopping over the Internet.

**Aims/Objective**

1. To develop 3D models for clothes and human body with precise mechanical control
2. To develop a user-friendly application for users to try out different types of clothes for visualization using Kinect
3. To develop possible templates for users to design their own clothes

**Overall Approach**

It is basically a 4-step approach. For each task, we first finish the idea with a prototype, and then we use it to do the testing. Testing includes collection of data, and sometimes conduction of a survey from other students, in order to evaluate our prototype on its effectiveness. Finally, we do a fine-tuning on the prototype to include good opinions and eliminate bad ones.
Milestone

Phase I

Main objective – to finish the 3D models and to fit clothes well on user with slight movements

1. To work on how the 3D models should be constructed, which consist of two major parts: the user human body model and the cloth model
   - For human model, it should be generated according to user body including shape and dimensions.
   - For cloth model, a simple cloth such as a T-shirt, which should be flexible and “real”, should be generated for initial testing on fitting onto the basic body model
2. To develop a simple User Interface for initial testing purpose only
3. To work on performance issue, such as data structures used to simulate the models, and algorithms to do the fitting etc.

Phase II

Main objective – to complete the application with add-on functionalities

1. To complete the design of the User Interface requiring:
   a. User-friendliness – the location of buttons and menus should be well-presented for users’ convenience;
   b. Graphics – design and style should be nice-looking to users;
   c. Easy Control – the control method should be intuitive, e.g. users use their hands to touch the virtual buttons to access different functions;
2. To construct more complicated types of clothes like skirts, trousers;
3. To implement add-on functionalities for users, such as:
   a. Photo-taking – allow users to take a picture and save it;
   b. Video-recording – allow users to take a short video and save it;
   c. Theme-changing – allow users to change the background image;
   d. “My Favourites” – allow users to save their favourite sets of clothing;

**Phase III**

**Main objective – to develop templates for users to design their own clothes**

1. Allow users to design different types of clothing – pattern on T-shirts, windbreaker etc;
2. Allow users to design with different cuttings and textures – several methods to be provided for creativity

**Phase IV (Optional)**

**Main objective – to make further possible improvements**

1. To further improve diversity of styles of clothes (hat, glasses, shoes etc)
2. To increase the number of users using simultaneously : 2 or more
3. To build up support on multi-language platform;
4. To be capable of checking the program version and updating to the latest version;
5. To provide a favour ranking functionality which suggest clothing to users with his/her similar fashion style.
## Work Division

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<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
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<tbody>
<tr>
<td><strong>Billy</strong></td>
<td>User body modeling; Analysis on improving performance issue</td>
<td>Enhance different functionalities for the application</td>
<td>Develop the cloth design functionality</td>
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<tr>
<td><strong>Charles</strong></td>
<td>Design the basic user interface; environment information analysis</td>
<td>Design the detailed user interface with graphics</td>
<td>Develop the cloth design functionality and its user interface</td>
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<tr>
<td><strong>Kit</strong></td>
<td>Cloth modeling; Physics formula</td>
<td>Further cloth modeling; Performance issue</td>
<td>Develop the cloth design functionality</td>
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## Project Schedule

![Project Schedule Diagram]

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- **Kit**: Phase I, Phase II, Phase III
- **Billy**: Phase I, Phase II, Phase III
- **Charles**: Phase I, Phase II, Phase III
Potential problems

1. **Light source problem** - The color of the clothes should vary based on the detected light source/ brightness of real or virtual environment.
   - Possible solution – collection and analysis of data from the environment (e.g. light intensity), then do the corresponding adjustments.

2. **Accuracy problem** - The accuracy of detecting the body shape and size by Kinect is limited, as the number of points returned provides a rough estimation only.
   - Possible solution - testing and evaluation should be carried out to obtain precise data, in order to construct a good human body model.

3. **Efficiency problem** – As the construction of 3D models may require a huge calculation process, the computational power of a CPU may not be enough.
   - Possible solution - GPU may be considered to improve the efficiency issue.

Project Website Management

The project website will be updated regularly to report our work progress according to our full year schedule. Updates may include:

- Any new ideas presented with brief notes
- Screen captures of progress
- Videos showing what we have done
- ….etc
**Equipments required**

1. **Hardware**
   a. Kinect for Xbox 360 x1
   b. Graphic card (maybe, for better graphics display)
   c. (Machine, reference for testing) SONY vaio Z139GG (Windows® 7 Professional, Intel® Core™ i7-640M, 2.80 GHz, 8 GB (4 GB x 2) DDR3 SDRAM*2, SSD-256 GB, NVIDIA® GeForce® GT 330M GPU)

2. **Software**
   a. Microsoft Visual Studio 2010 Service Pack 1
   b. Kinect for Windows Software Development Kit (SDK) beta
   c. (To be confirmed) Microsoft XNA Framework 3.1, which has better performance on graphics rendering with GPU
   d. (To be confirmed) DirectX, which can also improve the performance

**Budget Plan**

For the project, we have been granted $1000 per team member from the Department of Computer Science, so we have a total of $3000 as our total budget. Mainly we’ll be spending the money on:

1. Kinect for Xbox 360 $900
2. Accessory – NYKO Zoom for Kinect (to be confirmed) $300
3. Miscellaneous items – printing quotas, etc $100
   $1300
Project Outcomes

A. Cloth simulation: The cloth model should be moved with the “human body”, i.e. the body model, and covering the user’s original clothes. It should change with the shape of the “human body”. The cloth model rendered should not be rigid like a cardboard, it should be soft, elastic and flexible like normal clothing. The cloth model’s texture should also not just plain and uni-color, it should be fine, naturally, like “be weaved”, with color varied according to the given light source. The cloth model should have front and back views.

B. User-oriented: This project is basically targeted on commercial use such that it can be implemented in the changing room or electrical advertisement board of latest fashion in a garment shop, or even at the home of a normal customer for shopping via Internet, therefore, sizes of clothes should be fixed in, such as S, M, L, XL, such that it is more convenient for design companies to change clothes size. Those companies are provided with software to design their own design by themselves easily without help of programmer, while designed clothes could be saved as certain format which can be provided to the normal customer to download the clothes model via Internet onto their own computer.

Project Deliverables

1. The application software;
2. A final report that includes documentation, designs, algorithms, research findings, discussions and evaluations.
References

Technique:
Real-Time Cloth Simulation:
http://www.maxgarber.com/projects/cloth/

Software:
Kinect for Windows Software Development Kit (SDK) beta:

Project related:
Virtual fitting room for Topshop:
http://ar-door.com/2011/05/virtualnaya-primerocchnaya-dlya-topshop/

Fitnet:
http://www.fitnect.com/

Shopping of the Future with Microsoft Kinect:
http://www.youtube.com/watch?v=5jkO6KjhpjU&feature=autoplay&list=PLD386644B4103ECAE&lF=results_main&playnext=3/