POLITECNICO DI MILANO

School of Industrial and Information Engineering

Computer Science and Engineering

Project for Advanced User Interfaces:

“The Hair Double”

Design and Technology Documentation

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Abstract

"The Hair Double" is an application that allows users to scan a 3D model of their face which is then used to create a 3D avatar that resemble the user itself. Through the avatar it's possible to try and change different hair styles from a predefined set of existing hair styles and, when the user chooses one, he or she can see the final result on the avatar. An alternative use of the application is to try the hair style directly on a live video of the user.

The points of strength of this application are the possibility for the user of having a realistic view on him or herself with the desired hair style, the feeling, while viewing the final result, of standing in front of a mirror, as the avatar moves in a specular way with the user and the ease of use of the application.

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Introduction

“The Hair Double” is an application with two operation modes.
The first one, called “Create an Avatar”, allows users to scan a 3D model of their face which is then used to create a 3D avatar that resemble the user itself. Through the avatar it’s possible to try and change different hair styles from a predefined set of existing hair styles and, when the user chooses one, he or she can see the final result on the avatar.
The second one, called “Try on Yourself”, allows the user to have a preview of an hairstyle directly on a live video of the user itself, in a simulation of what it would look like in front of a mirror. It is possible also to take a screenshot and change the background.

The points of strength of this application are the possibility for the user of having a realistic view on him or herself with the desired hair style, the feeling, while viewing the final result, of standing in front of a mirror, as the avatar moves in a specular way with the user and the ease of use of the application.

The goal of “The Hair Double” is to be an instrument for users to have a realistic and detailed preview of a desired hairstyle on themselves, which is not achievable with a picture modified in Photoshop.

The following document is divided in 5 sections:

1. Target User Group and User Needs: this section describes the main target of the application and what are the needs that the application respond to
2. State of the Art: this section describes the current status of technologies used to develop the application and the current competitors on the market
3. UX Design: this section describes the design of the interface as well as a typical use case scenario
4. Implementation: this section describes the hardware requirements and the general architecture of the software
5. Discussion and Conclusion: this section presents a critical reflection on the development process of the application as well as possible future developments of the application itself

Target User Group and User Needs

The “The Hair Double” application has been developed to be used by all hair salons clients, with no limitations of gender or age. They are thought to be the primary users of the application.

Hair salons’ managers are supposed to be the secondary users of the application, as they should support the clients during the first use of the application.

This application is a response to specific needs from both clients and hairstylists. These needs are:

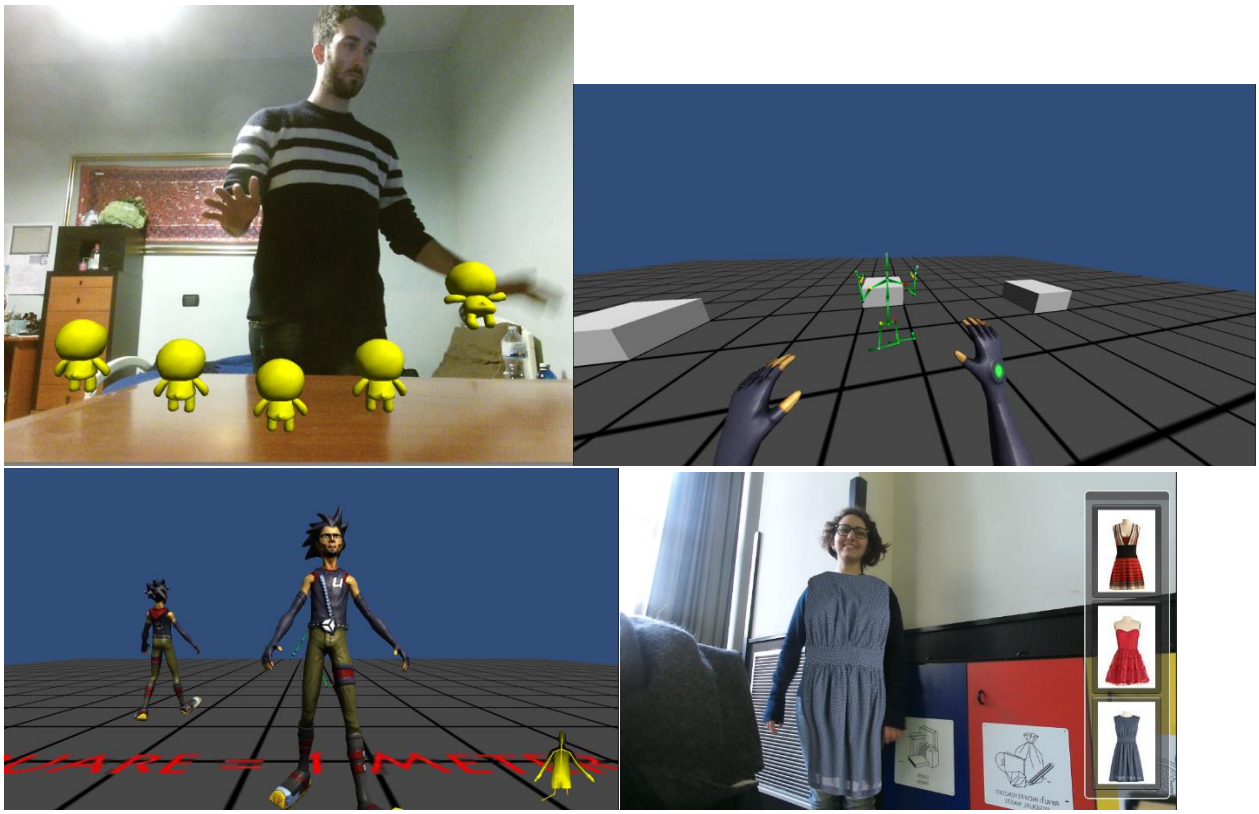
- Offering entertainment for the client during the waiting time at the hair salon
- Providing an instrument for hairstylists to have a clear idea of what the client’s request is
- Providing an instrument for clients to have a realistic preview of what their desired look is like
- Providing a visual feedback for users of how the desired look is like on themselves
- Giving the users a “mirror like” feeling when trying different looks

State of the art

Technology

Kinect v2 sensor was released with the XboxOne on November 2013. In July 2014 Microsoft released the Official Plugin for Unity that allowed to use the Kinect API on Unity Pro. In 2015 Microsoft bought Unity and

allowed to use Kinect v2 Unity Plugin for all Unity versions. Since 2015, a lot of project have started with Kinect API and Unity and all of the possible use have been explored. The main projects (a list of standard examples) are developed by http://rfilkov.com/ and http://pterneas.com/ . Their projects are very complete and well documented and are very useful, so they are suggested to be used for starting a new project from scratch. The main features that can be found in these projects are Avatar Creation, Background, Gestures, Face, Interaction and other examples. Actually, there not much research is done about the 3D Scan in Unity because the Mesh created by the Scan are bad detailed and very difficult to manipulate.



The pictures above are examples from http://rfilkov.com/ projects.

Competitors

To date, there are no known competitors on the market that offer the same advantages as “The Hair Double” application.

However, there are competitors that offer a similar product: starting from a picture of the user, these applications apply modification to the picture to show how a hair style might look. Example of said competitors are:

- HairStyle Mirror App: http://hairstylemirror.me
- InStyle Hairstyle Try-On App: https://itunes.apple.com/us/app/instyle-hairstyle-try-on/id434292927?mt=8
- Taaz: http://www.taaz.com/
- Salon Virtual Makeover: http://www.seventeen.com/beauty/a27087/salon-virtual-makeover/

There are also competitors that offer similar functionalities as “The Hair Double”, but in the accessory sector. An example is Glasses.com: http://www.glasses.com/virtual-try-on

UX Design

General Description

The graphics of the application is simple and essential, in order to avoid ambiguities and confusion from the user. Moreover, for the same reason, there are very few graphical elements, most of which are buttons with clear labels that indicate their functions and facilitate the user's navigation in the application.

The technology used to develop the application is very innovative, but still easy to use and easy to learn. In fact, the interface interaction occurs through the Kinect Gesture.

Scenarios

"CREATE AN AVATAR" MODE:

A Client C enters in the hair salon because he/she wants to do a haircut. The hair stylist advices C to try the new application "The Hair Double" and C accepts.
C place himself/herself in front of the screen of the application's station, where the Kinect sensor is also placed, and starts the application. The first screen is the "Welcome" page, where C is asked to select his/her gender by pressing the relative button and to select the operation mode.
The next screen is the "Scanning" page. Here C, when is ready, clicks the button "Start Cam" and activates the scanning process. C moves in front of the Kinect Sensor and when he/she is in the right position clicks on the button "Scan" to stop the scanning. If the result is not good enough for him/her, he/she can click on the button "Try Again" to start again.
When the scan is complete, C clicks on "Continue" to proceed to the next page, which is the "Choose Hair Style" page. Here C sees a collection of possible hair styles. Through scrolling, C selects the desired hair style.
By clicking "Continue", C is brought to the last screen, where he/she can see the final result, that is the 3D model of his/her head with the chosen hair style on. By simply moving in front of the Kinect sensor, C takes a look of the 3D model from all angles and by clicking on the arrows C can change the background image.
By clicking on the button "Back", C can go back to the "Choose Hair Style" page to try a diffrent hair style.

"TRY ON YOURSELF" MODE

A Client C enters in the hair salon because he/she wants to do a haircut. The hair stylist advices C to try the new application "The Hair Double" and C accepts.
C place himself/herself in front of the screen of the application's station, where the Kinect sensor is also placed, and starts the application. The first screen is the "Welcome" page, where C is asked to select his/her gender by pressing the relative button and to select the operation mode.
The next screen is the "Live Preview". Here C can look at different hair styles in real time with the video of him or herself. When C is happy with the hair style, he/she can click on "Continue" to proceed to the next page, where he/she can change the background image of the screenshot of the previous page.

Implementation

Hardware

The video output for the application should be a medium/large screen (at least 24" diagonal length) for an optimal result.

To guarantee better performances, the application should be used on a PC with these minimum requirements:

- Operating System: Windows 8/8.1 (x64) or next version
- 64 bit processor (x64) i7 3.1Ghz
- 4 GB memory
- Built-in USB 3.0 host controller
- DirectX11 capable graphics adapter:
  ATI Radeon (HD 5400 series, HD 6570, HD 7800),
  NVidia Quadro (600, K1000M), NVidia GeForce (GT 640, GTX 660),
  Intel HD 4400

Another needs is the Kinect v2 sensor and the adapter for Windows (with power supply and USB hub).

Software

The project code is available at https://github.com/enryls/TheHairDouble .

The software was developed with Kinect 2.0 SDK, Kinect Fusion API and Kinect Face API in Unity3D. For the scene in which you can create your avatar, the project was started with the Main Example of Microsoft (DepthSource) modified for our purpose. For the other scenes and for the gesture the starting point was the Kinect API Example of Rumen Filkov (http://rfilkov.com/).

The project is organized in seven scenes: one main menu where the mode can be selected, and three scenes for every mode. The scripts are contained inside the Assets and are divided in three folder:

- KScript: Contain the scripts taken from Rumen Filkov project, like GestureManager, KinectManager and BackgroundRemoval
- KinectView: Contain the scripts of the Kinect API Example released by Microsoft like DepthSourceManager and MultiFrameManager
- Script: Contain the scripts developed by us only for this project

Discussion and conclusion

"The Hair Double" application was really challenging from the development point of view. The goal was to create a complete upper body avatar that had the same physical features of the user, so the main obstacles were the correct capture of a 3D model of the user's face and the correct positioning of that model on a 3D premade mannequin. Unfortunately, "The Hair Double" is still a basic prototype, which means that there are some aspects that have not been implemented. For example, the possibility of changing the hair color, a full colored avatar or a more developed graphic interface.
Another major obstacle was the limitation of the technology that we had available to develop the project. Apart from the limitations of the Kinect v2 Sensor, having to manipulate complicated 3D graphic requires a considerable computing capability that we unluckily had no access to.

Further development of this application would aim in implementing the missing functionalities plus adding other new functionalities to expand the user experience and to reach a more diverse audience.
Here are some possible future functionalities that can be implemented: Personalize the hair styles

- Share the final result on social media
- Contest for best original hair style
    - Voting section in the application or on social media
    - As a prize for the winner of the contest, the hair salon can offer a discount code
- Possibility to try also facial hair or different accessories (like hats, glasses, sunglasses…)
- Possibility to develop a Windows Store App and a Xbox App with model “try and buy”

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