A Virtual Personal Fashion Consultant:
Learning from the Personal Preference of Fashion

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Abstract

Besides fashion, personalization is another important factor of wearing. How to balance fashion trend and personal preference to better appreciate wearing is a non-trivial task. In previous work we develop a demo, Magic Mirror, to recommend clothing collocation based on the fashion trend. However, the diversity of people's aesthetics is huge. In order to meet different demand, Magic Mirror is upgraded in this paper, and it can give out recommendations by considering both the fashion trend and personal preference, and work as a private clothing consultant. For more suitable recommendation, the virtual consultant will learn users' tastes and preferences from their behaviors by using Genetic algorithm. Users can get collocations or matched top/bottom recommendation after choosing occasion and style. They can also get a report about their fashion state and aesthetic standpoint on recent wearing.

Introduction

What to wear? This is an inevitable problem we are facing everyday. Nowadays, following the fashion trend is the need of wearing beautifully, and it is necessary to help people wear by appreciating and recommending the suitable and fashionable wearing automatically.

In previous work, (J. Jia 2016) researched how to appreciating the fashion of clothing collocation based on aesthetic theory. (Y. Liu 2016) also developed virtual fashion consultant, Magic Mirror, for further research and case study. The system uses the photos of clothing as the input, then automatically analyzes the style and parses the fashionable aesthetics of wearing in the photo. The recommendation is completely based on the appreciation of fashion.

However, personalization is another important factor of wearing. The diversity of people is huge, regardless in fig-

ures or tastes. The diversity could be reflected by people's choice of clothing collocation.

Therefore, this paper focuses on the personal preference of wearing. Magic Mirror uses genetic algorithm to learn users' personal preferences from their behaviors. Balance fashion trend and personal preference to appreciate and recommend clothing collocation better.

System Overview

System Architecture

We designed a demo to simulate the environment of a fitting room. Magic Mirror includes a display that is placed on end like a mirror, a Kinect to optimize the interaction and a computing device.
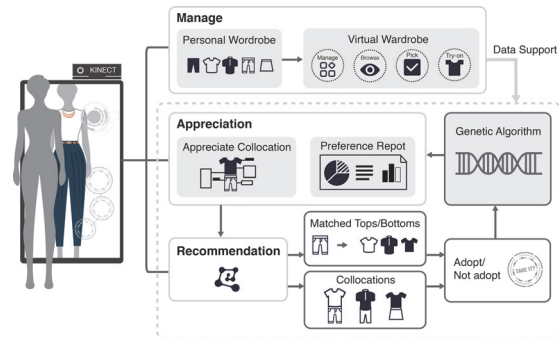

Figure 1:System Structure

System Modules

What can Magic Mirror do specifically? Magic Mirror system has 3 modules (Shown in Figure 1) :

- **Management module**. User can get into a virtual wardrobe to browse, add/delete, pick clothes by gestures, having a simple try-on looking in the screen.

- **Appreciation module**. User can get the appreciating analysis illustration of wearing with vivid visualization and a report about their own fashion state and aesthetic standpoint on clothing.
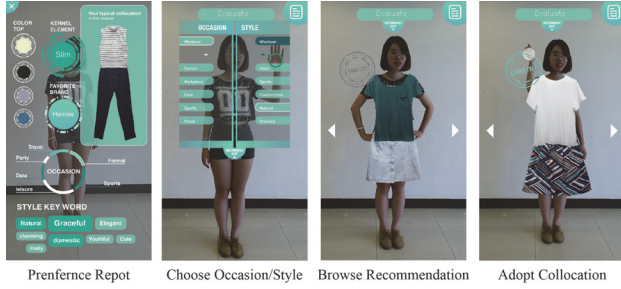

| Prenfernce Repot | Choose Occasion/Style | Browse Recommendation | Adopt Collocation |

Figure 2:Interface of Report and Recommendation

- **Recommendation module.** Magic Mirror can recommend collocations with assigned style and occasion. (Shown in Figure 2) Users can choose the occasion and style in the menu, Magic Mirror will give several collocations according to users' need.

  If the user is satisfied with it, he/she could touch the 'take it' bottom (Shown in Figure 2), which means the current collocation is adopted. The final recommendation is based on the fashion trend and user's preference, according to user's behavior.

How to learn personalization

Learning User Preference by Genetic algorithm

Magic Mirror uses genetic algorithm with the data of users' preference, to evolve the recommendation and realize the individuation.

The first problem is coding each clothing collocation. We use the features extracted by CNN network and treat each collocation's feature as DNA of individual. To calculate the adaptability of the individual, we give the base formula here:

$$R_i = \frac{\Sigma(point_j * part_i)}{sum} \tag{1}$$

Where R_i is the adaptability of one specified type of i_{th} feature, and the adaptability F of this individual is the *sum* of every feature. $Part_i$ means weight of i_{th} feature, it is a priori constant. $Point_j$ is the adopt rate of j_{th} individual in population that its i_{th} feature is the same specified type as R_i.

At first, all collocations in personal wardrobe form the initial population, in whole processing we keep R_i, use the average of i_{th} feature when i_{th} feature appears with unknown type. Finally we use the formula below to calculate grade S of each collocation with *DNA*:

$$S_i = F_i * \Sigma(DNA_i == UDNA_{ij}) * part_i \tag{2}$$

$$S = maxS_i \tag{3}$$

Where *UDNA* is the DNA of individual in population. To recommend individually, we use S to choose the best collocation.

Combining User Preference and Fashion Trend

Every collocation has two results, one from BDA-GCL(Liu.2016) and the other from genetic algorithm, we sort the collection by using these two results separately to get two ranks F and I, then we add them to get the final rank G, and give the list of collocation in ascending order of G as the final result.

User Study

We employed 9 participants, 4 males and 5 females, to use Magic Mirror for 3 weeks to recommend collocations everyday. Then let participants to evaluate Magic Mirror about their satisfaction base on a five-point scale: '1' (bad); '2' (poor); '3' (fair); '4' (good); '5' (excellent). The average mean opinion sore (MOS) is 3.78, and the confidence is level $0.95(\alpha=0.95)$. The average adopt rates in the first recommendation are 67.03%(male) and 53.08%(female), after 3-week using they rise to 70.24%(male) and 72.84%(female) in the last recommendation. According to the study, we can conclude that the personalization truly influences the recommendation.

Conclusion

In this demo, we focused on the influence of personality on clothing collocation. The work included two aspects: 1) Personalization learning based on users' behavior.2) Combine fashion trend and personal preference factors for recommendation. In the future work, we intend to add social system about interactive evaluation.

Acknowledgements

References

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