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Virtual Body Measurement System for Tailor Made Outfits

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ABSTRACT
We propose a system which will be able to measure the body parameters of the user to choose appropriate sized clothes or outfits. The necessity of this system is to reduce personal presence in today's busy world for measurements and selection of outfits; this will also help to create tailor made outfits as per the individual body parameters. The alteration of their respective outfits are based upon various bodily parameters like height, waist, bust, body built, neck, shoulder etc.
The system is based on modules of two processes; first one is to recognize the body parameters by using image capturing device from fixed distance. And second is to process image to get measurement or to calculate the body measurement parameters like tailor measurements. The proposed method will be assessed in body parameter recognitions problems under different challenges like Geographic, Demographic etc.
Keywords— Feature Measurement, Recognition, Selection.

I. INTRODUCTION

As we see today, The Internet has transformed many aspects of life, but perhaps none more so than how we shop for goods and services. It has been still important or nice to stop by a store to touch and see products; the convenience of online shopping can't be beat. And for some services, such as booking travel or buying concert tickets, the ability to do so online has made the process much easier and more efficient. The recent survey conducted by AC Nielson on global online consumers say that books and clothing will continue to top the list for planned online purchases in the next six months, It is growing due to technological development in virtual shopping experience with consumer. The survey done by Nielsen reports that 46 percent of global consumers said they purchased books in the past three months and 41 percent bought clothing online [1].

Shopping online consumers are growing at faster rate, because of time, convenience, cost effectiveness and many other reasons. There is a big difference between shopping in a physical store and in a virtual (garment) store [2].

In a physical store, garment is tangible and it is possible to touch the garment in order to feel and see how fits the body [2]. Besides there are sales persons available for personal advise. But there is a big gap between these two worlds. We want to eliminate the above shortcoming by developing a time and location independent dressing and body parameter measuring system for consumers [2].

This system, Virtual body measurement system (VDR), combines the both worlds. Namely the benefits of time and location independence of home shopping, the ability to clothing, and the use of a virtual assistant (VA) [2].

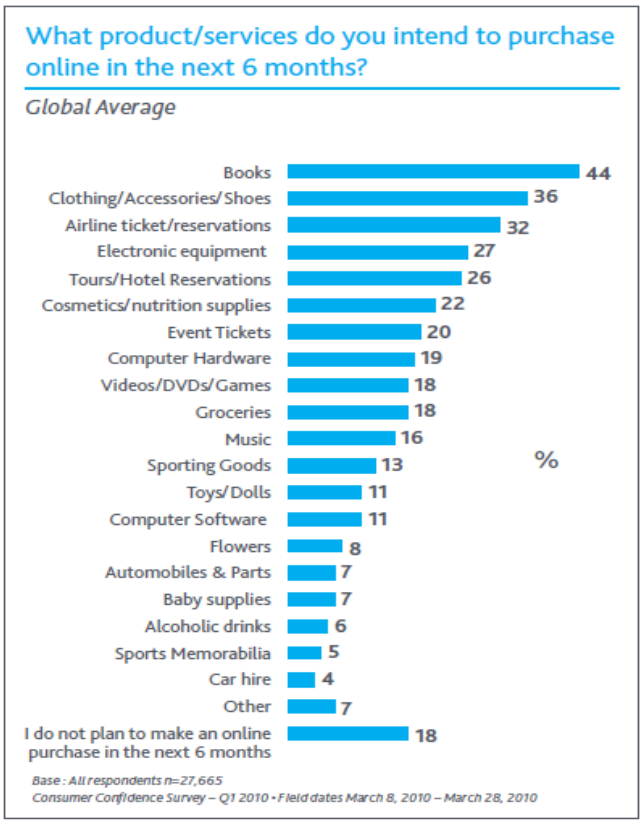


Fig. 1. Global trend on online shopping [1].

Our proposed system will help the users to give the body measurement parameters through the input device like camera to reduce the time in standing in queue. Furthermore, additional time is lost while don and doffing, and also most It also consider the colour recommendation by current fashions and trends.

In recent past, A number of studies identified the causes for consumer hesitancy, and of particular notes are the consumer's overwhelming concern with fit and correct sizing, and the inability to try on items online. Many surveys have shown that an estimated 30% of online garment purchases are sent back by consumers due to inappropriate fittings. Even in web shops people are very sceptic buying clothes because a try-on of clothes is not possible. The objective of this project is to develop a system where the users can provide their photographs which can be used in the system for measurement of body parameters.

This paper describes the background existing methodology, contribution towards the system, followed by the implementation of the system and discusses a possible scenario in which the system could be used. It will be closed with a conclusion. [2]

II. RELATED WORK

2.1 A Vision-Based System for Monitoring the Loss of Attention in Automotive Drivers [3].

The proposed system is a robust real-time embedded platform to monitor the loss of attention of the driver during day and night driving conditions. Here the face is detected using Haar-like features and is tracked using a Kalman filter. The percentage of eye closure has been used to indicate the alertness level. Below are the common HAAR features.

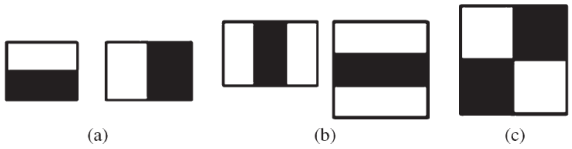


Fig. 2. (a) Two rectangle features. (b) Three rectangle features. (c) Four rectangle features [3].

2.2 Multistage particle Windows for Fast and Accurate Object Detection [4].

The Bayesian-recursive framework to exploit the temporal coherency of the target objects in videos. Several tests on pedestrian and face detection, both on images and videos, with several classifiers and features like Haar-like features to demonstrate the proposed method provides higher detection rates and accuracy as well as a lower computational burden with respect to sliding window (SW) detection.

2.3 Color Local Texture features for Color Face Recognition [5].

Here proposed a new color local texture features, that is Color Local Gabor Wavelets (CLGWs) and Color Local Binary Patterns (CLBP) for face recognition (FR).

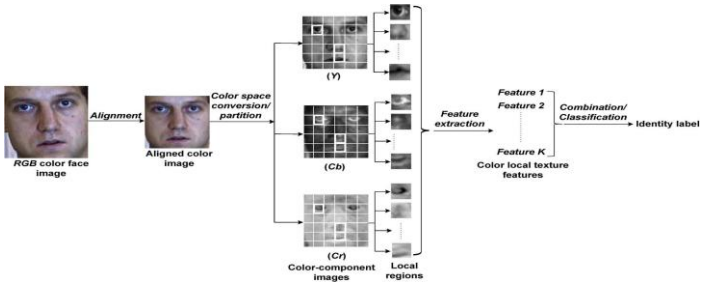


Fig. 3. Proposed color FR framework based on color local texture features [5].

As per above figure, the proposed color FR framework using Color local texture features contains 3 steps,

1. Color space conversion and partition
2. Feature extraction
3. Combination and classification

A face image represented in the RGB color space is initially translated, rotated and rescaled to a fixed template yielding resultant aligned face image.

2.4 Projection into Expression subspaces for face Recognition from Single Sample per Person [6].

The method introduced expression subspaces for approximating new expression images from one image of a subject. The system proposed two methods ESP and ESPSEE to use the synthesized images along with the gallery images and a generic training set to train a DA algorithm and improves the performance of the ESP method by using a validation set to estimate the second moment of the synthesis error respectively.

2.5 Face Identification Using Large Feature sets [7].

This method is used to a tree-based discriminative structure to reduce the time required to evaluate probe samples. The method is evaluated on Face Recognition Grand Challenge (FRGC) and Facial Recognition Technology (FERET) data sets. During the experimental analysis it found that identification method outperforms current state-of-the-art results, particularly for identifying faces acquired across varying conditions

2.6 Virtual Dressing Room for Home Shopping [2].

This system contains a Virtual Assistant which is capable of finding a specific piece of garment for a specific occasion and in compliance with physical characteristics of the users. Here also described some scenario based design idea that is GUI. The representation of garment is described below figure, the attributes considered are fabric, style color, fit, pattern, season, gender, age, category etc.

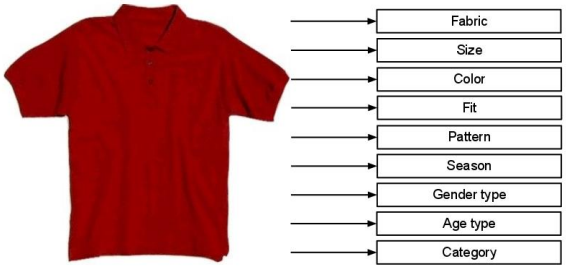


Fig. 4. Attributes to describe a garment model [2].

2.7 Gender classification by combining clothing, hair and facial component classifiers [8].

This paper proposed a novel classification framework which utilises not only facial features but also external informational like clothing and hair. Rather than using the whole face, it has considered five facial components: Forehead, Eyes, Nose, Mouth and Chin.

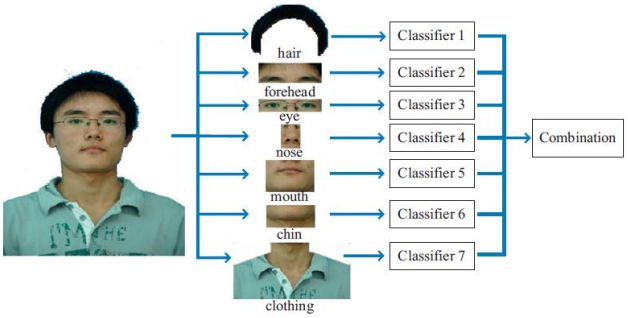


Fig. 5. Flowchart of gender classification framework [8].

The major contributions of this paper are:

1. Using facial components of the whole face to obtain higher robustness for occlusions and noise.
2. Examining the gender discriminative ability of clothing information.
3. Exploiting clothing and hair information to facilitate gender classification.

Title of the Paper	Conclusion	Drawbacks	Future Work
1. A Vision-Based System for Monitoring the Loss of Attention in Automotive Drivers[2013]	The face is detected at a lower resolution by using a Haar classifier.	Detection accuracy is low when lighting conditions are extremely dark or bright.	1. Future scope of research in detection of eyes occluded by spectacles or goggles. 2. Scope of further improvement to compensate for varying eliminations level.
2. Multistage particle Windows for Fast and Accurate Object Detection[2012]	1. Emphasized in complex data sets 2. SW approach obtains good detection result. 3. Faster and increased better accuracy.	47 percent slower on average.	1. Adapt MS-PW for the training phase for efficient bootstrapping. 2. To investigate the possibility to use MS-PW. 3. To test MS-PW
3. Color Local Texture features for Color Face Recognition	Better or comparable FR performance.	Consider only natural expression and illumination.	Devise a more effective weighted feature-level fusion scheme.
4. Projection into Expression subspaces for face Recognition from Single Sample per Person[2013]	1. Simplicity. 2. Both the gallery and probe images can have non-neutral expressions.	Recognizing occluded faces, faces wearing glasses, and age-variant faces.	More advanced DA methods can provide more improvement.
5. Face Identification Using Large Feature sets[2012]	Robust and scalable	FI with lack of training data or under uncontrolled environments is still unsolved problem.	Consider small as well as larger test set size.
6. Virtual Dressing Room for Home Shopping	1. Closes the gap between virtual- and physical environment. 2. useful for garment shopping	System is expensive in its current state.	Include bidirectional Q&A.
7. Gender classification by combining clothing, hair and facial component classifiers[2011]	It utilizes facial and hair and clothing information.	Complex background and is a big bottleneck which impedes real-time application for Hair feature extraction	1. Use state-of-the-art segmentation algorithm for complex background. 2. To accelerate this process.

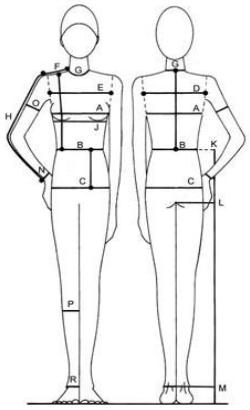
Table 1. Comparative Study of Different Methods for Detection

III. OUR CONTRIBUTION

From literature survey, we found that HAAR feature is used in the system which is developed for Vision-Based System for Monitoring the Loss of Attention in Automotive Drivers. Basically HAAR feature is used for face detection, but in our case it will be used for body parameter recognition. HAAR object detection are color independent, fast, accurate and low false positive rate.

3.1 Body Parameter Recognition :

Colors (hair, eye, skin etc.) and shapes (bust, waist, neck, shoulder etc.) are used for body features recognition. Category Color and shape are used for determining a personal color palette as well as for clothes to fit [2]. Following parameters will be extracted from the given image as a input. All body parameters mentioned below are discovered by using HAAR feature.



Bust	A
Waist	B
Hips	C
Back Width	D
Front Chest	E
Shoulder	F
Neck Size	G
Sleeve	H
Under Bust	J
Wrist	N
Upper Arm	O
Calf	P
Ankle	R
Nape to Waist	G-B
Waist to Hip	B-C
Front Shoulder to Waist	F-B
Outside Leg	K-M
Inside Leg	L-M

Fig. 6. Measurement points of the Body [2].

Category	Attribute	Type	Value
Color	Hair Color	rgb	blonde,black,red, brown,white, [..]
	Eye Color	rgb	Blue,green,brown, [..]
	Skin Color	rgb	Light,light-brown,brown, [..]
Shape	Bust	Inch	[..]
	Waist	inch	[..]
	Hips	inch	[..]
	Back width	inch	[..]
	Front chest	inch	[..]
	Shoulder	inch	[..]
	Neck size	inch	[..]
	Sleeve	inch	[..]
	Under bust	inch	[..]
	Wrist	inch	[..]
	Upper arm	inch	[..]
	Calf	inch	[..]
	Nape to waist	inch	[..]
	Waist to hip	inch	[..]
	Front shoulder to waist	inch	[..]
	Outside leg	inch	[..]
	Inside leg	inch	[..]

Table 2. Different Attributes of Body Measurement [2].

3.2 Fashion Style :

The fashion styles are generally categorized into different styles like sexy, modest, sophisticated, elegant, luxuriant, romantic, girly, masculine, sporty, and casual etc. Fashion style is also affected by outline shape, fabric material, print types and dominant color [2].

3.3 Clothing Psychology :

As considering color psychology light colors shows innocentness, where as dark colors does not gives gentle feel [2].

3.4 Alternation and Stitching :

The Alteration and stitching of clothes or outfits will be done based on above output parameter. Beauty of the system is user does not need to be stay in queue or need not have physical presence. The major benefits of this system include, avoid time spending in don and doffing to purchase clothes or outfits while shopping.

IV. METHODOLOGY

HAAR Feature :

The HAAR feature can be defined as Sum of all pixel values within a rectangular area in an image. The sum of pixel values refers to the value in some two –dimensional representation of an image. There are some benefits of HAAR feature are this is very fast, easy to implement, feature value changes continuously when moving feature. Most attractive property is to speed of feature value evaluation. Here sliding window technique is used. And all Operation is done in constant time when integral image is created [9].

Integral Image :

Integral image means the simple rectangular features of an image are calculated using an Intermediate representation of an image. Main purpose of this is to speed up the process of evaluation of HAAR feature [9].

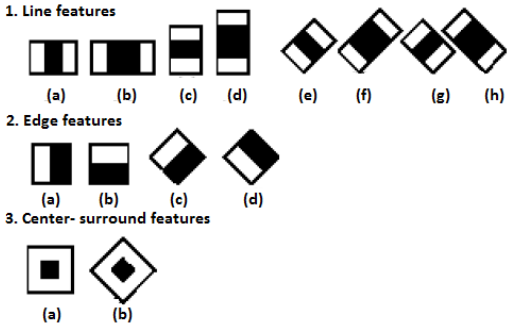


Fig. 7. Common Haar features [9].

Fig 7 requires another intermediate representation called the “Rotated Integral Image” or “Rotated sum Auxiliary Image” [9].

Training classifiers for facial features

Haar classifier cascades first be trained for Detecting human facial features, like mouth, nose, and eyes. Two set of images are needed for to train the classifiers. One set contains an scene or image that does not contain any object, This set of images is negative images. And in positive images, contain one or more instances of the object. The location of the objects within the positive images is specified by: image name, height, width and the upper left pixel. Three separate classifiers were trained, for the eyes, for the nose, and for the mouth. Once, they were used to detect the facial features within another set of images from the database after the classifiers were trained [9].

Facial Feature	Positve Hit Rate	Negative Hit Rate
Eyes	93%	23%
Nose	100%	29%
Mouth	67%	28%

Table 3. Accuracy of classifiers [9].

V. LIMITATION

To achieve more specific result we need to consider more parameters, but if we increased no of parameters record set will be much longer.

VI. CONCLUSIONS AND FUTURE WORKS

The body measurement system for tailor made cloths will be used to choose appropriate sized clothes or outfits. This will help the users to lessen delicate occurrence in today's demanding world for measurements of individual body parameters by using HAAR feature. The clothing's will be sewed as per their respective outfits are based upon various bodily parameters like height, waist, bust, body built, neck, shoulder etc.

Our idea is to extract body parameters from the image, it can be extended further to wear different outfits on the image. It is also possible to extend further in details to put on different things like ornaments, footwear, handbags etc.

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