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Virtual Dressing Room

Devansh Gupta[1], Bhasker Kapoor[2]

[1]*Devansh Gupta Information Technology & Maharaja Agrasen Institute of Technology*
[2]*Bhasker Kapoor Information Technology & Maharaja Agrasen Institute of Technology*

Abstract - There are many e-commerce portals for other shopping needs, but there are very few for school products, but they do not fulfil all the needs of an individual. People have to go to the shop to buy uniforms and wait for the assistant to help them. After picking the piece, they can try the piece. This takes time and effort from both the assistant and customer, and due to COVID-19, people will stop trying products in trial rooms. This will reduce the traffic at shops and vendors will suffer a great loss. Motivation here is to save time for consumer and increase profits for vendor also to make the process of changing clothes a lot easier by making Virtual dressing room app which will be beneficial for both vendor and consumer. In this paper we propose an approach that can be implemented with the help of webcam which can be easily found on today's laptops and smartphones. It will capture the human body image and then it will separate it from the background image then user will select the product they want to wear then that product image will be superimposed on the human body image taken from the camera which was separated from the background. Finally, the user will see the superimposed image of cloth on their body. In this approach the problem can occur at the accuracy of the model as it can result into less accurate sizes due the camera quality of the camera which the user is using. The project is implemented using OpenCV library of python for object detection.

Keywords: Virtual Dressing, haarcascade, AdaBoost, ROI, CMS, OpenCV, Adaboost

1.INTRODUCTION *(Size 11, Times New roman)*

As we all know, 2020 is a pandemic year due to COVID-19 people are now shifting to online shopping. [A] VIRTUAL DRESSING ROOM integrated on an e-commerce web portal with a content management system that would allow users to try uniform online and know his/her best fit is the need of the hour. Information about products is updated securely using a mobile device. Virtual dressing room is developed not only to make online shopping easier but it also makes trying clothes for women a lot easier as they don't have to worry about the two-way mirror or CCTV camera in trial room and try clothes without any hesitation with ease at their home only. VDR eliminates the issue of unsafe trial of clothes in trial room and provides full trial room experience at home.

The web portal consists of an online interface in the form of an e-commerce website that allows users to buy the complete range of school products they need during school life. Local uniform and school products vendors can showcase their products on the portal. This helps both the vendor and customer as many customers are comfortable with only specific vendors and the quality of the product they provide. [1]

[A]Virtual Dressing Room can be used as a separate app and can be integrated with any website. It increases the shopping experience of customers to a greater extent. It assists the buyers in visualizing themselves while trying a variety of clothes. It gives a clearer idea of the customer's apparel to provide better customer satisfaction. It can benefit both the customers and retailers. [2]

[A]The project is divided into the following separate components

- The Virtual Dressing Room Module
- The content management system (CMS)
- The e-commerce portal
- The product merchant and customer database
- Reporting of the sales, orders, shipments, etc
- The online transaction security system
- The data security system

[B]In earlier models of VDR it is implemented in many ways. Earlier approach was to take the measurements from the user and make a 3d model of it and then map the 2d product on the 3d model which will then give the final figure of superimposed product on the user body and other approach was implemented using Kinect installed in kiosk but it was not possible at home and kiosks are not affordable for many businesses also due to discontinuation of Kinect it is an obsolete approach.

[B]Consequently Section 2 contains the overview of the VDR. Methodology is given in section 3. Each & every hardware and software resources required for VDR is presented in section 4. Implementation results with algorithm and code are given in section 5. Contribution to the society is shown in section 6. Finally, section 7 contains Conclusion

2. Overview of Virtual Dressing Room

Trying clothes in stores is a very tedious process for everyone with a Virtual Dressing Room. This problem can be solved very easily. It provides the user with a complete experience of the trial room or changing room. [3][B]By staying at home, they can try each and every clothes without any hassle. This application provides especially to females is that they do not have to enter a changing room that may be exploited by some assistants in peeping (or other criminal acts). [C]Finally, this application results in our benefitting the great capacity provided by the science of the interaction between man and computer and setting up the baseline for the foundation for its future development to be used in other beneficial services and systems. [4]

3. Methodology

[D]It is an augmented reality dressing room where the user's image is captured by the camera and given as input. With the help of an OpenCV, we can detect the face and body and scan the video to detect the human faces to mask the product images. A masked image is then superimposed, and the user can see the pictures of the dresses on themselves, and then the actual size of the user is compared with the selected size of the garment, and the correct size of garment is suggested. The application approach is to replace the body image with garment mesh surface through garment image, based on the points taken from the front view. [5]

It is implemented in python. For face and body detection, OpenCV is used to use a haar cascade machine learning algorithm. The front end of the application is implemented using a flask, a web framework written in python. It has no database abstraction. [6]

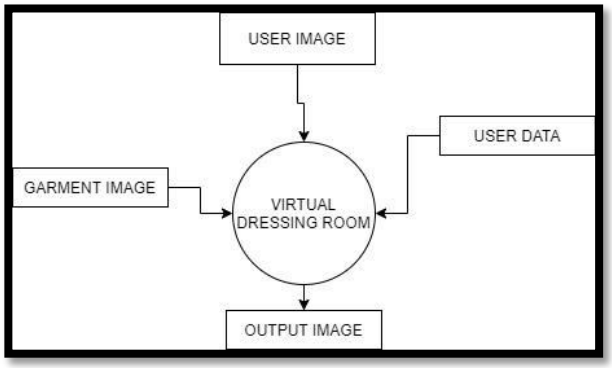


Fig -1: Schematic Diagram of VDR

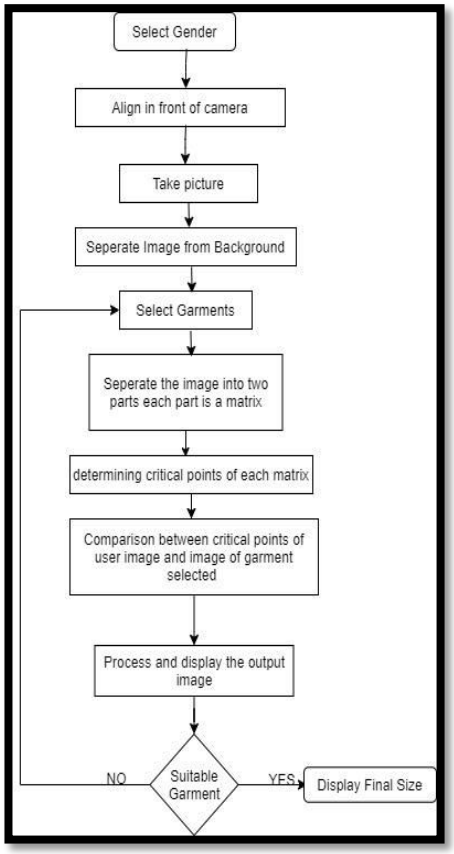


Fig. 2 Process Flow Diagram

4. Resources needed for virtual dressing room

4.1. Software

For the Virtual Dressing Room programming framework, python and flask are used, and OPEN CV is used for facial and body recognition. Haar Cascade Datasets are used to train the model

For Ecommerce Portal ReactJS is used for building user interfaces HTML, CSS, BOOTSTRAP 4 is used for frontend Mongo DB is used for backend

4.2. Hardware

For Virtual Dressing Room, a camera/webcam is required to capture the image, and Kinect is optional to detect the human body motion.

5. Results

5.1. Code

There is one python file, main.py, which contains the following:

OpenCV - Python library for image detection and processing. [7]

Flask - Micro web framework is written in python.

5.2. Algorithm

Haar cascade machine learning algorithm is used for facial and body detection. [8]

Code implemented for detection of face and pasting shirt and trouser on the user Body.

[E]OpenCV contains the trainer and also the detector. We can use OpenCV for training any classifier object like planes, cars, etc.

To deal with detection. Many skilled categories are present in OpenCV for various body parts and expressions. These categories are present in the form of xml files which are generally found in OpenCV/DATA/haarcascades/ path.

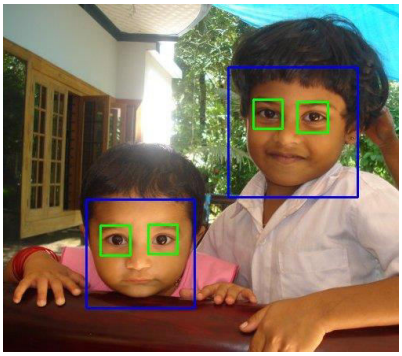
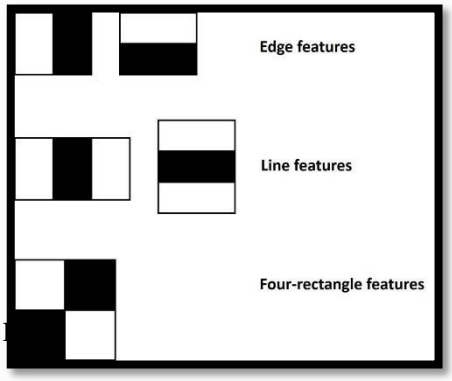


Fig. 3 Snapshot Image after Processing

[E]The XML files stored in OpenCV/data/haarcascades/ helps in the detection of human parts and expressions, a beneficial object detection method which is coined by Michael Jones and Paul Viola in their paper, "Rapid Object Detection using a Boosted Cascade of Simple Features" in 2001. Many images that can be positive or negative are used to train the cascade function with machine learning, which is further used in object detection in other images.

[E]We used face detection here. Many relevant (images of faces) and irrelevant (images without faces) images are used to teach the classifier. Exact information or correct detection is then extracted from it with the help of XML files or haar features, just like the convolutional kernel. The data obtained by extraction is found by subtracting all the pixels found under white figure from the sum of all the pixels found under black figure as shown below in fig 4.



[E]By locating all kernels' sizes and locations, they are used to calculate enormous features useful in detecting the human face. Take an example of a 24*24 window. It results in 160000 calculations. To calculate each feature, sum of all the pixels under white and black figures is found out. This is a very long process, so they founded integral images, which easily calculates the sum of pixels, the number of pixels, to any function using four pixels. This makes things fast.

[E]After all the information is extracted using haar-based features, most of it is useless. As shown in fig 5, it contains two significant features in the top row. By analyzing the first feature, we compared the region of eyes, nose& cheeks. We found out that the region of eyes is darker than the nose and cheeks region & By analyzing the second feature region of eyes looked darker than the region of the nose's bridge. Applying the same window on the cheeks or any other place is irrelevant. The question arises here how to select the best features out of 160000+ features? Adaboost achieves it.

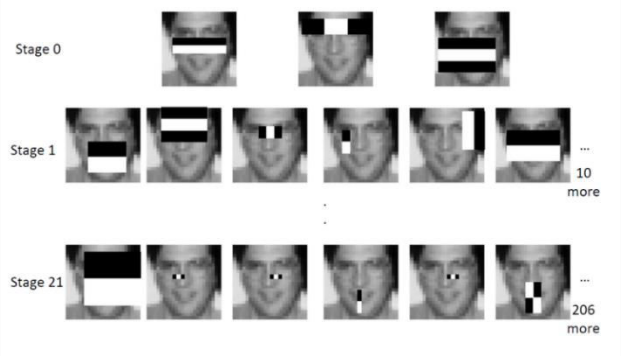


Fig. 5 Snapshot of detection using HaarCascades & Adaboost

[E]To achieve this objective, all the features are applied to all the training images. The aim is to find the threshold for every feature, and accordingly, two categories are made.

The images are segregated among positive and negative images. In this classification, there is a chance of error due to misclassifications. To minimize the error rate, the features with the minimum error are selected. The choice is made such that the selected feature is able to classify among the face and non-face images in the best way possible.

[E]By adding all the weak classifiers, we get the weighted final classifier to be weak. Weak classifiers are not able to classify among the images in comparison to other classifiers. That's why they are considered to be weak. 95% accuracy is achieved with 200 features. The final setup by them had around six thousand plus features.

For the image classification, a window of 24x24 is considered, and six thousand features are applied to it to recognize whether that image has a face or not.

[E]Using this approach, as a result, there will be more non-face regions than the face region in an image. It would be a better approach for checking whether the window is a non-face region. The image is neglected if it's not, and no further processing will be done on it. Using this approach, we want to focus on the region where the face can be present. Moreover, this approach buys more time to analyze the presence of the face region.

To make the task of classification more simpler, the grouping of features is done and applied to the different stages of classifiers one after another. In this optimization, instead of applying all the six thousand features on each window, the grouping of features, which is done, has introduced the concept of Cascade of Classifiers. If there arises a case in which the window fails during the first stage, in that scenario, that window can be discarded, and the remaining features are not further considered, which are there on the image. If that's not the case, that means the window passes, then it proceeds to put in the next that is the next stage of features, and thus the process continues. The window which can pass all the stages is considered to be a face region.

Authors' detector is made up of more than six thousand plus features having thirty-eight stages with 1, 10, 25, 25, and 50 features during the first five stages.

5.3 RESULTS

Fig. 6 Snapshot of Virtual dressing

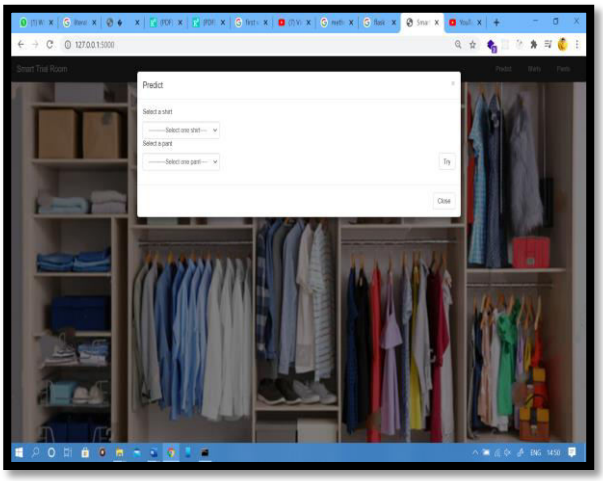


Fig. 7 Snapshot of Virtual dressing taking input from a user

Fig. 8 Snapshot of Final Output

6.Contribution to society

6.1 Desirable Store Management

By using the virtual dressing room, the usage of the trail rooms can be reduced, which ultimately leads to lower inventory damage. The virtual Dressing room also provides a free and easy option of trying as many dresses and without any restriction. As the experience is virtual, so it takes less time to swap between the dresses and choose the best option.

This will provide a better experience to the customer at the comfort of their home. [10]

6.2 Surge in Sales

[F]With the usage of Augmented reality shopping, this virtual dressing room is equipped to provide the customer with a comfortable, easy-going experience of a Virtual Trial Room. By using the VDR frequently, the complete experience of shopping is more satisfying to the customer, and it also turns out to be a profitable business option with better customer retention ability, which will ultimately lead to more significant sales.

The VDR makes it possible to have a better engagement of the Client, which leads to better returns as an outcome of efforts made for marketing. This virtual dressing room opens the door of endless possibilities for interactivity in the coming generations among the consumers, as it gives an unprecedented experience to them without any hassle, in their comfort zone. This would also allow them to experiment more with the available products and brands in the market. [11]

7. Conclusion

[G] VDR that realistically reflects the garments' look and feel suggests the best fit for the customer is implemented. After applying the suggested approach VDR can give accurate results of size prediction and look and feel of products on the use without any hassle and with ease at home. The customer can carry out the process of trying the clothing fast and efficiently, and then selecting the best for them. The application can act as an independent application and can be integrated on any platform and can also act as a start-up. The application integrated on a web portal helps the customer buy any garment hassle-free. Finally, this feature results in our benefitting the great capacity provided by the science of the interaction between man and computer, and setting up the baseline for the foundation for its future development to be used in other beneficial services and systems. [12]

This model provides the following features:

- User can try clothes online at home
- User can manage clothes online
- User can find their size online
- User can order clothes hassle-free
- It will help vendors to reduce the returns
- It will enhance the e-commerce business

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