WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Next-Generation Online Retail: A Dynamic Virtual Fitting Room for Clothing

Shreyas Rao T S

JAIN (Deemed-to-be University)

ABSTRACT :

In the realm of online shopping, many individuals hesitate when it comes to purchasing wearable items like clothing and accessories due to the challenge of gauging whether the products will suit them. To overcome this hurdle, we've developed an innovative Online Trial Room Application. Our method involves capturing a user's video via their device camera, segmenting it into frames, isolating the user's body from these frames, and employing algorithms to analyze the positioning of body joints. This enables us to dynamically adjust, rotate, and resize images of the wearables in real-time, ensuring an accurate fit for the user. Throughout our research, we've explored various methods to achieve this objective, each presenting its own set of advantages and disadvantages. Our implementation utilizes Flask Web application with OpenCV, a Python Module, making it compatible with devices equipped with an integrated or attached camera, an internet connection, and a web browser.

Introduction :

Even if technology is becoming more widely available and people are busier than ever, many still place a high value on keeping one's look. This frequently entails setting aside time to buy for specific clothing and other items in order to curate and enhance one's wardrobe. Online shopping provides a quicker option to putting on items in person, but it has significant disadvantages as well. For example, it might be challenging to visualize how a garment would look on oneself due to variations in body shape, size, hair color, and skin tone. Using multi-view systems for fabric tracking and retexturing, researchers have been investigating garment-trying simulation in recent years. One popular technique in this regard is optical flow.

While shopping for clothes is generally a pleasurable experience for many, the hassle of trying on numerous items in cramped fitting rooms can be a deterrent. The Augmented Reality Fashion Display seeks to enhance this process by eliminating the need for physical try-ons. By employing real-time augmented reality technology, this innovative product can swiftly identify individuals and virtually showcase clothing and accessories, including watches, on them.

By leveraging technology, we aim to transform the shopping journey by empowering users to visualize clothing items in real-time. Our objective is to enhance efficiency by reducing wait times and eliminating the inconvenience of trying on previously worn garments. This innovative technology holds promise beyond retail, with potential applications in fashion design. Designers can utilize virtual models to showcase prototype designs and initial concept art, facilitating testing and refinement before investing in physical materials and resources

Literature survey :

[1] In many video-based computer vision applications, identifying moving objects is an essential first step. Background subtraction is then frequently used to differentiate the foreground from the background. The objective is to apply these techniques to real-world applications like traffic surveillance, even though there is a plethora of literature on background removal and many mathematics and machine learning models being created to meet the issues found in videos. Nonetheless, there is frequently a disconnect between the techniques employed in basic research and practical applications, and the extensive datasets utilized for assessment could not encompass all the difficulties faced in real-world scenarios. As a result, our goal is to perform an extensive analysis of real-world applications that have employed background subtraction, identifying the difficulties associated with cameras, foreground items, and environments, as well as analysing the background models that are currently in use. This will aid in the identification of viable new background models that are reliable, efficient in terms of memory and processing time, and appropriate for real-world applications.

Limitations: There may be factors involved than the clothing.

[2] Virtual fitting could provide customers with a quick and easy fitting experience. Virtual fitting systems' efficacy is contingent upon their capacity to tackle two crucial obstacles: garment simulation and human-computer interaction. A positive user experience depends on the user and the system interacting, and earlier virtual fitting systems frequently relied on mouse and keyboard input, which led to subpar substitute and interaction. Low accuracy has been the outcome of earlier attempts to gather user photos and perform posture recognition using numerous cameras. We propose a real-

time interactive virtual fitting system that utilizes the Microsoft Kinect motion sensing device, an image transfer technique that matches skeleton information, and a gesture determination algorithm that recognizes fingers in order to address this problem. This strategy improves and deepens the client experience. We have created a motion-sensing capture module and a full real-time virtual fitting system by utilizing the OpenAI programming library and multi-threading technology. Both of these systems have undergone successful user experience testing.

Limitations: There may be factors involved than attire.

[3] Because it can be challenging to judge how wearable items like jewellery or clothes will look on an individual, online customers frequently hesitate to make these kinds of purchases. In order to address this issue, we have created an Online Trial Room Application that uses the user's device camera to record a video, splits the frames to extract the user's body, and uses joint placement data to modify wearable graphics in real-time onto the user. In order to accomplish this, we have reviewed a wide range of strategies and tactics in detail, emphasizing the benefits and limitations of each. The project, which can be used on devices having a camera, internet connection, and web browser, was created using the Flask Web application and the OpenCV Python Module.

Limitations: Factors other than the clothes can be included

[4] By superimposing digital data on our physical environment, augmented reality technology improves it. With the use of cameras or other sensors, this technology enhances real-time viewing with a digital element. The main goal of this project is to employ augmented reality to build a virtual trial area where consumers may virtually try on clothing. In order to analyse how the garments will seem on the user, the Kinect sensor is used to measure the distance between the sensor and the person. This application offers a full 3D perspective of the image instead of just a 2D view, which enhances the existing augmented-based posing technique.

Limitations: Factors other than the clothes can be included

[5] Time is a valuable resource in the fast-paced world of today, and buying clothes may be a difficult and time-consuming procedure. A virtual fitting platform was created to solve this problem and provide a sophisticated approach for buying clothes online. Both the merchant and the client need to put in less time and effort thanks to this platform. By using a picture of the user, the system creates a virtual changing room where customers may try on various costume designs and see how the item looks on their own body in real time. This project's objective was to develop a desktop program that offers accurate and dependable virtual try-on services, thereby enabling the creation of an engaging, interactive, and extremely realistic shopping experience. Customers can assess the appropriateness of apparel with realistic behaviour and details thanks to this approach.

Limitations: There may be factors involved than the clothing.

Problems in Existing System :

The existing method of shopping for apparel and other commodities necessitates in-person interaction, and trying on numerous items can be tedious and disappointing. Furthermore, dimensions and physical looks are frequently required in the fashion industry.

and making sure each person is properly fitted might be difficult. But Lenskart has successfully included an augmented reality function that allows users to test on goggles and glasses. Overcoming problems pertaining to individual sizes and appearances takes a lot of work in other areas of the fashion business.

Drawbacks of the current setup:

1. Wasting of time
2. Tough clothing to manage.
3. It's challenging to select among options.
4. It's challenging to offer a private trial space.
5. It costs more to operate.

Proposed system :

We are developing this project in Python and structuring it into distinct modules:

1. Data Collection: We're using the camera to collect a dataset comprising images containing various body parts and non-body parts, including eyes, noses, faces, and necks.

2. Data Preprocessing: Within this module, we resize the dataset images to a standardized size of 100x100 pixels using OpenCV. Additionally, we leverage OpenCV to convert the images from RGB to grayscale, enhancing the accuracy of body part identification.

Pseudo code:

```
ret, img = cam.read()
gray = cv2.cvtColor(img, cv2.COLORB GR2GRAY )
faces = detector.detectMultiScale(gray, 1.3, 5)
for (x,y,w,h) in faces:
cv2.rectangle(img,(x,y),(x+w,y+h),(255,0,0),2)
incrementing sample number
sampleNum=sampleNum+1
display the frame
cv2.imshow('frame',img)
```

3. Model Construction: In this phase, we employ the Haar Cascade classifier to construct and refine our predictive models. Initially, our focus is on identifying the body parts of the human target accurately and aligning items accordingly. For body part detection, we rely on the Haar Cascade dataset, which comprises features crucial for object detection, including line features, rectangular features, and edge features. These features are evaluated using integral images, enabling efficient computation akin to convolutional kernels, essential for object detection.

To enhance accuracy, we leverage the AdaBoost algorithm, which selects optimal feature values while discarding irrelevant ones. This strategic selection process ensures that Haar features effectively differentiate between objects of interest and non-interest in the image, ultimately improving the precision of our object detection system.

Pseudo code:

```
Procedure Building models()
Input: cleaned data
Output: pre-trained model
Step 1: Read the dataset using cv2
Step 2: Extract the face features
Step 3: convert into a numerical array
Step 4: Build model
Step 5: Train the model using data
Step 6: Save the pre-train model
```

4. Virtual Trial Room: Within this module, we capture input from the camera and employ the Haar Cascade classifier to identify individuals. Subsequently, we map their body parts to appropriately fit clothing items.

Pseudo code:

```
Input: camera frame and pre-trained model
Output: mapping to the body
Step 1: Read the frame
Step 2: Load the pre-train model
Step 3: detect the body parts
Step 4: read the matching clothes
Step 5: map the cloth features with the body features
Step 6: Display the virtual mirror
```

Algorithm :

The process of training a Haar Cascade Classifier for face detection involves several steps. Firstly, a substantial collection of positive images (images containing faces) and negative images (images without faces) is gathered. Then, Haar features are extracted from these images. These features, akin to convolutional kernels, are represented by a single value obtained from the difference between the sums of pixels in designated black and white rectangles. The algorithm explores various sizes and positions of these kernels, resulting in a vast number of features to compute, even for a modest window size like 24x24, amounting to over 160,000 features.

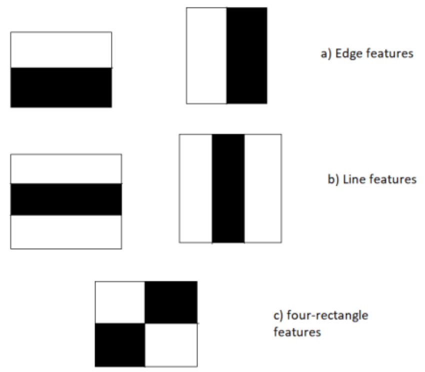

Fig. 1. haar cascade classifier

To efficiently compute the sums of pixels in the black and white rectangles for each feature, integral images are utilized. Integral images simplify this calculation by reducing it to a calculation involving only four pixels, greatly expediting the process. Despite computing numerous features, many of them are not useful for classification purposes.

The selection of optimal thresholds for distinguishing faces as positive and non-faces as negative is crucial. Even after this selection process, there may still be errors or misclassifications. The algorithm addresses this by iteratively adjusting the weights assigned to each image based on its classification accuracy. This process continues until the desired level of accuracy or error rate is achieved, or until the required number of features is discovered.

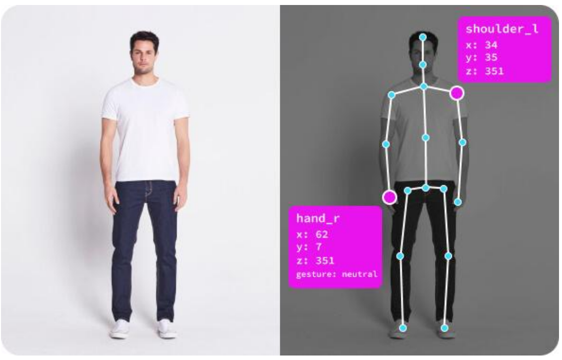

Fig. 1. haar cascade classifier for human body

The final classifier is a combination of weak classifiers, each contributing to the final decision through a weight value. Although individual weak classifiers may not be highly accurate, the weighted sum of all classifiers results in a robust classifier. Researchers have found that using a subset of only 200 features can achieve a 95% detection rate accuracy. In their implementation, they utilized around 6000 features, demonstrating a significant gain achieved by reducing the number of features from over 160,000 to 6,000.

Architecture :

A data-flow diagram (DFD) is a visual representation that illustrates the movement of data within a system or process, typically within an information system. It provides insight into the inputs and outputs of each entity, including the process itself. Unlike flowcharts, DFDs do not include control flow, such as decision-making rules or loops.

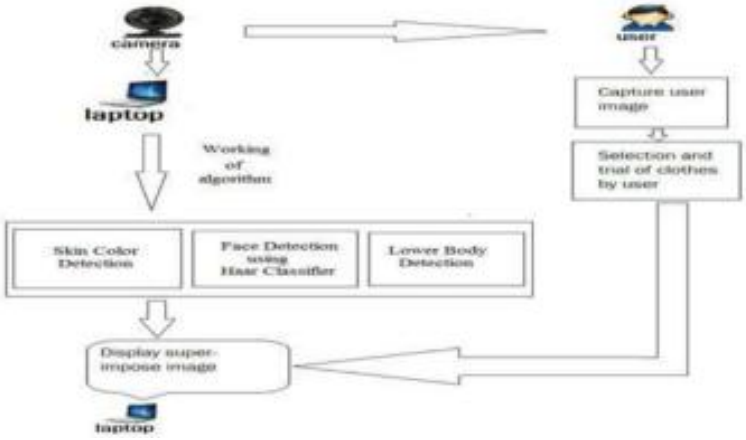

Fig. 3. System Architecture

While flowcharts focus on depicting specific data operations, DFDs are part of structured analysis and data modeling, used specifically to showcase how data flows through a system or process. In Unified Modeling Language (UML), activity diagrams often replace DFDs to represent the flow of activities within a system.

Furthermore, a site-oriented data-flow diagram is a distinct variant of a DFD, tailored to represent data flow in a specific site or context.

Conclusion :

In conclusion, the virtual try-on system offers a seamless experience for users to explore clothing options from a database based on their positioning and measurements. Through intuitive navigation using hand gestures on the graphical user interface (GUI), users can conveniently select apparel from various categories, eliminating any inconvenience in the virtual clothing selection process.

Furthermore, the system provides essential details such as clothing sizes (S, M, L, XL), prices, and product descriptions for each selected category, enhancing the overall user experience and facilitating informed decision-making.

The virtual dressing room application requires only a front-facing image, and the 2D graphics of the clothing products are practical and satisfactory for various purposes. The methodology for aligning models with users and testing under various conditions has been presented, yielding acceptable performance rates for regular postures.

Several potential implementations have been suggested to enhance the system further. These include utilizing homographic transformation for aligning multiple joints simultaneously, capturing multiple images from different angles to create more realistic video streams, or rendering 3D models based on current positions and angles, possibly incorporating a physics engine for added realism.

Overall, the virtual try-on system offers a promising solution for virtual clothing selection, providing users with a convenient and immersive experience while exploring clothing options.

REFERENCES:

1. Narit Hnoohom, Pitchaya Chotivatunyu, Nagorn Maitrichit, Virach Sornlertlamvanich. "Enhanced Background Subtraction Techniques for Monocular Video Applications" (2022)
2. Ying Wu, Hongbing Liu, Pengzhen Lu, Lihua Zhang, FangjianYuan. "Virtual Fitting Room based on Gesture Recognition And Clothing Transfer algorithm" (2022)
3. Amit Thakur, Suraj Virkar, Prof. Jyoti Gaikwad. "Virtual Trial Room Using OpenCV" (2020)
4. Akshay Shirsat, Samruddhi Sonimindia, Sushmita Patil, Nikita Kotecha, Prof Shweta Koparde. "Virtual Trial Room" (2019)
5. Vishruti Patel, Varsha Satpute, Shivani Kuhikar, Sayad Ahmed. "Simulation and Visualization of Virtual Trial Room" (2018)
6. Kshitij Shah, Mridul Pandey, Sharvesh Patki, Radha Shankarmani. "A Virtual Trial Room using Pose Estimation and Homography" (2020)
7. Deepthi Prakash, Sourav Ghosh Jay Vishaal J, Mrs. S. Angel Deborah, Mr. K. R. Sarath Chandran. "Virtual Fashion Mirror" (2021)
8. Syed Sanzam, Sourav Govinda Das, Sifat-Ul-Alam, Mohammad Imrul Jubair, Md. Faisal Ahmed. "Image-to-Image Attire Transfer for Virtual Trial Room" (2020)
9. Ahmad al-Qerem. "Virtual Dressing Room Implementation virtual trail room — 2023 Using Body Image-Cloth Mapping" (2016)
10. Xintong Han, Zuxuan Wu, Zhe Wu, Ruichi Yu, Larry S. Davis. "VITON: An Image-based Virtual Tryon Network" (2018). Available:

https://arxiv.org/pdf/1711.08447.pdf

11. Anna Watson, Bethan Alexander, Leyla Salavati. "The Impact Of Experiential Augmented Reality Applications On Fashion Purchase Intention", International Journal Of Retail Distribution Management (2018)
12. "Statista Research Department. U.S.Apparel Market – Statistics Facts". Available: https://www.statista.com/topics/965/apparel-market-inthe-us/ (Accessed: 2020-02-01)
13. "Americans spend two hours less a month on shopping than they did 15 years ago". Available: https://qz.com/1677747/americans-are-spending-wayless-time-shopping/ (Accessed: 2020-02-03)
14. http://glamstorm.com/en/fittingroom/clothes
15. http://www.metail.com
16. Jaychand Upadhyay, Divya Shukla, Nidhi Patel, Sheetal Nangare. "Virtual Trial Dressing" technology: International Journal of Innovative Research in Computer ISSN Online(2320-9801) Print (2320-9798)
17. Ari Kusumaningsih, Arik Kurniawati, Cucun Very Angkoso, Eko Mulyanto Yuniarno, Mochammad Hariadi. "User experience measurement on virtual dressing room of Madura Batik clothes" (2017 IEEE)
18. ShreyaKamani, Neel Vasa, Kriti Srivastava. "Virtual trial room using augmented reality", International Journal of Advanced Computer Technology (IJACT), Vol. 3/6, Dec. 2014, pp. 98-102
19. Nikki Singh, Sagar Murade, Prem Lone, Vikas Mulaje. "Virtual Trial Room" Vishwakarma Journal of Engineering Research, Volume 1 Issue 4, December 2017
20. Cecilia Garcia Martin, Erdal Oruklu. "Human Friendly Interface Design for Virtual Fitting Room Applications on Android Based Mobile Devices", Journal of Signal and Information Processing, Vol. 3/4, 2012, pp. 481-49