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Virtual Trailroom Using Machine Learning

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Abstract
The virtual trail room system receives a real-time video feed from a camera and processes data with the OpenCV computer vision library and Haarcascade classifier. In order to correctly identify faces in the video feed, the Haarcascade classifier is trained on a sizable dataset of human faces. OpenCV's computer vision algorithms then extract attributes from the discovered faces and follow the faces movements in real time. The Dlib, which offers a secure and scalable method for storing and retrieving massive volumes of data, is used to store the information gathered in a database. This makes it possible for the system's data to be managed and analysed effectively. The virtual trail room system can be set up to provide notifications in the event of unexpected movement patterns or behaviour, enabling proactive intervention and enhancing security. This makes it perfect for usage in a range of environments, including office buildings, public areas, and retail outlets, where real-time tracking and monitoring of people is necessary to maintain safety and security. The virtual trail room system's affordability is one of its main advantages. The virtual room system may function independently, which eliminates the need for additional employees and associated expenditures, in contrast to typical security systems that demand the presence of physical security officers. The system is also quite effective at tracking and monitoring people in real time, which is crucial for maintaining the safety and security of the building.

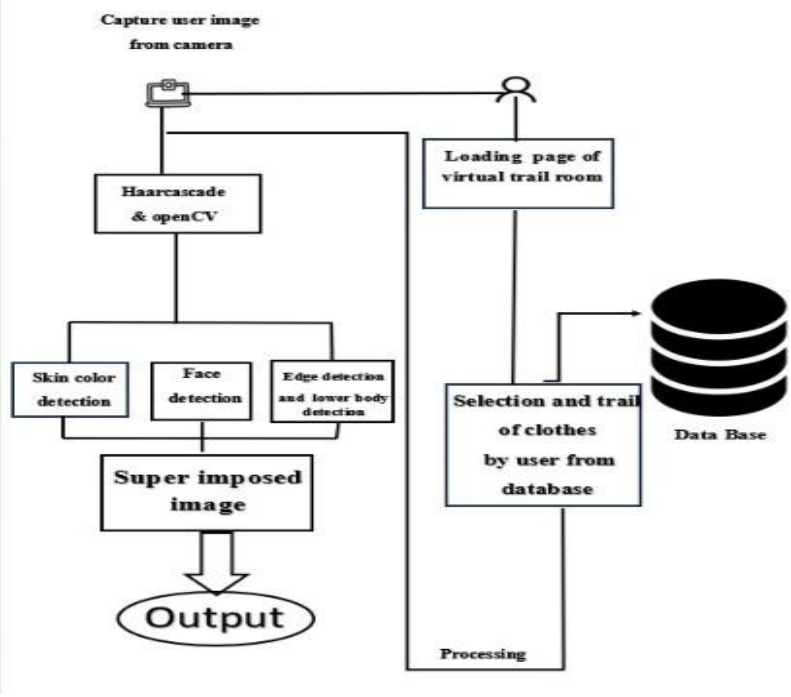
Keywords: Virtual trail room system, Computer vision, Haarcascade classifier, Dlib, Real-time tracking.

1. Introduction

The need for effective security solutions that can be utilised to keep an eye on public areas, shops, and office buildings is growing in the modern world. In response to the demand for real-time face identification and tracking systems, the Virtual Trail Room project was created. Modern computer vision methods, such the Haarcascade classifier and OpenCV, are used by this system to recognise and track human faces in real-time. The Haarcascade classifier is a machine learning-based method that can recognise faces in real-time video feeds after being trained on a sizable dataset of human faces. For image and video processing, the OpenCV library, on the other hand, offers a complete collection of computer vision techniques, including face detection, tracking, and feature extraction. The Virtual Trail Room system uses the Dlib to store the information gathered in a database in addition to real-time face

identification and tracking. In order to track people over time and identify anomalous behaviour or movement patterns, this offers a secure and scalable option for storing and retrieving massive amounts of data. Without the use of physical security officers, the Virtual Trail Room system provides a novel way to monitor and track people in public areas, shops, and office buildings in real-time. It offers a cost-effective and effective substitute for conventional security measures and has the power to completely shift the way we think about security in public areas.

2. Methodology



As shown in the above Figure, Virtual Trail room is a cutting-edge platform that allows users to try on virtual outfits from the comfort of their own homes. The user journey begins on the landing page, where they can browse through the extensive database of available outfits. Once the user selects an outfit, the platform uses advanced computer vision techniques to process both the user's image and the selected outfit. The platform utilizes several features to ensure that the virtual outfit appears as realistic as possible. These features include skin colour detection, which ensures that the outfit's colours are properly adjusted to match the user's skin tone, and facial detection, which allows the platform to accurately position the outfit on the user's body. Additionally, the platform uses edge detection to accurately separate the user from the background and superimpose the outfit onto the user's image seamlessly. The result is a realistic virtual try-on experience that provides users with a clear and accurate representation of how the outfit would look on them. Once the image processing is complete, the platform provides users with a live feed video output that allows them to see themselves in the virtual outfit in real-time. This output can be adjusted to ensure that the user has a clear view of themselves in the outfit and can evaluate how it looks from all angles. In conclusion, Virtual Trail Room offers a seamless and innovative virtual try-on experience that enables users to try on outfits without leaving their homes. By utilizing advanced computer vision techniques, the platform provides users with a realistic and accurate representation of how the outfit would look on them, helping them make informed purchase decisions.

3. Algorithm

Haarcascade Classifier

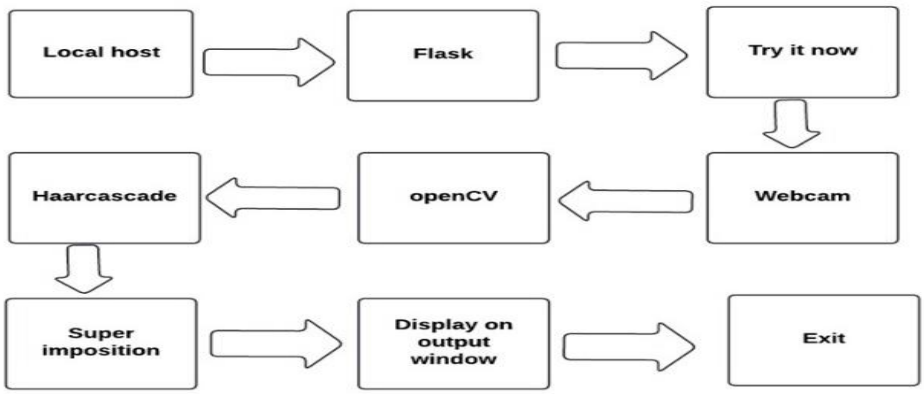
Haarcascade Classifier is a machine learning-based approach used for object detection in images and videos. It uses a set of pre-trained classifiers to detect features such as edges, comers, and lines in images. It is widely used in facial recognition and other computer vision tasks.

The Haar Cascade algorithm of the Virtual Trail Room system involves the following steps:

1. Load the Haar Cascade classifier XML file into the program.
2. Load the input image into the program.
3. Convert the input image to grayscale.
4. For each scale of the image pyramid (from the smallest to the largest)
5. Create a sliding window that scans across the image.
6. For each window position, extract a rectangular sub-image.
7. Resize the sub-image to the size required by the Haar Cascade classifier.
8. Apply the Haar Cascade classifier to the sub-image to detect faces.
9. If a face is detected, mark the window with a bounding box.
10. Display the input image with the bounding boxes drawn around the detected faces.

Overall, the algorithm of the Virtual Trail Room system utilizes cutting-edge computer vision techniques and secure data storage to provide real-time tracking and monitoring of people for enhanced safety and security in various environments.

4. UML Diagrams



DATA FLOW DIAGRAM

1. **Landing Page**: User lands on the Virtual Trail Room website.
2. **Browse Outfits**: User browses the extensive database of available outfits.
3. **Select Outfit**: User selects an outfit they are interested in trying on
4. **Image Processing**: Platform uses advanced computer vision techniques to process the user's image and the selected outfit
5. **Skin Color Detection**: Platform detects the user's skin tone and adjusts the outfit's colors accordingly
6. **Facial Detection**: Platform accurately positions the outfit on the user's body
7. **Edge Detection**: Platform separates the user from the background and superimposes the outfit onto the user's image seamlessly

8. **Live Video Feed**: Platform provides users with a live feed video output that allows them to see themselves in the virtual outfit in real-time
9. **Try-On**: User experiences a realistic representation of how the outfit would look.

5. Steps to Implement the project

5.1 Install any Python Environment or IDE

Install any Python Environment or IDE such as Anaconda, Vs code, PyCharm.

5.2 Install required packages

Open the command prompt or terminal and enter the following commands one by one:

pip install cmake
pip install dlib
pip install flask
pip install imutils
pip install open-cv python
pip install pillow

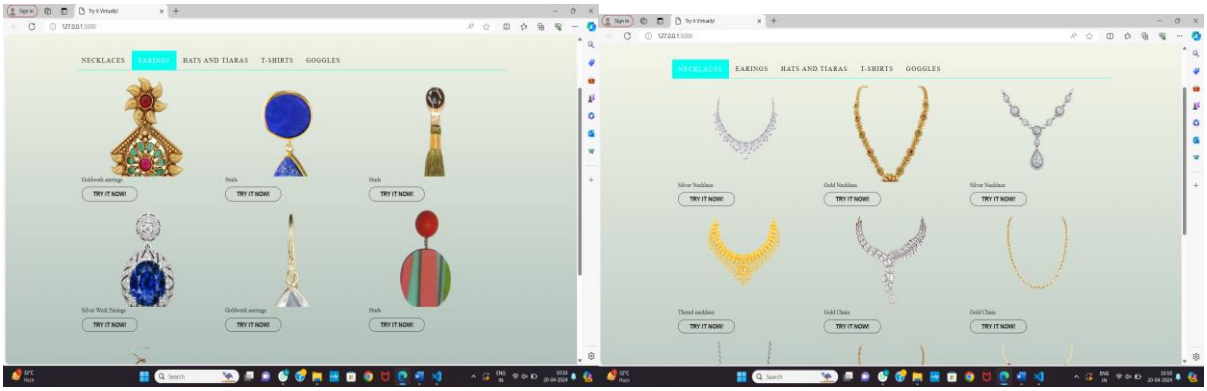
5.3 Run the project

1.After installing all the required packages and import all the files, then run the following command in the command prompt or terminal:

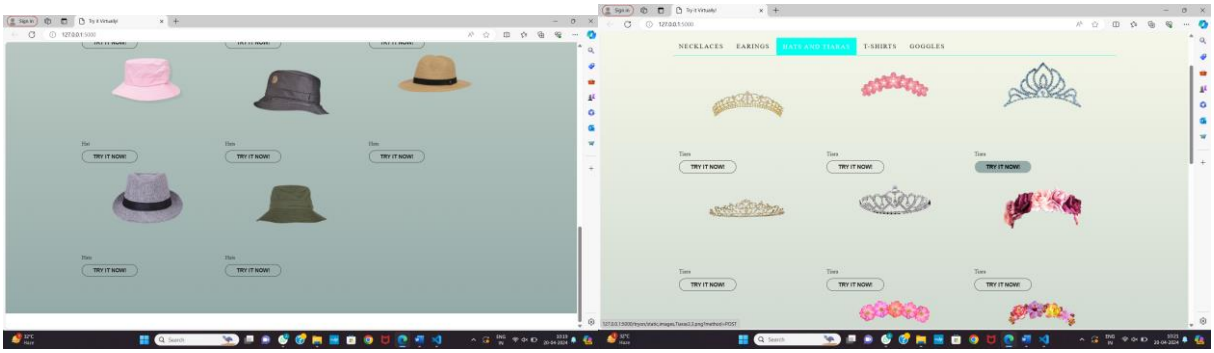
Python main.py

2. Once the run process is successful, click on the URL provided in the console output to access the project in your default web browser.

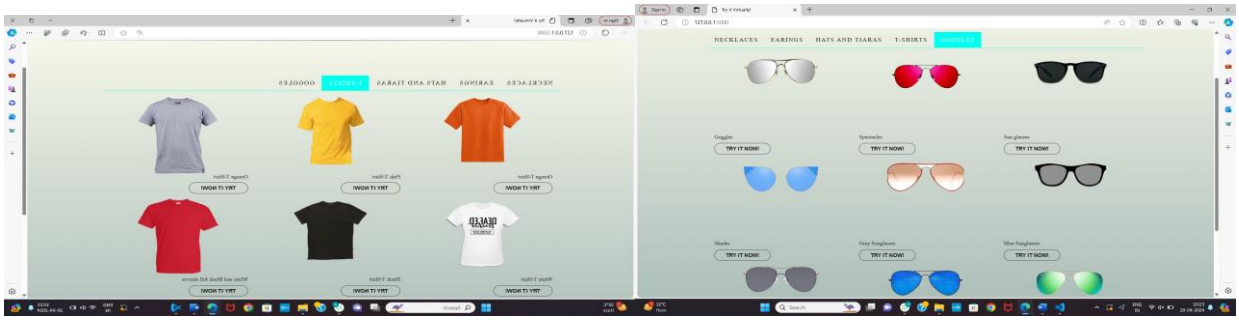
6. Input Images



EARINGS **NECKLACES**

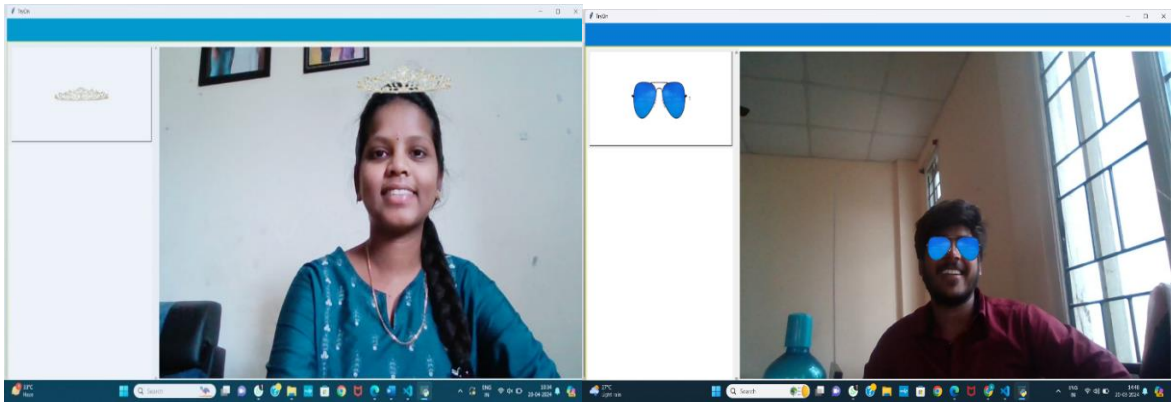


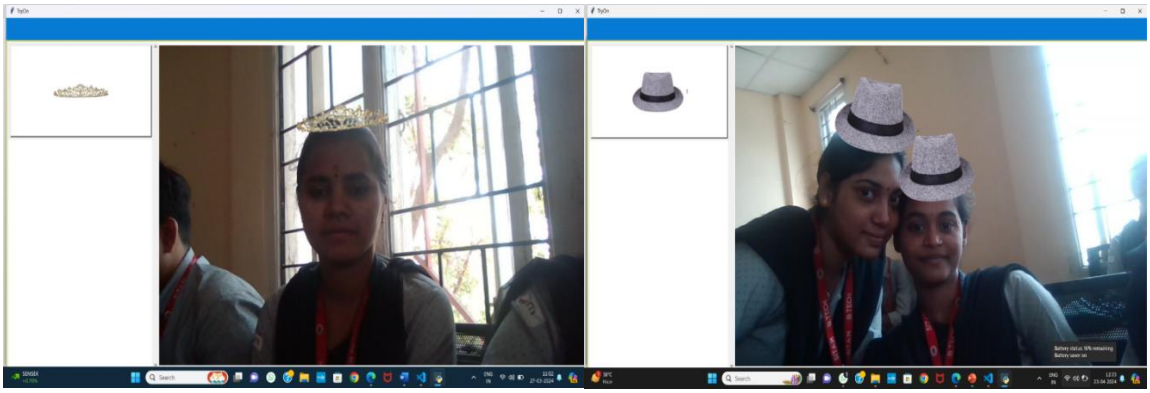
HATS **CROWNS**

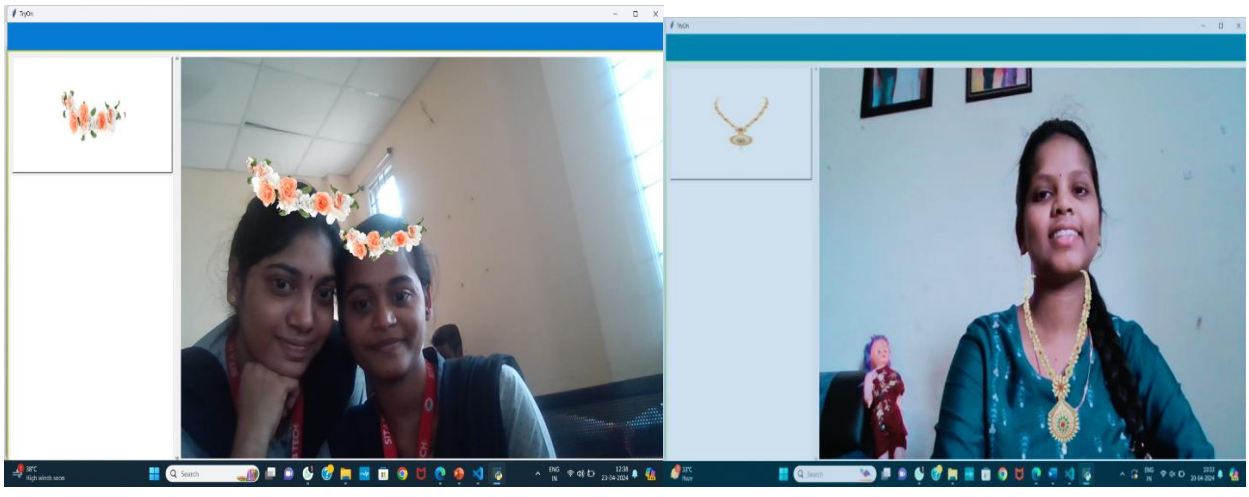


T-SHIRTS **GOGGLES**

7. Output Images







8. Conclusion

To sum up, the virtual trail room system is a key development in the security and surveillance industry. The system is able to detect and track human faces in real-time by employing cutting-edge computer vision technologies like the Haarcascade classifier and OpenCV .This allows for cost-effectiveness and efficient surveillance and tracking of people without the use of physical security staff.One crucial element that makes the system an indespensable tool for guaranteeing safety and security in a range of settings is its capacity to send out notifications in the event of aberrant behaviour or movement patterns. Rapid response times and enhanced security procedures are made possible by this proactive approach to security.

9. References

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