AI-ENABLED SALON & SPA BOOKING SYSTEM WITH VIRTUAL HAIRSTYLE VISUALIZATION USING FACIAL LANDMARK DETECTION

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Abstract:

The beauty and wellness industry has experienced significant growth in recent years due to increasing interest in personal grooming, appearance enhancement, and self-care. Services such as hairstyling, skincare treatments, and spa therapies play an important role in improving both physical appearance and individual confidence. However, customers frequently experience uncertainty while choosing hairstyles because the final result cannot be visualized before the service is performed. Traditional salon consultations rely mainly on verbal suggestions from stylists or static hairstyle images, which often results in trial-and-error decisions and dissatisfaction.This research proposes an AI-enabled salon and spa booking system that integrates virtual hairstyle visualization with digital service management. The platform allows users to upload a facial image or use a live camera to preview different hairstyles before selecting a service. Facial landmark detection is performed using the MediaPipe Face Mesh framework, which accurately identifies facial geometry and aligns hairstyle templates with the user's face. This enables realistic hairstyle previews and supports informed decision-making.

In addition to virtual try-on functionality, the system provides features such as appointment scheduling, service browsing, digital payment integration through UPI, automated notifications, and customer feedback collection. These capabilities create an integrated digital workflow for salon management and customer interaction. By combining artificial intelligence with modern booking functionality, the proposed system enhances personalization, improves service transparency, and increases customer satisfaction in the beauty and wellness sector.

Keywords: Artificial Intelligence, Virtual Hairstyle Try-On, MediaPipe Face Mesh, Computer Vision, Salon Booking System, Facial Landmark Detection, Digital Payment Integration

1. Introduction

The beauty and wellness sector plays a vital role in modern lifestyle by supporting personal grooming, relaxation, and overall well-being. Services such as hair styling, skin treatments, and spa therapies contribute to improved self-confidence and physical appearance. With the rapid development of digital technologies, customers increasingly expect personalized services and convenient online platforms for booking and consultation.

Despite this technological progress, many salons still rely on traditional consultation methods. Customers often choose hairstyles based on suggestions provided by stylists or by referring to limited hairstyle images. Since

there is no accurate preview of the final result, the decision-making process becomes uncertain. This lack of visualization frequently leads to dissatisfaction and repeated styling corrections.

Artificial intelligence and computer vision technologies offer effective solutions for this problem. By analyzing facial features and extracting facial landmarks, it is possible to digitally align hairstyle templates with a user's face. This approach allows customers to preview multiple hairstyles before committing to a specific service.

The objective of this research is to develop an AI-based platform that integrates virtual hairstyle try-on technology with a complete salon booking system. The proposed solution allows users to explore hairstyles, schedule appointments, complete digital payments, and provide feedback through a single unified platform.

2. Literature Review

Several studies have explored the application of computer vision and deep learning techniques in virtual try-on systems. Early research introduced image-based virtual try-on networks capable of overlaying clothing on human images while preserving body structure and texture details.

Han et al. proposed the VITON framework, which utilizes a neural network architecture to generate realistic clothing visualizations on human images. Later improvements such as CP-VTON and VITON-HD enhanced alignment accuracy and image resolution by introducing advanced feature preservation and normalization techniques.

Recent research has also explored transformer-based architectures and attention mechanisms to improve realism and handle occlusion challenges in virtual try-on environments. These systems primarily focus on clothing visualization in fashion applications.

However, limited research has addressed virtual hairstyle visualization integrated with booking and service management systems. Most existing solutions focus only on visualization without supporting appointment scheduling, payment processing, or administrative control.

Therefore, the proposed system extends existing research by combining facial landmark detection, hairstyle alignment, and salon service management within a unified web-based platform.

3. Proposed System

The proposed system integrates artificial intelligence, computer vision, and web technologies to create an interactive salon service platform.

The platform enables users to preview hairstyles, explore services, schedule appointments, and complete digital payments within a single environment.

3.1 Virtual Hairstyle Try-On

Users can upload a facial photograph or activate a live camera feed. The MediaPipe Face Mesh framework detects facial landmarks and extracts detailed facial geometry. Based on these landmarks, hairstyle templates are scaled and aligned to match the shape and orientation of the user's face.

3.2 Appointment Scheduling

After selecting a hairstyle and service, customers can choose an available appointment slot. The scheduling algorithm checks existing bookings and prevents overlapping reservations.

3.3 Payment Integration

The system supports secure digital payments through UPI integration. Payment processing can be performed either during booking confirmation or after service completion.

3.4 Service Management

Salon administrators can manage available services, update pricing, monitor appointments, and review customer feedback through an administrative interface.

3.5 Feedback Collection

After completing the service, customers can submit ratings and comments. This feedback helps salons evaluate service quality and improve operational performance.

4. Methodology

The system is developed using a combination of artificial intelligence techniques and modern web development technologies.

MediaPipe Face Mesh is used to detect facial landmarks from images or live video. The algorithm extracts hundreds of reference points representing the geometry of the face. These points are used to determine the position of facial features such as the forehead, jawline, and cheekbones.

Based on these landmarks, hairstyle templates are resized, rotated, and aligned to match the facial structure of the user. Computer vision processing is performed using OpenCV, while numerical computations are handled using the NumPy library.

The web application backend is implemented using Python and the Flask framework, while MySQL is used to manage user data, booking information, and payment records.

5. System Architecture

The proposed system follows a layered architecture consisting of multiple interconnected modules that support both user interaction and backend processing. The architecture mainly includes the user interface layer, application logic layer, artificial intelligence processing layer, and database layer.

In the user interface layer, customers interact with the platform through a web browser. The frontend is developed using HTML, CSS, JavaScript, and Bootstrap to

ensure a responsive and user-friendly interface. This layer allows users to upload images, preview hairstyles, browse services, and book appointments.

The application logic layer is implemented using the Flask web framework. This layer processes user requests, manages booking workflows, validates data, and coordinates communication between the frontend and backend components.

The AI processing layer is responsible for facial detection and hairstyle visualization. MediaPipe Face Mesh is used to detect facial landmarks and extract facial geometry. These landmarks are then used to align hairstyle templates accurately with the user's face. OpenCV and NumPy assist in image processing and mathematical operations required for overlay generation.

The database layer uses MySQL to store user information, appointment details, payment records, and feedback data. The integration of these layers ensures smooth communication between the user interface, AI modules, and service management components.

6. Implementation

The system is implemented as a web-based platform that integrates computer vision techniques with a service booking environment.

The frontend interface is designed using HTML, CSS, JavaScript, and Bootstrap to create an interactive and responsive user experience. Users can easily navigate through different sections such as hairstyle preview, service listing, appointment booking, and payment confirmation.

The backend logic is implemented using Python and the Flask framework. Flask handles routing, server-side processing, and interaction with the database. The system processes image uploads, performs facial detection, and returns hairstyle preview results to the user interface.

For facial analysis, the MediaPipe Face Mesh framework is integrated with OpenCV to detect facial landmarks in real time. The detected landmarks help determine the facial structure and enable accurate alignment of hairstyle templates.

The database is implemented using MySQL, which stores user profiles, booking schedules, service information, and payment records. This ensures reliable data management and supports administrative monitoring.

UPI-based payment integration is included to enable secure digital transactions within the booking workflow. Automated notification mechanisms inform users about appointment confirmations and updates.

7. Results and Discussion

The developed system was tested using multiple facial images and different hairstyle templates to evaluate its functionality and usability. The AI module successfully detected facial landmarks and aligned hairstyle overlays with user images in most test scenarios.

Users were able to preview multiple hairstyle options before selecting their preferred style. This feature significantly reduced uncertainty during the hairstyle selection process. The appointment scheduling module also functioned effectively by preventing double bookings and managing available time slots.

The integrated payment module ensured secure and convenient digital transactions through UPI. Automated notifications provided booking confirmations and reminders, improving communication between customers and salon administrators.

Overall testing results indicate that the system improves decision-making during hairstyle selection and enhances the overall user experience. The integration of AI visualization with booking management creates a more efficient and transparent salon service platform.

8. Conclusion and Future Scope

This research presents an AI-enabled salon and spa booking platform that integrates virtual hairstyle visualization with digital service management. The system utilizes facial landmark detection to accurately align hairstyle templates with user images, enabling customers to preview hairstyle options before selecting a service.

By combining artificial intelligence with appointment scheduling, digital payment integration, and feedback mechanisms, the platform provides a complete end-to-end solution for salon management. The system improves personalization, enhances transparency in service pricing, and simplifies the overall booking process.

The proposed solution demonstrates how AI-based visualization technologies can improve customer satisfaction and modernize service delivery in the beauty and wellness industry.

Future enhancements may include the integration of augmented reality-based live hairstyle preview, mobile application deployment, machine learning-based hairstyle recommendation models, and advanced personalization techniques based on user preferences and facial analysis.

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