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Virtual Try-On in E-Commerce: Challenges and Future Scope

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Abstract: ***The purpose of the study is to analyze the impact of Virtual Try-On (VTO) technology on the market of e-commerce. The study shows an online retail application with VTO capabilities which was developed in React.js on the frontend, Node.js on the backend, and MongoDB for the database. The used RapidHub API was not an exception since it employs basic 2D compositions that lack realism. AI-driven innovations will have a great impact on user experience customization and interactivity, which will lower return rates and improve customer trust. This research also explains the application of modern technology such as deep learning and computer vision to increase the responsiveness and overall demand of virtual try-on capabilities.***

Index Terms: Virtual Try-On, E-Commerce, Deep Learning, Garment Simulation, AI in Fashion

I. INTRODUCTION

Deep learning models have categorized Virtual Try-On (VTO) technologies into three groups: image-based, multi-pose, and video integrated models. While still image methods offer fast previews of garments, video and multi-angle methods provide adaptable, real-time try-on experiences [1].

Customers are not willing to purchase clothes online without seeing how they try on the item, which results in dissatisfaction and high returns. This shortcoming is what VTO technologies aim to tackle by providing users with virtual previews of clothing.

The main focus of this research Is to design and evaluate the Virtual Try-On (VTO) System Website integrated within an e-commerce site and analyze the current limitations and possible enhancements for such systems.

II. DATA COLLECTION

The following data sources were used in the implementation of the VTO system:. Apparel photos for simulation try on

A. User comparision of API integration accuracy and participant interactivity VTO testing

B. These aspects assisted in gaining knowledge on the available VTO technologies and their limits.

III. LITERATURE REVIEW

Advanced 3D virtual try-on systems are more precise but require complex hardware and computational power, limiting their scalability [2].

Research shows that AI-powered VTO features can significantly reduce customer hesitation and decrease returns. Though 3D simulations are more accurate than 2D overlays, they often require sophisticated rendering techniques and computing resources [3].

Most contemporary VTO systems use pose recognition, texture mapping, and image stitching but often fall short in dynamic, real-time customization [4].

Innovative methods, including neural rendering and generative models like diffusion networks, are enhancing realism in try-on solutions [5]. Augmented and virtual reality integrations also deliver immersive experiences that improve user confidence [6].

IV. RESEARCH METHODOLOGY

This research follows a development-centric approach, focusing on integrating a VTO module into an e-commerce platform and assessing its performance and limitations.

A. Website Development

The online platform was built using React.js (frontend), Node.js (backend), and MongoDB (database). Features included user registration, product browsing, and cart management.

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B. VTO Integration

Multiple third-party APIs were evaluated, and RapidHub was selected. However, the API offered only basic try-on functions through 2D superimposition, highlighting the limitations of current tools in replicating realistic garment fitting.

V. CHALLENGES AND OBSTACLES

A. Technical Constraints

Realistic VTO simulations demand high computational power and advanced AI models, which present a barrier for scalable implementation.

B. Integration Issues

Many APIs lack proper documentation, complicating the development and integration process.

C. User Experience Limitations

Garment misalignment, lack of body shape customization, and poor fabric simulation affect the realism and usability of VTO systems.

VI. KEY INSIGHTS AND FUTURE POSSIBILITIES

A. VTO Potential

The implementation of Virtual Try On features improve customer satisfaction while decreasing user retention.

B. Improvement Areas

Most user try-on APIs use protuberant 2D images instead of a fully integrated 4D interactive simulation, disengaging the user out of the experience.

C. Emerging Solutions

The advances of deep learning, augmented reality (AR), and real-time rendering are leading towards an era of more natural and flexible VTO systems.

VII. SYSTEM ARCHITECTURE

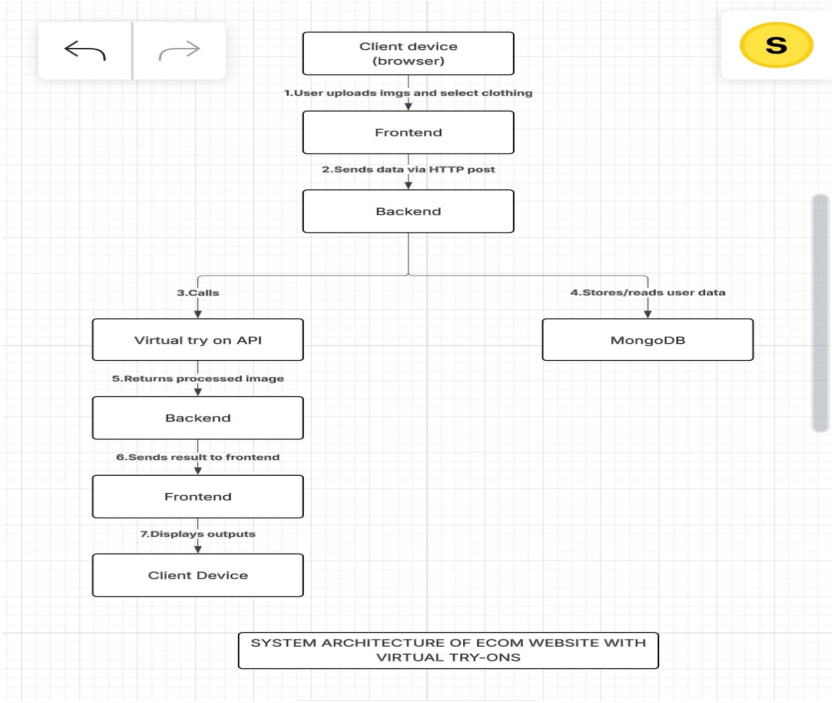


Figure 1: System Architecture of E-Commerce Website with Virtual Try-Ons

Workflow Overview

The flow of operation of the system is as follows:

1) User submits an image and selects a piece of clothing they wish to try on.
2) This information is sent to the backend by the frontend.
3) Image manipulation using the try-on API is executed by the backend.
4) The processed image is sent from the API to the backend.
5) The resulting image is sent to the frontend by the backend.
6) The output is displayed to the user by the frontend.
7) All appropriate data storage operations are handled in the background by MongoDB.

This structure places focus on modularity, ease of use, and efficiency which allows for streamlined interaction and an enhanced virtual shopping experience.

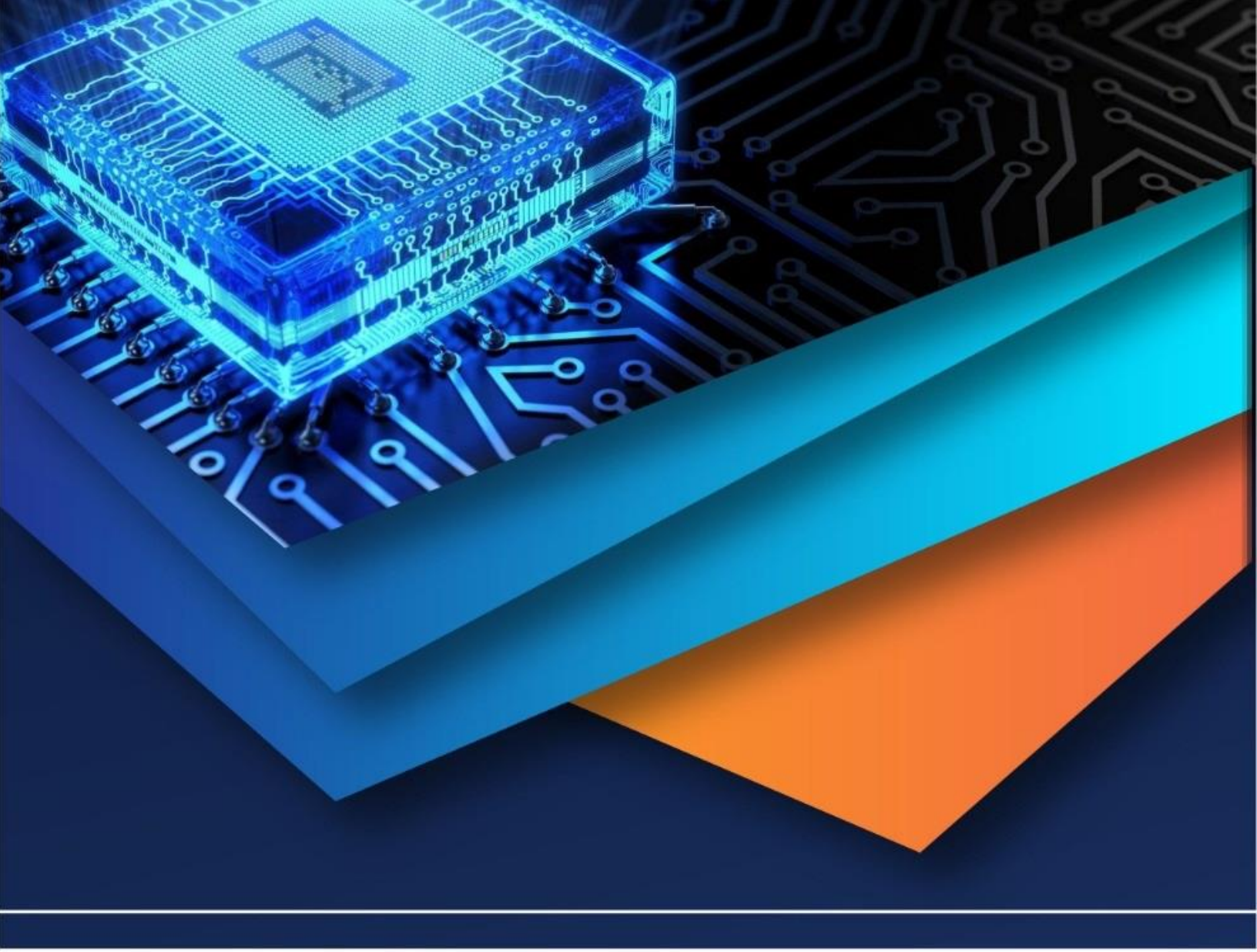
VIII. SUMMARY AND CONCLUSION

This study discusses integrating VTO functionalities into an existing e-commerce framework and reviews its existing technological features. Although RapidHub Integration APIs provide some level of service, there is still insufficiency of advanced, dynamic, and comprehensive solutions.

Advanced research should focus on real-time clothing deformation, enhancing model-free generative AI rendering, and increasing the interactivity of AR applications. When mature, Virtual Try-On solutions have the potential to transform the digital retail space by enhancing accessibility, certainty, and interaction.

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