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A Multi-Agent Shopping System

Prof. Samita Patil[1] and Singh Deepika[2]
Professor (Guide), Department of Computer Engineering[1]
Student, Department of Computer Engineering[2]
Shivajirao S. Jondhale College of Engineering Maharashtra, Mumbai, India

Abstract: *A multi-agent shopping system where system is fed with various product details such as product selection, price comparison, and personalized recommendations. These agents interact with users and various e-commerce platforms to facilitate reliable and efficient shopping experiences. Key features include personalized recommendations, price comparison, online transactions, card payment and cash on delivery option available. The system handles multiple users at a time and provide accurate result. This paper has proposed a multi-agent shopping system that help users or customers to buy quality goods, and get suggestion from the system itself to provide better results.*

Keywords: product selection, price comparison, personalized recommendation, online transaction, card payment, cash on delivery

I. INTRODUCTION

The growing e-commerce company has created very large number of option for consumers, often leading to decision failure and inefficiency in product selection. It is the system where multiple autonomous agents collaborate to enhance the shopping experience for users . These agents can represent customer, seller, and intermediators working together to automate various aspects of online shopping. By analysing customer behaviour, these agents can provide personalized shopping experiences, making the process more efficient and user-friendly. Filtering the product based on the price and categorizing into sub category make the best use of application in better way. The system can also handle real-time customer service, manage transactions, and help users find the best deals, ultimately improving both user satisfaction and operational efficiency for retailers.

Objectives:-

- Enable user to discover, compare and buy products.
- Offer best recommendation based on user preferences and history.
- Reduce the effort and time spent and decision-making.

System Features:-

- Product search – User can search any item and the agent can give the matching products.
- Price Comparison – The agent will scan multiple platform and give best result.
- Recommendation – Suggest products or item based on user preferences.
- Smart Filters – Allow users to sort their product by price, brand, colour, age, sex.

II. LITERATURE SURVEY

An AI-based multi-agent shopping system (2021) enhances online shopping by providing personalized product recommendations through intelligent automation. It compares items across multiple platforms, reducing search time and improving user satisfaction. The system uses multi-agent technology for web crawling, filtering, and feature extraction, but raises privacy concerns due to the collection and use of user data for recommendations.[1]

An AI-based multi-agent online shopping system (2021) automates the shopping process, matches user preferences, and provides timely purchase notifications. It streamlines shopping by reducing manual input, enhancing efficiency and personalization through intelligent agents. However, it may face risks like miscommunication during interactions.[2]

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An Online Shopping Management System was developed by Kamal Acharya in March 2023 to connect vendors and customers for convenient product browsing and purchasing. The platform emphasizes the growing reliance on online shopping, the importance of customer retention, and the role of data analysis in improving services and marketing. It offers a user-friendly experience with a wide product selection, saving time for users, though challenges like delivery delays and limited interaction remain.[3]

The Intelligent Shopping Trolley and Billing System, developed by Sunitha, aims to reduce customer wait times in supermarkets through an automated system. It uses RFID technology for real-time product scanning, billing, and inventory management, which enhances shopping efficiency and reduces queue times. The system incorporates Raspberry Pi, RFID readers, and a Wi-Fi module. However, challenges could arise due to technology dependence, particularly if the system malfunctions or if users are not familiar with it. [4]

Koren, Bell, and Volinsky (2009) applied matrix factorization and AI-driven algorithms to improve recommendation accuracy. These techniques identified latent user behaviour patterns to personalize cross-platform product recommendations. The use of AI models significantly enhanced the precision of recommendations by better understanding user preferences.[5]

III. PROBLEM STATEMENT

In the rapidly evolving e-commerce landscape, consumers face challenges in finding the best products at optimal prices while considering factors such as quality, reviews, and seller reliability. Traditional online shopping methods require significant time and effort from users to compare products, negotiate prices, and make informed purchase decisions.

Despite significant progress, challenges remain, such as:

- Scalability: Ensuring MAS can handle large-scale e-commerce environments.
- Interoperability: Standardizing agent communication protocols.
- Security Risks: Enhancing fraud detection mechanisms.
- User Trust: Developing transparent AI-driven recommendations.

Our Future search focus on enhancing AI-driven negotiations, improving explainable AI (XAI) in recommender systems, and integrating multi-modal interaction techniques.

IV. METHODOLOGY

The methodology for designing and implementing a Multi-Agent Shopping System (MASS) involves several key steps, including system design, agent development, communication protocols, and evaluation. Below is a structured approach:

1. System Architecture Design

Components include:

- Buyer Agents – Represent customers, search for products, and compare prices.
- Seller Agents – Represent vendors, set product prices, and engage in negotiations.
- Mediator Agents – Act as intermediaries for dispute resolution, trust management, and security enforcement.
- Recommendation Agents – Suggest products based on user preferences, browsing history, and reviews.

2. Agent Development and Intelligence

- Machine Learning Models: Implement AI-driven recommendation systems using techniques like collaborative filtering and deep learning.
- Negotiation Algorithms: Use game theory and reinforcement learning for dynamic price negotiation between buyer and seller agents.
- Natural Language Processing (NLP): Enable conversational shopping assistants for better user interaction.

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3. Communication Protocols

- Agent Communication Language (ACL): Use standardized protocols (e.g., FIPA-ACL) to facilitate agent interaction.
- Ontology Development: Define a shared knowledge representation for seamless communication between agents.

4. Data Management and Security

- BlockChain for Transactions: Ensure transparency and security in buyer-seller transactions.
- Trust and Reputation Mechanisms: Implement scoring systems to prevent fraud and improve reliability.

5. Implementation and Deployment

- Simulation Testing: Conduct experiments in a controlled environment to validate agent behaviours.
- Cloud-Based Deployment: Utilize cloud platforms for scalability and real-time data processing.

6. Performance Evaluation

- Accuracy Metrics: Evaluate the effectiveness of product recommendations.
- Efficiency Analysis: Measure response time for searches, negotiations, and transactions.
- User Satisfaction Surveys: Collect feedback to improve system usability.

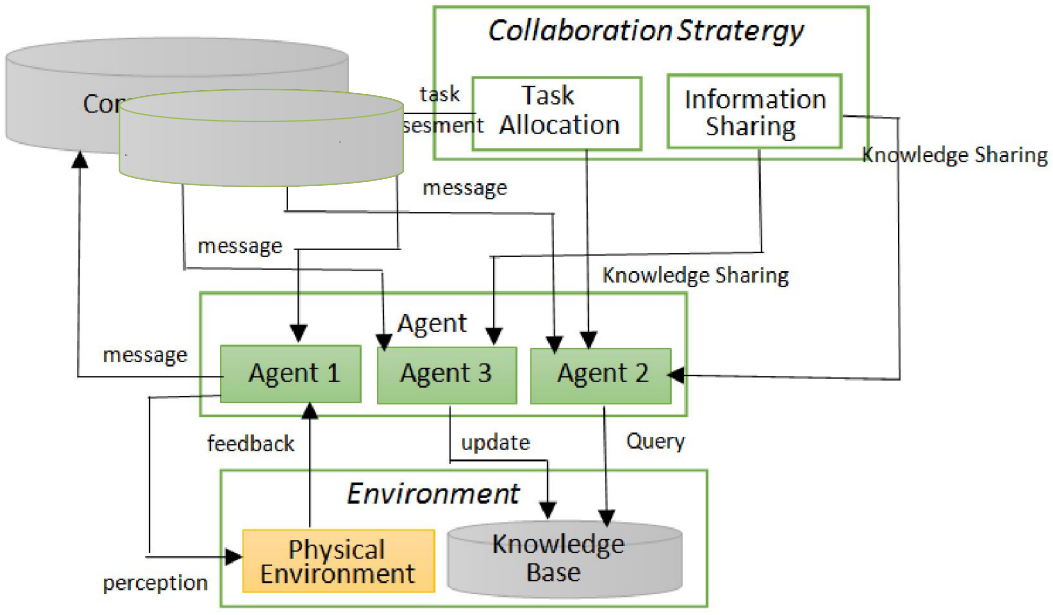

Fig.IV.1. System Architecture of Multi-Agent System

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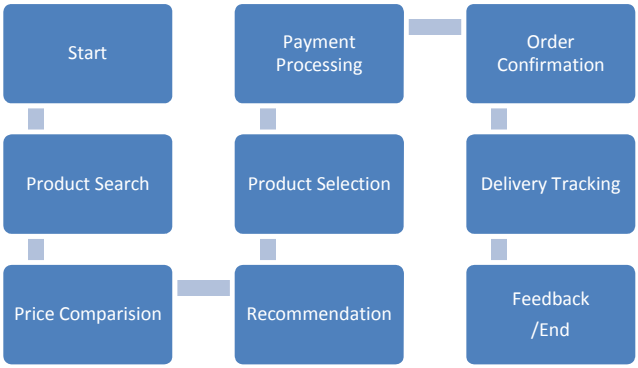

Fig.IV.2 Flow Chart of the Multi-agent Shopping System

V. SYSTEM REQUIREMENT

- **Microsoft Windows 11 :**It is Window's most recent operating System version.

SOFTWARE REQUIREMENT -

Backend Technologies :

- **Programming Languages :**Python
- **Database :**MySQL

Frontend Technologies :

- **Language :**HTML, CSS, Javascript
- **Framework :**React.js

API Integration :

- **REST APIs** for Amazon, Flipkart, Myntra, etc.
- **API Management Tools :**Postman

Development Tools :

- **IDE/Code Editor :**VS Code
- **Version Control :**Git/GitHub

HARDWARE REQUIREMENT –

Development Machine :

- **Processor :**Dual Core or Better
- **RAM :** 16GB or more
- **Storage :** 256 GB or more
- **Network :** Reliable Internet Connection

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VI. RESULT

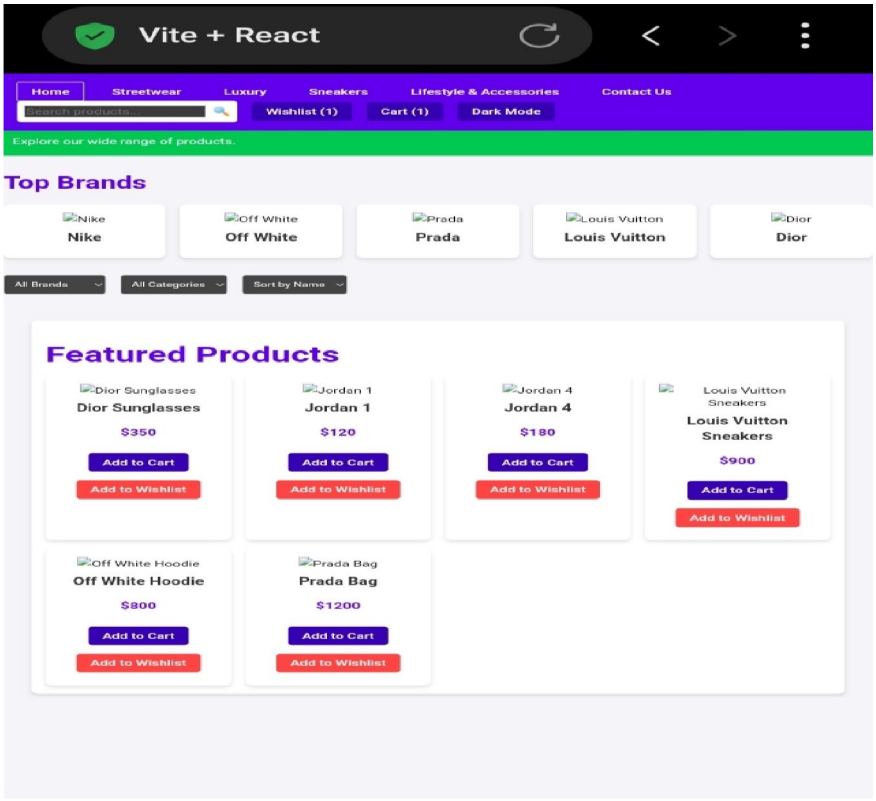

Fig.VI.1. Website first page

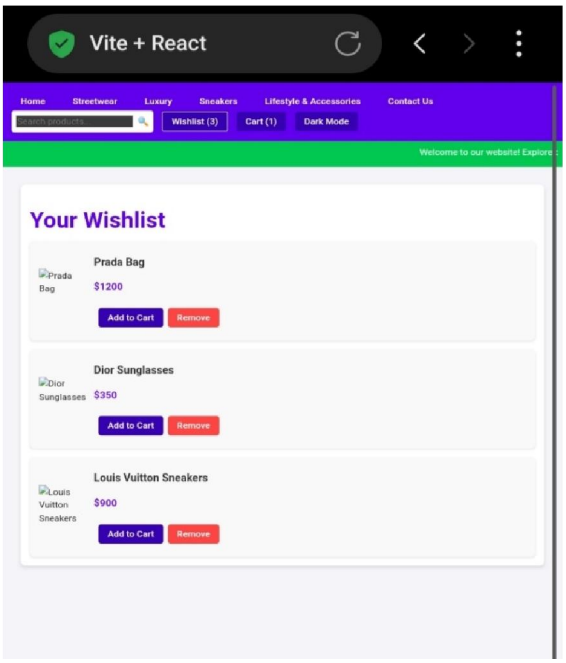

FIG.VI.2. Product Wishlist

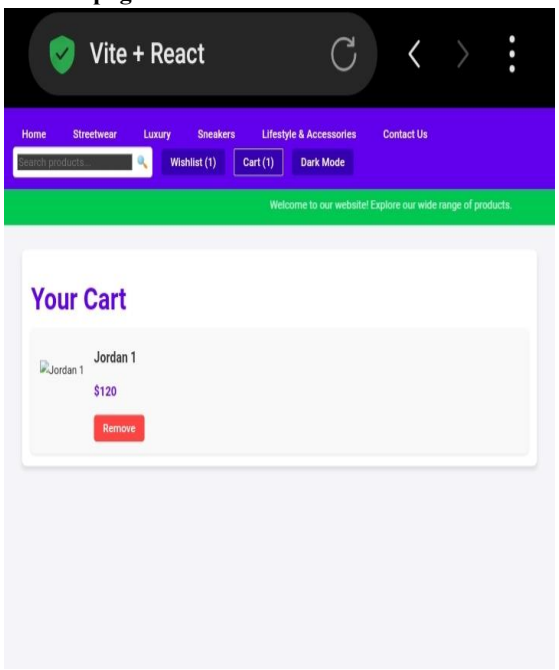

Fig.VI.3. Cart items

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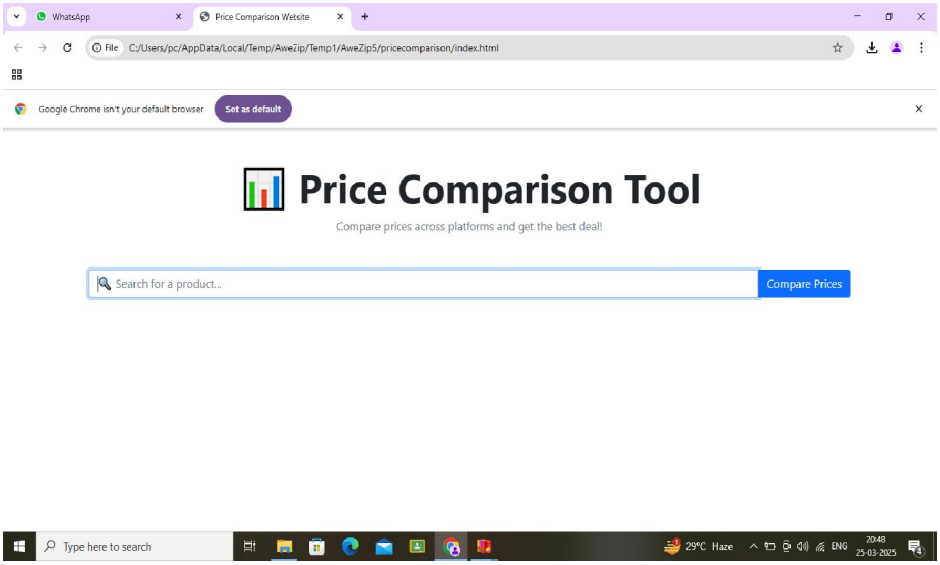

Fig.VI.4. price comparison

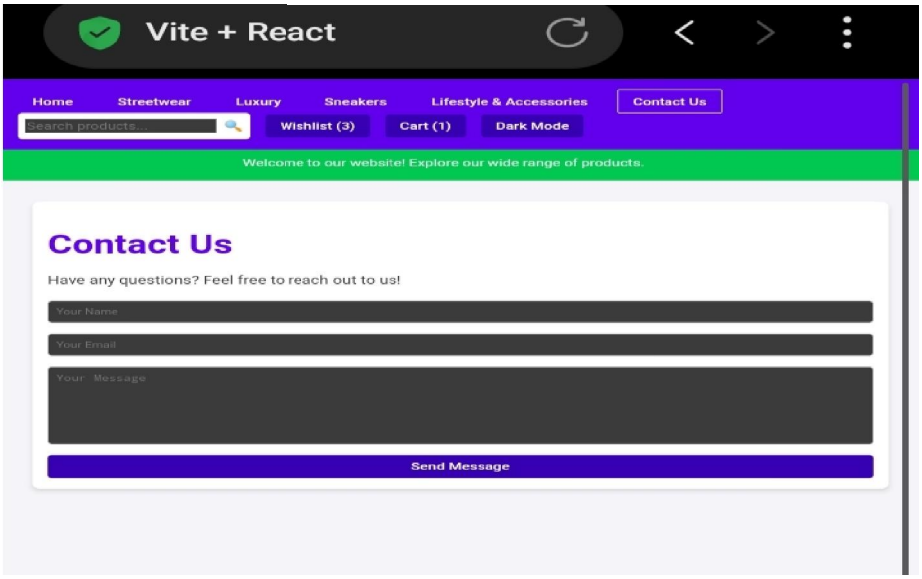

Fig.VI.5 Feedback \ Query page

VII. CONCLUSION

A smart multi-agent shopping system simplifies the shopping experience of user by saving their time and money. By comparing product on different platform based on price, rating, availability and quality of the product.

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