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SMART SHOPPING ASSISTANTS: HOW GUIDE ROBOTS IMPROVE CUSTOMER EXPERIENCE IN LARGE MALLS

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ABOUT ARTICLE

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Abstract: The Shopping Guide Robot System is a cutting-edge solution designed to enhance the customer experience in large shopping malls and commercial spaces. This system provides real-time route guidance to help customers quickly locate their desired stores by calculating the shortest path. It offers personalized recommendations based on customer profiles, adjusts dynamically to environmental changes, and supports multilingual communication to cater to diverse clientele. The robot not only guides users to their destinations but also answers inquiries about mall events, discounts, restaurants, and other services. Through advanced autonomous navigation technology, the system ensures a safe and efficient shopping experience, making it an invaluable tool in modern retail environments.

INTRODUCTION

1. Project Design

The shopping guide robot system is an innovative solution that helps customers quickly and easily find the stores they want in large shopping malls or complex commercial spaces. This system can greatly enhance user experience and offers the following features and advantages:

1. Real-Time Route Guidance

a. The robot can guide users from their current location to the desired store via the shortest route in real-time.

b. When a customer selects their preferred store through a touchscreen or voice recognition, the robot displays the route or accompanies the customer.

2. Convenience in Large Stores

a. In large shopping malls with numerous stores, finding a specific store can be challenging. The robot solves this issue by ensuring customers reach their destinations quickly without getting lost. In multi-story malls, it can guide customers to elevators or escalators and then present the next segment of the route.

3. Personalized Service

a. The robot can provide shopping recommendations tailored to the customer's profile. For example, if a customer is looking for clothing of a specific style, the robot can suggest relevant stores or inform them of special discounts.

b. It can also recommend stores or products based on the customer’s shopping history.

4. Dynamic Route Navigation in Complex Spaces

a. The robot detects changes in the mall environment (e.g., crowded areas, temporarily closed sections) and adjusts its route accordingly.

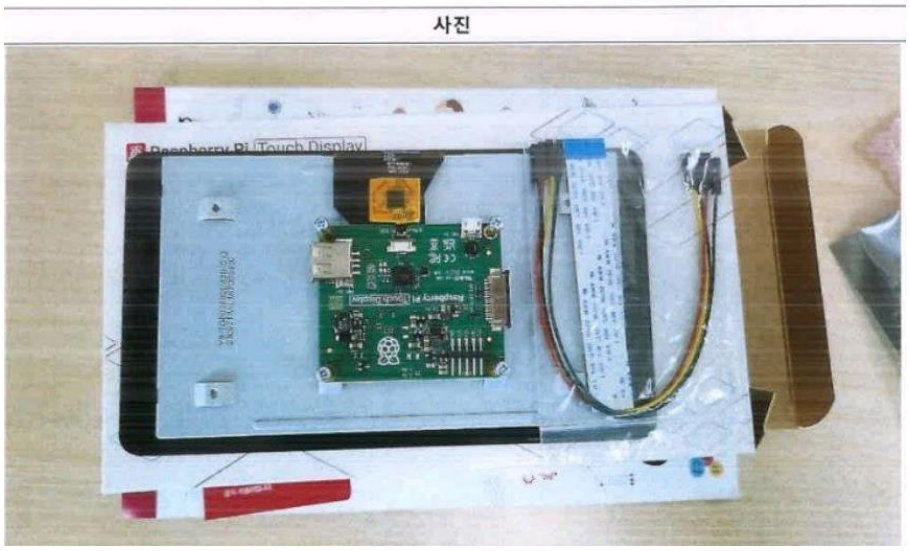
b. Using autonomous driving technology, the robot avoids obstacles (such as people or furniture) and guides the customer safely.

5. Multilingual Support

a. To cater to customers from various nationalities visiting the mall, the robot provides guidance in multiple languages, such as Korean, English, and Chinese, allowing seamless service without language barriers.

6. Interactivity

a. The robot offers various information within the mall, not just route guidance. It answers customers' questions about events, discounts, recommended restaurants, and locations of facilities in real time.



7. Convenient Additional Services

a. The robot allows customers to place orders or even proceed with payments directly.

b. For example, if a customer has pre-purchased a product online, the robot can guide them to the store holding the product or direct them to the pickup location.

2. Web Implementation and Use of Bridge Technology

1. **Web Interface for Store Information**: A web interface is developed to display store information, and Bridge technology is used to enable communication between the web server and the robot.

2. **Communication Between Robots**: When robots are jointly operating in separate zones, they can recognize each other's location and coordinate movements.

3. **In-depth Testing**: Testing is conducted to ensure that the robot stops accurately at designated locations in malls and underground spaces, and correctly detects obstacles.

3. Characteristics of the Online Shopping Market

The online shopping market is growing rapidly and offers a wide range of features. Key characteristics include:

1. Convenience and Accessibility

a. Online shopping allows customers to purchase items anytime and anywhere. With a smartphone or computer, shopping is accessible anytime, making it highly convenient.

2. Wide Range of Product Categories

a. Virtually any category of products can be purchased online, such as clothing, electronics, appliances, and groceries, with high demand particularly for everyday items, fashion, electronics, and cosmetics.

3. Price Competitiveness

a. Since operating costs are lower than physical stores, online shopping malls often offer products at a relatively lower price. Promotions like discount coupons, events, and membership benefits allow consumers to buy products at even cheaper rates.

4. Personalized Recommendations

a. Based on big data and artificial intelligence, personalized product recommendations enhance the shopping experience and increase customer satisfaction.

5. Advancements in Delivery Services

a. Quick and accurate delivery services, such as same-day, early-morning, and rocket delivery, continue to set higher standards. New logistics innovations, like drone delivery and unmanned vehicle delivery, are also being explored.

6. Reviews and Consumer Feedback

a. Reviews and ratings provide valuable insights into product quality and reliability, helping consumers make informed purchase decisions.

7. Sustainability and Eco-Friendly Consumption Trends

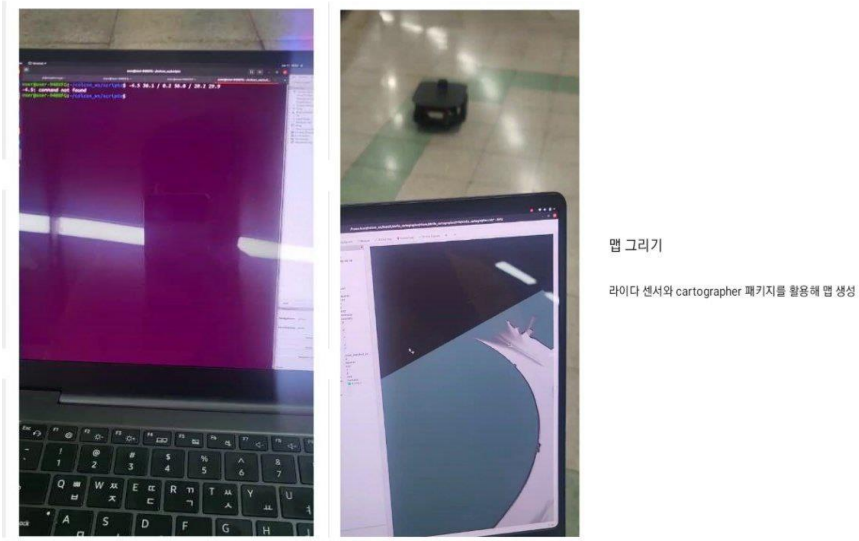
a. As environmental concerns rise, demand for eco-friendly products and sustainable consumption grows. Online stores respond with practices like reduced packaging, reusable packaging, and carbon-neutral delivery services.

8. Increase in Mobile Shopping

a. Mobile shopping has become mainstream, with the spread of mobile payment systems boosting convenience. Online stores are focusing more on mobile user experience due to the increasing share of purchases through mobile apps.

9. Globalization

a. Online shopping enables worldwide purchases. The activation of cross-border shopping markets makes it easier for consumers to access brands and products from different countries



Convenience and Challenges in Shopping Guide Systems

Benefits:

1. **Fast Search and Navigation**: Customers can find desired products quickly by entering keywords in the search bar. Filtering by price, brand, and category further refines the search, saving time.

2. **Personalized Recommendations**: Using AI and customer data, the system suggests products that may interest the customer, preventing them from missing out on relevant items.

3. **Customer Reviews and Ratings**: Customer reviews help assess product quality, improving purchase decisions. Popular items with high ratings are often perceived as more trustworthy.

4. **Convenient Payment Options**: Mobile payments, credit cards, and e-wallets streamline checkout, with saved payment details reducing repetitive data entry.

5. **Real-Time Inventory and Fast Delivery**: Online shopping systems allow customers to check stock in real-time and choose delivery options, including same-day and early-morning services.

6. **Comparison Shopping**: Customers can compare the same products from different sellers to find better prices and deals.

Challenges:

1. **Excessive Ads and Recommendations**: Overloaded with ads and irrelevant recommendations, the system may confuse customers and hinder their shopping experience.

2. **Privacy Concerns**: Personalized recommendations are based on customer data, raising privacy concerns as some consumers worry about data misuse.

3. **Inaccurate Recommendations and Filtering**: Occasionally, the system may recommend irrelevant items or fail to filter products accurately.

4. **Complex User Interface (UI)**: Some systems may have complex menus or non-intuitive designs, frustrating users who struggle to find necessary information.

5. **Review Reliability**: Some reviews may be biased or promotional, leading to misleading information about product quality.

6. **Delivery Issues**: Delays, incorrect shipments, or damaged goods are common problems, sometimes caused by unexpected factors, affecting the customer experience.

CONCLUSION

While shopping guide systems offer many conveniences, there are still challenges to overcome. Personalized recommendations, convenient payment, and fast delivery provide significant benefits to consumers, yet issues like excessive advertising, privacy concerns, and review reliability need to be addressed.

This study analyzed and suggested improvements for the efficiency of a shopping guide system that utilizes mobile robots. Although existing path planning algorithms offer optimal paths, issues such as proximity to obstacles limit practicality. Enhancing these algorithms will allow the robot to navigate safely without getting too close to obstacles. Additionally, improvements were made to the robot's location estimation algorithm, especially in environments like hallways, to provide stable guidance paths.

This study demonstrates that a robot-based navigation system in shopping mall environments can effectively improve the customer experience.

REFERENCES

1. Shopping Guide System Overview Video