

A Survey on Supermarket Navigation using Artificial Intelligence

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ABSTRACT

This paper aims to discuss the various methods that can be employed to assist a user in indoor navigation and innovations that can be brought about to existing systems to develop a better navigation infrastructure. We discuss various existing implementations of the shopping system, their advantages and disadvantages and discuss the design of the existing system.

Keywords – e-commerce, indoor navigation, pathfinding, supermarkets, web application

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I. INTRODUCTION

In recent years, the process of shopping has completely changed due to the internet. Online shopping is providing a convenient and efficient way for a user to shop. The traditional shopping method is falling short in satisfying the customers and hence being slowly replaced by the online shopping. It can be observed that the traditional shopping did not go through any significant change in spite of the wide spread and easy access to the technology. This makes the shopping experience for users to be mundane and boring. Users prefer the online shopping over the traditional method. In coming years, the traditional shopping needs a major upgrade or else it will fall out of competition.

The proposed system provides a new way to shop in the traditional shopping method. This system incorporates technologies such as augmented reality, computer vision and pathfinding. This is the solution to the stagnation in the existing shopping process which can drastically change the user experience making it more engaging & less tedious and time consuming. This application will be hosted on Android but it will also include the ios support. This will increase the usability and reach of the application. The motive of this application is to save the time and efforts of the user whenever he shops. As of now, system is not supposed to be used by the shop owners but only by the users.

Even today, when online shopping is ruling the market, traditional shopping has its own advantage which can include inspection of the product before buying, checking for offers and saving the time taken for the home delivery in case

of online shopping. This application will assist the user to achieve the above goals and make his shopping experience more comfortable.

Time efficiency has to be one of the most crucial parameters when it comes to user experience. When it comes to shopping, users tend to spend a lot of time roaming around the shop finding what they want. Also, they may buy unnecessary things in this time. This time can be saved and used for better purposes. This can be done by directing the user straight to the item which he desires to buy and not anywhere else. The additional benefit of this is that the user's money will be saved which he may have spent on buying things he did not need.

The other major parameter to be considered is the luxury of use. Users find their experience to be enhanced when they have to put minimum efforts and achieve the same goal. This can be achieved by letting users do minimum work and automating most of their tasks. But, the user interaction should be never lesser than a certain threshold otherwise, it can actually make the user experience worse and make the users feel disconnected from the task. Therefore, it is very important to find the balance in automating user processes.

As explained earlier, user will still need to interact with system for its basic functionalities. But, all the unnecessary additional overhead on the user will be removed and it will be handled by the application.

II. LITERATURE SURVEY

2.1 Physical Supermarkets

Physical supermarkets include large scale shopping facilities such as D-Mart, Reliance shopping and Big Basket.

Advantages

- a) Customers get to examine the product before buying.
- b) Customer can surf for ongoing offers and deals.

Disadvantages

- a) More time consuming.
- b) More tedious and less efficient.

2.2 E-commerce Websites

E-commerce websites include online shopping options such as Amazon, Flipkart and Ebay

Advantages

- a) Customers get a wide variety of options to select from.
- b) Customers can view the product reviews before buying them.

Disadvantages

- a) There is a chance of receiving faulty or incorrect product and the replacement might take a while.
- b) If a product goes out of stock, it might take a while for it to restock

2.3 Local Vendors

Local vendors include the independent sellers of groceries, electronics, clothing, etc.

Advantages

- a) The customers are able to bargain the prices.
- b) The customers have freedom to roam around local vendors to compare the prices.

Disadvantages

- a) The customers might receive a outdated or spoiled product and the return is generally not possible.
- b) The local vendors might alter the products' price for their profit.

2.4. Existing Systems

There are three major systems applied which make use of indoor navigation technology to make the user experience better.

2.4.1 Aisle411: This system is deployed in some areas of United States and it is mainly used for shopping purposes.

Advantages

- a) Makes shopping experience easy and user friendly with the help of augmented reality.
- b) The system gives complete assistance to the user in its shopping process from finding the products to the payment.

Disadvantages

- a) Not available in India.
- b) Use of augmented reality might be confusing for

some customers.

2.4.2 Ubamarket: This system is deployed in the UK

Advantages

- a) Uses the unique scanning cards placed over the products to keep track of customer's shopping list and loyalty score.
- b) Provides an in-built payment gateway.

Disadvantages

- a) Only deployed in UK so far.
 - b) Requires additional capital and time for creating and placing tags on the products.
- (iii) INNAV: This is a general purpose navigation system.

Advantages

- a) Makes use of BLE beacons and geomagnetic technologies to navigate the user.
- b) A general-purpose navigation system which can be used in large establishments such as shopping malls, airports and supermarkets.

Disadvantages: a) Requires additional capital for the placement of BLE beacons.

(b) A faulty BLE beacons can make a system non functional.

III. DESIGN OF THE PROPOSED SYSTEM

The user input item list is fed to the pathfinding algorithm which will generate the shortest path by sensing user location based on the item's location and user location to the unity engine which will generate a route on the virtual map and display that map to the user and updates the map as the user competes all the items in the list. our main aim is to change the traditional shopping way by saving the customer time and money and give a satisfying user-friendly experience

The modules included in the supermarket navigation project are as follows:

1. The pathfinding agent
2. Front end android application
3. Backend database storage

3.1 The pathfinding agent

The pathfinding agent uses the A* pathfinding algorithm to navigate through the supermarket. This pathfinder requires a rough pre-fed map of the supermarket. The agent traverses through the map finding the optimum shortest path between any two given points and directs the user through the course.

The default start location of the pathfinding agent is the shop entrance. From there it traverses throughout the given floor. It does not travel to the next floor until all the target locations on the current floor are visited.

The entry location on each floor is denoted by the red color whereas, the exit locations are denoted by the green color. These color codes act as triggers for the pathfinding agent.

3.2 The front-end android application

The user interacts with the system with the help of this application. It requires users to register with their credentials, email id and phone number. This is essential for personalized experience and maintaining data integrity in case of multi-user scenario.

3.3 Back-end database storage

The backend system is handled using a firebase server. This database mainly stores the credentials and authorization data of users. On top of that, the system is provided with two access control levels namely, user and owner. The user is the customer using the application who will authenticate and login into the system. Owner has the job of maintaining the store maps up to date and updating the store layout and item placement.

IV. CONCLUSION

The systems that we mentioned above suffer from mainly two problems. Firstly, the traditional shopping system such as E-commerce websites, physical shopping malls and local vendors are rigid and extremely less efficient. Whereas, in case of the modern approaches for this problem, the systems demand additional capital may it be for BLE beacons or smart tags. Therefore, we need a system that solves the issues faced in the traditional shopping process as well not straining the capital of the vendor.

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