International Journal of Research in Engineering, Science and Management
Volume-2, Issue-6, June-2019
www.ijresm.com | ISSN (Online): 2581-5792

Self-Deployable Indoor Navigation System using Dijkstra's-AES-Apriory Algorithm

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***Abstract*: Indoor navigation systems help people navigate inside large buildings such as shopping malls. In this paper, a smart location-based mobile shopping application for Android devices is proposed. The flow of the application is that user searches a product, and then INOP (Indoor Navigation and Online Payment) identifies the location and searches the product inside the shopping mall. To make the navigation system, this paper proposes Shortest Path Algorithm. To add product in the cart, the user should scan bar code of the product with their android phone. Once the shopping is done by user, the user can make payment online.**

***Keywords*: Indoor navigation, barcode scanner, Wi-Fi router, Advanced Encryption Standard**

1. Introduction

Manual Shopping is the traditional way of shopping where the customers choose their wished product and carry the products along with them. Currently shopping is a tedious and time consuming job. In current shopping, the customer waits in long queues at the cash counter. This consumes lot of time and energy of shopper and cashier. To overcome this law, the customer himself can scan the barcode using his mobile while making purchase, retrieve essential details of all products from shops database and generate bill himself. This bill sent to the customer's mobile through online banking service and user can make quick payment and leave the shop early. The Barcode of the product is scanned by the customer and move to the wish list if they are interested in choice of item by using the proposed mobile application. In order to develop an Android Application that uses a barcode scanner for the purchasing and navigation of items for store that will be self-checking and automatic payment transaction. Here comes the term indoor navigation and barcode scanning. Indoor positioning is still a challenging problem because satellite-based approach does not work properly inside buildings.

Barcodes are ubiquitously used to identify products, goods or deliveries. Devices to read barcodes are all around, in the form of pen type readers, laser scanners, or LED scanners. Camera-based readers, as a new kind of barcode reader, have recently gained much attention. The interest in camera-based barcode recognition is built on the fact that numerous mobile devices are already in use, which provide the capability to take images of a fair quality. This describes the hardware system architecture for implementing the barcode reading system in mobile phones and its process. The camera device and application processors are necessary hardware components for the system. The application processors are needed to implement the camera interface, LCD controllers, DSP for image processing, and application host in CPU for real-time computations. The application processor works for displaying the menu and preview of the display and computing of code recognition and decoding in real-time. With these systems, the user can control the position of the camera of smartphone and decides the capture timing of barcode.

2. Literature survey

Indoor positioning systems are specifically designed to assist users to navigate in internal environment. These systems use Wi-Fi signal and Dijkstra's Algorithm to assist in the movement proceeds. When Customer enters the current and destination location, then the direction is displayed on the customer device. Customer adds the product to the cart by scanning QR Code of the product. Then mark the bought product in the list. The Customer can check out after completing the shopping. Then the bill is generated by the server with the help of cart details. This bill is send to the customer device (mobile) and he/she can make payment online. In [1], Gennady Berkovich developed an Accurate and reliable real-time indoor positioning on commercial smartphones. This paper outlines the software navigation engine that was developed by SPIRIT Navigation for indoor positioning on commercial smartphones. First, the navigation engine can automatically start in any place of a building wherever user switches on his or her smartphone. There is no need to enter initial position manually or to start outdoors where initial position can be determined by GPS/GNSS receiver. Then, operating in the tracking mode, the navigation engine provides real-time indoor navigation for displaying current user position either on the floor plan or on Google Indoor Map if the latter is available for the building. At last, the navigation engine can recover tracking from failures that are the known problem of the particle filter occurring when all particles are accidentally discarded. In [3], Suk-Hoon Jung, Gunwoo Lee, and Dongsoo Han developed a Methods and Tools to Construct a Global Indoor Positioning System. This paper aims to collect indoor and radio maps from volunteers who are interested in deploying indoor positioning systems for their buildings. The methods and tools for the volunteers are also described in the process of developing an indoor positioning system within the larger GIPS (Global Indoor

Positioning System). An experimental GIPS, named KAIST indoor locating system (KAILOS), was developed integrating the methods and tools. Drawback is this system is in its initial state and need to solve lots of issues about navigation. In [4], Payam Nazemzadeh, Daniele Fontanelli, David Macii, and Luigi Palopoli developed an Indoor positioning of wheeled devices for Ambient Assisted Living. The position tracking technique presented in this paper is based on an Extended Kalman Filter (EKF) and is analyzed through simulations in view of minimizing the amount of sensors and devices in the environment. Drawback is that EKF is noise sensitive algorithm, simple changes in data could crash the application. In [5], Siti Fatimah Abdul Razak, Choon Lin Liew, Chin Poo Lee, and Kian Ming Lim developed an Interactive android-based indoor parking lot vehicle locator using QR code. This application is able to show the route from user current location to his parked vehicle based on an indoor map of the parking area stored in a database. In addition, it is also able to automatically detect user's current movement based on steps calculation. Drawback is that this system needs to generate different map for every different mall. In [6], Da Su, Zhenhui Situ, and Ivan Wang-Hei Ho developed a Mitigating the antenna orientation effect on indoor Wi-Fi positioning of mobile phones.

3. Design

User Login into system. System provide the list of most selling products. User search required product in system with the help of wifi. System send the location of product. User can view information along with rating of product. System provide the product recommendation to user. User scan the QR-Code using his mobile while making purchase, retrieve essential details of all products from shops database and generate bill. This bill sent to customer's mobile through online banking service thus user can make quick payment and leave the shop early. User can provide rating to product. Figure 1 describes the actual designing methods.

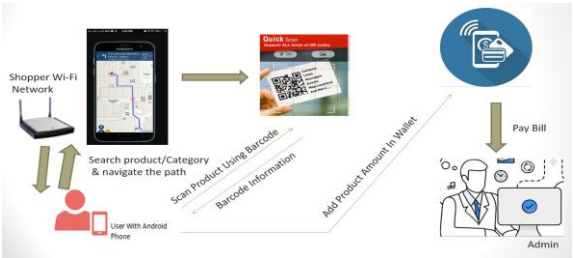

Fig. 1. Design

A. *Dijksrta's algorithm*

This work targets at accelerating a commonly used algorithm to solve, the Dijkstra's algorithm. We have exploited the best of the parallel as well as the sequential algorithms to result in an efficient hybrid approach. The proposed algorithm intelligently switches between these two kernels considering the size of nodes to process at run time. A detailed description of this can be found. This plays an important role in navigation systems as it can help to make sensible decision and time saving decisions. To solves the shortest path problem of a graph with nonnegative edge costs, gives shortest path tree, Dijkstra's Algorithm is used. This algorithm is mostly used in routing and other network connected protocols. For a given vertex in the graph, the algorithm gets by finding the costs of shortest way from one source vertex to one destination vertex, once the shortest path reach to the destination vertex has been found the algorithm is then stopped. The most commonly used algorithm for path finding is the Dijkstra's algorithm. This is a modification of BFS algorithm. While BFS considers equal weights for traversal between nodes (edges) in the graph, the Dijkstra's algorithm offers the advantage of assigning weights to each edge of the graph hence, making.

B. *Advanced Encryption Standard(AES)*

Cryptography (secret script) is the science and art of transformation of messages to make information secure and resistant to attack. Encryption is to guarantee safety of sensitive information. Encryption algorithm executes bytes substitutions and matrix transformations on the plaintext (original message before encryption) and converts it into cipher text (jumbled message). Information security can be handled using widely available encryption algorithms. The choice of key in cryptography is very vital since the security of encryption algorithm be determined by directly on it. Secrecy and Length of the key are important factors of the encryption key. A key can be numeric or alpha numeric text or may be a special symbol. AES algorithm takes the original main key, and performs a key expansion routine to generate the round keys. In each round, the first four bytes of the input KeyRound constitute the word w0, the next four bytes the word w1, and so on. The bytes of the final word are left rotated by one position, and then each byte passes thought substitution Sbox.

C. *Apriory algorithm*

The Apriori algorithm proposed by R. Agrawal et al. in 1993 is an algorithm for mining single dimensional, single layer and Boolean association rules. The core idea is using the recursive method of layer by layer search. Know as we are talking about the data mining task on datasets there will be a different type datasets are present. When we are talking about text type datasets the data present in the data container is neither in completely structured nor unstructured which is known as Semi-structured datasets. For example, a document may contain a few structured fields, such as title, authors, publication date, length, and category, and so on, but also contain some largely unstructured text component as an abstract and contents Apriori algorithms based on matrix need repeatedly retrieval and the process of reconstruction matrix spend a lot of time on inserting items and adjusting matrix structure, therefore is not an ideal choice under certain conditions, while the generation of Orthogonal List which structure is complex also spends a large amount of time on its construction. algorithm uses the logical

"And" operation for reference and uses a map structure to store the item sets table, then takes the intersection to obtain the corresponding support, avoiding frequently database scanning. They are text Mining has become a more and popular and indispensable theme in Data Mining. This text mining saves a lot of effort of persons.

4. Mathematical model

Let S be the whole system which consists:

$S = \{IP, Pro, OP\}$ ....(1)

where,

1. IP: is the input of the system.
2. Pro: is the procedure applied to the system to process the given input.
3. OP is the output of the system.

A. Input

$IP = \{Q, QRS, PR\}$ ....(2)

where,

1. Q: is query
2. QRS: is QR-Code scanner
3. PR: User Provide Product Rating

B. Process

$PRO = \{P, QS, U, SP, C, MS, RP, CB\}$ ....(3)

where,

1. P: is the set of product in the mall database
2. QS: set of QR-Codes for each product P there exist QR-Code
3. U: User scan QS
4. SP: Set of Products for which QS scanned by User U
5. C: Shopping Cart for User U. Adds Set of Products SP in Cart C
6. MS: is Most Selling product list from product P
7. RP: is Recommended Product list from product P
8. CB: is Bill Calculating and Payment as per Set of Products SP.

C. Output

$OP = \{PL, BA, C, VR\}$ ....(4)

where,

1. PL: Product Location
2. BA: Bill Amount
3. C: Purchase Product
4. VR: View or Provide Rating to product

D. Equations:

1) Search Product

$RP == DB\ \Sigma^{n}_{i=1}[pi]$ ....(5)

where,

1. RP: is user required product
2. DB: is Data-Base
3. n: is number of products
4. pi: is products from database

2) Recommendation Product

Probability of Purchase Product PP

$PP = ((\Sigma^{n}_{i=1}(P+PS)) / (\Sigma^{m}_{i=1}(P))$ ...(6)

where,

1. PS: is user Selected Product
2. P: is targeted Product
3. n: Number of records in sales history where P and PS occurrences together
4. m: Number of records in sales history for occurrences of PS

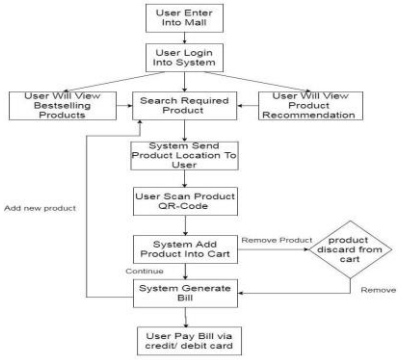

Fig. 2. Flowchart

5. Conclusion

In a step aimed at promoting shopping methods and make people life easier; we are going to build this mobile application that could play an important role in Indian society as a whole. Using Pocket PC mall navigator as a shopping mall navigator, in addition to helping the users find shops efficiently and effectively, were able to create awareness in using smart mobile devices for flexibility every task among the shopping.

Acknowledgment

The authors would like to thank the publishers, researchers for making their resources available and teachers for their guidance. We thank to the college authority for providing the required infrastructure and technical support. Finally, we extend our heartfelt gratitude to friends and family members.

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