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Enhancing Customer Experience Through Geofencing Technology

Mrs. Priyanka Gupta[1], Ameya Kannurkar[2], Vedant Bhugul[3], Saara Bansode[4], Gauri Nalawade[5], Jay Tathod[6]

[1]Professor, B.E. Information Technology, Dr. D Y Patil College of Engineering, Pune
[23456]Student, B.E. Information Technology, Dr. D Y Patil College of Engineering, Pune

A B S T R A C T

The rise of online shopping has transformed the retail industry, but that doesn't mean customers have abandoned offline shopping entirely. Both modes of shopping have their own strengths and weaknesses. Online shopping, for instance, is often plagued by hidden terms and conditions, while offline shopping can be limited by geography and marketing budgets. The lack of quality assurance and the prevalence of fake products, hidden costs, and delivery delays are some of the most common issues faced by online shoppers. Meanwhile, offline shoppers can struggle to find the products they want outside of their immediate vicinity. One solution to these problems is a product-based shop locator mobile application that uses geofencing technology. With this application, customers can search for a specific product and find nearby locations that carry it, eliminating the need to search for it manually. The customer simply inputs the product or service they desire and, with a single click, the app provides a list of nearby options. The customer can then select the appropriate option and contact the shop owner or depart to purchase the product in person. This type of mobile application can help address many of the issues faced by both online and offline shoppers. By bridging the gap between the two modes of shopping, it provides customers with more options and greater flexibility. By leveraging geofencing technology, it can also help improve the customer experience by making it easier for them to find the products they want. Overall, this technology has the potential to revolutionize the retail industry and create a more seamless shopping experience for consumers.

Keywords: Online shopping, offline shopping, geofencing technology, Google Android Geo API.

1. INTRODUCTION

Our offshop app utilizes geofencing, a location-based service that triggers targeted marketing actions when a mobile device or RFID tag enters or exits a virtual geographic boundary, known as a geofence. Geofencing uses various technologies like RFID, Wi-Fi, GPS, or cellular data to send targeted notifications such as text, email, social media ads, or app notifications. For example, if a young woman walks near a D-mart supermarket in Akurdi, Pune, she will receive an off-shop notification saying, "Today only! Buy 1 bedsheet, get 1 free!"

To track a consumer's location, our app uses GPS, and we will be using geofencing as a way to target consumers. Geotargeting, on the other hand, delivers targeted advertising to desktop users based on their location, while beaconing transmits targeted messages and information to nearby mobile devices. Geofencing, in contrast, focuses on building a virtual perimeter around a specific geographic location to deliver targeted notifications. By using geofencing, we can deliver targeted notifications to consumers when they are near a specific location, reducing the need for them to search for products and improving their shopping experience.

The drawback of online shopping:

There are various reasons people often do not choose various online shopping.

Below are the reasons why:

1. Frauds in online shopping

2. Delay in the delivery

3. You can't touch the product

4. You cannot bargain

5. Hidden costs and shipping charge

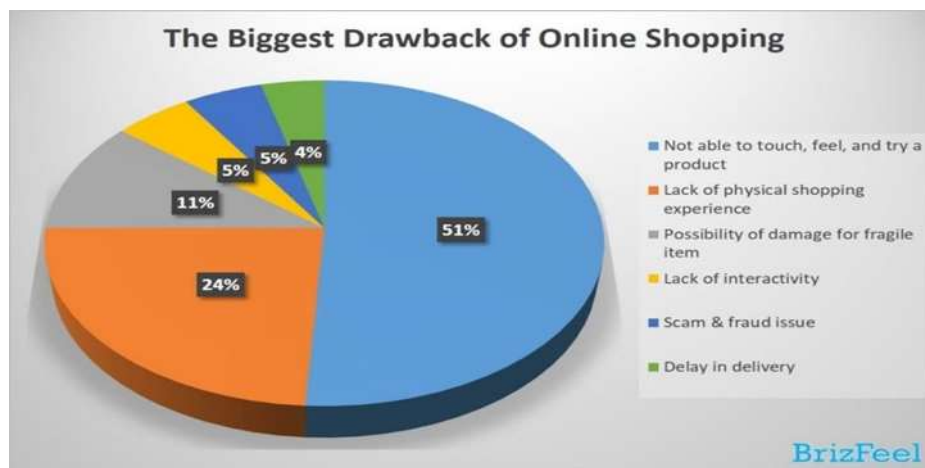6. Lack of interaction

7. Returning the product

Fig. 1. Drawbacks of online Shopping.

Why people are preferring offline shopping?

The advantages of offline shopping are apparent, as customers have the opportunity to physically inspect and evaluate products before making a purchase. However, this is not always the case with e-commerce, as there is often a lack of product awareness and trust. Online shoppers may also experience delays in product delivery, as well as concerns about security and the inability to physically touch and examine the product before making a purchase.

In contrast, offline shopping offers the convenience of immediate access to purchased products and services, as there is no need to wait for delivery. Furthermore, customers can immediately evaluate the quality of the product and provide feedback at the time of purchase.

To address the limitations of online shopping, our application offers an alternative for customers to search for the products they wish to acquire. The app provides a list of nearby shops that carry the desired product, along with distance and directions to the shop via Google Maps. By providing this service, customers can have the convenience of online shopping combined with the benefits of offline shopping, allowing them to inspect the product and purchase it immediately.

2. LITERATURE

[1] The paper analyses the impact of a "buy-online, pick-up-in-store" (BOPS) project using a proprietary dataset. The implementation of this project is associated with a decrease in online sales and an increase in store sales and traffic, which can be explained by the cross-selling effect and the channel-shift effect. The channel-shift effect is due to the increase in "research online, purchase offline" behavior enabled by BOPS implementation. The change in cart abandonment and conversion rates of brick-and-mortar and online channels validates this explanation. The paper highlights the limitations of drawing conclusions about complex interventions using single-channel data and provides insights into the impact of sharing inventory availability information. The paper was accepted for a special issue on business analytics by Alok Gupta.

[2] The Indian retail industry has experienced significant growth, particularly in the online shopping segment over the last decade. Retailers in India are increasingly appreciating online shopping because of its benefits, which include no real estate costs, enhanced customer service, mass customization, global reach, niche marketing, and specialized stores. Mega sale days have become popular, and many websites are selling products in large quantities. The paper discusses the evolution of online shopping in India, the pros and cons, and factors affecting its growth. The growth of online retailing in India is expected to strengthen in the future due to changing markets, developments in information technology, increased penetration of credit cards, secure payment gateways, and easy access to computing.

[3] As indicated by an ASSOCHAM-Forrester study paper, the yearly development rate is 51% which is considered as the most noteworthy of the world and is relied upon to reach $120 billion out of 2020 from $30 billion of every 2016.

[4] This paper presents Book Recommendation System (BRS) based on combined features of content-based filtering (CBF), collaborative filtering (CF) and association rule mining to produce efficient and effective recommendation. For this we are proposing a hybrid algorithm in which we combine two or more algorithms, so it helps the recommendation system to recommend the book based on the buyer's interest

[5] In this paper we can conclude that instead of large billboards they can now advertise on smartphones which is economically and accurately tested. Therefore, we have developed a concept for a market that offers geofence, which can be applied by all and increase the use and integration of proactive services based on location in everyday life.

3. Description

The Off-shop application provides customers with a list of nearby shops where they can find the product they are searching for. The list includes information such as the location, opening and closing times, contact information, and directions to the shop. The application also displays ongoing offers available on products in nearby shops, similar to online shopping. The recommendation system helps customers make better choices of products. This application also benefits shopkeepers, as it helps them promote their shop to potential customers.

4. Requirements

4.1 External Interface Requirement

The requirements section of hardware includes minimum of 180 GB hard disk and 4 GB RAM with 2 GHz or higher speed. The primary requirements include a memory of 4GB for the Android Application development.

4.2 Software Interfaces Requirement

This is the software configuration in which the project was shaped. The programming language used; tools used are described here.

• Operating System: Windows

• Front End: Kotlin and Java

• Tool: Android Studio.

• Database: FireBase.

4.3 Non-Functional Requirement

1. Performance Requirements

High Speed: System should process requested task in parallel for various action to give quick response. Then system must wait for process completion. Accuracy System should correctly execute process, display the result accurately. System output should be in user required format.

2. Safety Requirements

The data safety must be ensured by arranging for a secure and reliable transmission media. The source and destination information must be entered correctly to avoid any misuse or malfunctioning.
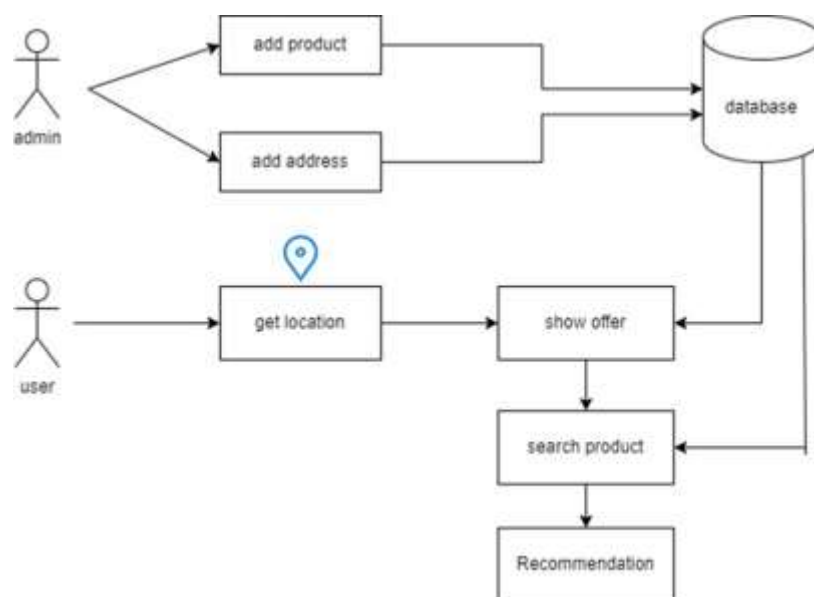
5. Proposed System Architecture

Fig. 2 System Architecture.

6. System Implementation

The primary goal of this project is to locate a required product in the vicinity. with the help of geofencing technology offers locating nearby shop can be obtain present in between the range.

Google Android Geo API

The Geolocation API returns a location and accuracy radius based on information about cell towers and Wi-Fi nodes that the mobile client can detect. This document describes the protocol used to send this data to the server and to return a response to the client. Communication is done over HTTPS using POST. Both request and response are formatted as JSON, and the content type of both is application/json.

Geofencing Technology

A geofence is a virtual boundary around a real-world geographic area. The use of a geofence is called geofencing.one example of use involves a location aware device such as a smartphone user entering or exiting a geofence, triggering an alert to the device's user. A "geofence" is a virtual border that is created using geofencing technology using the user's location and proximity to points of interest. A circular fence can be constructed around a site by providing its latitude, longitude, and radius. Nevertheless, there is a 100-geofence limit per app and per device user. Several geofences can be active at once. Each geofence's entrance and leave events can be defined by Location Services to transmit them, or they can be set up to send an event after a certain dwell period. It is also possible to arrange the geofence to be automatically removed by Location Services when a predetermined amount of time has passed.

Getting the required permissions is the first step in requesting geofence monitoring. Your app must ask for the following in order to enable geofencing:

• ACCESS FINE LOCATION

• ACCESS BACKGROUND LOCATION

(If your app targets Android 10 (API level 29) or higher)

Now should set up a Geofencing client instance in order to use the location APIs. To locate out how to link your client:

KOTLIN:

```
lateinit var geofencingClient: GeofencingClient

override fun onCreate (savedInstanceState: Bundle?) {

  // ...

  geofencingClient = LocationServices.getGeofencingClient(this)

}
```

Create and add geofences:

Your app needs to create and add geofences using the location API's builder class for creating Geofence objects, and the convenience class for adding them. Also, to handle the intents sent from Location Services when geofence transitions occur, you can define a PendingIntent as shown in this section.

Create geofence objects:

First, use Geofence.Builder to create a geofence, setting the desired radius, duration, and transition types for the geofence. For example, to populate a list object:

Kotlin:

```
geofenceList.add(new Geofence.Builder()

  // Set the request ID of the geofence. This is a string to identify this

  // geofence.

  .setRequestId(entry.getKey())

  .setCircularRegion(

      entry.getValue().latitude,

      entry.getValue().longitude,

      Constants.GEOFENCE_RADIUS_IN_METERS

  )
```

```
    .setExpirationDuration(Constants.GEOFENCE_EXPIRATION_IN_MILLISECONDS)

    .setTransitionTypes(Geofence.GEOFENCE_TRANSITION_ENTER |

        Geofence.GEOFENCE_TRANSITION_EXIT)

  .build());
```

This example pulls data from a constants file. In actual practice, apps might dynamically create geofences based on the user's location.

Specify geofences and initial triggers

The following snippet uses the GeofencingRequest class and its nested GeofencingRequestBuilder class to specify the geofences to monitor and to set how related geofence events are triggered:

Kotlin:

```
private fun getGeofencingRequest(): GeofencingRequest {

  return GeofencingRequest.Builder().apply {

    setInitialTrigger(GeofencingRequest.INITIAL_TRIGGER_ENTER)

    addGeofences(geofenceList)

  }.build()

}
```

Add geofences

To add geofences, use the GeofencingClient.addGeofences() method. Provide the GeofencingRequest object, and the PendingIntent. The following snippet demonstrates processing the results:

KOTLIN:

```
geofencingClient?.addGeofences(getGeofencingRequest(), geofencePendingIntent)?.run {

  addOnSuccessListener {

    // Geofences added

    // ...

  }

  addOnFailureListener {

    // Failed to add geofences

    // ...

  }

}
```

7. Conclusion

People prefer to purchase things online however it is seen that sometimes the quality expected from the products are not up to the mark as well as the product can be duplicated or something else hence this creates problem and doubt in the minds of people about whether to purchase online or not, the geofencing technology gives edge over searching and locating mechanism. There are some specific products that people prefer to purchase offline however they don't assist, obtain the shops where they can assist, obtain easily find the product therefore in order to solve this problem, we have created a product-based shop locator mobile application in the vicinity with geofencing technology [Off-shop] which will provide a list of shops near you where you can find those products easily.

It will provide the shopkeepers the more exposure to customers and can request them to create their inventory and request them to keep the track of product availability. It can also request the customer to find the products, its cost also the purchase will be immediate thus buyers can verify the products on the spot which will nullify the defectiveness of the product. Also, there is a recommendation system, additionally, customers can find the ongoing offers available on products in shops near them.

E-commerce sites have some disadvantages as they don't deliver immediately therefore for the urgent handle, require we will not assist, obtain those products at a fortunate time thus we can find them nearby using a product-based shop locator mobile application in the vicinity with geofencing technology

[Off-shop] which will provide real-time GPS navigation of stores on reside maps along with the time of stores, which will save a lot of time of customers. For medical needs, this application will request us to find the availability of medicines in the nearby stores. This platform can even request the small business to boom as they can showcase the various products they have. Therefore, by application of the above platform, we can definitely solve the problems of both buyers and sellers.

8. Acknowledgement

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