Finding the closest and lowest price pharmacy over a given location

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Abstract
If an object is required, people will buy it, but they will search for a seller who is deserving of their cash. Timing and approval are not very important factors when making a buy. Negotiating a lower price is essential because it might make them happier. You may be wondering why drugstore prices differ so much. The cost of treatments, even those that aren't prescribed, can vary considerably. These expenses change because various pharmacy benefit managers (PBMs) bargain prices on behalf of pharmacies and drug companies. When there are numerous PBMs and shops, drug prices frequently fluctuate. The purpose of this paper is to provide customers with the opportunity to input their desired medication and location in order to find the nearest (driving distance) pharmacy that will provide their desired medications at a reduced price.

Introduction

Customers should look for the pharmacy with the best prices in a particular area for a number of factors. One justification is to lower their out-of-pocket costs for prescribed drugs. Drug costs can differ considerably between pharmacies, says a Consumer Reports article [1]. Therefore, customers can save money on their prescription medications by looking around for the lowest price pharmacy.

In an effort to retain customers, some pharmacies also provide specific medications for free or at a very low cost, especially high-volume prescription drugs [2]. Additionally, the cost of the same medicine can vary significantly between pharmacies. For instance, when compared to Walmart and Kroger, Target/CVS had the lowest rates for a particular market basket of prescription drugs [3].

Customers can use resources like prescription discount cards or pharmacy search tools, like those offered by RxSaver and Health Peek [4-7], to discover the lowest-priced pharmacy. Customers can then evaluate prices at various pharmacies in their neighborhood and select the one with the best deal for their required medication. Customers may also think about buying prescribed drugs from foreign online pharmacies that adhere to strict guidelines for pharmacy practice and have been approved by the PharmacyChecker Verification Program [8].

STEPS OF DEVELOPMENT

Although PostgreSQL is a strong relational database system, it does not come with built-in support for location-based search. However, location-based searches can be executed using PostGIS' spatial extension [9]. Here are some steps you can take to use PostgreSQL to locate the nearby, lowest-priced pharmacy near a specific location:
1. Gather information about pharmacy locations, such as prices and addresses.
2. Transfer the data into a PostgreSQL database with PostGIS support.
3. To locate the pharmacy with the best deal near a specific place, run a database query combining spatial and aggregation functions. We use the MIN function to locate the pharmacy with the lowest price within a certain

distance range and the ST Distance function to determine the distance between the given location and each pharmacy. To make sure the locate of the pharmacy that is nearest to each location, are grouped the pharmacies by their locations.

Lets suppose we have 2 tables which contains multiple possible combinations between the respective id-s.

```
SELECT FirstMap.id1, SecondMap.*
FROM   map1 FirstMap
CROSS  JOIN LATERAL (
SELECT  ST_HausdorffDistance(FirstMap.cordinates1, SecondMap. cordinates2) AS  h_dist, SecondMap.id2, SecondMap. cordinates2
FROM   map2 SecondMap
WHERE  ST_HausdorffDistance(FirstMap. cordinates1, SecondMap. cordinates2) < 2
ORDER  BY 1, 2
LIMIT  2
) m2;
```

Depending on the minimal Hausdorff distance, returns 1 or 2 rows for each row in FirstMap, along with the top 2 corresponding rows in SecondMap and the minimum Hausdorff distance between them. No row is returned if SecondMap doesn't contain any rows with Hausdorff distances less than 2.

HAUSDORFF DISTANCE

The Hausdorff distance, also referred to as the Hausdorff metric, is a measurement of the separation between two groups of a metric space. It can be used to compare shapes and find variations between them in mathematics and computer science. Felix Hausdorff and Dimitrie Pompeiu invented the distance, which bears his name.

The Hausdorff distance [10] calculates the greatest distance possible between any two points in a rectangle. The infinity of all integers dH(f(X), g(Y)) for all metric spaces M and all isometric maps f and g is used to define this distance. If every point of one set is close to some point of the other set, and vice versa, two sets are said to be close in the Hausdorff distance. The Hausdorff distance transforms a metric space's collection of non-empty compact subsets into a separate metric space [11].

Numerous computer science applications, especially in the areas of image processing and computer vision, make use of the Hausdorff distance [12-13]. It is used to assess medical picture segmentation techniques and compare binary images and portions of them [14-15]. The Frechet distance, on the other hand, is more appropriate for curves because it is less susceptible to outliers [16].

Hausdorff dimension, which is a measurement of roughness or fractal dimension, should not be confused with Hausdorff distance, it is essential to note [17]. Additionally, in a Hausdorff space, every pair of unique points has a neighborhood that is disconnected from the other [18].

Briefly stated, the Hausdorff distance is a mathematical measure of how comparable two shapes are in a metric space. It has a wide range of uses in computer science and other disciplines.

Other Options

It could be possible to make the data visualisation even through some Python libraries as per below:

Matplotlib: For making static, interactive, and animated visualizations in Python, Matplotlib is one of the most popular libraries. It offers numerous layout types, such as line, bar, scatter, pie, and many more. Seaborn: Seaborn is a Matplotlib-based Python data visualization tool. It offers a sophisticated user interface for producing visually appealing and educational statistical images. Plotly is a web-based application for data visualization that works with Python, R, and MATLAB. It offers many dynamic plot types, such as scatter, line, bar, and more. Online sharing of dynamic plots can be done using Plotly. Bokeh: Bokeh is a Python library that gives contemporary web browsers access to dynamic visualization tools. For the creation of interactive plots like scatter, line, and bar charts, it offers a high-level UI. Altair: For the purpose of producing declarative statistical graphics, Altair is a Python library. By offering a clear and succinct API, it enables users to concentrate on the data rather than the specifics of the visualization. ggplot: Based on the R package ggplot2, ggplot is a Python library. Using a syntax of graphics, it offers a high-level interface for producing statistical graphics. Pygal: A Python tool called Pygal is used to create SVG (Scalable Vector Graphics) charts. It offers a straightforward API for making various types of plots, such as line, bar, pie, and more. 4. Another possibility is utilizing a geocoding API to transform the user's location into coordinates prior to querying the database.

Results

PostGIS is an effective tool that can be used to carry out location-based searches, such as locating the pharmacy with the best prices in a specific area. As a spatial database extender for PostgreSQL, PostGIS makes the PostgreSQL database more compatible with geographic objects and spatial searches [19].

You will need a dataset with information on the locations and costs of pharmacists in order to run this query. Once you have this information, you can use PostGIS to run spatial searches to identify the pharmacy with the best prices nearby. Spatial searches can be carried out using a variety of PostGIS functions. To determine whether a point is inside a polygon, for instance, use the ST Contains method [20]. This feature can be used to locate every pharmacy in a specific area. When you have this list of pharmacies, you can use SQL searches to identify which has the best deal. Additionally, PostGIS has tools for computing the separations between locations. To determine the separation between two locations, use the ST Distance function [19]. This function can be used to determine how far pharmacies are from a particular location. Once you know how far something is from another location, you can use SQL queries to locate the pharmacy with the best deal nearby.

It's important to remember that PostGIS, when used correctly, can be quite quick for spatial queries. For instance, PostGIS nearest neighbor support can deliver results with significantly improved performance when a spatial index is present [18]. Additionally, PostGIS enables you to write a small amount of SQL code to build location-aware queries [17]. In summation, PostGIS can be used to run location-based queries, such as locating the pharmacy with the best prices in a specific area. You will need a da-taset that lists the locations and costs of shops in order to accomplish this. Once you have this information, you can use PostGIS to run spatial searches to identify the pharmacy with the best prices nearby.

Conclusion

In conclusion, customers who want to save money on their prescribed medications should search for the lowest cost pharmacy in the area. Customers can use a variety of resources and tools to evaluate prices at various pharmacies and select the one that charges the least for the prescription drugs they require. In this paper is discussed the possibility to use the PostgreSQL DB over locating the nearby, lowest-priced pharmacy near a specific location. There are created a list of necessary steps to be followed and discussed different ways that possible to make the data visualization of the nearest location required.

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