

Mechanic Tracking and Allocation in Breakdown Scenario using LBS and K-NN algorithm

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ABSTRACT

Location sensing and awareness have been exciting research topics in pervasive computing. In fact, location was arguably one of the formative topics in what has become the broad field of pervasive computing. The success key for every business is the response time for the customer's service requests. The efficiency and performance of a service provider for a client depends on how less time the service provider takes to deliver a certain service. In this project, location based service which allocates mechanic on the basis of customer requirement in the breakdown scenario has been presented.

Both enrolled mechanics and users use smart-phones to share their respective location co-ordinates and working status, which is directly associated with database. The k-nearest neighbour algorithm has been used as dispatcher with Google API to provide nearest mechanic services to the respective customer. This will allocate the mechanic to customer depending on the vicinity of both after request from customers end.

Keywords: GPS, Geocoding, ID (Identification), J2ME (Platform Micro Edition), K Nearest Neighbor, LBS (Location Based Service), Technician Dispatching , Technician Dispatching and Allocation.

I. INTRODUCTION

There is no current system available for finding appropriate technician to solve problem of our vehicle so this application will be useful for both technician and users. As sometimes technicians are not having work to do and they are free and users are in trouble at unknown location. Our system will help user to find technician by using their GPS location and technicians GPS location and user will get accurate information of technician location. Also user can send description of their problem to technician. If the problem is solvable by technician then he will accept the request and visit at users' location. On the basis of service provided user can get bills of

that service. Users are allowed to give rating and feedback regarding the technician and also complaint about technician to admin.

This system can be used as it is the real time application used for daily use by the needy user who have problem in their daily routine. It will be very helpful during the troublesome conditions where there is no one is available to help you. As everyone is having smart phone that will be beneficial for us. In this system, there are classes of information which will provide meaningful information according to the request/point of interest of user.

1.1 Mobile Computing

Mobile computing is human-computer interaction by which a computer is expected to be transported during normal usage, which allows for transmission of data, voice and video. Mobile computing involves mobile communication, mobile hardware, and mobile software. Communication issues include ad hoc networks and infrastructure networks as well as communication properties, protocols, data formats and concrete technologies. Hardware includes mobile devices or device components. Mobile software deals with the characteristics and requirements of mobile applications. Many commercial and government field forces deploy a rugged portable computer with their fleet of vehicles. This requires the units to be anchored to the vehicle for driver safety, device security, and ergonomics. Rugged computers are rated for severe vibration associated with large service vehicles and off-road driving and the harsh environmental conditions of constant professional use such as in emergency medical services, fire, and public safety.

1.2 Literature Survey

Year	Paper Name	Algorithm/Method	Advantages	Disadvantages
2000	RADAR- An in-building Rf-based User Location and Tracking System.	Rf-based user location and tracking	1-Used to build "Location Services" 2-RADAR could locate users with high degree	1-unsuitable for rapid development due

		algori thm.	of accuracy.	to initia l infra struc ture requi red. 2- Notc lear how RAD AR well work in real worl d settin g.
2003	Location- Based Services for Mobile Telephony: a study of user's privacy concerns	Servi ces 1- Locat ion Track ing 2-	Result shows that people are less concerned about their location being tracked , as long as they find the service useful	Pape r base d on hypo theti cal servi ces but did not impl



				ement nt tech nolo gy.
2013	Understanding the use of Location-based service applications : do privacy concerns Matter?	UTA UT- Unified theory of acceptance and use of technology .	Valuable theoretical contribution to field of information privacy through its risky shift phenomenon.	UTA UT does n't support to social influence on continuous usage intention.
2014	Practical k Nearest Neighbour Queries with Location	PIR- paillier public-key crypt	1-Provide both location privacy and data privacy. 2-Solution allows the	Challenge to give practical solution

	Privacy	osystem.	mobile user to retrieve one type of POI.	ion for K-NN queries on the basis of PIR.
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II.GOALS AND OBJECTIVES

- Seed of recovering breakdown vehicles.
- Quality of service given by mechanic.
- Effortless service in vehicle breakdown scenario. So that will be easier for accessing information.

III.RELEVANT MATHEMATICS RELATED TO THE PROJECT

3.1 System Description

Haversine is an algorithm used to calculate the Distance between user and technician. Haversine Formula calculate geographic distance on earth. If you have two different latitude longitude values of two different point on earth, then with the help of Haversine Formula, you can easily compute the great-circle distance (The shortest distance between two points on the surface of a Sphere). The term Haversine was coined by Prof. James Inman in 1835. Haversine is very popular and frequently used formula when developing a GIS (Geographic Information System) application or analyzing path and fields.

Central angle Haversine can be computed, between two points with r as radius of earth, ' d ' as the distance between two points, is latitude of two points and is longitude of two points respectively.

IV.REVIEW OF CONFERENCE/JOURNAL PAPERS SUPPORTING PROJECT IDEA

I.Location-Based Services for Mobile Telephony: A study of users privacy concerns-

Location-tracking and position-aware services. We then presented a case study that examines peoples concern for privacy in relation to location-based services and compared peoples perceived usefulness of the two types of services. Development emphasis should initially be on the more acceptable position-aware services. Future research should focus on studies involving implemented technology. Because our study is based on hypothetical services, the findings do not necessarily reflect user's behavior in a real setting.

II.A Secure Nearest Neighbor Revisited-

Work revisits the secure nearest neighbor problem. We show the insecurity of existing solutions, and the hardness of the SNN problem. We then design a new partition-based secure Voronoi diagram (SVD) method. The SVD method is as secure as the encryption function it uses, and any standard secure encryption schemes can be employed by the SVD method.

III.The New Casper: Query Processing for Location Services without Compromising Privacy:

A novel framework in which mobile users can entertain location-based services without the need to disclose their private location information. Mobile users register with Casper by a user-specified privacy profile requirements from the location anonymizer are outlined namely, accuracy, quality, efficiency, and exibility private queries over public data, public queries over private data, and private queries over private data. We have provided a framework for dealing with these queries that returns a candidate list of answers rather than an exact answer. We have proved that the returned candidate list contains the exact answer and is of minimal size. Extensive experimental evaluation studies all the components of Casper and shows its efficiency, accuracy, and scalability with large number of mobile users and various privacy requirements.

IV.When Location-Based Services Meet Databases-

A couple of prototypes were briefly described to illustrate where the research may be applied in real-life applications. LBSs draw from many different research areas, ranging from systems to applications to user modeling. Research in these different areas must cope with the location aspects of LBSs. Regarding the system architecture, while most traditional research is based on the client-server architecture, the mobility and limited communication ranges of the clients make it natural to consider LBSs on peer-to-peer and mobile ad-hoc architectures.

V.PROBLEM DEFINITION AND SCOPE

5.1 Problem Statement:

- 1.To find and track the technician based on user location..
- 2.To achieve on time service delivery to user by technician.
- 3.To achieve the business growth by customer review and comments as we solve their problem

5.2 Statement of scope:

- ✓ This application will be helpful for users who have the trouble with their vehicles and at unknown location.
- ✓ As there will be admin part, so admin can monitor all the complaints and feedback regarding service by each other user and technician.
- ✓ Rating and feedback will help other user to select technician next time.
- ✓ Easy bill generation and sending will be possible.
- ✓ Live tracking of technician to get distance information.

VI.GOALS AND OBJECTIVES

- To achieve easiest process for solving problems.
- To achieve surety of service.
- To increase employability.
- To achieve massive business growth by on-time service to customer

VII.MATHEMATICAL MODEL FOR PROPOSED SYSTEM

7.1 System Description:

1) Input I= Problem Request and location.

2) Identify output as O

$S = \{I, O, \}$

O= The output will be acceptance of request.

3) Identify the process as P

$S = \{I, O, P, \}$

Where

P=E,D And E= GiveFeedback,requestlog,comment,Paymentdetails,technician information,

D=GPS Position, Tracking

4) Identify failure cases as F

$S = \{I, O, P, F, \dots\}$

F= Failure occurs when the system fails or GPS is OFF.

5) Identify success as s.

$S = \{I, O, P, F, s, \dots\}$

i.s=When system is capable of identify request and tracking of technician who accept request and process it

$S = \{I, O, P, F, s, Ic, \dots\}$

ii.Ic=User Should create a Comment,feedback,Tracking System details.

VIII.EFFICIENCY ISSUES

There is very rear case of failure is if any error occurs first time in team, no one faces this error and couldn't resolve it, and then system will fail for this fresh error.

IX.OUTCOME

This application will help users to get on time service in critical situation where they want. Also it is best option for all technicians to get work faster, normally they have to wait for cars to come for repairing.

X. APPLICATIONS

As it is the real time application used for daily use by the needy user who have problem in their daily routine. It will be very helpful during the troublesome conditions where there is no one is available to help you. As everyone is having smart phone that will be beneficial for us.

XI. TECHNOLOGIES USED

11.1 Android:

Android is a mobile operating system developed by Google, based on the Linux kernel and designed primarily for touchscreen mobile devices such as smartphones and tablets. Android's user interface is mainly based on direct manipulation, using touch gestures that loosely correspond to real-world actions, such as swiping, tapping and pinching, to manipulate on-screen objects, along with a virtual keyboard for text input. In addition to touchscreen devices, Google has further developed Android TV for televisions, Android Auto for cars, and Android Wear for wrist watches, each with a specialized user interface. Variants of Android are also used on notebooks, game consoles, digital cameras, and other electronics.

Android has the largest installed base of all operating systems (OS) of any kind. Android has been the best-selling OS on tablets since 2013, and on smartphones it is dominant by any metric.

Initially developed by Android, Inc., which Google bought in 2005, Android was unveiled in 2007 along with the founding of the Open Handset Alliance a consortium of hardware, software, and telecommunication companies devoted to advancing open standards for mobile devices. As of July 2013, the Google Play store has had over one million Android applications ("apps") published including many "business-class apps" that rival competing mobile platforms and over 50 billion applications downloaded. An April-May 2013 survey of mobile application developers found that 71 of developers create applications for Android, and a 2015 survey found that 40 of full-time professional developers see Android as their priority target platform, which is comparable to Apple's iOS on 37 with both platforms far above others. In September 2015, Android had 1.4 billion monthly active devices.

XII. ALGORITHMS USED FOR IMPLEMENTATION

1. K-NN algorithm.

In pattern recognition, the k-nearest neighbors algorithm (k-NN) is a non-parametric method used for classification and regression. In both cases, the input consists of the k closest training examples in the feature space. The output depends on whether k-NN is used for classification or regression:

- In k-NN classification, the output is a class membership. An object is classified by a majority vote of its neighbors, with the object being assigned to the class most common among its k nearest neighbors (k is a positive integer, typically small). If k = 1, then the object is simply assigned to the class of that single nearest neighbor.

- In k-NN regression, the output is the property value for the object. This value is the average of the values of its k nearest neighbors.

✓ Accuracy = (# of correctly classified examples / # of examples) X 100 "

✓ Standard Euclidean Distance $d(x_i, x_j) = \sqrt{\sum_{a=1}^n (x_{i,a} - x_{j,a})^2}$

K-NN can be implemented using following formulae:

- Euclidean** $= \sqrt{\sum_{i=1}^k (x_i - y_i)^2}$
- Manhattan $= \sum_{i=1}^k |x_i - y_i|$
- Minkowski $= \left\{ \sum_{i=1}^k (|x_i - y_i|)^q \right\}^{1/q}$

In this system KNN is used to allocate nearest mechanics to the customer request regarding customers current location

2. Haversine formula

Haversine is an algorithm used to calculate the Distance between user and technician. Haversine Formula Calculate geographic distance on earth. If you have two different latitude longitude values of two different point on earth, then with the help of Haversine Formula, you can easily compute the great-circle distance (The shortest distance between two points on the surface of a Sphere). The term Haversine was coined by Prof. James Inman in 1835. Haversine is very popular and frequently used formula when developing a GIS (Geographic Information System) application or analyzing path and fields.

Central angle Haversine can be computed, between two points with r as radius of earth, d as the distance between two points, is latitude of two points and is longitude of two points respectively.

The haversine formula determines the great-circle distance between two points on a sphere given their longitudes and latitudes. Important in navigation, it is a special case of a more general formula in spherical trigonometry, the law of haversines, that relates the sides and angles of spherical triangles.

These names follow from the fact that they are customarily written in terms of the haversine function, given by $\text{haversin}(\theta) = \sin^2(\theta/2)$. The formulas could equally be written in terms of any multiple of the haversine, such as the older versine function (twice the haversine).

For any two points on a sphere, the haversine of the central angle between them is given by

$$\text{hav}\left(\frac{d}{r}\right) = \text{hav}(\varphi_2 - \varphi_1) + \cos(\varphi_1) \cos(\varphi_2) \text{hav}(\lambda_2 - \lambda_1)$$

where

- hav is the **haversine** function:

$$\text{hav}(\theta) = \sin^2\left(\frac{\theta}{2}\right) = \frac{1 - \cos(\theta)}{2}$$

- d is the distance between the two points (along a **great circle** of the sphere; see **spherical distance**),
- r is the radius of the sphere,
- φ_1, φ_2 : latitude of point 1 and latitude of point 2, in radians
- λ_1, λ_2 : longitude of point 1 and longitude of point 2, in radians

On the left side of the equals sign d/r is the central angle, assuming angles are measured in **radians** (note that φ and λ ; can be converted from radians to degrees by multiplying by $180/\pi$ as usual).

Solve for d by applying the inverse haversine (if available) or by using the **arcsine** (inverse sine) function:

$$d = r \operatorname{hav}^{-1}(h) = 2r \arcsin(\sqrt{h})$$

where h is $\operatorname{hav}(d/r)$, or more explicitly:

$$d = 2r \arcsin\left(\sqrt{\operatorname{hav}(\varphi_2 - \varphi_1) + \cos(\varphi_1) \cos(\varphi_2) \operatorname{hav}(\lambda_2 - \lambda_1)}\right)$$

$$= 2r \arcsin\left(\sqrt{\sin^2\left(\frac{\varphi_2 - \varphi_1}{2}\right) + \cos(\varphi_1) \cos(\varphi_2) \sin^2\left(\frac{\lambda_2 - \lambda_1}{2}\right)}\right)$$

XIII.SOFTWARE ARCHITECTURE

Software architecture refers to the high level structures of a software system, the discipline of creating such structures, and the documentation of these structures. It is the set of structures needed to reason about the software system. Each structure comprises software elements, relations among them, and properties of both elements and relations.

13.1 Architectural Design

Client By using this system Clients can creates their account and take information regarding the nearest appropriate Mechanic/Technician and send him an appointment request.

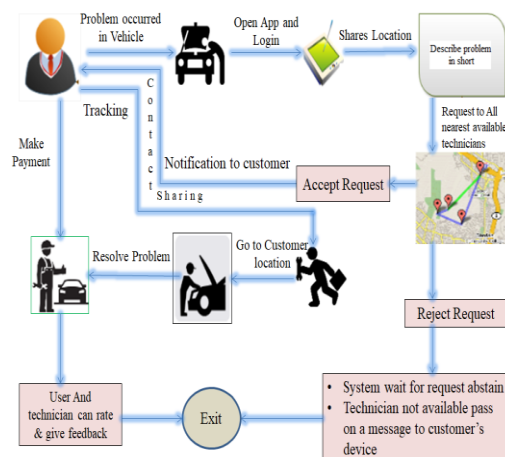


Figure:Architecture diagram

XIV.COMPARATIVE STUDY

Mechanic Tracking and Allocation in Breakdown Scenario using LBS and K-NN algorithm a peer-to-peer car repair marketplace that enables mechanics to fix users' cars at their home or office,

Mechanic Tracking and Allocation in Breakdown Scenario using LBS and K-NN algorithm offers mechanic profiles, reviews from customers, a fair price calculator "to ensure that you are paying a fair price," and online repair records.

Scrutinizing about the idea, research claims that it is found that most mechanics only make about 120Rs/hour because they are only paid when they're fixing a car. Our study explains that the difference between what Garage/shop owners pay for a job at a shop and what the mechanic earns goes mostly to the Garage/shop owners. Having a conversation with a mechanic during the study period; he explained how mechanics want to make the money themselves, rather than having the majority of the revenue go to Garage/shop owners.

We worked on to removing the shop owner from the equation.

19.1 General Analysis table

Existing System Service	Our System Service
Usually the oil change service only	Oil changes is the least of what we do. Our job is basically to fix your car at lower cost and greater convenience. We Usually provide all types of services (repair, maintenance etc.) at lower costs.
Existing System incurs the high Cost services and long waiting time for customers to process requests when mechanics are busy with other clients or jst idle but ignore case .	The mechanics can set their own availability timings, and customers can book them during those hours. The work is done at 20 to 40% lower costs than a local dealership.
Time Delay in the arrival of mechanic after the generation and processing of the request online. Some or the other times chances of miscarrying the Tools	Upon booking, the mechanic arrives at the scheduled time with all the required tools to service your car. All one needs to do is provide some space for the mechanic to perform his job
Think of it as the other system for car repair. You book a mechanic, and you are able to track him driving to your location on the day	In Case , Our System provides a online detailed list of cost, parts, and services needed for the car to be

of the appointment. A text and email will be sent to you when the mechanic leaves for a visit. Once they Visit lots of hidden surprises regarding car repair and extra charges are encountered by customer from mechanic which inturn disappoints a customer and forces to pay these hidden charges compulsorily.	served leaving no room for hidden surprises or last minute negotiation or any of the extra hidden charges.
No Detailed profile available ; includes only a short description providing as lump-some information. Chances of fraud .	Your customers and mechanics can create and maintain a detailed profile so that you will know your ecosystem better. No chances of Fraud.
No repair warranties provided in any of the services offered.	Repair warranties provided under some exceptional services offered. (Batteries, spare parts etc.)

19.2 Comparative Analysis for algorithms:

K - means	KNN
In training phase of K-Means, K observations are arbitrarily selected (known as centroids). Each point in the vector space is assigned to a cluster represented by nearest (euclidean distance) centroid. Once the clusters are formed, for each cluster the centroid is updated to the mean of all cluster members. And the cluster formation restarts with new centroids. This repeats until the centroids themselves become mean of clusters, i.e., when updating centroids to mean doesn't change them. The prediction of a test observation is done based on nearest centroid.	K-NN doesn't have a training phase as such. But the prediction of a test observation is done based on the K-Nearest (often euclidean distance) Neighbours (observations) based on weighted averages/votes.
K-means has time complexity $O(n^2)$	K-NN has time complexity $O(n \log n)$
K-means refers to the global data	K-NN refers to the local data points

points	
It is an Unsupervised learning technique	It is a Supervised learning technique
Purposed for Clustering use	It is used mostly for Classification , and sometimes even for Regression

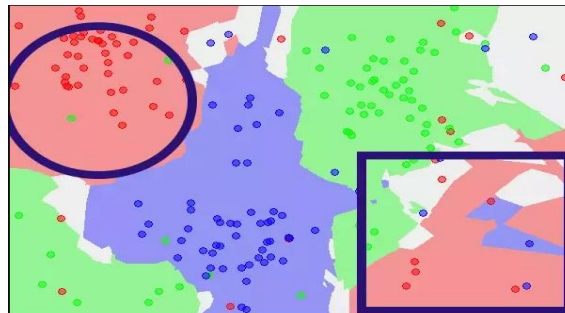


Figure :K-means considering global values for clustering vs
K-NN considering local values for clustering schema

XV. CONCLUSION

Our System have shown different technologies that are used in LBSs and ways of choosing a suitable technology to use, given a particular situation. We developed both mobile and web base application and incorporated location based services in both applications. Also, we have included maps in the mobile application that is used by technicians and to get a callers location automatically using the call information, like caller ID. This will eliminate the request for meter numbers from the customer. The product of this research can play a big role in any service delivery organization in the future by improving or minimizing the time to deliver a service.

REFERENCES

- [1] B. I. A. Junglas and R. T. Watson, Location-based services, Commun. ACM, vol. 51, no. 3, pp. 6569, 2008.
- [2] L. Barkuus, A. Dey, and L. Barkhuus, Location-Based Services for Mobile Telephony: a Study of Users Privacy Concerns, in INTERACT, 2003, pp. 702712.
- [3] P. Bahl and V. N. Padmanabhan, RADAR: An in-building RF-based user location and tracking system, in INFOCOM 2000. Nineteenth Annual Joint Conference of the IEEE Computer and Communications Societies. Proceedings. IEEE, 2000, pp. 775784..
- [4] J. K.-Y. Ng, K.-Y. Lam, Q. J. Cheng, and K. C. Y. Shum, An effective signal strength-based wireless location estimation system for tracking indoor mobile users, J. Comput. Syst. Sci., vol. 79, no. 7, pp. 10051016, 2013.
- [5] X. Yi, R. Paulet, E. Bertino, V. Varadharajan. Practical k nearest neighbor queries with location privacy. In Proc. ICDE 2014. Pages 640-651.