A Secure Augmented Reality Based Recommender System with Location Based Services

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Abstract: In recent years, the mobile applications have gained heaps of attention due to the rapid rise of the computational capabilities of mobile devices. The introduction of augmented reality in mobile devices has headed to the evolution of many android applications. The Location based services are gaining attention in different domains. This paper presents a location based service recommender system that provides the best service recommendations that are nearby to the user location while preserving the privacy of user.

KEYWORDS: Mobile Device, Location Based Service, Augmented Reality.

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I. INTRODUCTION

Augmented reality (AR) technology has become widespread in mobile devices with the increasing use of smart devices. In day to day life, the application that uses Mobile augmented reality has become more useful for existing IT solutions (Korinth, M., et al) but, the improvement of this application type is still challenging in a robust and reliable manner.

AR can provide visual guidance to users and can support task assistance more effectively by embedding visual information onto the real environment (Blattgerste et al.) Thus, AR has been applied to various fields such as Internet-of-Things (IoT) (Huo et al., 2018), product design, infrastructure visualization etc. (Schall et al.).

A Location-Based Service (LBS) is a mobile computing application that offers users with services depending on the geographic location. Location-based services are extremely popular as mobile devices with even more features and functionality (particularly Apple's iPhone and Android-based devices) become more widely obtainable. While more information is enriched with geo data, it can be presented not only in a virtual space, but also in real, mobile contexts and in a context-sensitive manner tailored to the user's entreaty (Aurelia, et al)

With the advancement of wireless sensor technology and smart gadgets, it is now possible to acquire accurate personal location information of mobile terminal users at a certain time and from any location; thus, location based service (LBS) is a new class of applications. Amongst the most common services provided by AR is location-based service, which intercepts the user's position information via mobile wireless network or external positioning mode (Deidda et al). It increases the value of services by using information. LBS typically include a location system, mobile devices, a network, and a service provider (LBS server). Users of this service send their local location coordinates to the LBS server and receive the commensurate probe results (Yin and Xi).

In Location Based Service (LBS), Sensitive attribute data may be the time data and spatial data associated to the users. The content of the provider request carries many aspects like health care information, etc. The attackers can use this data to deduce the user's travel patterns, interest, nature of work and other personal information. Therefore, during the unauthorized situation, the Location privacy threat refers to the fact that attacker tracks the exact position information of the user through location device and technology and infers the privacy information associated to user location through reasoning method (Sun, et al.).

Location privacy protection approach specifically refers to the fact that false user location information or anonymous user's identity information is affording by the user to the server through the method of location service. The GPS- equipped smartphones and IOT devices is widely used in the existing system which generates a large amount of data with location information at an unprecedented rate.

STRUCTURE OF PAPER

The paper is organized as follows: In Section 1, the introduction of the paper is provided along with the structure, important terms, objectives and overall description. In Section 2 we discuss related work. In Section 3 describes the architecture of the proposed model and the section 4 provides the system model and explanation of the proposed model. Section 5 describes the implementation with result and section 6 is the conclusion.

OBJECTIVES

This paper proposes scalable indexing; querying services and lightweight for large spatial data that are stored in graph-based systems or distributed storage systems. Augmented Reality is used for mapping the services. To preserve user's location privacy, exact location is hidden and obfuscation is created depending on the status of user's policy. The User's query is compared with the related keywords and hence the proposed system will help users to get services nearby also. Finally the best services is found based on the feedback of the previous users.

II. RELATED WORK

Varshavsky et al proposed a secure pairing of wireless devices with the help of common radio environment as evidence of near proximity. This technique does not require extra hardware; rather it makes use of the benefits available on radio interfaces which already available on mobile devices like wifi and GSM. This technique is less susceptible to eavesdropping attacks because the shared secret used to secure communication is obtained by hearing the common radio environment instead of transmission. But this technique is not concentrated about the secure pairing of co-located devices.

A ubiquitous interface agent with the Bluetooth wireless technique is proposed by Yang et al in cloud computing environments and also for ontology technology OntoIAS. Based on the concept of packet decoding and packet recognizing, the agent makes use of CURRL to transform the user query into the required canonical format for the purpose of processing commands, conveniently with the help of OntoIAS. Therefore, it avoids large number of jumbled and incorrect information that occurs due to the misunderstanding of the information that are provided by the users. The experimental results exposed that this technique provides high-level recommendation. Conversely this system is limited in performance efficiency, and the above discussed technique can be improved through ontology database, linking the interface and also by developing the middle programs.

Location-based service (LBS) using ontology-based semantic query is proposed by Kangjae Lee et al (2017) with an attention on the indoor activities in a university context. 'University activity ontology', is an ontology model designed with the intension of the indoor activities at the university in-order to share, manage and query data semantically. Semantic queries create reasoning rules to retrieve and provide information about the nearest places which are relevant to the destination with keywords based on the users input

The privacy preserving is an important aspect in LBS systems. The proposed system recommends the best services without revealing the exact location of the user using the concept of ontology based querying and augmented reality.

III. PROPOSED METHODOLOGY

This paper proposes a service recommendation using Location based Services which concentrates on lightweight, scalable indexing and also on querying services for large spatial data that are stored in distributed storage systems or through graph-based systems. Augmented Reality for mapping the services is implemented.

To preserve the user's location privacy, exact location is hidden and obfuscation is achieved based on the user's policy status. The architecture of the proposed system is given in figure 1. User's query is compared with the related or the synonym keywords. This recommender system will help users to get services that are close proximity and provides the recommendations based on the feedback of the previous user.

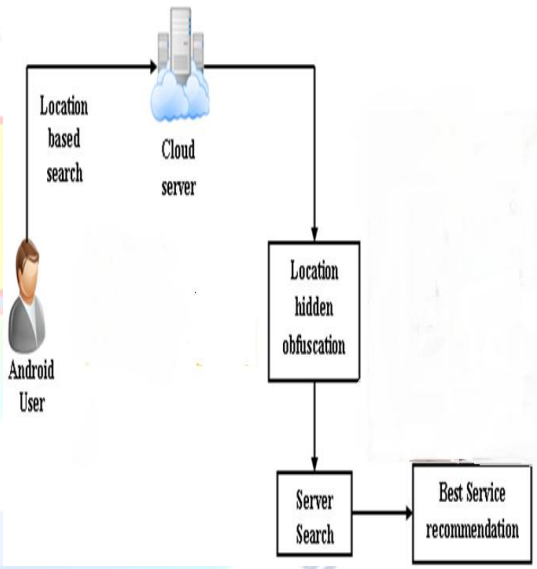

Figure :1 Architecture of Proposed Recommender system

IV. SYSTEM MODEL

The system framework for the proposed augmented reality based privacy preserving location-based recommender solution is given in this section.

User (U): Refers to users' mobile devices requesting for the service.

Clocking Agent (CA): On receiving the user query request, CA use to identify the precise location of the user based on the GPS available in the user's mobile device. The movement of user either towards / away

from the location is tracked by CA. Based on the movement, the safe region is computed by the clocking agent.

if $m = y + k$

$SR(y) = y + k$

Else if

$m = y - k$

$SR(y) = y - k$

Current location is y, m is the movement, $y + k$ is movement of the user towards the next region from the current location and $y - k$ is movement of the user away from the current location.

Augmented Reality is used to identify the user current location.

Once the query result is received from CS, CA applies the KNN Query Algorithm to fetch the nearest location based service in accordance to user's current location. Hence the user receives the exact information. At the same time the user's exact location is preserved because the CS update user location as safe region location.

Cloud server (CS): CS fetches the location of the safe region and send to the CA. On receiving the query from CA, CS process the user query and provides the results based location and Ontology. Based on the ontological query retrieval, the relevant search keywords is obtained and the query result is sent to CA.

Algorithm:

Registration phase:

CA --> User (un, ps)

User needs to get registered with clocking agent to access location based service. User provides his details - name, address. Then the User is identified with unique username un and password ps.

Authentication

User sign in with the unique credentials to send the query. The query is passed to clocking agent which is then sent to the CS.

U-->CA(Service)

Query phase

U (x)--> CA

Safe region (SR) is calculated based on current user location and send to CS

CA --> CS (SR)

CA send the query to CS with the safe region.

CS-->CA (Query result of SR)

CA computes the service for the nearest location of user and send it.

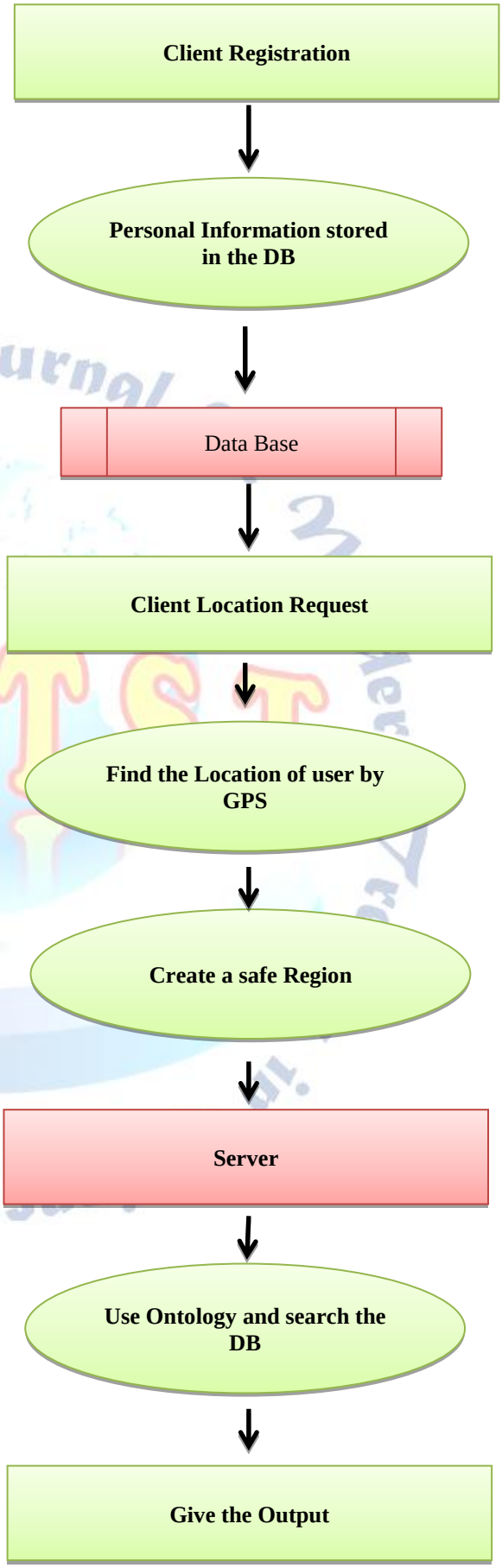

Figure : 2 Flowchart of the proposed system

V. RESULTS

The proposed system is implemented in the Android Platform using GPS for location identification and Cloud server for IAAS Data Process and Ontology for effective data retrieval.

The registration phase is given in the figure 3.

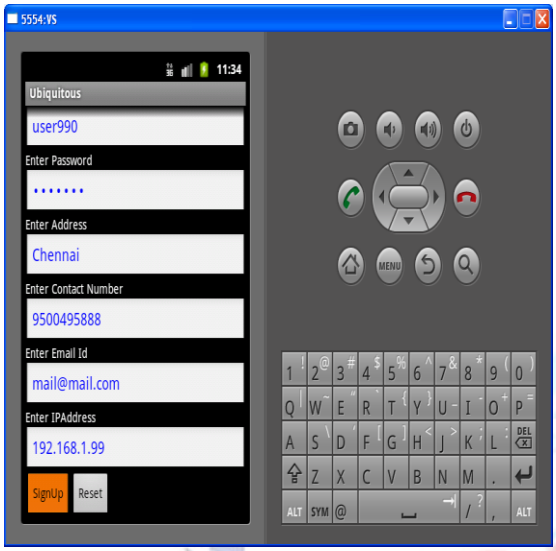

Figure 3 : User registration

The user's query is shown in figure 4 and query result is given in figure 5.

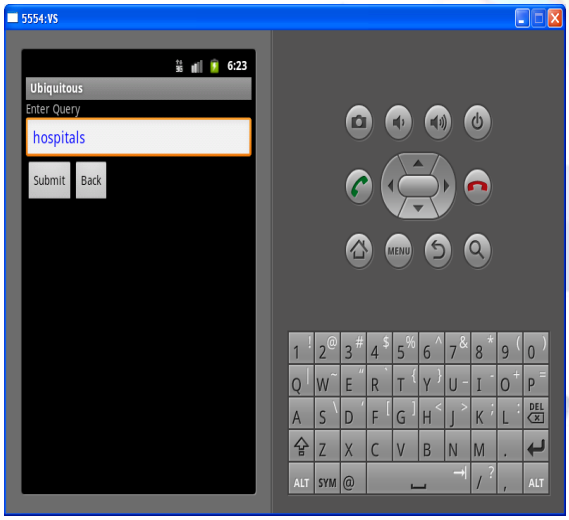

Figure 4: User query

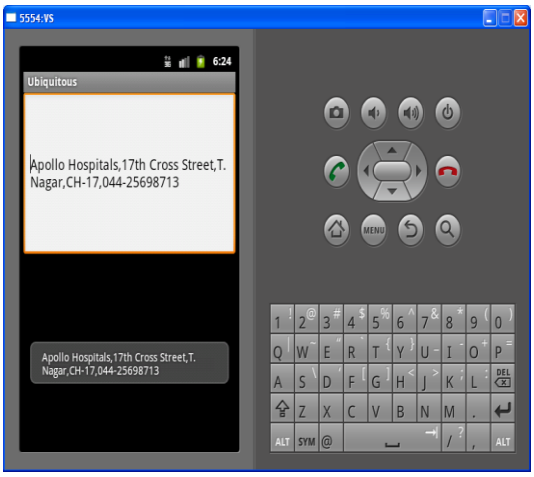

Figure 5 : Query Result

For the given query, the list of relevant results is shown in figure 6.

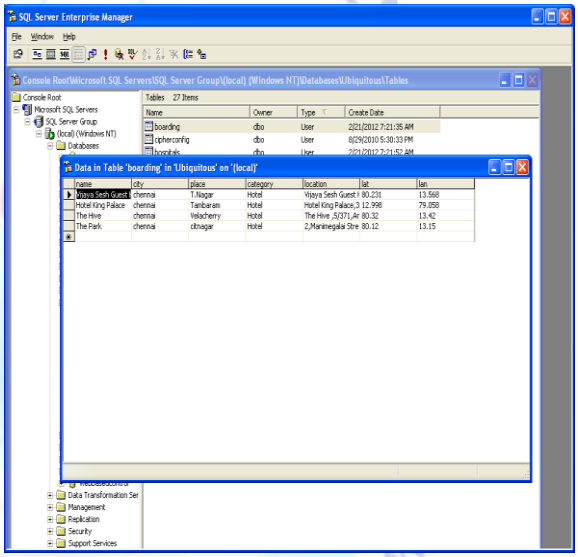

Figure 6: List of services

The proposed AR based location based service recommender system provides the recommendations of service based on the nearest location along with the privacy preserving of the user. Whereas in the existing web sites portal fails to recommend the services at all time and the privacy of the user is not maintained,

VI. CONCLUSION

Location based Services provide several benefits to the mobile users. The information about their current location of the user can be retrieved easily and it also provides more useful information near to their location. They provide personalized services according to their

current location. However the privacy preserving of the user is as important to the best recommendations. The proposed method provide the best recommendation as well as preserve the current location of user, it uses the AR based system with ontological querying to achieve the best results.

REFERENCES

1. Aurelia, S., Raj, M. D., & Saleh, O. (2014). Mobile augmented reality and location based service. Advances in Information Science and Applications, 2, 551-558.
2. Korinth, M., et al., 2020. Design and Evaluation of a Virtual Reality-Based Car Configuration Concept, in: Advances in Computer Vision, Springer. pp. 169–189.
3. Blattgerste J., Strenge, B., Renner P., Pfeiffer T., & Essig K. (2017). Comparing conventional and augmented reality instructions for manual assembly tasks. Proc. PETRA'17, 75-82.
4. Huo, K., Cao, Y., Yoon, S.H., Xu, Z., Chen, G., & Ramani, K. (2018). Scenariot: Spatially mapping smart things within augmented reality scenes. Proc. CHI'18, 219.
5. Schall, G. et al. (2009). Handheld augmented reality for underground infrastructure visualization. Personal and Ubiquitous Computing, 13(4), 281-291.
6. M. Deidda, A. Pala, and G. Vacca, "An example of a tourist location - based service with open-source software," Applied Geomatics, vol. 5, no. 1, pp. 73–86, 2013.
7. C. Yin and J. Xi, "Maximum entropy model for mobile text classification in cloud computing using improved information gain algorithm" Multimedia Tools & Applications, 2016.
8. Y. Sun, L. Liu, L. Yin, and S. Xin, "Toward inference attacks for k-anonymity" , Personal and Ubiquitous Computing, vol. 18, no. 8, pp. 1871–1880, 2014.
9. A. Varshavsky, E. de Lara and A. LaMarca, "Enabling Secure and Spontaneous Communication between Mobile Devices using Common Radio Environment", 8th IEEE Workshop on Mobile Computing Systems and Applications, 2007, pp. 9-13, doi: 10.1109/HotMobile.2007.12.
10. S. Yang, C. Hsu and D. Lee, "An ontology-supported ubiquitous interface agent for cloud computing - Example on Bluetooth wireless technique with Java programming", International Conference on Machine Learning and Cybernetics, 2010, pp. 2971-2978, doi: 10.1109/ ICMLC.2010.5580762.
11. Jiyeong Lee, Kangjae Lee and Mei-Po Kwan, "Location-based service using ontology-based semantic queries: A study with a focus on indoor activities in a university context", Computers, Environment and Urban Systems, Vol 62, 2017, pp 41-52.