

Optimization approach for Convergence Aspect of Wireless Communication, Positioning Techniques and Spatial Databases in Facilitating Logistics Industry

Harsh Dev, Ph.D
Professor and Director

Pranveer Singh Institute of
Technology, 544-555 NH-2,
Kalpi road Bahuti, Kanpur
U.P,India.

Rajeev Kumar
Research Scholar

Department of computer
science, Bhagwant University
Ajmer, Rajasthan-226021, India

Suman Kumar Mishra

Research Scholar
Department of computer
science, Bhagwant University
Ajmer, Rajasthan-226021, India

ABSTRACT

In current scenario of technological advancement popular resources are mobile phones, personal digital assistance and palmtops computers providing many related information whenever needed. From ancient time people have been concerned with their spatial information and gathering on earth. The methods of finding routes and estimating the position of one person from other have always been a function of available resources. For the logistics industry, the potential is created by the convergence of wireless communication, positioning techniques and the Spatial Data Infrastructures (SDIs) is incredible. It is now easy to provide concerned information when it is needed most. By this convergence time dependent and location dependent information is key finding. This convergence is termed as location based services. Not only professional workers but common man will also get benefit by using LBS. In Many cases the benefits are realized, even in India many criminal cases are exposed by using explained technological coordination. The logistics industry is highly movement based. Favorable results are being delivered by dynamic integration of LBS and underlying technologies. The underlying technologies of LBS and their synergy will be examined by collecting relevant information. This collected information will be optimized by using dynamic programming approach.

Keywords

Positioning technique, GIS, SDIs etc

1. INTRODUCTION

1.1 Wireless communication

A new arena of information exchange and extraction is provided by wireless communication. Wireless data communication combines mobile communication and data communication by presenting easy access to users through wireless devices to the related information on the specified network. The relevancy of information is having personal to organizational commitments depending on the need occurred. In the current years, there has been a great development in wireless access technologies, to complete the need of people to be "Always Proper Connected". There are plentiful technologies, networks, systems, applications and devices. These various technologies bring a well-known issue to the field of wireless access networks: seamless handover services [1].

1.2 Positioning techniques

The frame work for Mobile based technologies prepared by the involvement of wireless data communication. The Location based service is the example of such kind of advancement. The most important factor in enabling LBS stipulation is the positioning technique, which estimates the accuracy of location. There are multiple methods utilized now days:

- Time of arrival – This technique is based on the time it takes for a signal to move from the cell phone to the base station that it is connected to. The accuracy is achieved by this technique but there are relevant costs of implementation with a high number of location measurement units.
- Cell of origin – The most elementary and easy in implantation technique to use the location of the radio base station that the cell phone is connected to. Accuracy less than other technique, the location can be determined within 0.5 km in urban areas and 35 kms in rural areas [2]. There is no extra cost associated to the handset or to the network to utilize this service.
- Enhanced observed time difference (E-OTD) – handsets with this technique measure the time difference between adjacent coordinated base stations, for this the location of the base stations must in record. Accuracy within 100 to 300 metres is achieved through this method.
- Angle of arrival – the angles at which a service signal arrives at two base stations are measured and triangulation used to estimate the location of the user. Here accuracy can be less in urban areas due to buildings creating obstacles to the signals.
- The Global Positioning System (GPS)- is an assemblage of 27* Earth-orbiting satellites. The U.S. military developed and implemented this satellite network as a military navigation system but, soon opened it up to everyone. Each of these 3500-4500-pound solar-powered satellites circles the globe at about of 12500 miles, making two complete rotations every day. The orbits are arranged so that at anytime, anywhere on the earth there are at least four satellites appearing in the sky [3].
- A-GPS – the current technology that coordinates the mobile network with the GPS to give a good accuracy of 5 to 10 meters. This system identifies the position within seconds, has broad coverage and can in some cases be used indoors. Less power is

consumed and requires minimum number of satellites.

1.3 Spatial database system

In tracking related fields there is a need to manage geometric, geographic, or spatial data, which means data related to space. Following views can be drawn about spatial database systems.

- A spatial database system is considered as database system.
- Spatial data types (SDTs) are provided in its data model and query language.
- Spatial data types are supported in its implementation, providing spatial indexing and algorithms for spatial join [4].

The layout of this paper is designed into five sections: section 1 is introduction of convergence aspect. Section 2 is explaining about the services yielded by the convergence, Section 3 describes the approach for optimization of converging factors, section 4 illustrate conclusion and future work. Further, section 5 illustrate list of references and books.

2. ANALYSIS OF CONVERGENCE ASPECT

The convergence of wireless data communication, positioning techniques and spatial data support has given rise to a new flavor of services with some related applications which are location dependent. The convergence of location dependent services is reflected in Fig 1

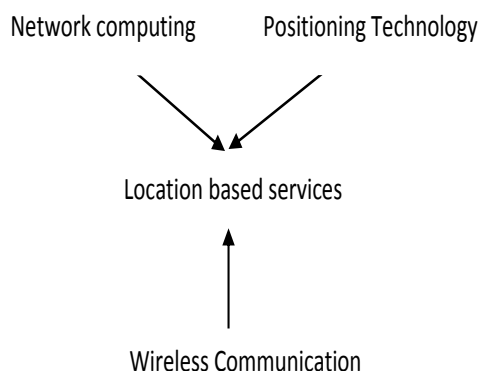


Fig.1 Actual scenario in LBS[4]

Location based service has been widely used in commercial and daily life, but as far as technical concern currently most of applications are based on the convergence of said parameters. Now a days, LBS has much benefit to the people. But with the increase requirement of accuracy and speed, new special application fields, and control of the accurate satellite signal opening to the public and so on, many new applications to LBS have been inefficient [5]. To solve these efficiency related problems, many persons, countries and organizations have contributed a lot. The satellite navigation systems or wireless communication network with positioning techniques are used to optimize and enhance the information received through LBS.

For observing efficiency related issues coming between various users of LBS in logistics related services, a survey has been conducted by us. Survey is conducted between 15 users of LBS in logistic industry. The result of survey is reflected by table 1

Table1. Identification of issues which are in need to optimize

Issues Factors	In navigation Services (%)	In tracking (%)	In group management (%)	In location based content delivery (%)	In Finders (%)	Social Networking (%)
Coverage(a)	70	90	82	99	18	21
Position Accuracy(b)	92	12	05	05	12	43
Timing Accuracy(c)	98	32	02	20	12	32
Availability(d)	92	43	32	43	14	31
Integrity(e)	43	76	42	64	32	21
Access	32	43	21	86	31	42
Control(f)						

The survey is basically uttered to evaluate the user experience while considering technological and working issues by using a model (drawn in Fig. 2). It has been partially applied to the analysis of ten logistic companies currently availing location based services, representative for the categories identified above.

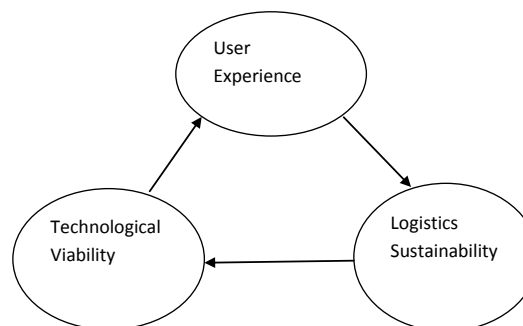


Fig2. Model of evaluation [7]

Evaluating running effects in combination with climate response provides a basis for setting technical priorities given that damage and deterioration can bring about loss in performance of the functional elements of the LBS. The process is used to establish risk of deterioration among the different walls for a given building façade, between the level of risk among different buildings in a given climate, or for comparing the relative effects of similar facades located in different climate zones [6].

3. PROPOSED APPROCH FOR OPTIMIZATION

3.1 Dynamic programming considerations

From above analysis, we can affirm that in this current scenario, mobile service providers are key players in the value chain: cellular technologies combining with GPS enable many of the available LBS [7]. Optimization on all the levels of location based services is needed for extracting best results in

the working environment of logistics industry. Favorable results will be got by involving dynamic programming in the convergence of various explained parameters.

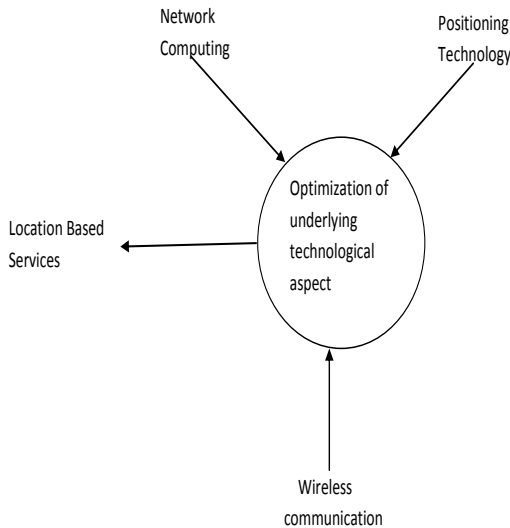


Fig3. Approach for optimization

with the performance of LBS needed to be optimized so that performance of existing systems should improved. Criticalness of the optimization through dynamic programming handled with extreme care because all the usable approaches consists a level of penetration into factor considerations. The smoothness of information extraction through convergence of wireless communication, positioning techniques and spatial database has governed by technical facilitations in logistics industry being emerged day by day.

3.2 Modeling by using dynamic programming

Dynamic Programming is a recursive method for solving sequential decision problems. Also known as backward induction, it is used to find optimal decision solution in “games against nature” [9].

The General Problem:

$$\text{Max } U(x, a, b; c, d, e);$$

a, b, c, d, e, f=Identified factors.

0=Starting of observation.

1=End of Observation

subject to i) $c \geq 0$

G =state variables

ii) W for all $t = 0, 1$ up to condition for a, b, c, d, e, f satisfied.

iii) Given speed of signal at $T(t) = f$.

iv) $e \leq T \leq d$.

$U(x)$ = Objective function.

$G(n)$ = constraints connecting the state and control variables.

$W(m)$ =is the feasible set for the control factors – assumed to be closed and bounded.

3.3 Service controlling by proposed approach

Location based services are treated as value added services. The used model is having following points in consideration.

- Service providers are allowed to specify service dependent parameters (identified by figure 1) and

location dependent information for populating this information in interest of user’s need.

- Service providers are allowed to establish relationship between the services and parameters which are required for proper working of LBS. These definitions are regularly configurable without interrupting the services.
- Usage scheme in case of change of area for a user provided.
- Status of the user is validated before charging to ensure the correctness of charging [8].

The controlling of optimization approach is done by following sequence reflected by Fig. 4.

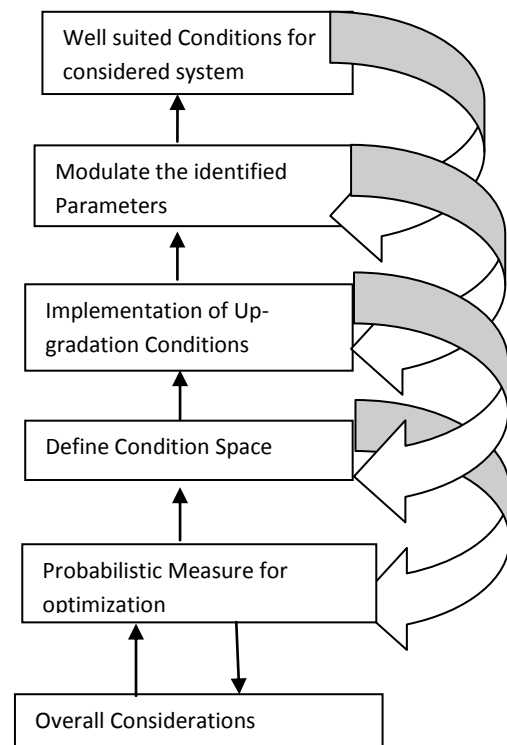


Fig. 4 Process of control for optimization

4. CONCLUSION AND FUTURE WORK

This paper focused on optimized consideration for convergence of explained factors can be achieved by applying dynamic programming approach. As LBS technologies are emerging, there is a need to be always best connected, easily found and data support. This cannot be done without the possibility of optimized convergence aspect within different networks and different tracking services. The process which facilitates this is needed to be crosschecked. As the most promising new technologies emerging the need for efficient access coming in front of LBS users. The research first focused on modeling of efficiency related factors and then searching the implementation process in future. After exploring the technical details of LBS environment, the tool will be designed for verification of results through proposed approach.

5. ACKNOWLEDGEMENT

I especially extend my sincere and grateful thanks to various LBS service users who provided us the usage information through which we could make some background about the convergence of wireless communication, positioning technology and spatial database. This was impossible to conduct the survey and collect the information about the technical aspects of LBS. We are also grateful some service providers who shared the information about their clients for making our survey successful.

6. REFERENCES

- [1] Ms. Madhuri R. Pawar, Prof. Santosh Sheshrao Sambare, "A Brief Review of Handover schemes in Wireless communication, (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 3 (1), 2012, 3269 - 3278
- [2] White paper on Location Based Services (LBS) on Mobile indicus. Mobile LBS, version Apr 14, 2008
- [3] Rajeev Kumar, Harsh Dev "Efficiency Related Parameters in GPS based Vehicle Tracking System Working for an Organization", International Journal of Computer Applications (0975 – 8887) Volume 68– No.19, April 2013
- [4] Ralf Hartmut Güting, "An Introduction to Spatial Database Systems" Invited Contribution to a Special Issue on Spatial Database Systems of the VLDB Journal (Vol. 3, No. 4, October 1994).
- [5] Jun-jie Peng, "A Survey of Location Based Service for Galileo System". 2008 International Symposium on Computer Science and Computational Technology ,978-0-7695-3498-5/08737
- [6] Kyle, B.; Lacasse, M.A.; Cornick, S.M.; Abdulghani, K.; Hilly, T., "A GIS-based framework for the evaluation of building façade performance and maintenance prioritization", 11th International Conference on the Durability of Building Materials and Components, Istanbul, Turkey, May 11-14, 2008, pp. 1-9,
- [7] Ana M. Bernardos, José R. Casar and Paula Tarrío, "A Feature-based Model to Analyze Mobile Location Services", Sixth International Conference on the Management of Mobile Business (ICMB 2007) 0-7695-2803-1/07 \$25.00 © 2007 IEEE.
- [8] Dillip Mohapatra, Suma S.B, "Survey Of Location Based Wireless Services", Jataayu Software (P) Ltd, 4, 12 KM, Bellary Road, Jakkur, Bangalore - 560064, India.
- [9] John Rust, "Dynamic Programming entry for consideration by the New Palgrave Dictionary of Economics", University of Maryland, April 5 ,2006.