

USERS ONLY INDOOR SPATIAL INFORMATION SERVICES, POTENTIAL FUTURE RESEARCH

Yongwon(Conrad), Cho

VIRTUAL BUILDERS Corporation
Digital Space Research Lab, Researcher Engineer
Seoul, Republic of Korea

Sunhwie, Hwang

VIRTUAL BUILDERS Corporation
Digital Space Research Lab, Chief Engineer
Seoul, Republic of Korea

Jinwon(Frank), Choi

VIRTUAL BUILDERS Corporation
Ph.D, CEO & Founder
Seoul, Republic of Korea

Suyeon, Cho

VIRTUAL BUILDERS Corporation
Digital Space Research Lab, Assistant Manager
Seoul, Republic of Korea

Abstract—Recently, Spatial information technology closer to real 3D space, a variety of web-based content to provide information services. The complexity of the interior space was larger and information, convention, shopping and entertainment, such as a variety of outdoor activities are done without moving from the living room space become share while gradually increasing. And rather than simply using the services while meeting the requirements of consumers are being offered is the latest indoor spatial information services competitive. In this study, 'Virtual Builders INC' (VB) developed its own 'Gong builder' Incheon International Airport (IIA) application program is being commercialized. Introduced to show the indoor spatial information, future market service potential of available the Asian market to propose.

Index Terms—Indoor map, Customer service, Application, PalladiON LBS, Spatial information, User participation.

I. INTRODUCTION

In the field of spatial information process of building a real time digital map of the various types of information that must be collected. These service is spatial information in the field of indoor and outdoor space together without distinction to handle demand [1]. Recently, spatial information technology service deployment from real 3D space, multi-dimensional space based information service and web-based content through a variety of service [2].

We are looking for the convenience of living a variety of techniques have been developed to be used in real life. This made possible the reality is that smart devices. Smart phone applications, instead of finding themselves on the existing can be. Typical examples, directions or ordering food, data search, contact search, public transport, such as arrival time of the service through the smart devices can be used anywhere, anytime. Percentage of smart phone users worldwide in 2012 and the end of the 1 billion people use around the world, given the population of 7 billion people 1 out of 7 people are using the smart devices [7]. This spread is the spread of smart devices, a wide range of services as a new chapter in the fusion of interior space is increasingly emerging as important. And, according to a report by the U.S. Environmental Protection Agency said, "For about 80% on average over the entire life takes place in the room" [9].

Location Based Services (LBS) is a wireless Internet user, user-specific information according to the changing location of the points to provide wireless content services. LTE smart phones are becoming common as full-fledged competition in a variety of services that take advantage of this emerging. In particular, the location positioning function smart phones (ex.

GPS, WiFi, Bluetooth) is applied, LBS is emerging as a major specialized services.

In addition, recent LBS link connects the online and offline global big players in the role of interest for LBS heating up more than ever and LBS will continue to expand the areas to be utilized. The LBS is out-door, so far outside the building takes place mainly focus on the activity in recent years, the navigation inside the building and the location-based information provided to enable the interest in the technology and services increase. The technology is that available in terms of indoor positioning system (IPS, Indoor Positioning System) is being called a highlight. Mainly in outdoor LBS to identify the location through GPS when indoors, but because it is hard to receive a satellite signal of the importance of IPS is increase. IPS is mainly utilizing WiFi triangulation or Wi-Fi devices to uniquely identify the location of the fingerprint, such as Fingerprinting methods are being utilized. In recent years, particularly Bluetooth Low Energy (BLE, Bluetooth 4.0) providing location information by utilizing a method, even indoors market interest has been concentrated [4].

Thus, based on IPS technology, including the evolution of new technologies and the BLE has just started and the competition can be said to be in phase. In the future, these techniques are more convenient payment or to provide customized information in the room, as to enhance the user experience is expected to be a real advantage. And ultimately that while these techniques are difficult to access areas in-door & out-door Seamless existing region and contribute to the connection, a more elaborate form of location-based services would be possible [4]. LBS are no longer simply a location-based information (Such as a friend's location or places) to provide a step beyond, to improve the customer experience with sophisticated support to be more focused in giving. Future user's time to saving copper and providing a tangible value such operators are expected to be given more attention.

In this study, the spatial information service is simply the service is currently deployed outside the center, but in recent years a number of spatial information services research related companies in relation to the room we were self-made VB 'Gong builder' program is being commercialized and Incheon International Airport application services. More convenient to introduce the competitors, the high quality of service and the UI components to best meet the needs of consumers in the future information services to the interior space. More competitive and high-quality service that increasing the lead to market.

II. INDOOR GIS & LBS

Percentage of smart phone users worldwide in 2012 and the end of the 1 billion people use around the world, given the population of 7 billion people 1 out of 7 people are using smart phones. This spread is the spread of smart devices, a wide range of services as a new chapter in the fusion of interior space is gradually emerging importance [8].

A. Indoor GIS

GIS is geographic information are integrated into a quantitative one was indifferent about the human scale of the room. So interior space contains a symbol of various services and information, or an interface (Tag, POI, etc.) are present but there is no information about its real [5].



Fig. 1. People spend 80~90% of their time indoors. (NOKIA Source Strategy Analytics)

Focusing on recent academic to integrate BIM and GIS research is actively underway. GIS is based information, BIM provides the details of the center of the building. However, the level of detail is very large grid. Indoor GIS & BIM are in nature having a point of use, and service-oriented information structure. The interior is the use of all buildings, scale, design, location, depending on the various and varied interior spaces. Scale, purpose, design, and location are different according to the morphological characteristics difficult typed. It means necessary to build an optimized DB. Stairs, escalators and elevators are difficult to define in addition to the basement floor, including a 3D information space to be implicated. Such as underground nest and the oldest man stayed in most of the telecommunication spaces are generated. This information is interior space concern the future of global companies.

B. LBS

Location Based Services (LBS) is a wireless Internet user, user-specific information according to the changing location of the points to provide wireless content services. Location Services (LCS) may be referred. The main advantage of the LBS wireless mobile Internet users in multiple locations, but directly enter the address or area classification, and that you do not have GPS positioning technology make it possible to easily access the wireless Internet access technology is one of the major factors [7].

Here are some examples of location-based services are :

- 1) ATM, restaurant, close to the location of services and facilities to look up information
- 2) Save your gas station location information and notification services, such as traffic congestion warning
- 3) Find a friend's location

LBS market has gradually expanded the number of services being offered internationally. Representatively 'Waze, iBeacons' a close, the system proposed in this study can itself developed LBS 'PalladiON'. Personally, for the development of these programs in the 'Star City for South Korea's Lotte Department Store' as a model for 'SKY POLL' was to create an application [8], all stages of commercialization. 'SKY POLL' application to the motif of the institute called 'PalladiON' by Virtual Builders. Software to satisfy the customers' requirements as much as possible and to provide convenient services currently under development will be available to consumers soon. The figure below is made of the existing temporary 'SKY POLL' of the application form.



Fig. 2. LBS platform indoor map application, 'SKY POLL'.

III. INTRODUCE OF 'PALLADION LBS'

Of consumer location-based services for complex indoor spaces provide convenience to consumers and the nearest location of the most efficient and effective business strategy (marketing, advertising, etc.) are presented.

Interior map 'writings > Design > Service' completed the three steps based on the information in 3D space can be utilized in a variety of business sectors can implement an indoor location-based services.

Be made, particularly in the Institute 'PalladiON LBS' search for a location, driving directions, parking control, travel information, and private and public business sectors throughout the Multi Device (Mobile, KIOSK, etc.) technology, SNS, Navigation, shopping, and a variety of technologies and services Mash-up of the service, and expansion. JavaScript API, Mobile SDK (Android, iOS) development environment and a wide range of services, including a variety of customized products at low cost through the configuration it is possible to develop a quick service.

In this study, through the simulation proceeds and example 'World Space' shown below presents a potential [12].

The figure below shows the 'Immersive media' building information modeling in the indoor and outdoor map service.



Fig. 3. VB technology process 3 steps.

If you are currently in service with the following benefits and effects you can think of expectations.

- Indoor LBS-specific automatic conversion to 3D Map Data can be easily authored
- Flexible input method POI indoor map service can be designed to fit the purpose
- The basic controls and provide additional control functions of the API service
- Collectively and individually placed in-POI information management through effective POI
- Service is convenient to take advantage of domain-specific category Map Display implement management
- Real-time path finding required origin/destination/destinations path visualization API services

A. Currently VB technology

In this study, the current global market is going to expand in relation to LBS Indoor Map program being developed at the Institute of the market potential for commercialization of the proposed technology and the benefits for our own previously presented.

So being produced in the institute 'PalladiON' relation that platform during the operation as shown below, and a plan.

Platform is divided into three main steps to build deploy, manage and leverage to be divided.

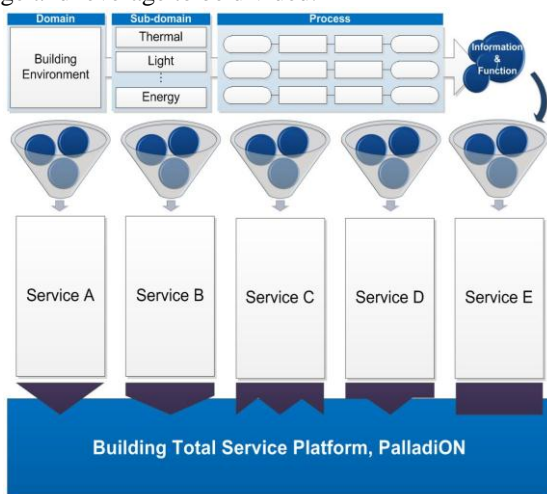


Fig. 4. VB 'PalladiON' Platform.

Virtual Builders Institute, the currently Google, Microsoft, Nokia, Daum, Naver, etc. which provided indoor Map service more convenient and easy way to build the building a low-cost, high-precision, high-quality service to provide.



Fig. 5. Indoor & Outdoor Map service. (Immersive Media)

'PalladiON' Service Builder, Manager, Viewer 3 constitutes different product configurations, providing you have the following features: [13]

- Efficient POI Management

Manager of the POI batch management capabilities and enables the efficient deployment of individual POI management.

- Flexible input method POI

POI is arranged directly in 3D space, the service information suitable for the purpose of design is possible.

- Service specific type, LOD management

In-door map level design of visualization. POI redundant processing by exposure. Policy service specific POI type designs.

- Provides a variety of visualization

Interior visualization modes, and a wide variety of map Top, Bird Eye, Walking time mode consists of three kinds of functions, such as providing a visualization API.

- Indoor Driving Directions API function

Optimum, theme for destination, path destinations and real-time visualization, simulation drive directions visualization API.

- Global Service and Support

Indoor led multi-language support services tailored to the global business environment, Indoor Business Platform solutions.

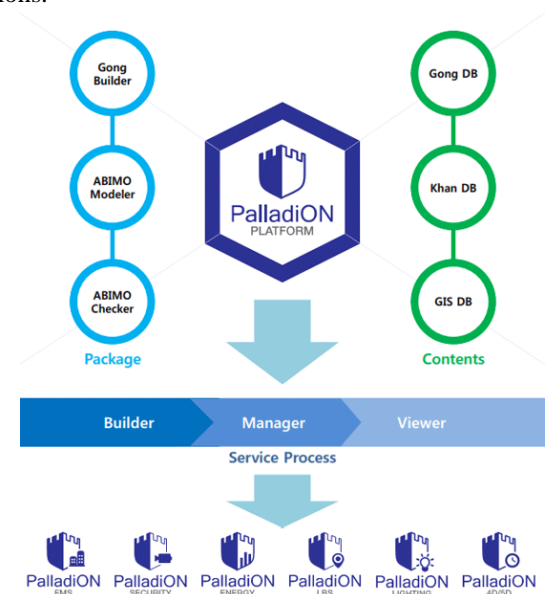


Fig. 6. VB 'PalladiON' platform process

IV. FUTURE OF 'PALLADION' SERVICE

Virtual Builders corporation service is now or where the test was in progress at the airport, metro and public institutions such as the flow of people is where a lot of ordinary people.

However, this is always limited and, to some extent, and technical skills, and test results are quite looking forward to being seen as being 'PalladiON' I think the service could be expanded gradually.

PalladiON Platform

*VB's spatial information solutions are being along with you.
VB's spatial information business is becoming smarter and more intelligent.
Our professional solutions at business, service and technology raise your values up through new perspective of space, challenge and integration with technology.*

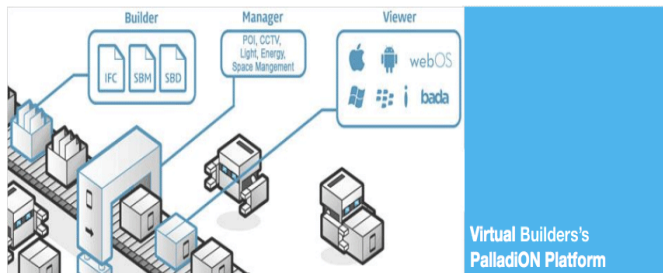


Fig. 7. VB 'PalladiON' platform.

Virtual Builders corporation research is simply because it is not only place but also software should be developed and commercialized.

So many global companies floating population, franchises and services to the target is thought that supply.

Typical examples are the major department stores and an internationally renowned national and international hotel chains and focuses on the global business model for indoor spatial information quickly if the people who built and convenient interior space than you think you can provide information about the service [6].

As mentioned previously, self-development programs interior space more efficiently and at low cost to build information and LBS market by 2020 at the peak of the world, so different from the expected 'PalladiON' services bring great success in the market be expected.



Fig. 8. VB 'PalladiON' platform.

V. RESEARCH RESULT

In the U.S. Stores are indoor map service to increase customer convenience and sales. Mainly from the state or the store building (Floor plan) that takes the form of digital conversion of indoor map competition is becoming more

intense. Google for the past three years to a lot of effort has been to ensure indoor map so far, about 10,000 places around the world for ensuring that the indoor map [4]. Leading provider of Google, Nokia, Microsoft, Aisle411 etc. indoor map building.

The results are as follows:

Company	Maps in the US	Maps outside of the US	Mall Maps	Airport Maps	Retail Maps	Other* Venues
Google	6,000	4,000	60%	20%	10%	10%
NOKIA	2,500	2,100	70%	20%	0%	10%
Microsoft	1,500	1,200	70%	20%	0%	10%
Aisle411	9,000	0	0%	0%	100%	0%
Microsoft	6,500	250	80%	10%		10%
Point Inside	1,000	250	80%	10%	5%	5%

Fig. 9. Performances by operator indoor map. (Google image)

The most of the store map is secure (The latest data show that about in 12,000 stores more than one building to be known as the indoor map) to look at 'Aisle411', 'Aisle411' is the retailer's inventory, product location, floor plan information and get other data to convert digital map, and store information for the consumer point of the 'Search for store map' building form[4].

'Aisle411' application consumers in the store order to identify the real-time location of your smart phone with WiFi utilizes various sensors. In recent years, the ability to make more accurate indoor location at 'Estimote' was previously partnership.

'Aisle411' of consumers find mobile apps in the near store, or retailers find my way through the store (Indoor Navigation) functions can be used. After selecting a shopping list in detail to actually visit the store, based on the shopping cart may be planning a route, you want to purchase a particular product go directly to the display may be find in store.



Fig. 10. Service image by 'Aisle411'. (iTunes)

'Aisle411' is the biggest advantage of retailers offline stores have their own, so to take full advantage of this mobile must be based on the position of digitization. Users to enter store

without getting lost or wandering makes it easy to find the desired product, the more sales will rise and be appealing to retailers.

'Aisle411' customers living in the introduction 'Walgreens, Home Depot, Hy-Vee, Price Chopper', such as the Walgreens stores throughout the United States the services of 'Aisle411' (7,900 pieces) was also introduced in the expansion. 'Aisle411' the Mapping/Navigation solutions one step further from what the user's shopping list, store and analyze customer behavior to suit the situation of consumers that send coupons as a marketing platform that we plan to expand.

As shown in the two previous cases are no longer simply LBS location-based information (such as a friend's location or places) to provide a step beyond, to improve the consumer experience to a more precise focusing support. Future user's time and shortening the path of travel, such as a more reliable value for the operators are expected to attract attention [7].

Many of the authors in the case of South Korea are to hold a chain supermarkets 'E-mart' is aimed at the business, cart, smartphone sensors in conjunction with the information service through the interior space to offer a convenient grocery shopping applications South Korea's Ministry of Land, government-affiliated agency proposal had been accepted [3].

The figure below shows the modeling of the time when the state is proposed.



Fig. 11. Utilizing the LBS application development 'my style cart'.

VI. CONCLUSION

This LBS related technologies evolve gradually making it possible to be more precise location positioning, especially

those that had been considered during the wasteland of the Indoor LBS is enabled. Also LBS is faster than ever, commerce, payment, transport, advertising expanded to a variety of services and industry [4]. Securing new sources of global big players and improve the quality of service for the purpose of gaining competence LBS linking existing services and efforts to be. In the case of domestic LBS will still find most restaurants, such as navigation or search for places by default/recommended services and mainstream reality, LBS Indoor LBS related technology development and market growth potential of the new view, the future is the LBS market in Korea this is expected to receive revisited. And Indoor LBS market still is not exclusively for influential business and local commerce through the combination of the area and the Indoor LBS possibility of the emergence of a variety of service providers who are new opportunities in Korea will be able to act. Benefits on the basis of domestic as well as market expansion in Southeast Asia can look even.

ACKNOWLEDGMENT

This research was supported by a grant (11 High-tech G11) from Architecture & Urban Development Research Program funded by Ministry of Land, Infrastructure and Transport of Korean government.

REFERENCES

- [1] H. J. Lee, "Using multi-dimensional spatial information orthophoto production plan realized", Journal of Korea Society Surveying, Vol. 26, No. 3. pp.241~253, 2008.
- [2] D. G. Lowe, Distinctive Image Features from Scale-invariant Keypoints, 2004.
- [3] Y.W. Cho, " LBS application development utilizing ' my style cart'", Republic of Korea Government Ministry of Land, Sensible citizens ideas, 2013.
- [4] S.Y. Kim, " Status and implications of major operators abroad LBS", Loa Consulting, 2014.
- [5] S. J. Moon, M. W. Pyeon, C. J. Kim, S. W. Lee, and N. G. Kang, "Element Analysis for Constructing a Multidimensional Real-Time Map Service", ICONI, 2012.
- [6] Y. W. Cho, M.W. Pyeon, and D. S. Kim, Comparison of Image Matching Algorithms in the Spatial Information System, Journal of Korea Society for Geospatial Information, 2013.
- [7] Y.W. Cho, M.W. Pyeon, I.W. Jang, and T. Hur, "A study on real time digital map data construction through user participation", IIENG2013, 2013.
- [8] Y.W. Cho, and I.W. Jang, "Customer for Indoor Location service Used to Application Development", Science and technology policy ideas, 2013.
- [9] Google Image, "NOKIA Source Strategy Analytics", 2012.
- [10] iTunes Image, " Aisle411 service", 2013.
- [11] Google Image, "Performances by operators indoor map", 2012.
- [12] J.W. Choi, "3D Indoor Spatial Information Set up and Using Technology", Virtual Builders, INC., 2013.
- [13] Virtual Builders, "Virtual Builders Guide", Virtual Builders Brochure, 2014.