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INFORMATION TECHNOLOGY INFRASTRUCTURE FOR SMART TOURISM IN DA NANG CITY

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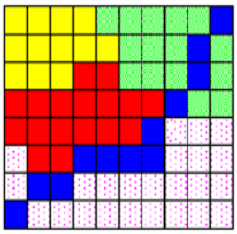
1. Introduction

The outstanding development of science and technology in recent years, intelligent technologies have gradually been applied in many areas of human life. Along with that development trend, the orientation for the destinations in the current development strategy is smart tourism. Indeed, tourists today are increasingly familiar with the use of modern technology to support their travels. Therefore, tourism organizers must also develop technology infrastructure in a way that meets the wishes of tourists using the technology. At the same time, developing a smart tourism environment is also a means to promote efficiency and increase attractiveness according to current trends.

In order for the locality to build a smart tourism environment, there are a lot of demands placed on both hardware and software. Technical infrastructure is one of the basic issues to be completed first. In which, information source plays an extremely important and decisive role in the operation of the whole system.

A smart destination management system always needs data to perform functions, meeting the needs from multiple users. Therefore, establishing a well integrated database will be a solid foundation for developing the capabilities of local smart tourism.

The authors analyze the requirements that a local tourism smart database must meet on a theoretical basis, combined with assessments of the practical requirements of tourism activities. From there, propose a sample database model for local can be built to meet the information needs of all tourists.



- Stores images as rows and columns of numbers with a Digital Value/Number (DN) for each cell
- Units are usually represented as square grid cells that are uniform in size.
- Cells often called pixels (picture elements); raster data often called image data

Figure 1. Raster map

2. Smart tourism concept

"Smart" has become a new popular word to describe the technological, economic and social development driven by technology based on sensor types, big data, open data, binding protocols. Connection and exchange new information (eg Internet of Things, RFID and NFC) as well as the ability to reason and think (Gretzel, Reino, Kopera, & Koo, 2015). In the context of tourism, intelligence is used to talk about a complex synthesis of everything from smart cities to connectivity to infrastructure (Gretzel, Sigala, Xiang, & Koo, 2015). From this basis, Gretzel et al. (2015) proposed the definition of smart tourism as “tourism is

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supported by integration efforts at one destination to collect and synthesize / exploit data obtained from physical infrastructure, social links, government / organizational resources, and the human body / mind associated with the use of advanced technology to transform data into on-site experience and propose business value with a clear focus on efficiency, sustainability and enriching experience."

Smart tourism is an inevitable development step from traditional tourism and later e-tourism. Smart tourism is formed with the background of innovation and technology orientation of industry and consumers. Besides, the widespread application of information and communication technology (ICT) in tourism also contributed to this formation. For example, the global distribution form and central booking system, integrating web-based technologies (Buhalis, 2003; Werthner & Ricci, 2004). Gretzel et al. (2015) suggest that smart tourism is included Many smart components and layers are supported by ICT. The components of smart tourism include smart destinations, smart experiences, and smart business ecosystems; also collect, exchange, and process data identified as layers of smart travel.These components and classes are illustrated in Figure 1.

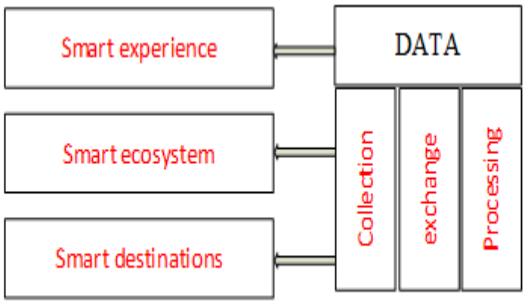

Figure 1. Component and class of smart tourism

Today, there is still no clear distinction between smart tourism and e-tourism because ICT, information systems and social media concepts in smart tourism are also important for e-tourism (Gretzel, Sigala, et al., 2015; Li, Hu, Huang, & Duan, 2017; CW Yoo, Goo, Huang, Nam, & Woo, 2017). The differences between smart tourism and e-tourism are summarized in Table 1.

Table 1: Differences between smart tourism and e-tourism (Gretzel, Sigala, et al., 2015)

	E-tourism	Smart tourism
Area	Digital	Digital & physical bridge
Core technology	Websites	Sensors and smart phones
Travel period	Before & after the tour	During the tour
Core throughout	Information	Big data
Paradigm	Interactive	Co-creation through intermediaries Technology
Structure	Value chain / intermediary	Ecosystem
Exchange	Business to Business, Business with Customers, Customers with Customers	Public-private partnership

The definition of smart tourism presented above also received an inadequate assessment because of too much emphasis on ICT but lack of environmental factors (Yalçınkaya, Atay, & Korkmaz, 2018). Yalçınkaya et al. (2018) suggested that environmental awareness should be included in the definition of smart tourism, city smart destinations and destinations as defined by the World Tourism Organization.

3. Background of smart tourism

"Buhalis and Amaranggana (2013) identify three main components of the ICT necessary to enhance smartness in a tourism destination: "Cloud Computing, Internet of Things (IoT) and End-User Internet Service System". Cloud Computing helps reducing fixed costs and sharing information. IoT the means that not just screens are connected via the Internet, but also other items and that they all illustrate one big network. The IoT

generally supports "providing information and analysis as well as automation and control" while the End-User Internet Service System refers to different applications at different levels (Buhalis & Amaranggana, 2013). An important content of a smart destination is the integration of ICT into the infrastructure to enhance competition and improve the quality of life of all stakeholders, including local residents and guests. (Boes, Buhalis, & Inversini, 2015; Buhalis & Amaranggana, 2013; Caragliu, Del Bo, & Nijkamp, 2011; Gretzel, Zhong, & Koo, 2016). In addition to destination composition, smart tourism is a social phenomenon arising from a combination of ICT with travel experience (Hunter, Chung, Gretzel, & Koo, 2015). Smart experiences are especially focused on technology-driven travel, personalization, contextual awareness and real-time monitoring (Buhalis & Amaranggana, 2013; Neuhofer, Buhalis, & Ladkin, 2015). The third component, the smart business ecosystem, addresses the complex business ecosystem that contributes to and facilitates the exchange of tourism resources and co-creates travel experiences (Buhalis & Amaranggana. 2013). The business component of smart tourism is characterized by dynamic stakeholders, electronicizing the core business processes and organizational flexibility (Buhalis & Amaranggana, 2013). Collaboration between the public and private sectors is the difference of the business intelligence component. This can lead to governments becoming more open and becoming suppliers of infrastructure and data.

In smart tourism, there are three layers covering the three components above: an intelligent information layer geared towards data collection; an intelligent exchange layer that supports connectivity; and an intelligent processing layer responsible for analyzing, visualizing, integrating and using data (Tu & Liu, 2014). ICT is the key to the conceptualization and development of smart tourism. In a smart tourism environment, ICT will provide consumers and travel service providers with more relevant information, support better decisions, greater mobility, and ultimately experience more interesting travel experiences (Gretzel, 2011; Sigala & Chalkiti, 2014;Werthner, 2002).

From a visitor's perspective, these systems assist travelers by: 1) estimating user needs based on a variety of factors and giving suggestions for favorite places to eat and drink. and entertainment; 2) increase the visitor experience at the site by providing additional information, recommending services tailored to personal preferences; 3) allow visitors to share their own experiences to assist other travelers in making decisions (Gretzel, Reino, et al., 2015; Gretzel, Sigala, et al., 2015). From a tourism industry perspective, these intelligent systems play a role in infrastructure and contribute to automating business processes, increasing efficiency, supporting new product design, forecasting, and managing risk management - crisis (Sigala 2011, 2012; Washburn et al., 2009; Werthner, 2002; K.-H. Yoo, Sigala, & Gretzel, 2016).

4. Integrated database meets smart tourism requirements

Ensuring the source of information is a factor must be a top priority when deploying a smart travel destination. All

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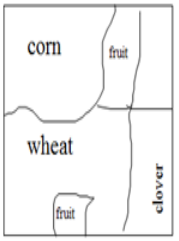
components of smart tourism in operation must be based on the important information. Without information, system components would not be able to operate and perform their functions. Therefore, ensuring the source of information is a factor that must be given top priority when deploying a smart tourism destination.

Characteristics of information related to data and knowledge, data representing values assigned to parameters and knowledge that indicate an understanding of facts or abstract concepts (Merriam- Webster, 2019). Therefore, in order to get rich and efficient information in mining, a really large and systematic amount of data is collected. This collection of data is stored and managed through a computer system in the form of a database. With the task of effectively managing the necessary information, the database plays an important role in the system structure of smart travel destinations.

In fact, the current demand for information in tourism, the integrated database of attribute information and spatial information is the direction to choose which brings many advantages.

This database model allows user applications to access not only specific descriptive information about the object of interest, but also helps to locate and assist in handling a lot of spatial questions - something that travelers Calendars are often interested in activities. The questions asked by travelers often ask about both attributes and space such as: What? Where?



	0	1	2	3	4	5	6	7	8	9
0	1	1	1	1	1	4	4	5	5	5
1	1	1	1	1	1	4	4	5	5	5
2	1	1	1	1	1	4	4	5	5	5
3	1	1	1	1	1	4	4	5	5	5
4	1	1	1	1	1	4	4	5	5	5
5	2	2	2	2	2	2	2	3	3	3
6	2	2	2	2	2	2	2	3	3	3
7	2	2	2	2	2	2	2	3	3	3
8	2	2	4	4	2	2	2	3	3	3
9	2	2	4	4	2	2	2	3	3	3

Figure 2a. Raster map representation on computer

What are the characteristics? How far is it to there? Which is the best way to get there? ... These questions can be answered well with a management system that exploits spatial information integration databases. These databases are a type of geographic information system (GIS) application that has been widely developed in many countries around the world.

Developing a database to meet smart tourism will gather all basic information about local tourism, catering for many types of objects according to different needs. To serve a wide range, with different capacities and qualifications, the database needs to be designed in a simple but detailed and specific way to provide effective information and facilitate easy queries when needed. In addition, specific technical requirements must be met to suit local infrastructure. Within the scope of this study, we will only focus on the information organization structure first to provide recommendations for effective information management for localities in tourism development.

Actual tourism activities, the demand for information is extremely diverse. With a smart tourism destination, the demand for information is much

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greater, covering many different areas of visitor interest (Fodness & Murray, 1997). In order to meet the needs of tourists, the database needs to be built with basic information layers including:

- Background data: provincial, district and commune administrative; topographic; aquatic system; roads, overlays, typical socio-economic spots (post office, hospital, bank, administrative offices ...)

- Specialized data: natural tourist sites, humanistic tourism, hotels, restaurants, entertainment areas, cafes - bars, health care services, travel services, transportation services , shopping…

These data layers will include spatial information and all attribute information about the objects of interest in local tourism activities. Depending on the selected data model, the data layers will have a way of organizing in a way that is reasonable and most effective in the application deployment and development process.

Data consistency must be maintained at a high level, and must be open to facilitate the sharing of data exchanges with relevant industries and meet the need to upgrade and expand the scope of the space. Database once the development needs of society in the future.

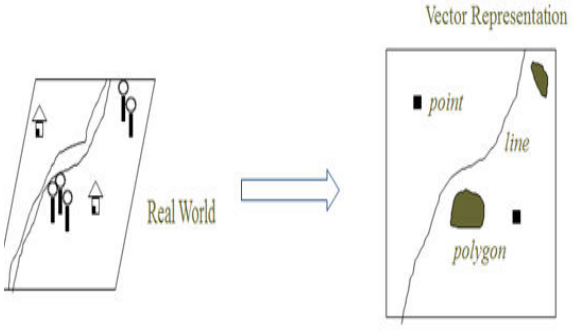

Figure 2b. Vector map representation

Tourism is an area that requires constant innovation to meet the needs of tourists and always create an attraction to attract visitors. In addition, in the development of society, the structure and face of the society are constantly changing and of course all elements of the tourism industry are constantly changing. Therefore, tourism data are dynamic data that requires constant updates to be closely aligned with the actual development situation and the database must meet the criteria for easy updating.

5. Proposing the information structure of integrated database

Integrated database includes spatial data and attribute data about managed objects.

- Spatial data relate to the geometry of spatial features
- Attribute data describe the characteristics of the spatial feature

In particular, spatial data or map data are information describing the shape, size and location of objects that exist in reality. Attribute data are data that describe the characteristics of specific objects. They are linked together to represent complete information about an object.

GIS (geo relational data model) stores spatial data and attribute data separately and links the two by the feature ID. The two data sets are synchronized so that they can be queried, analysed, and displayed in unison. The geo relational Data Model stores spatial and attribute data separately : spatial data (“geo”) in graphic files and attribute data (“relational”) in a relational database.

According to the way of organizing data according to the relational model

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along with the required characteristics of the tourist information field of a destination, the structure of attribute information in the database is organized into two groups: background data and data. thematic material

5.1. Background data layers

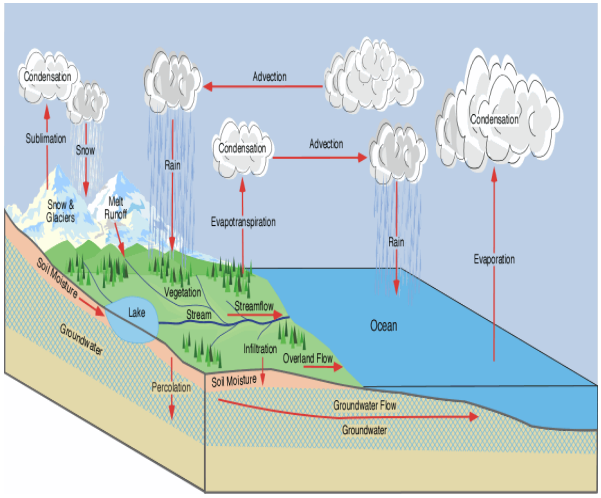

Figure 3. Realistic model background map

Information layers for local spatial areas, providing general geographic features, including administrative boundaries, topography, hydrology, roads, socio-economic points, etc

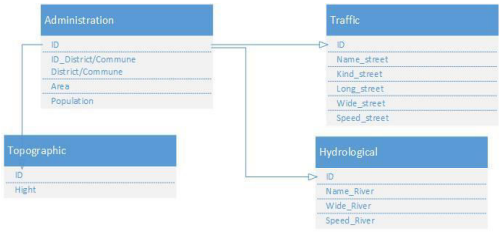

Figure 4. Information layers for local spatial areas

5.2. Thematic data classes

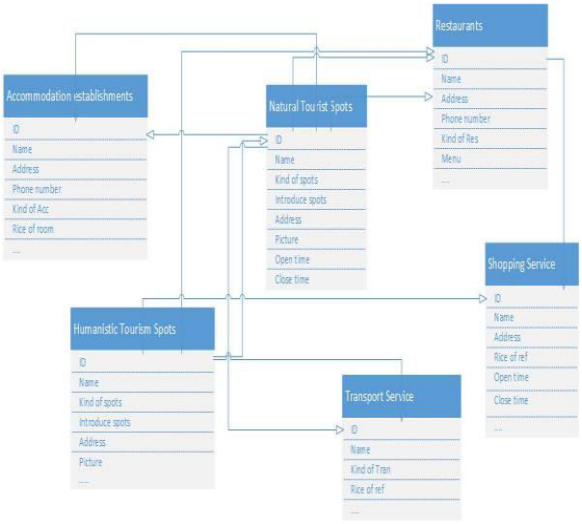

Figure 5. Data layer Thematic model for smart tourism

Thematic data shows information related to tourist destinations and infrastructure systems, technical facilities and services for tourism. This is the main information that meets the specific interests of visitors during each trip, so it is important to elaborate details.

Although the two data models handle the storage of spatial data differently, both operate in the same **relational database** environment.

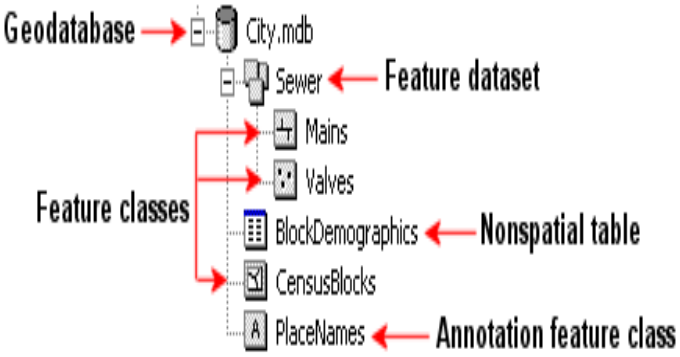

Figure 6. The geodatabase is a vector data format with ArcGIS® software

6. Conclusion

Smart tourism system has an important role of using information and communication technology to form an intelligent tourism ecosystem, build a high quality tourism industry to serve tourists, contributing to the sustainable economic development.

Integrated database is an important platform that provides information for destinations in smart tourism development. In line with current tourism development needs, a database should be built in the direction of integrating the largest information possible. The information contained in it should cover many aspects of the visitors' requirements including location and spatial relations as well as object specification features. In order to have a truly smart tourism environment, certain investments in database development are really necessary for localities that want to develop this trend.

The database is built for smart tourism based on GIS (Geographic Information Systems) is a new direction with the development of IT infrastructure, not outside of building smart cities.

In our future work, Based on the proposed database, continue to research solutions to allocate virtual server resources to meet the processing needs, diverse from smart tourism in the future. Application of artificial intelligence to provide automated services upon the request of stakeholders of smart tourism, blockchain applications to manage and develop tourism products, travel cards, etc.

References

[1]. Jinyao Ya, Optimal Routing and Resource Allocation for Multimedia Cloud Computing. Vol. 2, Iss. 8, (Dec 2016).

[2]. Maria Alejandra R.S, Resource Provisioning and Scheduling Algorithms for Scientific Workflows in Cloud Computing Environments. Department of Computing and Information Systems University of Melbourne, Australia, June 2016.

[3]. Manca, G., Waters, N. W., & Sandi, G. (2016). Using cloud computing to develop an integrated virtual system for online GIScience programs. Knowledge Management & ELearning, 8(4), 514–527

[4] Albert K.W Yeung (2006), Concepts and Techniques of Geographic Information System, Prentice Hall

[5] Brian Marchionni (2008), MapWindowGIS, Department of Geosciences Idaho State University

[6] Daniel P. Ames, Ph.D P.E (2007), Mapwingis Reference Manual, Idaho State University

[7]. M.Stillwell, D. Schanzenbach, F.Vivien, H. Casanova, Resource allocation algortihms for virtualized servive hosting platforms. Internationanl Journal of Parall el and Distibuted Computing (JPDC), 70(9), pp. 962-974, 2013.

[8]. Abderrahim El Mhouti, Mohamed Erradi, Azeddine Nasseh; Using cloud computing services in e-learning process:Benefits and challenges. 2017, Print ISSN1360 -2357

[9]. Goldberg A V, Harrelson C, Computing the shortest path: A search meets graph theory[C]. Proceedings of the sixteenth annual ACM-SIAM

symposium on Discrete algorithms. Society for Industrial and Applied Mathematics, 2005: 156-165.

[10]. Mohamed A. Elsharkawey, MLRTS: Multi-Level Real- Time Scheduling Algorithm for Load Balancing in Fog Computing Environment. Modern Education and Computer Science, 2018, 2, 1-15

[11]. Nan X, He Y, Guan L, Optimal allocation of virtual machines for cloudbased multimedia applications[C]. 3rd ed. Multimedia Signal Processing (MMSP). 2012 IEEE 14th International Workshop on. IEEE, 2012.

[12]. HHC Nguyen, VK Solanki, D Van Thang, TT Nguyen, Resource allocation for heterogeneous cloud computing. Resource 9 (1-2), SSN 1943-35812017, Vol.9, No.1-2

[14]. Nguyen, Ha Huy Cuong; Le, Van Son; Nguyen, Thanh Thuy, Algorithmic approach to deadlock detection for resource allocation in heterogeneous platforms. Inc. (IEEE) Nov 2014.

[15]. Yazir, Y.O., Matthews, C., Farahbod, R., Neville, Dynamic resource allocation in Computing Clouds using distributed multipke criteria decision analysis. Proceeding of the 3ht Cloud Computing (CLOUD), 5-10 July 2010, Miami FL, IEEE, pp. 91 -98, 2010

[16]. Zhen Xiao, Weijia Song, Qi Chen, Dyamic resource allocation using virtual machines for cloud computing enviroment. International Journal of IEEE Transactions on Parallel and Distributed Systems, 24(6), pp. 1107-1117, 2013

[17]. Zhan F B, Three fastest shortest path algorithms on real road networks: Data structures and procedures[J]. Journal of geographic information and decision analysis, 1997, 1(1): 69-82.

[18]. Qiang Li, Qinfen Hao, Limin Xiao, Zhoujun Li, Adaptive management of virtualized resources in Cloud Computing using feeback control. Proceedings of the 1th Information Science and Engineering (ICISE), 26-28 Dec. 2009, IEEE, pp. 99-102, 2009

[19]. Walsh, W.E., Tesauro, G., Kephart, J.O.Das R, Utility functions in autonomic systems. Proceeding International Conference on Autonomic Computing. 17-18 May 2004, pp. 70-77, 2010