ICBMIS 2012
19th - 20th January 2012

Ontology-Driven Information Retrieval System for Regional Attractions

[1]Naruepon Panawong, [1]Chakkrit Snae and [1]Michael Brueckner
[1]Department of Computer Science and Information Technology, Naresuan University, Phitsanulok, Thailand
Email: jnaruepon.p@gmail.com, chakkrits@nu.ac.th, michaelb@nu.ac.th

ABSTRACT

The tourism industry has grown immensely in the past decades and is expected to do so in the near future since it has become a popular global leisure activity. For Thailand, the tourism sector is of great importance and is contributing around 6% of the GDP. The tourism business relies heavily on information since customers compare places and facilities when they plan travelling to destinations they have not yet been to. The Internet offers a tremendous amount of information not only to tourists but also to professional travel agencies. It is therefore essential that the information is properly updated, presented and accessible be it in textual or in multimedia form. Using a search engine for the World Wide Web makes the retrieval of current information laborious. Therefore, special tourism search engines have been proposed. In this paper we focus on the information retrieval for regional attractions. For this, we created an ontology covering regional details, e.g. attractions, accommodation, restaurants, souvenir shops and OTOP (One Tambon [Sub-District] One Product).

Keywords – tourism, ontology, searching, name matching

1. Introduction

Currently, industrial services add to revenue for many countries including Thailand. Here, tourism has a significant role of economic development for the country, but the question remains how to manage the growing tourism. The Tourism Authority of Thailand and the Tourism Bureau are responsible for the efficient presentation and handling of all touristic fields in Thailand. Experts (e.g., Chuthakon and Charoensuksai, 2009) share the travel patterns of tourism resources into two types of travel resources that occur naturally: tourism resources and man-made. The economic recovery, especially in countries affected by conditions that show shrinking global economy, domestic politics, competition from neighboring countries, is important. Government policy support, led by the Tourism Authority of Thailand has been promoting and working for Thailand Tourist Information, for Thai and foreign tourists, respectively, through websites, brochures, television and other media, over the last decade or so. In 2009 the Tourism Authority of Thailand (TAT) organized a campaign "Thai merry way. Thai dynamic economy" to help the Thai economy to grow by 5% .

Tourism has been enhanced by information technology since the 1980s leading to the introduction of electronic tourism (eTourism) and many applications which simplify and ease the management of traditional tourism (Buhalis and Law, 2008). Moreover, the World Wide Web (WWW) has emerged since 1990, and we can divide its development roughly into three phases:

* the 1990s with supplier generated content (Web 1.0),
* the 2000s with user generated content (Web 2.0),
* the 2010s with semantic data (e.g., ontologies, see section 2) and 3D content (Web 3.0).

Snae and Brueckner (2007) have use an ontology for name resolution, which focuses on organizations and companies in different region. The system is designed with an ontology using Protégé and use a composite methods name matching algorithm for resolving several written form. The prototype system is related to Phitsanulok Province in Thailand. Moreover, Buhalis and Law (2008) presented the conclusions to guide the success and components of tourism on the Internet (e-Tourism), going back 20 years, can be used as a guide in the development and design in current and future development, e-Tourism. After that, Brueckner et el. (2008) using Canonical Name matching to help in solving the problem for finding a place on the map geographic information systems to print different, but read the same and the principles of Ontology to support the search in Thai, English and Japanese. The present concept and architectural design is assisted with the Google Map showing maps with additional information about places, and so it can be used for this problem.

Therefore, we design of touristic search systems for Thailand using ontology that designs to get the results directly and most comprehensive travel information.

This paper presents a way to improve this situation by introducing an ontology for the design of touristic search systems for Thailand (see section 2). Moreover, we design Ontology, System Architecture and

User Interface (see section 3). In Section 4 we draw conclusions from this research and discuss further work that will enhance the applicability of the system.

2. Ontologies for tourism

Ontologies became known and widely used in fields such as artificial intelligence, computer science and information science. Moreover, they are used in Intelligence Information, Information Retrieval, Knowledge Representation, Database Design. Knowledge Management and Database Management Systems (Guarino, 1998; Andrade and Saltz, 1999; Andrade and Saltz, 2000). In all of these fields is the meaning of the word Ontology is different and has also been mentioned in literature as in various branches of philosophy Major artificial intelligence etc.

Gruber (2007) is define Ontology which is known widely field which to model a domain of knowledge or discourse. The representational primitives are typically classes (or sets), attributes (or properties), and relationships (or relations among class members). So, when we want to show the concept of objects or things that we should be clear and detailed course description such to defining a group of words that show relationships between words and that explanation may be related to what is the name of the program, which may include Classes, Relations, Functions or Other Objects.

Blackburn (1996) Ontology is learning or related to any type of things existing in this world which may take many forms but need is clear and Uschold at el.(1998) include a vocabulary of words or objects and the specific of details that meaning of words or objects include definitions and determine how concepts are related.

After that, Chandrasekaran (1999) described the Ontology that shows vocabulary and details of the scope or objects or things and ideas that word in the vocabulary are likely to be explained and mention. In the design of computer systems may be used Ontology determine the scope mechanism of the computer such as Ontology may be used to identify the concept of components of the computer such as CD-ROM, disk drive, mouse, keyboard etc. and importance between components. The computer as a group of these mechanisms may be one subtype or another part of what one has. Around the concept beyond the specific need for a meticulous analysis of the types of objects and remains important to the extent that we called Upper ontology which describe knowledge base around the other to describe the object or objects can be managed across the various sectors and to the region.

Later, Smith and Welty (2001) defined Ontology as a branch of Philosophy that managing the type and structure of the material properties, processes and relevant in every field and scope of reality such as Ontology efforts to identify the property what remains is to identify the object or objects that in artificial intelligence and knowledge representation and Noy and McGuinness (2001) is defined Ontology is formal explicit description which details requests with the concept different in the domain can set explained by Class Slot and Facet.

Ontology consist of (W3C, 2010)

- Class or Concepts is the things that you want or describe within the clearly scope and describe relation between classes in scope that is interest.
- Properties or Slots or Role is descript properties of class and attributes that define by score
- Facets or Role Restrictions is control or define scope of properties
- Instances of Class is a member set within class

Class can divide Subclass and Super class and Relate within Class that same domain. Moreover, class can be inheritance.

Murua at el. (2006) presented the semantic web technologies for tourism services using ontology to link holiday information in the form of packets under ANOTA to collect user information here. The results of this study will be useful to users is extremely including small businesses will be discovered and an opportunity to more business.

Snae at el. (2007) was presented using ontology, semantic web and knowledge to manage organizations and companies in Phitsanulok Province at Thailand. The system architecture has been designed. To develop in the future to provide information that is important to tourists. This research was designed ontology using Protégé. Moreover, the system also IT-TELLS to assist in the search of users of different languages.

Siricharoen (2008) uses an Ontology for E-Tourism that can answer four types of questions and can be asked when developing the e-tourism package. These questions involve the predicates "What" (What can a tourist do while staying?), "Where" (Where are located the interesting places to see and visit), "When" (When can the tourist visit a particular place?), and "How" (How can the tourist get to its destination to see or do an activity?). Moreover, he summary on the e-tourism ontologies projects such as Harmonise Project HI-TOUCH SATINE and IM@GINE IT

Dema (2008), offers a travel planning system in Bhutan. The system comprises Ontology Knowledge Base (Knowlegde-base) and the OO jDREW as open source and is developed using Java technology to manage

RuleML displaying the search results for travel planning. But we found that the system is not offered as a Web page and not the technology, cartography, geographic information systems used to connect the path to tourism.

Siriratchanikon and Lao-arun (2009) developed a complex system of search for Tourism in Thailand. The development of the Semantic Web used Java technology. Tourists can find information in the form of places nearby an area or a street, or find nearby places of reference needed. The system also does not support search with Thai.

3. System Framework

Touristic spots have many different characteristics and attributes that have to be taken into account for the users' decision-making process. In reality there are such criteria as cost, accommodation, transport time (means of transportation and distance), attractions and facilities that might be important for the purchasing decision. For the virtual tourist the first three criteria are insignificant, whereas attractions and facilities are not. In fact, the experience of the virtual tourist will be more like being on a tour, which means that the length of time needed to complete the tour can be important even if the virtual tour can be terminated at any time.

The data on touristic spots comprise

1. attraction type (e.g. cultural, natural, or recreational),
2. location (e.g. seashore, mountain, hill, or forest), and
3. spatial properties, such as nodal (localized place), linear (excursion route or coast line) or extensive (national park).

Many spots also have a "what you shouldn't miss" tag, which work as a recommendation for the virtual tourist and as a first step into a guided virtual tour. Unguided virtual tours are also an option; they lead to a browse process through the touristic spot they have chosen and totally managed by the users themselves.

This system design has 3 part: ontology, system architecture and user interface.

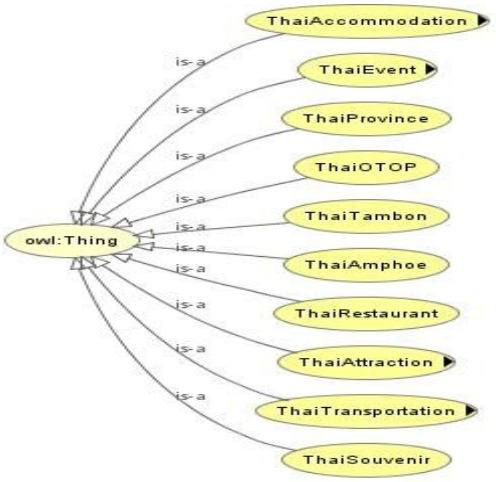

Figure 1. tourism ontology

Figure 1 shows the tourism ontology for Thailand developed with Protégé 4.1. It consists of 10 classes including Province, Amphoe, Tambon, Event, Accommodation, Attraction, Restaurant, Souvenir, OTOP, and Transportation class. Each class is unclassified has shown that 2, 3, 4 and 5.

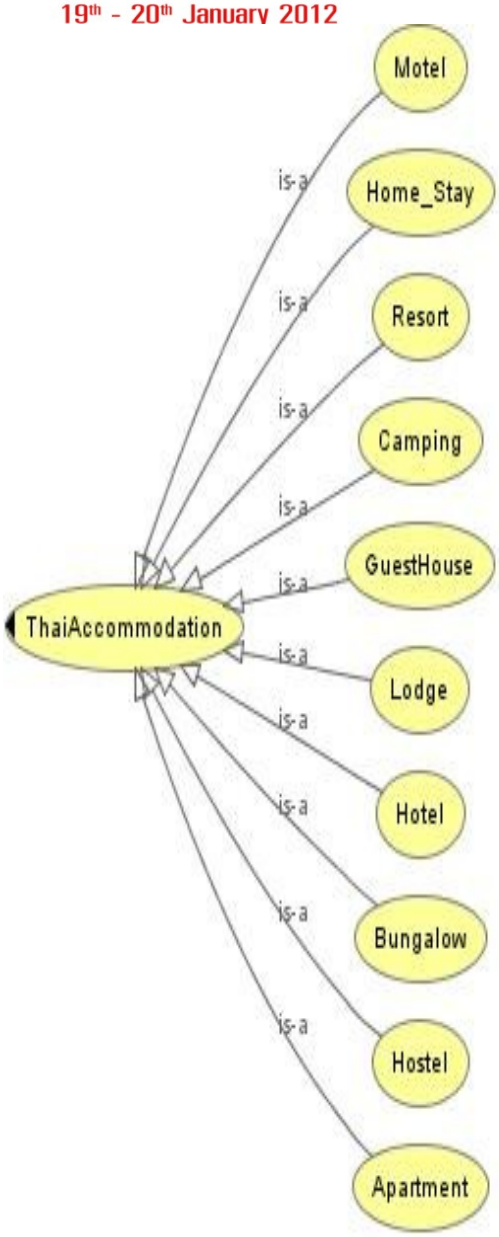

Figure 2. Accommodation Class

Figure 2 depicts the accommodation class for Thailand that tourism can search on internet include Motel, Lodge, Resort, Guesthouse, Hotel, Hostel, Apartment, Camping, Home stay and Bungalow

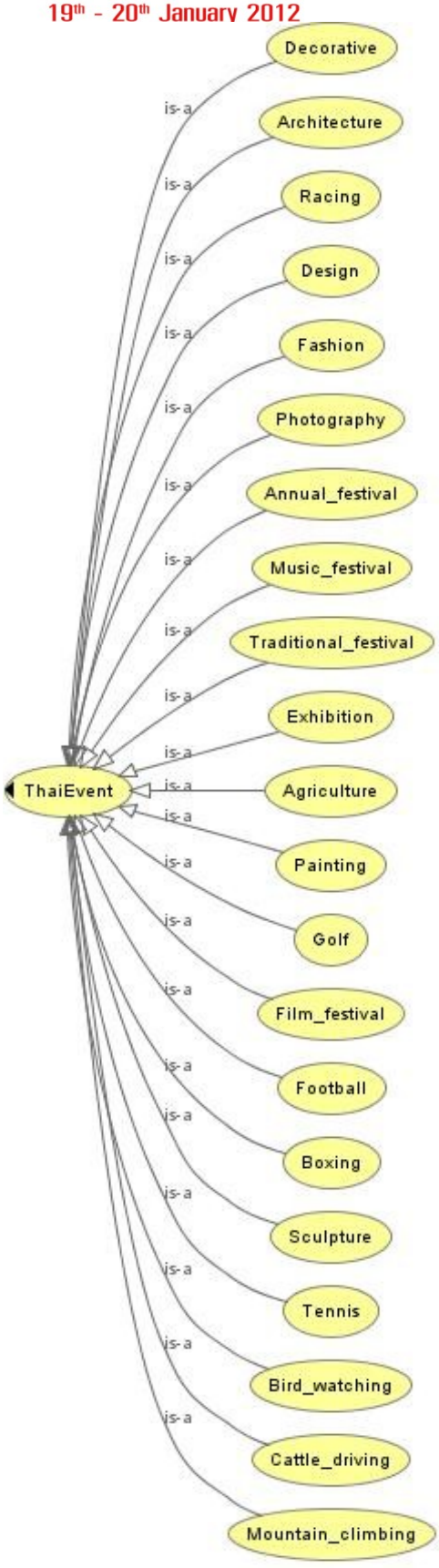

Figure 3. Event Class

Figure 3 relates the event class for Thailand with architecture, music festival, mountain climbing, sculpture, bird watching, decorative, racing, fashion, exhibition, photography, football, traditional festival, golf, design, annual festival, painting, film festival, tennis, boxing, agriculture and cattle driving as sub classes.

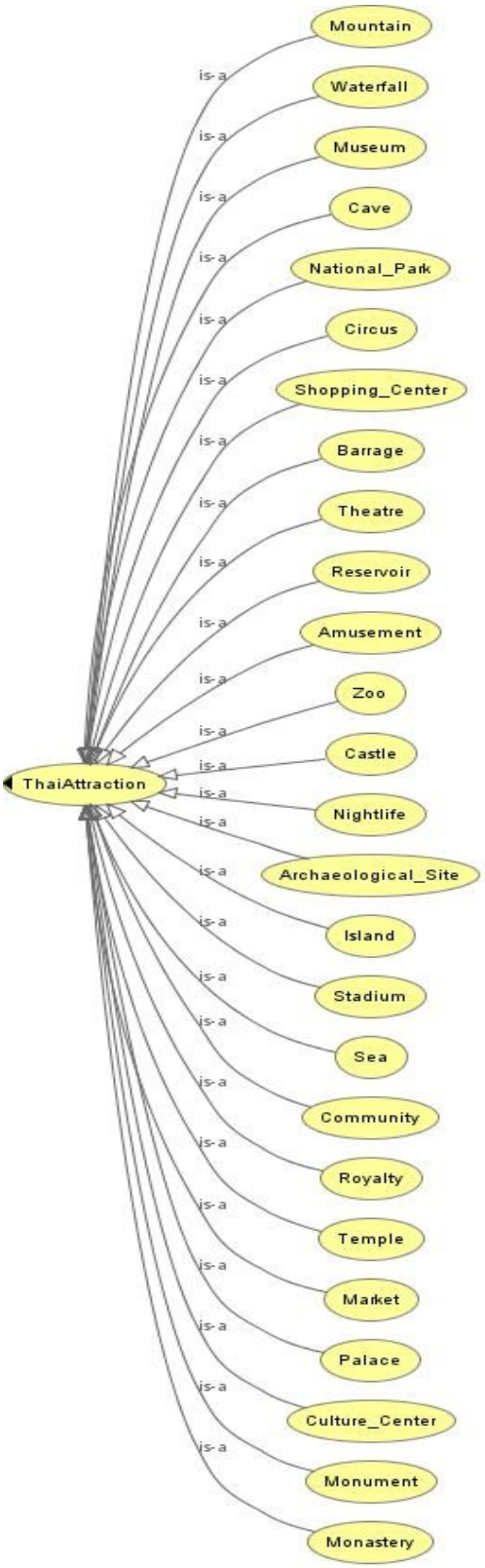

Figure 4. Attraction Class

Figure 4 centers on the attraction class for Thailand including mountain, waterfall, museum, cave, national park, circus, shopping center, barrage, theatre, reservoir, amusement, zoo, castle, nightlife, archaeological site, island, stadium, sea, community, royalty, temple, market, palace, culture center, monument and monastery (in Thailand mainly Buddhist temples).

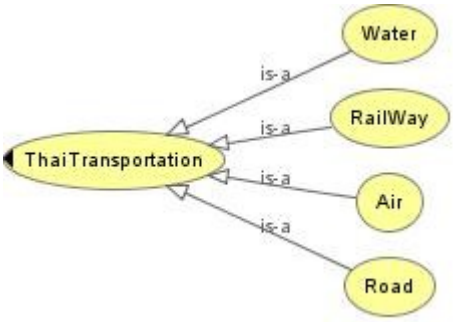

Figure 5. Transportation Class

Figure 5 is about the transportation class for Thailand including water, railway, air and road.

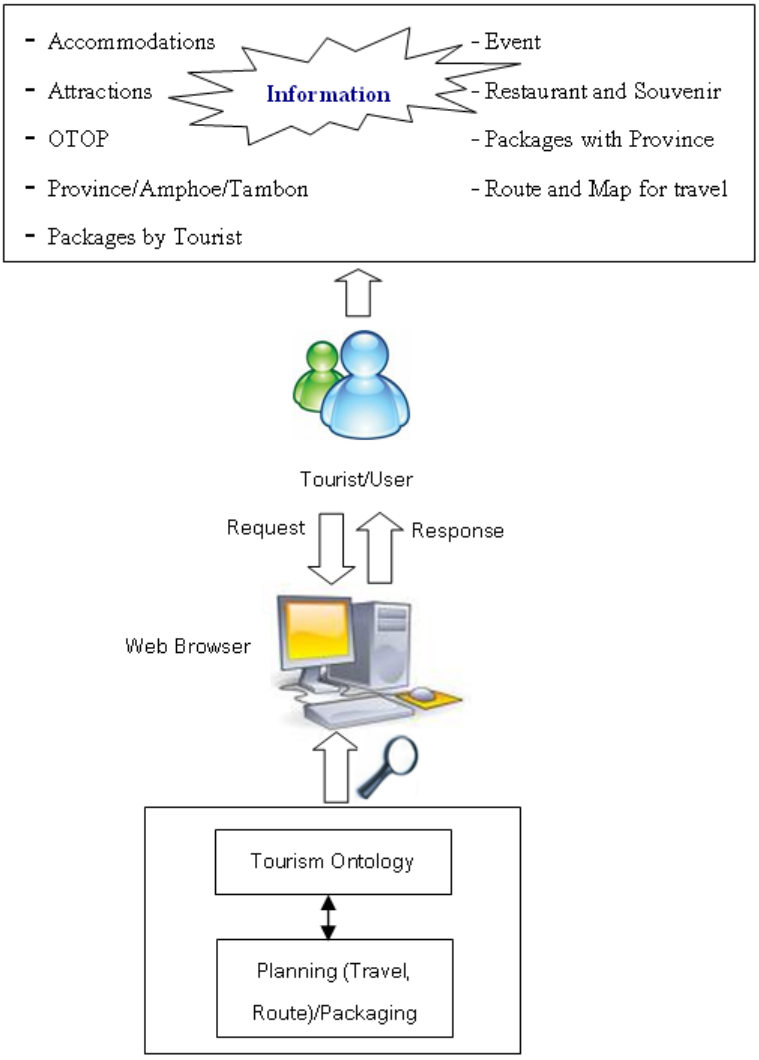

Figure 6. System Architecture

In Figure 6 the system architecture is presented. When the users or tourists want to know attractions in Thailand, they can use search and the system will retrieve information from the knowledge base and other information from the ontology. The result will be search results in a form that can also be used on web application.

Figure 7. User Interface

Figure 7 depicts the user interface, which is designed in a user friendly way together with a search engine. We develop web application using JSP and the ontology for tourism information in Thailand including attractions, transportation, accommodation, restaurants, souvenir shops, and OTOP shops (One Subdistrict One Product). Also available is a Packages button to show packaged and press Travel Route and Map button to show travel route and map.

4. Conclusions and further work

In this paper, we present a way to improve this situation by introducing an ontology for the design of touristic search systems for Thailand. In the future, we use a name matching algorithm that can deal with name variations both in Latin and Thai scripts. This algorithm ensures that misspelled or otherwise incorrectly written names can still be used and found by the search engine. With our system erroneous spellings also can be found on the Internet easily and we will add algorithm for provide automatic package to tourist which it is decrease time to search and decide for travel. Moreover, we will use semantic web technology used to store and present structured content. The data here are various links related to each other to make finding information easier.

REFERENCES

Andrade, H. & Saltz, J. (1999). Towards a knowledge base management system KBMS:an ontology-aware database management system DBMS. in the 14th Brazilian Symposium on Database, Florianopolis, Brazil, Oct., 27-39.

Andrade, H. & Saltz, J. (2000). Query optimization in kess an ontology-based KBMS. in the 15th Brazilian Symposium on Databases (SBBD'2000). Joao Pessoa, Brazil, 35-48.

Ball, M. & Craig, B. (2010). Object oriented jDREW. Retrieved from http://jdrew.org/oojdrew

Blackburn, S. (1996).The Oxford Dictionary of Philosophy. *Oxford: Oxford University Press*.

Brueckner, M., Snae, C. & Payakpate, J. (2008). Ontology-based name matching of toponyms for geographical information systems (ONTO-GIS). LADIS International Conference ICT, Society and Human Beings, Amsterdam, The Netherlands, Jul., 108-114.

Buhalisa, D. & Law, R. (2008). Progress in information technology and tourism management: 20 years on and 10 years after the Internet the state of Tourism research. Tourism Management, Elsevier Ltd.

Chandrasekaran, B., Josephson, J.R. & Benjamins, V.R. (1999). What are ontologies and why do we need them. IEEE Intelligent System. 14(1), 20-26.

Chuthakon, S. & Charoensuksai, C. (2007). Introduction to the tourism industry.

Dema, T. (2008). eTourPlan: A knowledge-based tourist route and activity planner. Master thesis, M.Sc., University of New Brunswick.

Gruber, T. Ontology. Retrieved from http://tomgruber.org/writing/ontology-definition-2007.htm

Guarino, N. (1998). Formal ontology and information systems. in the First International Conference (FOIS'98), Amsterdam: IOS Press, Jun., 3-15.

Murua, I., Llado, E. & Llodra, B. (2006). The semantic web for improving dynamic tourist packages commercialization. Retrieved from http://www.ibit.org/dades/doc/1108_ca.pdf

Noy, N.F. & McGuinness, D.L. (2001). Ontology development: a guide to creating your first ontology", California : Stanford Knowledge Systems Laboratory Technical Report.

Protégé. The Protégé Ontology Editor and Knowledge Acquisition System. Retrieved from http://protege.stanford.edu

Siricharoen, W. V. (2008). Learning semantic web from e-tourism. in the 2nd KES International conference on Agent and Multi-Agent Systems: Technologies and Applications, Inha University, Korea, Mar., 516–525.

Siriratchanikon, C. & Lao-arun, R. Complex system of search for Tourism in Thailand. Retrieved from http://cpe.kmutt.ac.th/previousproject/2006/26/Index.htm

Smith, B. & Welty, C. (2001). Formal ontology in information systems. in the 2nd International conference on formal Ontology in Information Systems, Ogunquit, Maine, New York: ACM Press, Oct.

Snae, C. & Brueckner, M. (2007). LOWCOST: Local organization search with consolidated ontologies for name, space and time. in International Conference on Software Engineering, Innsbruck, Austria, Feb., 13-15.

Snae, C., Brueckner, M. & Wongthongtham, P. (2007). Local organization and business ontology (LOBO). in IEEE International Conference on Digital Ecosystems and Technologies, Rydges Tradewinds Cairns, Australia, Feb., 292-295.

Snae, C., Singhadech, N., Emapana, B. & Brueckner, M. (2006). Interactive transliteration tools for explanation level language system (IT-TELLS). in International Technical Conference on Circuits/Systems Computers and Communication, Chiang Mai, Thailand, Jul., 245-248.

Tourism Authority of Thailand. Thai project merry way. Thai economy dynamic. Retrieved from http://thai.tourismthailand.org

Uschold, M., King, M., Moralee, S. & Zorgios, Y. (1998). The Enterprise Ontology. The Knowledge Engineering Review. SpecialIssue on Putting Ontologies to Use, 13(1), 31-89.

W3C. OWL Web Ontology Language Guide. Retrieved from http://www.w3.org/tr/owl-guide