A Semantic Web Service for Tourism Information over the Mobile Web*
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Abstract: To better publish geographical information on the Web, it is important to capture how Web technologies are changing. For a recent decade, Semantic Web has been developed by incorporating ontologies into the current Web, with an aim to make computers understand rather than simply display. Ontology, an explicit specification of a conceptualization, and the Semantic Web grounded on the ontology, have the potential for effective sharing and appropriate retrieval of geographical information. This paper describes a Semantic Web Service over the mobile Web that can offer pertinent tourism information according to user contexts. To do this, a tourism ontology was formalized in the PARA (Place-Attraction-Resource-Activity) ontology model by organizing tourist places, tourist attractions, tourism resources, and activities. Locational relationships between tourist places were also included in the PARA ontology model to take into account the movements of tourists on a railway network. The XML (Extensible Markup Language) Web Service in the middle tier manages the client-side request for information retrieval and the corresponding server-side response from the data provider. The PARA ontology was integrated into the XML Web Service for the concept-based discovery of tourism information. The applicability of the proposed system was tested through a simulation experiment for Tokyo tourism.

Keywords: mobile Web, ontology, Semantic Web, tourism information

Abstract: 웹 기술의 변화발전 동향을 파악하는 것은 지리정보의 웹 공유에 있어서 우선적으로 고려되어야 할 사항 중의 하나이다. 시맨틱 웹은 컴퓨터가 정보를 보여주는 것에 그치지 않고 정보를 이해하도록 하는 방법론 및 기술로서, 기존의 웹과 온돌로지의 결합을 통해 이루어진다. 개념화의 명시적인 사양이라고 정의되는 온돌로지는 이에 기반한 시맨틱 웹은 지리정보의 효과적인 공유와 검색을 위해 활용될 수 있다. 이 논문에서는 모바일 웹 상에서 사용자의 행동맥락에 부합되는 관광정보를 제공하기 위한 시맨틱 웹 서비스에 대해 논의한다. 이를 위해 관광지, 관광자원, 관광객의 행동 등이 계획적으로 개념화 및 조직화된 PARA (Place-Attraction-Resource-Activity) 온돌로지 모형을 구축하고, 관광객의 이동을 고려하기 위하여 관광지와 연결된 전철 네트워크를 이 모형에 결합시킨다. XML (Extensible Markup Language) 웹 서비스는 클라이언트의 요청과 이에 따른 서버의 응답을 중개하는 역할을 하는데, PARA 온돌로지 모형과 연동되는 XML 웹 서비스를 통해 개념기반의 관광정보 발전이 가능하도록 한다. 이 연구에서 제안하는 시스템은 도쿄 관광정보의 검색 시뮬레이션을 통해 그 가능성에 태스트되었다.

Keywords: 관광정보, 모바일 웹, 시맨틱 웹, 온돌로지

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1. Introduction

To better publish geographical information on the Web, it is important to capture how Web technologies are changing. For a recent decade, the Semantic Web for machine-understandable information has been developed by incorporating ontologies into the current Web (Berners-Lee and Hendler, 2001). As an explicit specification of a conceptualization (Gruber, 1993), the ontology has drawn attention of various communities in information science including GIS (Geographic Information System). Geographical information is not straightforward, and many concepts in geography and related fields might be vague and ambiguous. Modeling an explicit specification of the concepts in geographical domains at an adequate level would be crucial to the advancement of Web GIS. The combination of ontologies with the Web can overcome the problems coming from the inexplicitness, and also facilitate geographical knowledge sharing and reuse.

An exhaustive ontology for geographical domains is not established yet. However, as a foundation for such goal, generic spatial and temporal entities are being converted to ontologies, using the standards of the ISO (International Organization for Standardization), the OGC (Open Geospatial Consortium), and the FGDC (Federal Geographic Data Committee). The GIS applications using ontologies have been constructed primarily in the fields of transportation (Lorenz et al., 2005; Obitko and Marik, 2005), navigation (Schlenoff et al., 2003; Hong, 2006; Tvarozek, 2006), cartography (Gandon et al., 2003; Kulik et al., 2005), tourism (Tomai et al., 2005; Cardoso, 2006; Lam and Lee, 2006; Yueh et al., 2007), and natural resource management (Yoon and Yoo, 2000; Bennett, 2001; Third et al., 2007). Now, Semantic Web Services based on the geographical ontologies should be challenged by succeeding the existing theoretical and technological achievements and by building a pertinent domain-specific ontology to be accessed through the Internet.

This paper describes a Semantic Web Service for tourism information over the mobile Web. The author built an ontology model, named PARA (Place-Attraction-Resource-Activity), to formalize tourism information based on the concepts of “what,” “where,” and “when,” as well as the locational contexts between tourist places. A case of Tokyo tourism was tested for the applicability of the proposed ontology model. To service the tourism information over the mobile Web, an XML (Extensible Markup Language) Web Service was built to manage the communication between mobile clients and a server-side data provider. Upon a request of a mobile client, the XML Web Service searches the PARA ontology to discover appropriate sets of recommendation. The information of recommended tourist attractions and the vicinity are represented in a map of SVG (Scalar Vector Graphics) on mobile devices. The Semantic Web Service with the PARA ontology model can answer to the question like “I have something in mind but I am not sure about where to go.” or “She and I have a little different tastes but we want to go to some place together.”

This paper is organized as follows (Figure 1). While the background and objective being briefly introduced in this section, the theoretical and technological issues as to ontologies, Semantic Web, and the geographical information are explored in section 2. Basics for building a tourism ontology and the principles for the PARA ontology model are described in section 3. In section 4, the Semantic Web Service with the PARA ontology model is examined, and a simulation experiment for Tokyo tourism information is demonstrated over the mobile Web. Section 5 concludes the paper with a