

A Context-Aware Museum-Guide System Based on Cloud Computing

Hamed Vahdat-Nejad, University of Birjand, Birjand, Iran

Mohammad Sadeq Navabi, University of Birjand, Birjand, Iran

Hosein Khosravi-Mahmouei, University of Birjand, Birjand, Iran

ABSTRACT

This paper proposes a context-aware museum-guide system, which is able to present information on exhibits in accordance with visitor needs. Other features of the system include planning and directing a visit as well as providing locations, facilities and additional services. The architecture is designed based on the attribute-driven design method. It consists of two components including mobile and server components. The server component is located in the cloud and is regarded as the backup for the mobile component. The software architecture analysis method is employed to evaluate the proposed architecture. To this end, some scenarios have been codified for system functionalities by consulting museum experts. The proposed architecture satisfies the scenarios by resolving the issues arisen in each one. The CIF-based questionnaire method indicates a high usability score for the proposed system. Finally, comparison of the capabilities of the proposed system with related research reveals that it benefits from a comprehensive design.

KEYWORDS

Cloud Computing, Context-Awareness, Museum-Guide Systems, Recommendation System, Software Architecture

INTRODUCTION

Nowadays, tourism is one of the greatest and most productive economic activities in the world. This industry has been rapidly progressing in many countries (Yu, 2014). Tourism can be highly influential in economic, social and cultural developments in developing countries (Iso, Mishina, Shimazaki, & Ishibashi, 2008; Bojanic & Lo, 2016). With improvements in the financial status and social welfare of the middle class citizens, tourism has been booming, significantly.

One of the main concerns of tourists is the need for an appropriate guide. Many of them forbear to travel and visit places due to the absence of a guide. Others traveling without a guide, get confused without enjoying enough (Ferdiana & Hantono, 2014).

In the light of modern technologies, human life has undergone tremendous developments. These technologies have made significant changes to human lifestyle. With the advent and spread of new generations of smart phones equipped with different sensors such as positioning systems and the development of wireless sensor networks in public places (Guo, et al., 2014), a smart phone has

DOI: 10.4018/IJCAC.2018100101

turned into an interesting and popular Personal Digital Assistant (PDA) to help tourists. Besides, with advances in pervasive computing, the things around us have now processing and storing capability, and everyone can receive customized services on computers embedded in the surrounding environment (Saha & Mukherjee, 2003; Mohammadi-Bezanaj & Vahdat-Nejad, 2015). Mark Weiser was the first theorist who introduced his viewpoint on pervasive computing as the third wave of computing technology (Weiser, 1991; Vahdat-Nejad, 2014). Pervasive computing tries to be aware of user's situation as well as the surrounding environment to adapt the actions to the current situation (Beresford & Stajano, 2003). Pervasive computing applications are mostly context-aware. In other words, they receive context information characterizing the surrounding environment in an implicit way and perform appropriate operations, accordingly (Vahdat-Nejad, Zamanifar, & Nematbakhsh, 2013). Context is "any information that is used to characterize the situation of an entity" pertaining to the scenario of the application (Abowd, et al., 1999; Dey, 2001). The application uses this information to provide adaptive services regarding the current situation of the user.

Previously, some mobile museum guide systems have been introduced to help visitors (Abowd, et al., 1997; Oppermann & Specht, 2000; Bay, Fasel, & Van Gool, 2005; Bruns, Brombach, Zeidler, & Bimber, 2007). One of the main functionalities of such systems is to determine visitor's current location to present information on nearby exhibits. GPS, Wi-Fi, QR Code, RFID and NFC are among the technologies used for positioning. In this regard, NFC is a modern and developing technology. According to the statistics, it is predicted that in the near future most of mobile phones will be equipped to the NFC features (Ok, Coskun, Aydin, & Ozdenizci, 2010). Related museum guide papers do not benefit enough from the context-awareness potential. In fact, they at most use location for providing services and information. This study is meant to extensively use the context-aware potential and provide users with customized services based on age, language, education, specialty and interests. It proposes a mobile Context-Aware Museum Guide (CAM-Guide) system based on the NFC tag. The proposed system is designed to have four functionalities including presenting information on exhibits in accordance with visitor needs, planning and directing a visit, and providing location as well as facilities services. It is also designed to satisfy usability and modifiability. The opinions stated by the experts at Cultural Heritage Organization (Organization, 2017) in South Khorasan Province and the experts at Akbarieh Garden and Museum (Akbarieh, 2016) in Birjand have been used for requirement gathering and analysis. The SAAM method is used to evaluate the CAM-Guide architecture. In this method, a scenario is provided for each functionality of the system and the proposed architecture is investigated accordingly. To evaluate usability of the proposed application, a questionnaire with three aspects is used including graphical design, application usability, and the usability of a specific functionality (providing information on exhibits). Investigating questionnaires indicates that the application usability indicator is high, something which shows the system is easy for users to use.

The rest of this paper is organized as follows: the second section reviews previous studies on mobile museum guide systems and investigates the technologies used in them. The third and fourth sections deal with the design and evaluation of the proposed system. Finally, the fifth section presents conclusion remarks as well as open research directions.

BACKGROUND

Pervasive computing and cloud computing are regarded as new computing models that complement each other (Vahdat-Nejad, Eilaki, & Izadpanah, 2018). Cloud computing has gained applications in various domains (Hossain, et al., 2017). To this end, several research studies have addressed different issues of realizing cloud computing such as distributed data management (Al Zain et al., 2015), cooperation (Li, Gupta, & Metere, 2017), and security (Stergiou, et al., 2018).

Preliminary museum guide systems, proposed before the advent of smart phones, included mobile cassette players by which visitors could listen to the introductions on exhibits while going through the museum. The visitors could rewind any part that they did not understand. In this evolution,

17 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/article/a-context-aware-museum-guide-system-based-on-cloud-computing/213986

Related Content

Centralized Fog Computing Security Platform for IoT and Cloud in Healthcare System

Chandu Thota, Revathi Sundarasekar, Gunasekaran Manogaran, Varatharajan Rand Priyan M. K. (2018). *Fog Computing: Breakthroughs in Research and Practice* (pp. 365-378).

www.irma-international.org/chapter/centralized-fog-computing-security-platform-for-iot-and-cloud-in-healthcare-system/205985

Fog Computing Quality of Experience: Review and Open Challenges

William Tichaona Vambe (2023). *International Journal of Fog Computing* (pp. 1-16).

www.irma-international.org/article/fog-computing-quality-of-experience/317110

Load and Cost-Aware Min-Min Workflow Scheduling Algorithm for Heterogeneous Resources in Fog, Cloud, and Edge Scenarios

Jyoti Bishtand Venkata Subrahmanyam Vampugani (2022). *International Journal of Cloud Applications and Computing* (pp. 1-20).

www.irma-international.org/article/load-and-cost-aware-min-min-workflow-scheduling-algorithm-for-heterogeneous-resources-in-fog-cloud-and-edge-scenarios/284496

Transforming Application Development With Serverless Computing

Suliman Mohamed Fatiand Mamdouh Alenezi (2024). *International Journal of Cloud Applications and Computing* (pp. 1-16).

www.irma-international.org/article/transforming-application-development-with-serverless-computing/365288

The New Paradigms of the Internet Combined with Energy Management: New Models and Tools to Aid the Integration of Data

Joel G. Oliveira (2014). *Mobile Networks and Cloud Computing Convergence for Progressive Services and Applications* (pp. 218-230).

www.irma-international.org/chapter/the-new-paradigms-of-the-internet-combined-with-energy-management/90116