

Context-Awareness for Location Based-Service for Ubiquitous Learning with underlying Principles of Ontology, Constructivism, Artificial Intelligence

Yvette Gelogo^{1*}, Hye-jin Kim²

^{1*}*Department of Multimedia Engineering, Hannam University, Korea
Vette_mis@yahoo.com*

²*Continuing Education Center, Wooseok University, Korea
hyejinaa@daum.net*

Abstract

In this paper, we defined constructivism and ontology theory and associate it in ubiquitous learning. The typical ubiquitous learning involving the Context Aware Intelligent system was presented. Also the Architecture for learning environment including the key idea and technical concept is being presented in this paper. Guided with these principles and with the advancement of information and communication technology the context-awareness based on Artificial intelligence for Location based Service for ubiquitous Learning was conceptualized.

Keywords: *Ontology, Constructivism, Artificial Intelligence, Context-awareness, Ubiquitous learning, Location Based Service*

1. Introduction

The close cooperation between the artificial intelligence community and researchers studying context-aware mobile and ubiquitous applications will be indispensable for the future success of context-aware applications. The context-awareness can be supported by the concept of AI and Location Base Service for ubiquitous learning.

Ubiquitous learning is the next step in performing e-learning and by some groups it is expected to lead to an educational paradigm shift, or at least, to new ways of learning. The potential of ubiquitous learning results from the enhanced possibilities of accessing learning content and computer-supported collaborative learning environments at the right time, at the right place, and in the right form. Furthermore, it enables seamless combination of virtual environments and physical spaces^[3]. The location-based optimal grouping service is to group geographically nearby students to together to create ad hoc online learning groups. In this service, the positioning accuracy is not critical^[7].

One challenge of mobile distributed computing is to exploit the changing environment with a new class of applications that are aware of the context in which they are run. Such context-aware software adapts according to the location of use, the collection of nearby people, hosts, and accessible devices, as well as to changes to such things over time. A system with these capabilities can examine the computing environment

and react to changes to the environment ^[8].

To sum-up, ubiquitous learning needs a concrete platform guided all the needed idea since technology is already possible. Only the concrete learning architecture is need to be design. In this study we proposed a typical ubiquitous learning architecture and a learning environment which was formulated based on the current trend of communication and information technology with the underlying learning theories applicable for ubiquitous learning.

2. Background

Ubiquitous learning is supported by ubiquitous computing and represents the next step in the field of e-learning. The goal is that learning environments will be accessed increasingly in various contexts and situations. From this challenge, new questions arise concerning the adaptation of learning spaces to different contexts of use, so that they continue to enable and support learning processes. As a basic work in this direction, this paper introduces a first notion of a comprehensive definition of 'plasticity of digital learning spaces'. It exemplifies some of the facets affecting the plasticity and presents aspects of a first system prototype, which enables to select learning materials depending on a given situation. ^[2]

A ubiquitous learning environment provides an interoperable, pervasive, and seamless learning architecture to connect, integrate, and share three major dimensions of learning resources: learning collaborators, learning contents, and learning services. Ubiquitous learning is characterized by providing intuitive ways for identifying right learning collaborators, right learning contents and right learning services in the right place at the right time. ^[3]

Context awareness is defined complementary to location awareness. Whereas location may serve as a determinant for resident processes, context may be applied more flexibly with mobile computing with any moving entities, especially with bearers of smart communicators. Context awareness originated as a term from ubiquitous computing or as so-called pervasive computing which sought to deal with linking changes in the environment with computer systems, which are otherwise static. ^[1]

The concept of context awareness is that, the learning environment information can be known by the ubiquitous learning system; the learning resources learners might need can be provided according to learners' profiles and learning status; learners' learning activities will not be stopped in ubiquitous learning even though they move to another place; and, the learning materials will be delivered to learners automatically to avoid interrupting learners with different devices. ^[2]

The artificial intelligence community and researchers studying context-aware mobile and ubiquitous applications will be indispensable for the future success of context-aware applications. The notions of context and context-awareness are introduced. It is shown that typical issues arising in context-awareness can be supported by concepts and methods developed within the AI community ^[4].

3. Ontology, Constructivism and Artificial Intelligence Definitions

Ontology is the philosophical study of the nature of being, existence or reality as such, as well as the basic categories of being and their relations. Traditionally listed as a part of the major branch of philosophy known as metaphysics, ontology deals with questions concerning what entities exist or can be said to exist, and how such entities can be grouped, related within a hierarchy, and subdivided according to similarities and differences.

Constructivism is a theory of knowledge (epistemology) that argues that humans generate knowledge and meaning from an interaction between their experiences and their ideas. During infancy, it is an interaction between their experiences and their reflexes or behavior-patterns. Piaget called these systems of knowledge schemata. Piaget's theory of constructivist learning has had wide ranging impact on learning theories and

teaching methods in education and is an underlying theme of many education reform movements. Research support for constructivist teaching techniques has been mixed, with some research supporting these techniques and other research contradicting those results.

Artificial intelligence (AI) is the intelligence of machines and the branch of computer science that aims to create it. AI textbooks define the field as "the study and design of intelligent agents"^[5] where an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success.

4. Context Awareness

Context awareness is defined complementary to location awareness. Whereas location may serve as a determinant for resident processes, context may be applied more flexibly with mobile computing with any moving entities, especially with bearers of smart communicators. Context awareness originated as a term from ubiquitous computing or as so-called pervasive computing which sought to deal with linking changes in the environment with computer systems, which are otherwise static. Although it originated as a computer science term, it has also been applied to business theory in relation to business process management issues ^[1].

Context-aware computing, and describe four categories of context-aware applications: proximate selection, automatic contextual reconfiguration, contextual information and commands, and context-triggered actions. ^[8]

One significant aspect of this emerging mode of computing is the constantly changing execution environment. The processors available for a task, the devices accessible for user input and display, the network capacity, connectivity, and costs may all change over time and place. In short, the hardware configuration is continually changing. Similarly, the computer user may move from one location to another, joining and leaving groups of people, and frequently interacting with computers while in changing social situations ^[8].

5. Ubiquitous Learning

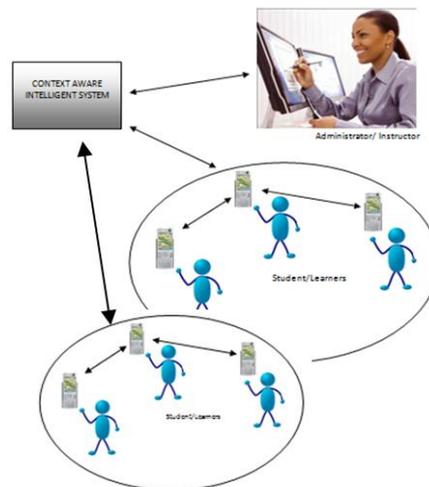


Figure 1. Ubiquitous Environment

This is the typical representation of the learning environment where learners at near location is grouped which offered an avenue for collaboration. They have the same program and level of learning which the theory of ontology applied. IT is being reflected to Constructivism pedagogy that learners with the same

level of learning should be grouped to determine the proper learning program best suited for them.

5. Ubiquitous Environment Architecture

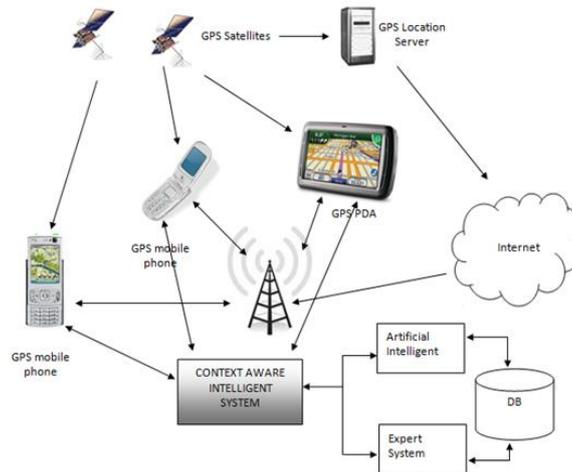


Figure 2. Ubiquitous Environment Architecture

The above figure shows the LBS Ubiquitous architecture. Context awareness through LBS is a perfect concept for ubiquitous learning. In order to give the proper learning program for a student in ubiquitous environment first is to locate the learner's location information through GPS then information sent via mobile devices in Context Aware Intelligent System. Then after the analysis of the data received it will be send back to the student via mobile phone including the possible program that is suited for him/her.

Other systems might learn about location by other means: for example, by using global positioning (GPS) or dead-reckoning, or simply by monitoring workstation interactions. An alternative to the tab system's locating scheme – where the mobile devices beacon – is a scheme where stationary devices broadcast a message identifying their fixed location. Mobile computers can listen to these broadcasts to determine their own locations^[8].

Previously, expert system and artificial intelligent brought many advantages in e-learning. The main relevance of artificial intelligent and expert system in e-learning is that the analysis of the data, for example after giving the examination the result is analyzed by the expert system based on the data generated. Thus, the result is statistically or graphically presented. Which can gave better evaluation results and feedbacks. With the advent of new trend in learning, this two had a counterpart in ubiquitous environment which is the context-aware which was believed to revolutionize ubiquitous learning.

6. Conclusion

The advancement of information and communication technology brought many opportunities in any field of science and technology research. Along with these advancements, the perspectives in learning become pervasive. The idea in "anytime, anywhere" educational paradigm become subject by many academic and research institutions. Applying the concepts of Constructivism theory which the underlying idea is "humans generate knowledge and meaning from an interaction between their experiences and their ideas", the new concept which is "Context-awareness" in learning become new model for ubiquitous learning. Plus the idea of artificial intelligence, knowledge base and expert system the ubiquitous learning will have more defined model

References

- [1] Rosemann, M., & Recker, J. (2006). "Context-aware process design: Exploring the extrinsic drivers for process flexibility". In T. Latour & M. Petit. 18th international conference on advanced information systems engineering. proceedings of workshops and doctoral consortium. Luxembourg: Namur University Press. pp. 149–158.e
- [2] Yang, S. J. H. (2006). "Context Aware Ubiquitous Learning Environments for Peer-to-Peer Collaborative Learning. Educational Technology & Society, 9 (1), 188-201.
- [3] Birgit Bommsdorf, "Adaptation of Learning Spaces: Supporting Ubiquitous Learning in Higher Distance Education", University of Hagen, Information Systems and Databases, 58084 Hagen, Germany
- [4] Pichler, Mario, Ulrich Bodenhofer, Wieland Schwinger, "Context-Awareness and Artificial Intelligence". ÖGAI Journal 23/1.
- [5] Definition of AI as the study of intelligent agents: Poole, Mackworth & Goebel 1998, p. 1, which provides the version that is used in this article. Note that they use the term "computational intelligence" as a synonym for artificial intelligence. Russell & Norvig (2003) (who prefer the term "rational agent") and write "The whole-agent view is now widely accepted in the field" (Russell & Norvig 2003, p. 55). Nilsson 1998
- [6] The intelligent agent paradigm: Russell & Norvig 2003, pp. 27, 32–58, 968–972 Poole, Mackworth & Goebel 1998, pp. 7–21, Luger & Stubblefield 2004, pp. 235–240, The definition used in this article, in terms of goals, actions, perception and environment, is due to Russell & Norvig (2003). Other definitions also include knowledge and learning as additional criteria.
- [7] Maiga Changa, Qing Tana, Tzu-Chien Liub, Oscar Lina, "Multi-Agent Architecture-based Location-aware Service Project for Ubiquitous Learning"
- [8] Bill N. Schilit, Norman Adams, and Roy Want, "Context- Aware Computing Applications"
- [9] Vicki Jones, Jun H. Jo, "Ubiquitous learning environment: An adaptive teaching system using ubiquitous technology"