

Design of an Active Course-base and Construction Methods of Courses based on the Course-base

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Haihong Cheng, Z. Cheng, A.Koyama, S.Noguchi

Computer Network Lab. , Department of Computer Software

The University of Aizu, Japan

1. Introduction

Building distance learning system and virtual university have been hot computer-mediated applications in Education area in the last ten years, but by now, there is still no generally accepted model for distance learning, the disadvantages of the common virtual universities built are:

- lack of continuous and in-depth interactions with learners.
- courses are delivered in static and massive-oriented manner.
- course delivery does not take into account of individual learning factors and psychological factors.

We therefore intent to develop a highly interactive, collaborative as well as personalized education system by integrating the technologies in high-speed network, massive scale database, multimedia delivery and intelligent software agent all together.

2. System Model

Our CoD system mainly compose of three modules:

- ① Knowledge base
- ② Response channel and manipulation system
- ③ Content assembly mechanism

Figure 1 is the logical level of these three modules.

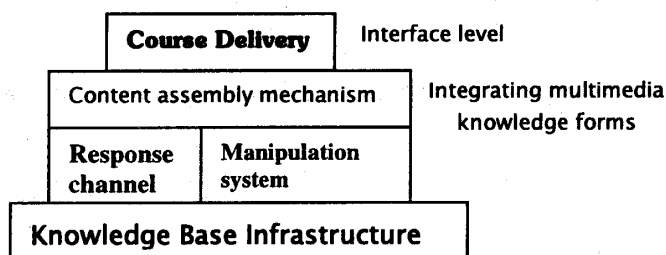


Figure 1

we focus pedagogical instruction and content delivery strategy, especially on how to create and organize knowledge, how to materialize and digitalize intelligence, as well as how to construct comprehension. We demonstrate these strategies in mainly two learning styles:

1) supervised learning

In supervised model, we incorporate several kinds of instructional strategies in the form of intelligent agents. On the basis of response collection and response handling, the response data from learner will become the supplementary and tuning parameters of the pre-settled instructional strategies. We mainly adopt two instructional strategies: 1) case-based learning and 2) problem-based learning.

In supervised model, prior to the beginning of a specific learning process, the system will negotiate with the learner in terms of: learning objective, parameter and definition of interactivity, control level, delivery inclination, etc.

2) unsupervised learning

In unsupervised model, learners learn by actively exploring through the Knowledge Base by themselves. The system provides pertinent services supporting such intelligent exploration. The services include:

- ① Providing multifarious representation and presentation forms of the relationships between Kus(Knowledge Units).
- ② Different directing strategies for exploring through the KB: Question-driven directing strategy, Object-driven directing strategy, Region-driven directing strategy, Relation-driven directing strategy, Level-driven directing strategy, etc.

3. Database and Structure of Knowledge Base

3.1 Structure of Knowledge Base The Knowledge Base in our system is a multimedia database management system composed of many Knowledge Units. We define a Knowledge Unit as anything that's meaningful, and relatively independent as well as self-contained knowledge object. KU can refer to concept, behavior, function, and relationship alike. We classify two types of KU: Concept type Ku and Relationship type Ku. Concept Type Ku represents any class of knowledge object and its instances that are concept-derived; Relationship Type represents the interaction and connection methods between Kus.

The concept type Ku contains relatively static information, it depicts the status, conditions and features of a Ku which shall be static for a certain period of time, it will describe the specific concept in terms of its name, attributes, methods, descriptions, extension points, etc. ; The relationship type Ku contains relatively dynamic information, it depicts the interaction, influence effect, relating ways between Kus, it will define as many as possible whatever relationships there are

between Kus. We represent the relationships between concepts in three ways :

① Circuit-switch connection

The relationship between any pair of concepts is one-to-one, and hence form a concept hierarchy. This type is typically used for concept definition.

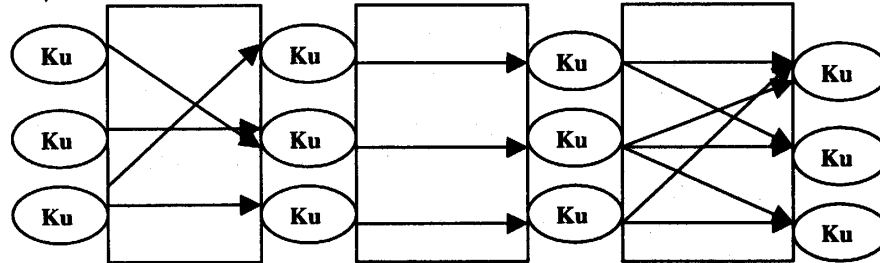


Figure 2: Circuit-switch concept connection

② Bus-type connection

In this scheme, the description of the mainline (the bus) will link several or many different concepts into together. The bus has two open ends, which means it's free to add or remove concepts on the bus. This type is typically used for knowledge retrieval.

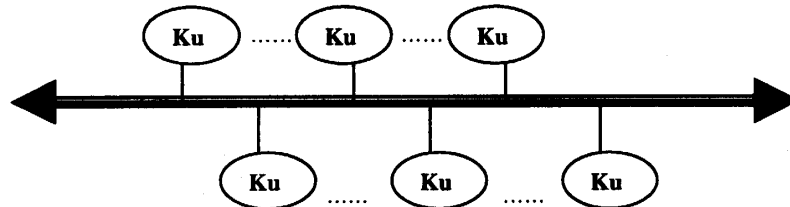


Figure 3: Bus-type concept connection

③ Route-table connection

This scheme is highly similar to network routing table.

Apart from classifying the various relationships among Kus, we define supplementary properties for each relationship:

- ① Solidity property---- Describes how close are the two Kus related with each other.
- ② Time to last property----Describes how long will a relationship last.
- ③ Degree property----Describes how deep a relationship can be.
- ④ Cost property----Describes if two Kus don't have direct links, how many concept relay paths need to be setup.

3.2 Relative Technology We select Postgres database management system to hold the Knowledge Base, and use the following tools to produce the visual knowledge units: PhotoShop, Premiere, Illustrator, PowerPoint, Director, etc.

4. Response Channel and Manipulation System

Response channels and response manipulation system support in-depth and efficient interactions with learners. Response channels will collect, track, analyze and monitor learners' responses and comments in the first time. Upon the data accumulated, the kernel control/switch agency in the Response Manipulation System will deliver customized course content to specific learners and to specific learners' requirements. The Response Channels get learner's response in the following ways:

- learner asks question(s) about particular knowledge points
- learner engages into public/private communication area
- learner's response and comments
- learning speed and period, etc.

5. Summary

In this paper, we introduced the Knowledge-Base-derived Course on Demand system, by constructing Knowledge base, Response channel & manipulation system, and Content assembly mechanism, our CoD system is suitable to provide individual-oriented course. The open architecture of our system makes it easy to integrate other distance learning systems, various course wares and to set up the collaborative learning environment.

Reference

- Larry Gilbert, David R. Moore. Building interactivity into web courses: Tools for social and instructional interaction. Educational Technology May, 1998.
- H.S. Nwana, M. Wooldridge. Software Agent Technologies. Software Agents and Soft Computing---Towards Enhancing Machine Intelligence.