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Personalized Web-based Systems with fuzzy systems based on CI modeling

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Abstract: Personalization involves using technology of accommodate the differences between individual ones confined mainly to the web it is increasing by becoming a factor in education , health care, television and in both business to business and business to consumer settings. In this paper, the computational intelligence methods are identified and critically reviewed. Here, we have described about Fuzzy logic in fuzzy systems. Generic algorithms, neural networks, artificial immune systems and swarm intelligence which includes particle swarm optimization, ant colony optimization, bee colony optimization and wasp colony optimization. Here personalization involves two main approaches one is personalized navigation and personalized content.
Key Words: personalization, computer intelligence, web based system, modeling.

I. INTRODUCTION

Personalization involves using technology to accommodate the differences between individuals once confined mainly to the web, it is increasing by becoming a factor in education, healthcare, television, and in both "business to business" and "business to consumer" settings. The study of adaptive mechanisms to "enable or facilitate intelligent behavior in complex and changing environments".

The main computational intelligent methods for personalization of web-based systems are identified and critically reviewed. The taxonomy of personalization of web systems is proposed, it is based on CI method. It identifies two main approaches to personalize web based systems as profile generation.CI method is nothing but computational intelligence method. These above approaches are either classified as either personalized navigation or personalized content. Now a days internet is very important one which is used by many users, so users are facing many difficulties in interacting with web interfaces. Users have some difficulties like time consuming, confusing, and frustrating. Here, in above case web personalization is a major part of user centered design which addresses these user problems. Personalization navigation provides automatic generation of user adapted navigated hierarchy for a set of web pages. We are creating user profiles for personalization of navigation or They are

(a)Information Filtering(IF)
(b)Information Extraction (IE)
(c)Information Retrieval (IR)
(d)Collaborative Filtering (CF)

CI techniques are "more suitable than standard techniques to approach these tasks"

Methodology:

Computational Intelligence:

The field is often called Artificial Intelligence. Scientific goal: to understand the principles that make intelligent behavior possible, in natural or artificial systems. Engineering goal: to specify methods for the design of useful, intelligent artifacts. Fuzzy logic is a joint offering between Electrical Engineering and Industrial Engineering and is cross-listed. Because of this, the course has attracted electrical engineering students (about 60%), industrial engineering students (about 30%) and others, mainly biomedical engineers. The text used has been Fuzzy Logic with Engineering Applications.

II. ARTIFICIAL OR COMPUTATIONAL INTELLIGENCE

The field is often called Artificial Intelligence. Scientific goal: to understand the principles that make intelligent behavior possible, in natural or artificial systems. Engineering goal: to specify methods for the design of useful, intelligent artifacts. Analogy between studying flying machines and thinking machines.

Central hypotheses of CI Symbol-system hypothesis: Reasoning is symbol manipulation. Church–Turing thesis: Any symbol manipulation can be carried out on a Turing machine.

Fig 1.Representation and Reasoning

To use these inputs an agent needs a representation of them.

⇒ knowledge :Most common sense tasks rely on a lot of knowledge Artificial Intelligence.Representation and Reasoning System

Problem ⇒ representation ⇒ computation

(i)A representation and reasoning system (RRS) consists of

- Language to communicate with the computer.
- A way to assign meaning to the symbols.
- Procedures to compute answers or solve problems.

Example RRSs:

- Programming languages: Fortran, C++.
- Natural Language
- We want something between these extremes.

Example Application Domains

- Autonomous delivery robot roams around an office environment and delivers coffee, parcels.
- Diagnostic assistant helps a human troubleshoot problems and suggests repairs or treatments. E.g., electrical problems, medical diagnosis.
- Infobot searches for information on a computer system or network.

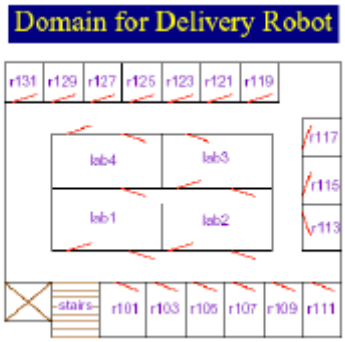

Fig.2 Domain for Delivery Robot

Example inputs:

Prior knowledge: it's capabilities, objects it may encounter, maps. Past experience: which actions are useful and when, what objects are there, how its actions affect its position.

Goals: what it needs to deliver and when, tradeoffs between acting quickly and acting safely.

Observations: about its environment from cameras, sonar, sound, laser range finders, or keyboards.

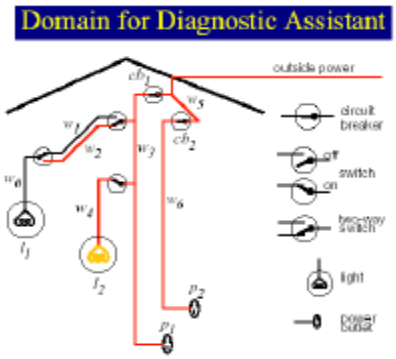

Fig.3 Domain for Diagnostic Assistant

Subtasks for the diagnostic assistant

- Derive the effects of faults and interventions.
- Search through the space of possible fault complexes.
- Explain its reasoning to the human who is using it.
- Derive possible causes for symptoms; rule out other causes.
- Plan courses of tests and treatments to address the problems.
- Reason about the uncertainties/ambiguities given symptoms.
- Trade off alternate courses of action.
- Learn about what symptoms are associated with the faults,
- the effects of treatments, and the accuracy of tests.

Example Application Domains Infobot

Infobot interacts with an information environment: It takes in high-level, perhaps informal, queries. It finds relevant information. It presents the information in a meaningful way.

III. OUR APPROACH TO TEACHING CI

Our goal is to study these four tasks. We build the tools needed from the bottom up. We start with some restrictive simplifying assumptions and lift them as we get more sophisticated representations and more powerful reasoning strategies. The theory and practice are built from solid foundations.

The taxonomy for this application is proposed here,

Paradigm of CI consists of

(a)Fuzzy Systems(FS)
(b)Evolutionary Algorithms (EA)
(c)Artificial Neural Networks (ANN)
(d)Swarm Intelligence (SI)

Fuzzy Systems (FS) and Fuzzy Logic (FL) mimic the concept the way people think, that is, with reasoning rather than precise. Fuzzy methods were found to be instrumental

in web-based Personalization when used with WUM data. User profiles are processed using fuzzy approximate reasoning to recommend personalized URLs.

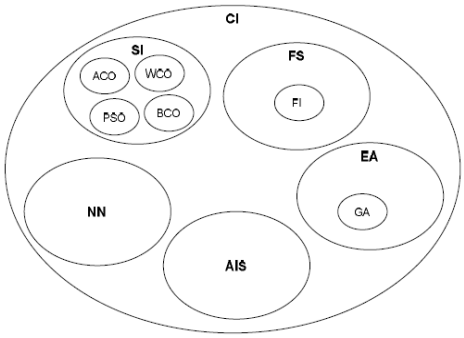

Fig 4. Taxonomy of CI

Evolutionary Algorithms (EA) use mechanisms inspired by biological evolution such as reproduction, mutation, recombination and selection. One of the most popular EA is Genetic Algorithms (GA). They mimic the gene structure in humans based on evolutionary theory. GA has been used to address some of the flaws of WUM and to tackle different problems such as personalized search, IR, query optimization and document representation.

Artificial Neural Networks (ANN) or simply Neural Networks (NN) mimic the biological process of the human brain. A NN can be trained to group users into specified categories or into clusters. This is useful in personalization as each user group may possess similar preferences and hence the content of a web interface can be adapted to each group. NNs can also be trained to learn the behavior of website users. Swarm Intelligence (SI) is based on the collective behavior of animals in nature such as birds, ants, bees and wasps. Particle Swarm Optimization (PSO) models the convergence behavior of a flock of birds. PSO was used for analyzing unique behavior of web user for manipulation of web access log data and user profile data.

Research has also been done using PSO as a clustering algorithm but no use of this approach to clustering was found in relation to website personalization Profile exploitation personalizes various aspects of a web-based system by predefined user fuzzy system which consists of one important logic namely fuzzy logic.

IV. FUZZY LOGIC

This course is a joint offering between Electrical Engineering and Industrial Engineering and is cross-listed. Because of this, the course has attracted electrical engineering students (about 60%), industrial engineering students (about 30%) and others, mainly biomedical engineers. The text used has been Fuzzy Logic with Engineering Applications.

This text is very comprehensive, however some of the problems at the end of the chapters are confusing and were not received well by the students. The text was supplemented with more details from other texts and papers, especially on control, clustering and real applications. A more mathematical and logic oriented text is Klir and Folger's Fuzzy Sets, Uncertainty, and Information. Other possibilities are Fuzzy Logic and Control.

Fuzzy Set Theory and Its Applications

A Course in Fuzzy Systems and Control by Fuzzy Set Theory, The first book includes some real, detailed applications. The grading basis for the course consisted of a single exam, given midway through the course, a semester long project (individuals or pairs) and five homework assignments. The homeworks consisted of mostly manual problems with some that required software or spreadsheet implementation. Most students used some self developed software for their projects while a few used the TilShell fuzzy logic software. Some students coded in languages such as C or Basic, but most used Matlab.

The topics were covered in this order:

1. Motivation and basic description of fuzzy logic.
2. Membership functions, methods of composition, methods of fuzzification and defuzzification.
3. Expert systems and fuzzy logic.
4. Clustering and pattern classification and fuzzy logic.
5. Control systems and fuzzy logic.

Fig.5 Classic butterfly problem for pattern classification

Some time was spent interactively with the students motivating the need and utility of fuzzy logic at the course's onset. It was important to convince them of the relevance of fuzzy logic to current and future engineering problems. The basics were covered without much mathematical theory or formal logic constructs. The simplest and classic rules were emphasized. The module on rule based systems first required an introduction to expert systems, modus ponens logic, backward or forward chaining, and other fundamental aspects. Then the advantages of fuzzy logic were presented, and students were required to construct their own simple rule bases, without and with fuzzy logic. The clustering module proved to be novel to all students. First, an introduction to the field of clustering and classification was given, culminating in the standard c-means algorithm. Then, fuzzy c-means was introduced along with various measures of cluster appropriateness. A C code of the classic and fuzzy versions of c-means was given to the students to use for homework and projects. Some classic pattern classification tasks studied included the two class. Fuzzy edge detection algorithms for machine vision and medical image processing were also introduced. Two main approaches to personalize web based systems were identified as

(a)Personalization of navigation
(b)Personalization of content

(a)Personalization of Navigation:

Based on the eight major CI methods described above, it is noticed that WUM is the common input for all models. Data

mining in a sense provides the fuel for personalization using CI methods. CI methods are comparable to taxonomy of intelligent agents for personalization. Building on ideas from this approach taxonomy for personalization of web-based systems was proposed two main uses are identified for CI methods when applied to personalization: profile generation and profile exploitation.

(b)Personalized of Content:

Personalized content refers to WUM for personalized web objects on each web page and sequence of content. FL, NN, GA, PSO and WCO were the main CI techniques found with applications in this area FL was used for a web search algorithm and to automate recommendations to ecommerce customers. It was found to be flexible and able to support ecommerce application. NN was used to group users into clusters for content recommendations however over fitting problem still exist today.

V. CONCLUSIONS

Here we introduced the concept of teaching CI. Fuzzy logic is the essential one. Eight main computational intelligence techniques were identified and critically reviewed regarding their application to personalization of web-based systems. Taxonomy with two main personalization categories as profile generation and profile exploitation was proposed. For profile generation FL, NN, PSO, GA, ACO and AIS were found to be the main CI techniques used and also a hybrid between GA and NN. Research studies show that PSO outperforms GA and ACO. PSO has relatively few parameters as compared to NN and has a more sound theoretical foundation than AIS. PSO is also relatively easier to program and easier to interpret than FL. Of the five methods presented above for profile generation using WUM data, PSO seems to be the more tested, useful and well rounded method.

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