

SYNASC09 - Artificial Intelligence

Enhanced Rule-based Phonetic Transcription for the Romanian Language

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Abstract - This paper presents a rule-based approach for the phonetic transcription of the Romanian language. We integrate this phonetic analysis in the text processing component of a text-to-speech system for Romanian. Graphemeto-phoneme rules are constructed based on expert information from DOOM II dictionary [1]. In the cases when rules are useless, we employed decision trees constructed on engineered training sets to help the classifiers to learn the language exceptions.

Mamdani FLC with various implications

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Abstract—The task of the standard Mamdani fuzzy logic controller is to find a crisp control action from the fuzzy rulebase and from a set of crisp inputs. Because the interval inputs are frequently used in various domains (online shopping, for instance), in this paper we propose an extension of this type of controller which works with intervals as inputs and with various implication operators. For any implication we obtain a crisp value as output. Finally, these outputs are combined to obtain the overall crisp output action of the system.

Exploring New Directions in Iris Recognition

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Abstract—A new approach in iris recognition based on Circular Fuzzy Iris Segmentation and Gabor Analytic Iris Texture Binary Encoder is proposed and tested here. Circular Fuzzy Iris Segmentation procedure is designed to guarantee that similar iris segment will be obtained for similar eye images, despite the fact that the degree of occlusion may vary from an image to another. Its result is a circular iris ring (concentric with the pupil) which approximates the actual iris. Gabor Analytic Iris Texture Binary Encoder proves better encoding of statistical independence between the phase content of the iris texture extracted from different irises using Hilbert Transform. Irises from University of Bath Iris Database are binary encoded at two different lengths (768 / 192 bytes) and tested in both single enrollment and multi-enrollment identification scenarios. All cases illustrate the capacity of the newly proposed methodology to narrow the distribution of inter-class matching scores, and consequently, to guarantee a steeper descent of the False Accept Rate.

A Policy-based Context Aware Self-Management Model

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Abstract—This paper proposes a generic policy based self-management model that can be used to automatically detect and repair the problems appeared during the context adaptation processes. To successfully capture and evaluate the dynamic rules that govern the context aware adaptation processes we have defined an generic context policy representation model and an associated conversion model in a reasoning language run-time evaluation. To evaluate the run-time degree of respecting the context policies we define and formalize the concept of context entropy. The context information is modeled in a system programmatic manner using both the set based and ontology based representations provided by our RAP context model. The context model artifacts are generated and administrated at run time by a management infrastructure based on BDI (Believe, Desire, Intentions) agents. The model was tested and validated within the premises of our Distributed Systems Research Laboratory smart environment.

Relational operators in heterogeneous random databases

Letitia Velcescu and Laurentiu Vasile

Abstract—In this paper, we investigate the sizes of some approximate relational operations results, focusing on join and outer join. We extend the notion of random database, in which the records are random vectors following a certain probability distribution, to heterogeneous random databases, in which each column can have its own unidimensional distribution.

Immune-inspired Web Service Composition Framework

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Abstract— This paper presents a new Web service composition method which combines the AI planning graph technique with an immune-inspired algorithm to find the optimal composition solution. Simultaneously with the planning graph construction, a matrix of semantic links is built to store the semantic links established between the services on different layers of the graph. The planning graph and the matrix of semantic links represent the main building blocks of our immune-inspired technique for finding the optimal composition solution. We use a multi-criteria function which evaluates the quality of a composition solution in terms of its QoS and semantic attributes. In order to validate our approach to automatically compose Web services, we have developed an experimental framework that integrates the planning graph composition approach and the immune-inspired selection technique. We have performed our experiments on a set of Web services from the trip planning domain.

Alleviating Urban Traffic Congestion by Means of Adaptive Routing

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Abstract—Traffic congestion is an important problem of today's urban life. Various approaches have been analyzed for solving this problem, most solutions addressing only a specific cause of the congestion. This paper focuses on rush hour congestion and aims to address its cause, the fact that many drivers need to reach the same destination and use the same routes, most frequently the shortest ones. A simple solution would be a collaborative behavior from the drivers, so as to ensure that some of the drivers choose slightly longer routes in order to avoid congestion. This paper aims to investigate the improvement potential of using intelligent routing, while offering (as much as possible) the fastest available routes to the drivers. A simple yet effective routing algorithm is proposed and tested by means of a multi-agent system on top of a traffic simulator. Experimental results conform to the expected behavior of the algorithm and are meant to provide reference values for further research.

A Bray-Curtis Weighted Automaton for Detecting Malicious Code Through System-Call Analysis

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Abstract—Malicious code detection is one of the top subjects of interest for intrusion detection systems in today's computer security research areas. In this paper we propose a new heuristic method for detecting malicious code through system call matching, which also takes in consideration the time of the system call, by using an adaptive search for an extended Aho-Corasick automaton supporting a subset of the regular expressions language, through the use of a normalization technique known as the Bray-Curtis (Sorensen) distance. We will also discuss how this technique can be applied to enrich the set of existing rules from the knowledge base for improving the detection rate.

Dynamic customization of data structures instances using an agent based approach

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Abstract—Abstract data types (ADTs) represent the core for any software application, and a proper use of them is an essential requirement for developing a robust and efficient system. Moreover, a proper instantiation of a data structure that implements an abstract data type can greatly impact the performance of the system. In this paper we propose an agent based approach for the dynamic configuration of data structures instances in a software system. In order to adapt a data structure to the system's current execution context, a neural network will be used and an agent based system is proposed. We experimentally evaluate our system on a case study, emphasizing the advantages of the proposed approach.

On Sensor Data Simulation

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Abstract— In the context of the DEHEMS project, aiming to analyze real-time sensor readings related with the energy performance of individual households, the research and development stages of various modules have underlined the need of a fast and scalable means for generating large amounts of high quality sensor data. This paper introduces a multi-purpose sensor simulation system (DS3) that successfully meets all the data generation requirements imposed by DEHEMS . Primarily designed as an internal tool for testing and tuning the storage and data analysis engines, DS3 will act also as a support platform for a number of end-user orientated applications.

Matching Semantic Web Services Using Learning Accuracy

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Abstract — The automatic discovery of suitable Web services for a given task is one of the key elements in implementing the Semantic Web vision. This paper presents a new semantic matching algorithm for Semantic Web service discovery. Our semantic matching algorithm allows for ranking the discovered Web services according to their relevance to the service request. The learning accuracy is proposed as a suitable metric for determining the semantic similarity between a service request and the service advertisements. The semantic similarity is computed by considering the semantic information encoded in a domain ontology, including both the concept hierarchy and the properties of the concepts. Evaluating the semantic similarity between a service request and a service advertisement is based on the concepts, their semantic relations, their common and distinguishing properties, and properties semantic relations.

Semantic Web Service Composition Method based on Fluent Calculus

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Abstract—This paper presents a new approach for automatic Web service composition based on the formalism of Fluent Calculus using semantic Web service descriptions. In our approach, the Web service composition process is viewed as an AI planning problem in the Fluent Calculus formalism. To semantically describe Web services, we have used a Web service domain ontology which is then translated into a Fluent Calculus knowledge base, necessary for the composition planning phase. For verifying the composed services, the Label Transition System Analyzer (LTSA) formalism is used. The paper also presents an experimental prototype for the Fluent Calculus based Web service composition and demonstrates its effectiveness with the help of an application scenario from the social event planning domain.

Unified Strategy for Feature Selection and Data Imputation

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Abstract - Data-related issues represent the main causes for insufficient performance in data mining. Fundamental strategies for tackling these issues include procedures for handling incomplete data – mandatory in various schemes, and feature selection, both augmenting the learning process. Our previous work on data imputation has shown that predicting strongly correlated attributes with the class can improve the learning accuracy. Feature selection also enhances the performance of an inducer. The focus of the paper is to validate the performance and stability of our methodology for preprocessing data. The novelty of the method resides in the combination of feature selection with data imputation, in order to obtain an improved version of the training set. The experimental results have shown that, when mining incomplete data, our combined preprocessing methodology boosts the accuracy of a classifier. Moreover, it is more successful than the individual steps combined, feature selection and imputation, producing better or similar results.

BELIEFS AND COMMUNICATION, THE BASIS OF COLLABORATIVE AGENTS

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Abstract—Nowadays, simulation scenarios require enhanced agents being capable of communication, learning and having beliefs about their self or about their world. The distinction between facts and (possible false) beliefs is part of the requirements in order to describe scenarios closer to real world. This work proposes a solution which allows information exchange between agents, making use of generic/standard and ad-hoc message types, involving their self beliefs and their beliefs about the world where they act. Standard agent types being capable of automatic management of standard message types are defined. SPARQL, a standard RDF based query language, is used as part of the communication protocol. The paper is build around a social simulation scenario that provides the possibility of testing and describing the benefices of this work.

Approximating and Combining Equilibria in Non-cooperative Games

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Abstract—Generative relations for different equilibria types in finite non cooperative games are proposed. These relations induce appropriate domination concepts. Using an evolutionary technique approximations for different equilibria are computed. The concept of game is extended in order to allow players to have different types of rationality. The new game allows us to combine different equilibria. Numerical experiments indicate the potential of the proposed concepts and technique and offers an inside view of the implication of the rationality in the solution concept.

A CONCEPTUAL ARCHITECTURE FOR CONTEXT-AWARE SYSTEMS

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Abstract - Today applications give us complex services in behalf of the user no matter of location, time or hardware infrastructure. There is a growing realization that computer systems will need to be increasingly sensitive to their context. That is, the application can decide what to do, based not only on the explicitly presented input, but also on the context, and its result can affect not only the explicit output, but also the context. This paper describes the need for an extensible context framework with embedded features. A hybrid (symbolic/connectionist) architecture is proposed. It consists of a multitude of agents having both a symbolic and a connectionist part. The symbolic part represents some knowledge structure, while the connectionist part represents its relevance to the current context. The performance of the system emerges as a result of the work and interaction of the currently active agents, where the set of active agents is not predefined for a specific task but is dynamic and reflects the specific context.