

FLAIRS Poster Abstracts

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Situated Strategic Organizations

Saad Alqithami and Henry Hexmoor
(Southern Illinois University, USA).

In this article, we focus on an emerging literature on the social networks analysis in dynamic organizational models of virtual interactions. We consider how important developments in social networking have contributed to the theory of real life strategic organization, the Arab Spring for example. These social actions are often observed as network spikes and bursts that propagate and saturate the network rapidly. There are several organizational models published that explain behavioral dynamics in such organizations. However, these models lack the representational power required for modeling situated strategic organizations (SSOs) in a way that account for rapid rates of dissemination in ad-hoc networks. Therefore, we have conceived this in a life cycle for a prototypical situated society and describe operations therein from formation to dissolution. After describing the life cycle, we offer insights for a model of a successful situated organization.

Data Driven Social Activity Recognition under Uncertainty Conditions Case Study: Social Activity Recognition in Ambient Environments

Farzad Amirjavid (UQAC, Canada)

An activity is a chain of fuzzy events that occur in an environment by an intelligent system in order to achieve a goal, which is a special world state. A goal may also be achieved by the effort of more than one individual (society). Regardless of the physical entity (modality and location) of the intelligence source and the quantity of individuals who perform the activities, per each possible goal or activity, we consider a source of intelligence who directs the order of

fuzzy events that occur in the world. By frequent observation of the world, the intelligence behind world actuations is modeled applying extensions of the fuzzy logic. Therefore, at the recognition time, when a few primary events concerning to a known (social or individual) plan is observed, we can predict the possible events that may occur in the consequence of these world actuations. In this poster, it is presumed that a modeled intelligence source may repeat his behavior similar to its past realizations. A key point that we deal with is the analysis of the observations that concern the individual activities in order to make inferences about possible social activities that may be planned and realized by a society. A fuzzy conceptual structure for each social or individual activity is considered; however, the model tolerates small deviations from the activity structure. The context of the presented research is the recognition of the Activities of Daily Living in a smart home.

Finding Minimum Satisfying Assignments of Boolean Formulas

Martin Babka, Tomáš Balyo and Jaroslav Kezníkl
(Charles University, Prague, Czech Republic)

Most modern state-of-the-art SAT solvers output a complete assignment of variables for satisfiable formulas. However, in many cases the formulas can be satisfied by partial truth assignments, assigning truth values only to a fraction of the variables. We describe a scenario from SMT-solving where short satisfying partial assignments are desirable. We show the practical relevance of this scenario by describing its application in the code performance modeling domain. The advantage of finding a shorter satisfying assignment is caused by a time-consuming decision procedure. The time spent by finding the shortest assignment by far outweighs the running time of the decision procedure of the described domain. The problem of finding minimum-size satisfying partial truth assignments is well-known in the field of Boolean optimization as the shortest implicant problem. We describe and experimentally evaluate several

methods of solving this problem. These include reduction to partial maximum/minimum satisfiability — PMAX-SAT/PMINSAT, pseudo-Boolean optimization and iterated SAT solving. We examine these methods experimentally on existing benchmark formulas as well as on our new benchmark set based on the performance modeling scenario. Our experiments on the chosen benchmarks indicate that the iterated SAT solving is the fastest method.

A Stream of Thought Model for Anxiety and Depression

Lisa Ball and Antonio Sanchez
(Texas Christian University, USA)

Depression and anxiety are debilitating conditions that significantly reduce the quality of life for many people and their loved ones. Understanding the “internal world” of the sufferer is difficult for those who have not had direct experience. We are examining the internal scripts that are a hallmark of these illnesses. Once triggered by external and internal events, what is the path, duration, and severity of resultant thoughts and emotions? These paths may be called thought streams. We are creating a simulator to better understand an abstracted version of these thought streams. Existing research has been done in modeling mental illness, for example connectionist or hybrid models of the neurobiological mechanism of illness. SAD is more closely related to earlier work on goal-oriented, normal day dreaming since it symbolically represents conscious aspects of thought. The difference is that SAD is intended to capture depressive or anxious thinking over time. The SAD model for Anxiety and Depression is an early attempt to capture the stream of thoughts that occur within individuals who are experiencing the commonly co-occurring illnesses of anxiety and depression. Thoughts, emotions, behaviors and external events may cause individuals to become better or worse over time. Challenges include (1) determining the proper level of granularity for modeling thought streams, (2) determining conditions under which the individual changes states, e.g., from mild depression (dysthymia) to major depression, (3) the interaction of these two conditions and how thoughts switch between them, and (4) appropriate knowledge representation and reasoning strategies.

imageFARMER: A Data Mining Framework for the Creation of Large-Scale Content-Based Image Retrieval Systems

Juan Banda, Rafal Angryk, Petrus Martens and Michael Schuh (Montana State University, USA)

In this work we present imageFARMER, a framework that allows data mining researchers and educators to develop and customize domain-specific content-based image retrieval systems with great ease and a deeper understanding of the underlying representation of domain-specific image data. imageFARMER incorporates several different aspects of image processing and information retrieval, such as image parameter extraction for image representation, image parameter evaluation for validation, evaluation of multiple dissimilarity measures for accurate data analysis, analysis of dimensionality reduction methods for storage and processing optimization, and indexing and retrieval algorithms for fast and efficient search. The unique capabilities of this framework have never been available together as an open-source comprehensive software package for research, offering enhanced knowledge discovery and validation of the steps involved in the creation of large-scale content-based image retrieval systems through exhaustive evaluation methods.

Evolutionary Approach to Building Light Weight Cognitive Models and Application to Role Players in Simulation Environments

Benjamin Bell, Andrew Rosoff and James Eilbert
(CHI Systems Inc., USA)

Massive feedback and rational overlays on even basic behavior make humans a very difficult target for modeling. The alternative suggested here is to develop a pre-cognitive autonomous architecture (PCAA) where the focus is on behaviors underlying autonomy rather than problem solving and logic. The suggestion for an animal basis for a PCAA was reptiles. They are autonomous over a wide range of terrains, and while they do not reason they are probably the simplest animals with predictive or anticipatory abilities. We describe initial work on using ASIST-AT a light-weight cognitive modeling toolkit to build a PCAA models

DIANE – Dialogue-Interactive Agents for NextGen Experimentation

Benjamin Bell, Andrew Rosoff and James Eilbert
(CHI Systems Inc., USA)

In support of the FAA’s Next Generation Air Transportation System (NextGen), advanced methods are needed to provide realistic pilot and controller simulations to reduce reliance on human role-players and create scalable, replicable experiments. CHI Systems recently demonstrated the feasibility of applying speech-interactive intelligent agents to meeting the evolving needs of the FAA’s simulation and

experimentation efforts. Intelligent agents represent a promising technology for exploring multiple combinations of alternative tasks and responsibilities controllers might assume under NextGen. This same technology provides the additional option for applying these intelligent agents for training purposes, once tasks and responsibilities have been established and a training simulation is required. In this study, we describe a solution to some of these NextGen challenges that demonstrates the utility of speech-enabled synthetic pilots integrated with an FAA simulation environment, and discuss how this preliminary work lays a foundation for solving a diverse range of NextGen experimentation needs.

Using Co-Occurrences to Identify the Production Rules in a Serious Game

Fazel Keshtkar, Brent Morgan and Art Graesser
(University of Memphis, USA)

Multi-party chat presents significant difficulties to the field of natural language processing. This is especially true for Intelligent Tutoring Systems (ITS), which must decide when and how to appropriately respond in group chat. This paper proposes a set of sophisticated production rules to ease this computational burden. We use a state-of-the-art computational approach to identify these production rules using co-occurrences of distinct terms from a group chat during a STEM-related serious game. A Production Rule consists of a collection of “IF-THEN” rules that together form an information-processing model of some task, or range of tasks. They can be represented in multiple forms, (e.g., IF condition THEN action; IF premise THEN conclusion; IF proposition p1 AND proposition p2 are true THEN proposition p3 is true). Within the context of a serious game, these production rules can help an ITS guide the players as they navigate through the game environment.

A Benchmark for Expert Use of Mixed-Initiative Intelligent Assistants

Joseph Kendall-Morwick (DePauw University, USA)

Many intelligent assistants employ a mixed-initiative approach to problem-solving, in which a human and an automated agent work in tandem to accomplish a goal. Furthermore, many of these systems are intended for expert users who are otherwise capable of independently accomplishing tasks and benefit from assistance in the form of time savings. Such systems can increase the productivity of experts by relieving them of tedious tasks that can be appropriately handled by a computer. However, research into such systems is hindered by the expense of performing user-studies to measure the potential impact of a technique; a

problem made more difficult by the value placed on an expert user's time. A new method for evaluating such systems has been developed that orients fully automated benchmarks of the reasoning component of an intelligent assistant within a user-centric context aimed particularly at expert users. The presented metric, the ideal performance ratio, reports on system performance in terms of measurable user attributes. This metric serves as a normalized metric for comparing the performance of distinct, competing systems. This metric can be used in place of a user study as a means of evaluating early results or incremental changes for which an expensive or lengthy study would not be feasible.

A Conceptualization of Agent-Based Epistemic Secrecy

Patrick Krümpelmann and Gabriele Kern-Isberner
(Technische Universität Dortmund, Germany)

Secrecy in multiagent systems is often defined from an abstract, global perspective with unrealistic presumptions. The resulting notions of secrecy are very strict and heavily constrain the information flow. We approach the topic of secrecy from the point of view of an autonomous epistemic agent with incomplete and uncertain information. It is situated in a multiagent system and needs to communicate with other agents to achieve its goals. It has an uncertain and incomplete view on the world and the information available to its fellow agents. It shall only reveal secret information if it considers it necessary in order to achieve its goals, which depend on the strength of the secret and the utility of the goals. That is, an agent has to take its secrets into account while acting and, moreover, while planning its intended course of action. In our approach secrets are local in their content as an agent has different secrets with respect to different agents. Secrets are graded: an agent wants to keep some information more secret than other. Secrets are dynamic, they are adopted, changed in strength and can be dropped during runtime. An agent has to be able to handle these changes adequately. We present an agent model based on the local epistemic state of an agent and define an agent-based notion of secrecy. We relate our notion of secrecy to other approaches, in particular to those basing Halpern and O'Neill's runs-and-systems framework, and show that our notion generalizes them.

A New GA-Based Method for Winner Determination in Combinatorial Reverse Auctions

Shubhashis Kumar Shil, Malek Mouhoub and Samira Sadaoui (University of Regina, Canada)

An auction is a market scenario in which bidders compete

for one or more items. In traditional auctions, an individual item is auctioned separately, which leads to an inefficient allocation and processing time. On the other hand, combinatorial auctions have been proposed to improve the efficiency of bid allocation by allowing bidders to negotiate on multiple items. Being commercially efficient, combinatorial auctions are getting more attention than traditional auctions. However, winner determination problem is still one of the main challenges of combinatorial auctions. Indeed, determining the winner(s) in combinatorial auctions is an extremely complex problem and has been shown to be NP-complete. We are interested particularly in combinatorial reverse auctions in which we consider the procurement of a single unit of multiple items. In this regard, we propose a new method based on genetic algorithms to address two important issues in the context of combinatorial reverse auctions: determining the winner(s) in a reasonable processing time, and reducing the procurement cost. In fact, not much work has been done using genetic algorithms to solve winner determination problem specifically for combinatorial reverse auctions. In order to evaluate the performance of our method, we conducted several experiments to compare our proposed method with a well-known technique for determining the winner(s) in combinatorial reverse auctions. The results of these experiments clearly demonstrate the superiority of our method in terms of processing time and procurement cost. We also performed some statistical measurements that reveal the consistency of the proposed method.

Towards Hybrid Collaborative Filtering Recommender System

Ingyu Lee (Troy University, USA)

Consumers have trouble choosing proper products or services with the increasing number of available products and services throughout the Internet. As a consequence, many studies have been done in recommender systems and many companies including Netflix and Amazon have provided recommender systems to provide better consumer satisfaction. Especially, recommender systems become more important in the movie, music and book industry since consumers want to share their experience with others after watching the same movies, listening to the same music, and reading the same books. Recommender systems are categorized into two different types: Content based filtering and Collaborative filtering. Content based filtering is based on the characteristics of users and products. The method characterizes each product based on attributes such as genre, actors, directors, or each user based on profiles using demographic information such as gender, age, and income levels. On the other hand, collaborative filtering is

based on the previous user rating data. The method assumes that the number of users is more than the number of products, and similar types of users will experience similar types of products. Especially, latent factor model represents users or products with a combination of hidden factors. Content based filtering is relatively easy to implement. The method can handle a new user or a new product since the algorithm depends on properties of user or product rather than previous user ratings. However, the method depends on a human to extract the features. Consequently, it shows a relatively poor performance compared to a collaborative filtering method. On the other hand, collaborative filtering algorithm shows better performance by using hidden latent factors in user ratings. However, it is expensive to build a collaborative filtering system, and has trouble rating a newly introduced product or user. Hybrid recommender system was proposed to overcome the limitations of both methods with a little bit of implementation overhead. In this study, we explore a framework of hybrid collaborative filtering recommender system considering product properties and user profiles. Our limited experimental results with movie data shows that hybrid recommender system shows better results by considering product properties and user profiles.

Does Chinese Political Leaders' Language Formality Decrease with Aging?

Haiying Li, Arthur Graesser, and Zhiqiang Cai
(University of Memphis, USA)

In comparison to informal texts, formal texts are assumed to have more abstract words, complex syntax, higher cohesion, and be in the expository rather than narrative. Using the linguistic and psychological features at the word level and cohesion to measure formality, this paper aims to investigate whether the Chinese political leaders' formality declines throughout the lifespan in a case study. The corpora are a collection of original Chinese spoken and written discourse excerpts produced by three Chinese political leaders: Mao Zedong from the age of 28 to 82; Deng Xiaoping, 34 to 88; and Jiang Zemin, 52 to 78. These three leaders represent the three generations of central collective leadership core of the Chinese Communist Party. Even though it represents the voice of the Party and the nation, what they said or wrote reveals their own distinctive language style. Otherwise, their language style would remain the same. The formality of their language is measured by automated text analysis tools including Linguistic Inquiry and Word Count (LIWC), Latent Semantic Analysis (LSA), and Content Word Overlap (CWO). ANOVA results demonstrate formality among three leaders is significantly different, which denotes their speeches and written documents should be a reflection of their own language

style. Results of regression of formality and age controlling words per sentence show formality of all these three leaders is negative related with age across their lifetime with two dramatic declines in their life: one is in their sixties and another is in their late eighties.

Individualized Novel Character Emotion Analyzer

Yuchen Liao, Haiying Li, Zhiqiang Cai and Xiangen Hu
(University of Memphis, USA)

Novels are constructed by a series of intricate events occurring for main characters with complex relationships. This paper aims to develop an automated character emotion tool to analyze novel characters' emotion in each chapter with latent semantic analysis (LSA). The novel is composed of individual chapters with vivid themes involved in main characters, which are portrayed by intentional word choice either in conversation or narration. This automated character emotion analyzer uses word sets such as words related to affective process including negative emotion and positive emotion in LIWC dictionary. Each chapter is set up as an individual semantic space. Based on these semantic spaces, individualized induced semantic structure is created to evaluate the specific characters' positive and negative emotions. Thus, the highest negative and positive emotion words in each chapter are computed related to particular characters. Therefore, with the development of story plots, the variation of emotion of each character throughout chapters is unfolded to the audience in a scientific way with LSA. The practicability of this analyzer is evaluated by the novel "A song of ice and fire: A game of thrones" which contains many major characters within and between families with intricate relationships. The results show that novel character emotion analyzer is able to make precise measurements of emotion fluctuation of individual characters or multiple characters representing the same family benefits.

Building Entities Profiles Through Corpora Extraction

Lucelene Lopes and Renata Vieira (PUCRS, Brazil)

This abstract describes an automatic method to construct a natural language resource and the extraction of entities profiles. Specifically, the method's goal is to define a way to assemble natural language texts concerning a set of entities, and to analyze the texts associated to each entity. From this analysis, profiles summarize the entities' information making it possible to perform a rational and systematic analysis, e.g. classifications, rankings. The method starts with the definition of a set of entities to be profiled

and the choice of characteristics to observe. These entities could be, for instance, scholars in a given department and the profile goal may be to establish their research fields. In such an example, the first step is the construction of one corpus to each scholar with its bibliography production (e.g. papers, research projects, students' texts). Each corpus would be processed extracting ontological structures (e.g., concept hierarchy, relations and instances). Next, the produced ontological structure related to scholars would be compared to identify the particularities found in each one of them. From such information, a summary of the relevant concepts to each scholar would indicate its research fields. The extraction and comparison of ontological structures are complex tasks that could benefit from existing techniques. The proposed method is currently being experimented to profile scholars in the Computer Science Department of our University, and thus, providing automated, and free from prejudice, characterization of scholar domains. Such information is helpful to prospective students and industrial partners.

PR2 Teleoperation

Blake McMillian (Hampton University, USA),
Jason Allen (University of District of Columbia, USA),
C. J. Taylor (University of Pennsylvania, USA),
Lavonne Manning (University of District of Columbia, USA) and
Chutima Boonthum-Denecke (Hampton University, USA).

For decades the traditional joystick style controllers have hindered the scientific community. By using the Vicon cameras along with the robot operating system (ROS) we were able to build a prototype that has the potential to dexterously control the PR2's gripper. This is done using a system that integrates ROS, the Vicon system, and a mechanical hand motor that allows the user to interact with the PR2 in an innovative way. When an individual is allowed to control a robot using the natural motion of his or her own hand, something special happens; telemanipulation spontaneously becomes unambiguous. Nearly anyone with a properly functioning hand instantly gains the ability to manipulate a previously complex teleoperational system with ease.

Neptune: Aquatic Search and Rescue Robot

Blake McMillian, Albert Toledo and
Chutima Boonthum-Denecke (Hampton University, USA)

Robotics is a field that has many facets that make it special. One pivotal aspects of robotics involves aquatic autonomous search and rescue. The traditional means of finding lost individuals is inefficient and time consuming. The research is attempting to change that. A prototype is built from a battery powered motor boat, which is connected to

the Handy Cricket Microcontroller board, where other sensors are added, including infra-red (IR) sensor to detect a distance between a boat and an object. Switch sensors are used as a trigger when a human is up on a boat or holding on to a life-tube or lifeline. "Neptune" is a proof-of-concept prototype of a aquatic robot that is able to successfully search and find lost persons at sea.

Care Systematization in Nursing Applying Case-Based Reasoning

Marcio Mendes (Laboratório de Sistemas Integreveis, Brazil),
Rosane Severo (Laboratório de Sistemas Integreveis, Brazil),
Sergio Takeo Kofuji (Laboratório de Sistemas Integreveis, Bra-
zil), Ana Lucia Da Silva (Universidade Nove de Julho, Brazil),
and Marilza Antunes de Lemos
(Universidade Estadual Paulista, Brazil)

It is very difficult to gather and seek nursing diagnoses in hospitals where clinical records are still performed manually and stored on paper forms and the adoption of computerized systems that can assist healthcare professionals in their decisions still has high costs for its acquisition and deployment. This condition makes the clinical care lengthy and often frustrates researchers by foreclosing the discovery of important information that lead to the improvement of techniques and clinical procedures. The objective of this work is to present software that is able to help nurses in their clinical reasoning, recording his experiences as a collection of cases for future research. The process involves scanning nursing diagnoses and stores them in a database of cases, thus allowing its recovery and evaluation of the effectiveness of this prototype handle cases. The presented computational tool is able to recover past experiences of health professionals, employing techniques of Case-based Reasoning the performance of which was satisfactory in locating cases directly related to the test cases presented. This fact suggests that the presented prototype is able to recover diagnoses made previously and can in the future support the decision making processes of nurses and enhancing nursing diagnoses.

Preference Elicitation and Learning for Online Shopping

Bandar Mohammed, Eisa Alanazi, Malek Mouhoub
and Samira Sadaoui (University of Regina, Canada)

In order to understand online shoppers' needs and desires, several service providers rely on eliciting users' preferences. To suggest to the users a list of potential products, some shopping services take into consideration third-party recommendations. In this research work, we address preference elicitation as well as learning. More precisely, we

extend the online shopping system we recently developed, which is based on preference elicitation, in order to include the learning feature. In our previous system, the users are given the ability to provide their requirements and preferences in a qualitative or a quantitative way. This information is then managed, in a unique model, as a set of hard constraints and preferences through the C-semiring and CP-nets formalisms respectively. We give our shopping system the ability to recommend products to the users by incorporating a learning component that is based on data mining association rules as well as the AprioriTid algorithm. Furthermore, we conducted several tests on different data sets to assess the time performance of this learning component to come up with a list of recommendations. The results of the experiments are promising and demonstrate the efficiency of the AprioriTid algorithm.

Monte Carlo Robot Localization on a Graph-Based Map

David Obdrzalek and Ondrej Pilat
(Charles University in Prague, Czech Republic)

In our work, we present an implementation of the Monte Carlo Localization (MCL) algorithm for the localization of a robot in specific conditions. The task of the robot is to autonomously travel through a publicly accessible park while not endangering the crowd, the environment, or other robots. One of the input sensors used was a consumer GPS receiver. While we know the position acquired from it might not precisely correspond to the real one, we also know the localization algorithm should cope well with situations the receiver unexpectedly suggests the robot is not on the pathway but in fact it is true as the robot has erroneously left it. For the localization, the MCL has been selected and implemented. A map of the area was available in vector format so we adapted the general MCL to perform the localization on a graph. At the end, the whole system was successfully tested with real data despite the bad quality of the GPS signal.

Classifying Customer Complaints in Brazilian Websites: A Case Study

Thereza Padilha and Tiago Costa (UFT, Brazil)

To know what is going on in social networks and complaint websites is a new way to stay tuned about the reputation of an organization. The number of customer complaints in Internet, e-complaint, has increased quickly in recent years. It shows the strong influence of this kind of technology in modern society. These e-complaints have been considered a significant form of feedback for organizations. This poster shows a tool to aid in the automatic de-

tection (classification task) of complaint types available in three Brazilian websites. Our tool has three main components: pre-processing, mining, and post-processing. The preprocessing component is responsible for processing the raw text removing stop-words, applying stemming (PTStemmer and the Orenge algorithm) and spell checking (NHunspell library together with a Portuguese language dictionary). In the mining component, we implemented the keyword extraction approach based on term frequency and term frequency – inverse document frequency (TF-IDF) measures. The post-processing component, basically, presents the number of complaints for each category and organization. According to these numbers, it reports the main complaint of an organization, observing your highest value. Experiments showed that the number of complaints for delivery failure, product exchange and returns failure, and customer after purchase service failure categories were high in our test dataset.

Applying a Cloud-Based Web Workflow to Handle Clusters of Protein Snapshots in Flexible-Receptor Docking Experiments

Renata De Paris, Fábio A. Frantz, Osmar Norberto de Souza, and Duncan D. A. Ruiz (Pontifícia Universidade Católica do Rio Grande do Sul, Brazil)

Molecular docking simulations of Fully-flexible Protein Receptor (FFR) models are coming of age. In our studies, a FFR model is represented by a series of different conformations derived from a molecular dynamic simulation trajectory of the receptor. For each conformation in the FFR model, a docking simulation is executed and analyzed. An important challenge is to perform virtual screening of millions of ligands using a FFR model in a sequential mode since it can become computationally demanding. In this article, we use sets of protein snapshots, which were clustered by structured pattern analysis methods, to show the gains obtained with the execution of molecular docking simulations of a FFR model. For this purpose a web workflow was created. It is based on new workflow data pattern called Self-adapting Multiple Instances (P-SaMI) and on a middleware on the Cloud. P-SaMI identifies promising clusters of snapshots to be processed while the middleware speeds up the docking experiments by means of reducing the number of docking executions and an HPC environment on Amazon EC2. The experimental results show the reduction of the FFR model dimensionality by discarding the non-promising conformations and the quality of the new reduced receptor models.

Contextual Reasoning in Human Cognition and the Implications for Artificial Intelligence Systems

Jeanne Parker (University of Central Florida, USA),
Debra Hollister (Valencia College, USA)
and Avelino Gonzalez (University of Central Florida, USA).

Contextually based reasoning is an essential aspect of human cognition, permeating language, memory, and reasoning capabilities. This integral process is developed over the lifetime through experiential learning. Given the goal of artificial intelligence to create a human like intelligence, it is essential to include such contextual considerations in system design and implementation.

Graph-Structures Matching for Relevance Identification

Lakshmi Ramachandran and Edward Gehringer
(North Carolina State University, USA)

Reviews are text-based feedback provided by reviewers to authors. The quality of a review can be determined by identifying how relevant it is to the work that the review was written for. Relevance between two pieces of text can be determined by identifying semantic and syntactic similarities between them. We use a graph-based text representation and matching technique, where vertices, edges and double edges help determine how much structure-based relevance exists across texts. During text matching, edges and double edges are compared in the same and different orders to look for paraphrased reviews. Ours is a lexico-semantic relevance identification approach. We show that the use of edges and double edges helps improve the accuracy of review-submission relevance identification over when only vertices are used.

Predict the User Next Action in Smart Home Using Pattern Matching and Reinforcement

Mamun Reaz, Mohd Marufuzzaman and Tariqul Islam
(Universiti Kebangsaan Malaysia, Malaysia)

Smart home system is an intelligent system that needs to adapt to the inhabitant's lifestyle, predict their future actions and minimize the user device interaction. Such requirements will never be achieved without proper analysis of inhabitant's device interaction history for each particular state of the home environment. Future Smart-Home device usage prediction is a very important module in artificial intelligence. The technique involves analyzing the user performed actions history and apply mathematical methods to predict the most feasible next user action. This research

proposed a novel technique by combining the pattern matching and reinforcement learning techniques to predict the user's next action, which was not thought of earlier. By applying reinforcement learning the intelligent home system can receive positive reward for each action that is correctly predicted, on the other hand negative reward is given for each wrong action. By using this method the system can adapt the user's ideal actions. On the other hand pattern matching will be used to match the most recent user event sequence with the history of the recorded sequences, by combining the results obtained from both methods the algorithm should have sufficient information to calculate the probability of the next user action thus the performance improvement should be significant. Synthetic data was used to test the algorithm and the result shows that the accuracy of the proposed algorithm is 87%, which is better than ONSI, SHIP and IPAM algorithms from other researchers.

A Modified Smith-Waterman Pattern Matching Algorithm for Question Answering

Justin Refi and Fernando Gomez
(University of Central Florida , USA)

The field of pattern-matching based question answering has been dominated by systems which require seed instances and learned patterns. These techniques require a great deal of start-up time and effort. This paper presents a general alternative to these methods, which is based on a modified version of the Smith-Waterman sequence matching algorithm, which matches syntactic constituents rather than strings. The system presented is designed to be simple and general and with the ability of being extended to new question types and domain easily. The implementation of the system will be discussed in detail. The system will be evaluated against a standard set of questions.

A Hybrid Model for the Emergence of Skilled Agent Specialization

Saurabh Singh (University of Windsor, Canada),
Nayan Shah (Indian Institute of Technology, India)
and Ziad Kobti (University of Windsor, Canada)

We propose a hybrid model encompassing features from the well-known Genetic Threshold Model (GTM) and the Social Inhibition Model (SIM). Two equally weighted drivers are used in this model for changing agent's thresholds. The first one is a genetic pull toward performing the tasks at which the agents are most skilled and the second one is the competition from the other agents. Using a metric quantifying the quality of work performed, we show

that there is a significant improvement in the Division of Labor (DOL) and Quality of Work (QOW) in our model over the other models. Also, the effect of continuously varying and randomly chosen demands on the DOL and QOW is analyzed.

Practical Aspects on Parallel Sentences Mining from Strongly Comparable Corpora

Dan Ștefănescu (University of Memphis, USA)
and Radu Ion (Romanian Academy, Romania).

This presentation is about experimental research on extracting parallel sentences from strongly comparable corpora. Our study is a natural continuation of previous research work conducted within ACCURAT, a European project that aimed at finding ways of improving translation models by using parallel data extracted from comparable corpora. Our case study focuses on the functionality, usage and results obtained on Wikipedia by LEXACC, a tool that uses Cross-Language Information Retrieval methodology to efficiently harvest a remarkable quantity of parallel sentences from large amounts of comparable data, in practical time. We recently used LEXACC for extracting parallel sentences from the entire collection of Wikipedia for three pairs of languages: English-Spanish, English-German and English-Romanian. For each extracted sentence pair, LEXACC assigns a cross-lingual similarity score, which is essentially a measure of parallelism between the sentences forming the pair. This allows for customization, as the users are able to adjust the level of comparability depending on their goals. Our presentation gives details about the quantity and the quality of these newly created resources and about the processing flow that can be employed by anyone to obtain similar results on their own comparable data. Our experiments show that the extracted data is valuable for the Statistical Machine Translation (SMT) research community and provide insights about the optimal cross-lingual similarity threshold values that should be used for SMT systems. The data is freely available for research purposes at ws.racai.ro:9191/repository/search/?q=Parallel+Wiki

Uncertainty Measures for Second-Order Probability

David Sundgren (Stockholm University, Sweden) and
Alexander Karlsson (University of Skövde, Sweden).

Given that second-order probability distributions assign probabilities to probabilities there is uncertainty on two levels. On the level of first-order probabilities it would be natural to use entropy as measure of uncertainty. It is however not clear how to measure uncertainty on the second-

order level. Neither is it obvious how to combine first-order uncertainty with second-order information. And given uncertainty measures for the two levels of probability it would be advantageous to combine to a measure that captures the total uncertainty of a second-order probability distribution. There are some examples of second-order probability uncertainty measures in the literature, we introduce a few more and compare them with respect to some relevant properties. We conclude that the concepts of uncertainty and informativeness needs to be qualified if used in a second-order probability context and suggest that from a certain point of view information cannot be minimized, just shifted from one level to another.

Mirror Neuron: An Architectural Analysis

Bruce Toy (Lockheed Martin, USA)

This poster employs a novel functional model for artificial intelligence in conjunction with an analysis of its application to enhance the understanding of mirror neurons. This architecture model for AI is depicted as a protocol, with an underlying structure of control functions and data organization. Initially presented at EMSS 2012, it was developed as a system engineering tool that could facilitate the integration of separately-produced AI components. Mirror neurons were not originally addressed in the basic description of this protocol. They do, however, offer an excellent opportunity to demonstrate the utility of this AI structure to help explain the observed behavior of the brain. The protocol defines an individual's behavior pattern as consisting of a set of motivations, secondary motivations, and actions governed by a control program. It then goes on to show that when the individual assigns behavior patterns to others, it actually begins by using a direct copy of its own behavior pattern, complete with both motivations and actions. During subsequent observation the individual adjusts the assigned models to modify an action or motivation to build unique behavior models for other individuals. The result of this "code re-use" means that some neurons do double duty. In addition, some researchers have found links between autism and mirror neurons, but without fully explaining the relationship. This paper's protocol analysis, on the other hand, offers a convincing argument for the way in which secondary motivations are an important factor in both autism and the mirror neuron enigma.

A Learning Analytics System for Introductory Programming Classes

Franklyn Turbak, Eni Mustafaraj and Johanna Okerlund
(Wellesley College, USA)

We are developing an automated learning analytics system to analyze and describe students' learning in introductory programming classes. Such a system will alert students to concepts they need to understand better and help teachers customize their instruction. Our focus is on classes that teach App Inventor, a visual environment in which programs for Android mobile devices are composed out of blocks resembling jigsaw puzzle pieces. Blocks languages like App Inventor and Scratch lower barriers for novices by eliminating or reducing many common programming errors and by providing visual guidance for choosing, assembling, and understanding program structures. The main research question we are investigating is how to take advantage of massive amounts of data generated by students while they learn, to improve their learning and improve their teachers' instruction. Virtual learning environments, course management systems, and massive open online courses (MOOCs) are rapidly becoming fixtures of the educational landscape. Exploring how to use the data they generate to make education more effective is a high priority. App Inventor is a natural context for this research. App Inventor programs are stored in the cloud, making it possible to centrally record details of how programmers build, test, and debug programs. Over 33,000 App Inventor programmers generate programs daily that we can use to develop and tune machine learning algorithms for analyzing how students learn to program. In this poster, we will share first results about the available data and extracted features, in order to solicit feedback about possible research paths to follow.

Providing Guidance for Ontology Design

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(Drexel University, USA)

Ontologies are commonly used in support of application tasks such as natural language processing, knowledge management, and search. The application task is a constant parameter of an ontology's contextual setting, along with additional parameters such as the users and the domain. Literature recommends considering specific contextual settings during ontology design, and highlights that different contextual settings are responsible for problems in ontology reuse. What is still unclear is how to direct ontology design for a variety of contextual parameters, i.e., what kind of ontology design will better serve specific users in a specific domain for a specific task? There is an inherent con-

nection between ontology design and quality. For design to determine quality, we need to first assess quality to inform design. This study investigates the impact of context on ontology quality in order to support guidance for ontology design for a specific context. We compare the impact of a change in a lightweight ontology on the performance of novices versus experts performing a search application task in the medical domain. We propose a method with four steps: Select, Measure, Analyze, and Save. The method associates ontology design through ontology characteristics with context parameters in order to evaluate their combined performance. We use Path Selected and Guidelines Selected as the performance metrics. The results show a significant difference in a medical search application task performed by novice healthcare students due to a change made to the ontology's structural characteristics that impact expertise and no significant difference for expert healthcare students.

Arc Versus Bounds Consistency for Non-Monotonic Constraints on Integer Range Domains

Richard Wallace (University College Cork, Ireland)

For CSPs with numerical domains and non-monotonic constraints, some form of bounds consistency is the most common filtering method. In this work we consider methods for establishing full arc consistency in numeric CSPs whose domains are ranges of integers and whose constraints involve relational operators. The problems studied are random "relop" problems that include any or all of the possible relational operators (but always include not-equals) and scheduling problems with disjunctive less-than-or-equal constraints. We present a full arc consistency (AC) algorithm that can be used for preprocessing and for interleaving with search. This is compared with a bounds(D) consistency algorithm. Striking improvements in performance can be demonstrated for full AC over bounds consistency on these problems.

A Comparison of Two Different Methods to Individualize Students and Skills

Yutao Wang and Neil Heffernan
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One of the most popular methods for modeling students' knowledge is Corbett and Anderson's Bayesian Knowledge Tracing (KT) model. The original Knowledge Tracing model does not allow for individualization. Recently, Pardos and Heffernan showed that more information about students' prior knowledge can help build a

better fitting model and provide a more accurate prediction of student data. Our previous work showed that by further exploring the individualization of student parameters to allow the Bayesian network to keep track of all four parameters per student: prior knowledge, guess, slip, and learning, they are able to predict student responses better than the standard knowledge tracing model when the number of students and the number of skills is large. In this work, we focus on comparing two different individualized models: the Student Skill model and the two-step individualized student model, to find out which is the best for formulating the individualization problem within a Bayesian networks framework. Our result shows that for some situations the Student Skill model is reliably better in predicting students' performance accuracy, but not in all circumstances. This could suggest that, it may not be worth the effort to build large complex Bayesian Network models since multi-step simple models can perform just as well.

Playing Soccer with Lego Robots under RoboCup Small Size League Rules

Alfredo Weitzenfeld, William Cruz, Antonio Enriquez,
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An important challenge in evaluating multi-agent software in physical systems is to have well defined tasks and environments. For example, the RoboCup organization created 15 years ago robot soccer competitions where multi-agent software could be tested under well-defined rules and limited physical environments. In the RoboCup Small Size League (SSL) each team consists of 6 physical robots where coordination among multiple robots is critical for success. Our USF Robobulls team has competed in various RoboCup SSL world championships in collaboration with the Eagle Knights team from Mexico. One of the biggest challenges for our teams has been the effort to construct the sophisticated robot hardware while at the same time develop and test the advanced multi-agent system software that requires the robots to be fully functional. In this poster we describe our current efforts in developing a Lego based soccer playing platform using the actual RoboCup SSL rules where teams can test their multi-agent software strategies without requiring the advanced robotic hardware to be fully functional. Instead simple Lego robots are built and controlled by the same multi-agent software developed for the advanced robots although with some adjustments to address limitations in the actual robot hardware. Our effort goes beyond building simulation-only environment where software strategies cannot be fully tested under real-time constraints. The Lego-based robot architecture described in this poster presents a fully operational but lower cost SSL

architecture where multi-agent system software strategies may be tested in a physical platform.

A Cultural Intelligence Training System Based on AI Technologies

Zhao Xin Wu, Roger Nkambou and Jacqueline Bourdeau
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Research on Cultural Intelligence provides a new perspective and a promising means of reducing intercultural conflicts and obstacles. Up until now, research in this domain has used traditional methods and relied mainly on questionnaires to manually assess the Cultural Intelligence of individuals. This research aims at modeling four interdependent Cultural Intelligence dimensions as an integrated entity. Furthermore, a new Cultural Intelligence computational model based on an innovative breed of advanced AI technologies has been created and implemented in an intelligent system. The purpose of this system is to support individuals and organizations in solving the intercultural adaptation problems that they face in various authentic situations. This system makes it easier for ordinary people to improve their cultural skills.