Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
February 2015, Volume 40, Issue 2, pp 519-530

Dynamic and Quantitative Method of Analyzing Clock Inconsistency Factors among Distributed Nodes

- Xiangning Shi , Linjun Fan , Yunxiang Ling , Jing He , Dehui Xiong

Abstract:

Designing appropriate clock synchronization schemes and maintaining time consistency among many sensor nodes are crucial for novel distributed applications environments such as Internet of Thing (IoT). However, analyzing the various factors leading to clock inconsistency should be conducted first. The traditional analysis methods are primarily experiential and qualitative, and dynamic disturbances existing among the factors are not considered; moreover, the emerging IoT is rapidly evolving in terms of large-scale feature, service-oriented trend, complexity, and dynamics. Such developments present difficulties in the use of traditional methods in IoT for the analysis of factorial effects on system clocks. To remedy these problems, we propose a novel dynamic evolution model called clock finite state automata (CFSA) using formal methods, exhibiting the overall changing processes of global clock states. We also develop a clock consistency evolution algorithm using CFSA to quantitatively evaluate the influencing factors. The experimental evaluation shows that network delay (41.4% on average) is the greatest impact factor; the frequent entry and exit of the sensor nodes (29.9%) are the second greatest, and the oscillator jitter of computers (11.1%) is the least impact factor. Compared with traditional analysis methods, our method has good feasibility, effectiveness, and novelty. The analysis results can guide the designers of new clock synchronization algorithms for distributed sensor nodes in IoT.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
February 2015, Volume 40, Issue 2, pp 487-499

A New Reactive Routing Algorithm to Improve Capacity and Average End-to-End Delay in MANETs

- Elahe Ataee Bojd, Neda Moghim , Faria Nassiri-Mofakham, Naser Movahedinia

Abstract:

Delay and capacity are two important parameters in mobile ad hoc networks (MANETs). Increasing the network capacity almost leads to delay increases, as well. Many recent works have been conducted to achieve both desirable capacity and delay, simultaneously. To achieve such aim, this study proposes a new reactive routing algorithm. This algorithm modifies multi-hop Dynamic Virtual Router algorithm to overcome the performance limits of MANETs. Mobility metrics are defined to estimate the mobility degree of the nodes' neighborhood. A new route setup process is defined; using the estimated information and a local repair mechanism is also introduced in the new proposed algorithm. In this local repair mechanism, a new route is sought between the repairing node and its next hop on the communication path. Simulation study shows that the proposed algorithm significantly improves the network performance, including throughput and delay; so that, the increasing overhead is not remarkable considering the great performance improvement of the algorithm.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
February 2015, Volume 40, Issue 2, pp 501-518

Bi-languages Mining Algorithm for Extraction Useful Web Contents (BiLEx)

- Sumaia Mohammed AL-Ghuribi , Saleh Alshomrani

Abstract:

Extracting useful Web content is a major step in data mining. The Web content extraction process is very important for many technologies or uses as a preprocessing of many systems such as crawlers and indexers. Additionally, the extracted content is needed by the end users especially for blind and visually impaired users. It aims to extract useful and meaningful data from Webpages that are surrounded with various clutters such as advertisements and navigation menus. Many extraction algorithms are designed for English Language and perform less efficient and less accurate in Arabic language. In this paper, a bi-languages mining algorithm for extracting Web contents called BiLEx is presented. It extracts useful Web content from Arabic and English Webpages in the approximately same level of efficiency and accuracy. An experiment is made for 600 Webpages which are chosen randomly from 30 different Websites to test the proposed algorithm performance and efficiency. Results prove that BiLEx algorithm gives high precision, recall, and F1-measure for both Arabic and English Webpages.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
February 2015, Volume 40, Issue 2, pp 475-486

Resolving Aspect Dependencies for Composition of Aspects

- K. Santhi, G. Zayaraz , V. Vijayalakshmi

Abstract:

A new modularization technique is used in Aspect-oriented software development for the separation of widely used functions such as logging, caching, synchronization, and exception handling from the core business logic functions. Aspects are identified using the mathematical modeling tool, Colored Petri nets. During the software development process, dependencies may arise as a result of using operators such as Before, After, Around, and Replace; such dependencies are consumed by our framework. Using the specification of aspects, we generate a composition rule for every match point, which directs the composition process at the initial requirements phase of software development. The proposed FTS approach, incorporating a feedback edge set, topological ordering, and second valid ordering, is efficient in resolving conflicts and dependencies among the aspects. To analyze the second valid ordering, grey relational analysis is used to rank the aspects, while analysis of variance method is used for the verification thereof. The proposed approach is illustrated by a case study.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
February 2015, Volume 40, Issue 2, pp 451-474

USTA: An Aspect-Oriented Knowledge Management Framework for Reusable Assets Discovery

- Islam Elgedawy

Abstract:

Currently, companies apply existing asset discovery approaches in an ad hoc manner over asset repositories to find the right assets. To precisely identify the right assets, the discovery engine should acquire different types of knowledge regarding: (1) the created assets, (2) the involved application domains, (3) the adopted software ontologies, (4) the adopted matching approaches, and (5) users' contexts and goals. Then the discovery engine uses all these types of knowledge to find the right assets. Hence, we need a framework that is able to manage all these types of knowledge in a dynamic, machine-understandable, and context-sensitive manner. Therefore, this article proposes USTA an aspect-oriented knowledge management framework for reusable assets discovery. USTA enables companies to define and manage their software ontologies in an aspect-oriented manner. It also enables them to define their corresponding matching schemes. USTA enables users to define their goals, contexts, and their preferred matching policies along with their aspect-oriented queries. USTA uses all this information to dynamically create a customized discovery process for every query. Experimental results show that the dynamic and customized discovery approach adopted by USTA provides better matching precision when compared to existing discovery approaches that adopt a static discovery process for all queries.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2015, Volume 40, Issue 3, pp 857-872

Improved AODV Routing Protocol Based on Restricted Broadcasting by Communication Zones in Large-Scale VANET

- Haiqing Liu, Licai Yang , Yao Zhang

Abstract:

The performance of traditional AODV protocol will be sharply decreased in the scenario of large-scale VANET, which covers a wide range geographic space and contains a huge number of vehicles. This paper proposes an improved AODV routing protocol based on restricted broadcasting by communication zones for data transmitting in large-scale VANET. The whole network is divided into several communication zones according to the spatial distribution characteristic of inter-vehicle communication connectivity probabilities of road sections. The connectivity performance of the communication zone is evaluated using the grey correlation analysis method, in which both the historical and forecasting connectivity probabilities of road sections are considered. Following the maximum grey correlation degree principle, a series of key communication zones is selected to construct a restricted broadcasting area for route discovery in AODV. In the paper, the simulation scheme for the proposed AODV protocol in large-scale VANET scenario is also presented. Simulation results show that, compared with traditional AODV, the proposed improved protocol has advantages in packet delivery fraction, overhead and route setup time.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2015, Volume 40, Issue 3, pp 845-855

Do Systematic Literature Reviews Outperform Informal Literature Reviews in the Software Engineering Domain? An Initial Case Study

- Mahmood Niazi

Abstract:

The systematic literature reviews (SLRs) are a formally planned approach in finding, evaluating and summarising all available evidence on a specific research question. The objective of this paper is to compare formal SLRs and informal literature reviews in software engineering. For this purpose, a SLR has been conducted to compare the results with a previously conducted informal literature review of software process improvement success factors. Previous research using an informal literature review approach found 47 articles via the snow balling technique. For formal literature reviews, the SLR was conducted by applying customised search strings covering the time to 30 June 2004 (this is the deadline of the informal literature review). In total, 38 relevant articles were identified via the formal literature review. The results show that the data extraction process in the formal literature review enabled more success factors to be extracted (i.e. 34) than the informal literature review (i.e. 18). In the formal literature review, the publication inclusion and exclusion criteria and selecting primary studies helped in identifying the right list of publications. A real challenge in the formal literature review was to define a search string. In general it was observed that the SLR methodology is better than the informal literature review with respect to the planning for literature review, the design of search string, sources to be searched, publication inclusion and exclusion criteria, publication quality assessment and the data extraction process. However, the informal literature review has identified more articles than the formal literature review. Snow balling technique should be used with the formal literature review in order to identify all the relevant articles.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2015, Volume 40, Issue 3, pp 799-816

Width-Packing Heuristic for Grouping in Two-Dimensional Irregular Shapes Cutting Stock Problem

- Aliya Awais, Anjum Naveed

Abstract:

This paper investigates cutting stock problem with fixed number of weakly heterogeneous shapes and multiple open-dimension stock sheets having fixed width and variable length with the objective of minimizing the stock sheet wastage. The research is based on the hypothesis that creating groups of shapes and mapping the generated groups on heterogeneous stock sheets leads to improved utilization, compared to using single stock sheet. A width-packing heuristic for shapes grouping has been proposed, which generates feasible groups considering width margin of stock sheet along with length and overlap margin of shapes. The groups are mapped onto stock sheets using column generation method by replicating each shape in the group multiple times such that aggregate length of all shapes in group results in minimum trim loss along the length. Linear programming approach is used to select the minimum number of stock sheet layouts that can fulfill the quantity requirements of shapes. Comparison with the existing commercial system shows that the proposed technique achieves up to 3 % improved utilization for all input samples where rectangular enclosure utilization of shapes is high.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2015, Volume 40, Issue 3, pp 773-785

Evaluation of the Impact of EDoS Attacks Against Cloud Computing Services

- F. Al-Haidari , M. Sqalli , K. Salah

Abstract:

Cloud computing is currently one of the fastest growing segments of IT. To date, and according to a recent survey conducted by the International Data Corporation, security is the biggest challenge to cloud computing. A cloud introduces resource-rich computing platforms, where adopters are charged based on the usage of the cloud's resources, known as "pay-as-you-use" or utility computing. However, a conventional Distributed Denial-of-Service (DDoS) attack on server and network resources compromises cloud computing services by charging cloud adopters more cost due to the attack activities that consume cloud's resources. In such case, the main goal of such attack is to make the cloud computing unsustainable by targeting the cloud adopter's economic resources. Thus, it constitutes a new breed of DDoS attacks, namely Economic Denial of Sustainability (EDoS) attack. In this paper, we study the impact of EDoS attacks on the cloud computing services, considering only a single class of service. We developed an analytical model verified by a simulation model to study such impact of EDoS attacks on the cloud computing. The analytical model relies on the queuing model that captures the cloud services and considers a number of performance and cost metrics including end-to-end response time, utilization of computing resources, throughput, and the incurred cost resulting from the attack.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2015, Volume 40, Issue 3, pp 787-798

Low-Energy Instruction Precision Assignment for Multi-mode Multiplier Under Accuracy and Performance Constraints

- S.-R. Kuang , K.-Y. Wu

Abstract:

Floating-point (FP) multipliers are the main energy consumers in many FP applications. Recently several FP multipliers with multiple- precision modes have been designed to trade energy consumption with output accuracy of FP multiplication operation (MOP). To effectively apply these multi-mode multipliers to FP applications, this paper presents a fast instruction precision assignment method for reducing energy consumption under accuracy and performance constraints. To easily set and check the accuracy constraint, we first build an affine arithmetic based error model to evaluate the overall output accuracy loss caused by inaccurate FP MOPs. Moreover, a simplified instruction scheduling method is also developed to quickly check the performance constraint. Based on these two check functions and the characteristics of proposed multi-mode multiplier, a fast Tabu search (TS) algorithm is then proposed to assign the precision mode of each FP MOP under the accuracy and performance constraints imposed on the given application. Experimental results show that the proposed fast TS algorithm can find the precision assignment with more energy saving and less searching time when compared to previous methods.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2015, Volume 40, Issue 3, pp 817-844

Task Scheduling Using Two-Phase Variable Neighborhood Search Algorithm on Heterogeneous Computing and Grid Environments

- S. Selvi , D. Manimegalai

Abstract:

Grid computing solves high-performance and high-throughput computing problems through sharing nodes ranging from personal computers to supercomputers distributed around the world. As the grid environments facilitate distributed computation, the scheduling of grid jobs has become an important issue. In this paper, an investigation on implementing Two-Phase Variable Neighborhood Search (TPVNS) algorithm for scheduling independent jobs on computational grid is carried out. The proposed algorithm consists of two modules with General Variable Neighborhood Search and Basic Variable Neighborhood Search algorithms in order to find a good mapping of grid jobs with grid nodes. The performance of the proposed algorithm has been evaluated with deterministic heuristic and evolutionary algorithms. Simulation results show that TPVNS algorithm generally performs better than the existing methods.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
April 2015, Volume 40, Issue 4, pp 1045-1055

Prediction of Upper Body Power of Cross-Country Skiers Using Support Vector Machines

- Mehmet Fatih Akay, Fatih Abut , Shahaboddin Daneshvar , Dan Heil

Abstract:

Upper body power (UBP) is an important determinant of cross-country ski race performance. Although numerous studies exist to measure UBP of cross-country skiers, to date, no study has ever attempted to predict UBP of cross-country skiers. The purpose of this paper was to develop prediction models for estimating 10-s UBP (UBP10) and 60-s UBP (UBP60) of cross-country skiers using support vector machines (SVM). Four types of SVMs have been considered, they are as follows: SVM using the radial basis function kernel (SVM-RBF), SVM using the sigmoid kernel, SVM using the polynomial kernel, and SVM using the linear kernel. For comparison purposes, UBP prediction models based on multilayer perceptron and multiple linear regression have also been developed. The dataset used in this study includes data of 77 subjects. Age, gender, height, weight, body mass index, maximal heart rate, maximal oxygen uptake, and exercise time are the predictor variables, and UBP10 and UBP60 are the target variables. Several UBP prediction models have been developed by using the combination of the predictor variables to predict UBP10 and UBP60 . By using 10-fold cross-validation on the datasets, the performance of the models has been evaluated by calculating their standard error of estimates (SEEs) and multiple correlation coefficients (*R*s). The results show that SVM-RBF-based UBP prediction models perform much better (i.e., yield lower SEEs and higher *R*s) than the prediction models developed by other regression methods and can be safely used for the prediction of UBP of cross-country skiers.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
April 2015, Volume 40, Issue 4, pp 1057-1067

Rated Window and Packet Size Differentiation Methods for Per-Rate TCP Fairness Over IEEE 802.11

- Mohamed Othman , Nasim Ferdosian , Tareq Rasul

Abstract:

In WLANs, with the existence of multi-rate capability, the Distributed Coordination Function (DCF) of MAC layer protocol equalizes the throughput of all the stations regardless of their own link rate. This equalization leads to the Performance Anomaly of IEEE 802.11 where the throughput of the station with the higher data transmission rate is decreased as much as that of the lower rate station. The objective of this study was to provide fair proportional throughput for TCP flows of competing stations in multi-rate IEEE 802.11 WLANs infrastructure. This research considers the scenarios when there are other kinds of unfairness along with per-rate unfairness. In this work, Rated Window and Packet Size Differentiation schemes are proposed by adjusting window and packet size according to the availability of buffer size in the access point and transmission rates of each flow. We validate the proposed methods by means of simulation and compare the results of the total throughput and fairness index with previous methods. The results show that the proposed methods generate fair service in terms of proportional throughput among wireless stations having different numbers and directions of flow with various data transmission rates. By getting appropriate fairness among stations in WLAN infrastructure, a Wireless Internet Service Provider (WISP) can significantly increase its revenue by providing various appropriate service plans.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
April 2015, Volume 40, Issue 4, pp 1069-1080

Provably Secure and Pairing-Based Strong Designated Verifier Signature Scheme with Message Recovery

- SK Hafizul Islam , G. P. Biswas

Abstract:

In this paper, an efficient and secure strong designated verifier signature with message recovery scheme is presented using elliptic curve and bilinear pairing. In our scheme, the signer implants a message on the signature and sends it without message to the verifier, who then extracts the original message and validates the message-signature pair. However, an outsider is unable to verify the message-signature pair since the verifier's private key is strictly required for verification. Our scheme has been designed to achieve confidentiality, integrity, authentication and non-repudiation of message transmitted through hostile networks. Our scheme is secure against adaptive chosen message attack in the random oracle model under the intractability assumption of Co-Bilinear Diffie–Hellman problem. Besides, our scheme is computation and communication efficient than other schemes, and hence, it may be useful in many small message applications and also for the resource-constrained environments.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
April 2015, Volume 40, Issue 4, pp 1097-1109

A Semi-Blind Robust DCT Watermarking Approach for Sensitive Text Images

- Lamri Laouamer , Omar Tayan

Abstract:

This paper presents a new approach to address the challenges associated with integrity verification, proof of authenticity, tamper detection and assurance of copyright protection for digital images propagated online. In particular, the problem addressed here primarily relates to the protection of sensitive online textual images that may be targeted for counterfeiting or intentional/unintentional modifications which would result with a fake copy being disseminated. Typically, sensitive text images are characteristic of further challenges and constraints on embedding/extraction techniques compared to their more general digital picture/image counterparts. With many digital protection schemes addressing the problem of less-sensitive content comprising of a rich set of colours and textures, this paper proposes a novel watermarking approach for the case of sensitive text images in order to confirm content originality and integrity verification under some known constraints of the image type. Hence, a new approach based on discrete cosine transform and linear interpolation is proposed and applied on digital Quran text images, which are considered as ideal samples of content with stringent sensitivity requirements. Detailed results had presented the significance of this approach and had demonstrated the high robustness obtained when faced with various attack scenarios that include rotational attacks, JPEG compression attacks, noising attacks and median filtering attacks. Significantly, a major contribution of this paper was found in the novel watermark extraction approach which had enabled perfect watermark extraction under a range of attack scenarios. Finally, a significant advantage of the proposed approach was found in its broad applicability for authentication and protection of other sensitive and less-sensitive digital image content.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
April 2015, Volume 40, Issue 4, pp 1081-1096

Forecasting Oil Production Time Series with a Population-Based Simulated Annealing Method

- Juan Frausto-Solís , Manuel Chi-Chim , Leonid Sheremetov

Abstract:

This paper addresses the oil production forecasting problem, closely related to the estimation of reserves remaining in oil fields. We present a new method, named SAM-oil, which combines simulated annealing metaheuristic with evolutionary computing techniques, statistical analysis and quality assessment of solutions. The method implements a learning-based scheme for pre-processing, modeling and forecasting of monthly oil production time series. Accuracy of point forecasts is compared between SAM-oil and a typical technique in petroleum engineering, known as decline curve analysis, as well as with well-established forecasting methods such as ARIMA, neural networks, and some members of the exponential smoothing family. For the study case, a clustering process has been conducted in order to map forecasting difficulty for three clusters of time series. Our experiments evidence that SAM-oil's is a very competitive method in oil production forecasting: SAM-oil's forecasts outperform, in average, those from decline curve analysis and the other forecasting methods, both for the clusters and for the whole set of the experimental time series.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
May 2015, Volume 40, Issue 5, pp 1427-1441

Extracting Refined Low-Rank Features of Robust PCA for Human Action Recognition

- Shijian Huang, Junyong Ye , Tongqing Wang , Li Jiang , Xuegang Wu , Yang Li

Abstract:

Motion representation is a challenging task in human action recognition. To represent motion, most traditional methods usually require certain intermediate processing steps such as actor segmentation, body tracking, and interest point detection, which make these methods sensitive to errors caused by these processing steps. In this paper, motivated by the successful recovery of low-rank matrix using robust principal component analysis (RPCA), we present a novel motion representation method for action recognition by extracting refined low-rank features of RPCA. Compared with the traditional methods, our method does not require the intermediate processing steps mentioned above. Unfortunately, with traditional λ, RPCA is incapable of extracting the discriminative information of motion in action videos, thus we first conduct extensive experiments to determine a feasible parameter λ suitable for action recognition. Then, we perform RPCA with this λ to obtain the low-rank images including the discriminative information of motion. To represent characteristic of the obtained low-rank images, we define two descriptors [i.e., edge distribution histogram (EDH) and accumulated edge distribution histogram (AEDH)] to refine the low-rank images. Finally, a support vector machine is trained to classify human actions represented by EDH or AEDH features. The efficacy of the proposed method is verified on three public datasets, and experimental results have shown the promising results of our method for human action recognition.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
May 2015, Volume 40, Issue 5, pp 1385-1407

A Survey on Obstacle Modeling Patterns in Radio Propagation Models for Vehicular Ad Hoc Networks

- Muhammad Ahsan Qureshi, Rafidah Md Noor , Shahaboddin Shamshirband , Sharmin Parveen , Muhammad Shiraz , Abdullah Gani

Abstract:

Vehicular ad hoc networks (VANETs) form an evolving field of wireless technology that focuses on a wide range of useful applications from safety-related applications to infotainment services. Radio propagation models (RPMs) in VANETs require a high level of realistic detail due to mobility, the nature of the network, technology limitations and urgency of information dissemination. Hence, developing realistic RPMs in VANETs is a challenging task. Nonetheless, a number of traditional models are considered realistic; however, the absence of a required level of detail is a critical aspect of currently employed RPMs. For instance, modeling obstacles in VANETs is a challenging research perspective. Two types of radio obstacles exist in an urban transportation environment: moving obstacles and static obstacles, both of which block radio signals in vehicle-to-infrastructure and vehicle-to-vehicle communication. In this paper, a thematic taxonomy of existing RPMs is proposed and the major challenges involved in modeling realistic radio propagation for VANETs, especially in urban environments, are presented. Existing RPMs are classified and compared using the proposed taxonomy. These RPMs are grouped according to obstacle modeling pattern and are analyzed using important parameters, such as received signal strength, packet delivery ratio, delivery latency and average path length. Issues and challenges with existing RPMs are put forward and recommendations that may be helpful for developing realistic RPMs are made.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
May 2015, Volume 40, Issue 5, pp 1343-1358

Measuring Flexibility in Software Project Schedules

- Muhammad Ali Khan , Sajjad Mahmood

Abstract:

The complexity of software projects is growing with the increasing complexity of software systems. The pressure to fit schedules within shorter periods of time leads to initial project schedules with a complex logic. These schedules are often highly susceptible to any subsequent delays in project activities. Thus, techniques need to be developed to determine the quality of a software project schedule. Most of the existing measures of schedule quality define the goodness of a schedule in terms of its network complexity. However, these measures fail to estimate the flexibility of a schedule, that is, the extent to which a schedule can withstand delays without requiring extensive changes. The relatively few schedule flexibility measures that exist in literature suffer from several drawbacks such as lack of a theoretical foundation, not having a definite scale and not being able to distinguish between schedules with similar network topologies. In this paper, we address these issues by defining two flexibility measures for software project schedules, namely path shift and value shift, which, respectively, predict the impact of changes in activity durations on the critical paths and the critical value of a schedule. Inspired by the notion of betweenness centrality, these measures are theoretically sound, have a well-defined scale, and require little computational effort. Furthermore, by several examples and two real-life software project case studies, we demonstrate that these measures outperform the existing flexibility measures in clearly discriminating between the flexibility of software project schedules having very similar topologies.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
May 2015, Volume 40, Issue 5, pp 1375-1384

An Efficient Monte Carlo-Based Localization Algorithm for Mobile Wireless Sensor Networks

- Aysegul Alaybeyoglu

Abstract:

The aim of this paper is to propose a localization algorithm in which nodes are able to estimate their speeds, directions and motion types. By this way, node's next state can be estimated and the particles can be distributed closer to the predicted locations. Hence, accuracy and the precision of the localization are increased considerably. Sequential Monte Carlo method is used to represent the posterior distribution of a node's possible locations with a set of weighted samples. The developed algorithm is designed for a general network where no restrictions are made on the densities and the distributions of the nodes. Eight localization algorithms, namely Centroid, APIT, Amorphous, DV-Hop, MCL, SMCL, MCB and the developed algorithm SMCLA are implemented and compared for different parameters and mobility models. Simulation results show that the developed algorithm performs best for each of the simulation comparisons.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
May 2015, Volume 40, Issue 5, pp 1443-1453

Information Recommendation Between User Groups in Social Networks

- Zhenhua Huang, Jiawen Zhang , Bo Zhang

Abstract:

Information recommendation between different user groups has recently received a lot of attention in the information service community. However, we find that obtaining the exact optimal recommendation solution is an NP-hard problem. Based on the above finding, in this paper, we present an efficient method achieving approximate optimal recommendation solution (AAORS) to reduce this NP-hard problem to an equivalent extended Steiner tree problem and obtain the approximate optimal recommendation solution *appIRS* in polynomial time. We theoretically prove that the global trust value of *appIRS* is at least 63 % of that obtained for the exact optimal solution *optIRS*. Moreover, in real applications, based on a computed index of reputation gain, we also adjust the recommendation solution produced by the AAORS method in polynomial time and obtain the optimal recommendation solution which satisfies the global reputation constraint. The detailed theoretical analyses and extensive experiments demonstrate that our proposed methods are both efficient and effective.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
May 2015, Volume 40, Issue 5, pp 1359-1373

A Technique for Metamodeling Diagram Types with Tool Support

- Iván García-Magariño , Guillermo Palacios-Navarro

Abstract:

Some domain-specific modeling languages (DSMLs) use different diagram types but these are not explicitly included in metamodels. The definition of diagram types is an increasing demand for some computer-aided software engineering tools for DSMLs. The current work presents a technique that allows designers to define diagram types of DSMLs with metamodels in a straightforward and tool-supported way. This technique also facilitates the processing of models when some elements appear in several diagrams, by including a single dictionary of all the entities and their relationships. The presented technique is supported with a novel tool called diagram-type editor tool (DTET). DTET receives input from a DSML metamodel and allows designers to define a set of diagram types with a graphical user interface. Then, DTET generates a metamodel with these diagram-type definitions. For the evaluation, 39 testers from five different countries (Spain, Dominican Republic, Colombia, Ecuador and France) experienced the presented approach and other alternatives, measuring the times of definition and the numbers of mistakes. The results show that the presented technique and DTET are faster and less error-prone for the definition of diagram types than the alternatives with statistically significant differences.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
May 2015, Volume 40, Issue 5, pp 1409-1425

Development and Analysis of a New Cloudlet Allocation Strategy for QoS Improvement in Cloud

- Sourav Banerjee , Mainak Adhikari , Sukhendu Kar , Utpal Biswas

Abstract:

Cloud computing has emerged as a dominant and transformational paradigm in Information technology domain over the last few years. It begins to affect a multitude of industries such as government, finance, telecommunications, and education. The Quality of Service (QoS) of a cloud service provider is an important research field which encompasses different critical issues such as efficient load balancing, response time optimization, completion time improvement, makespan improvement, and reduction in wastage of bandwidth, accountability of the overall system. This paper highlights a new cloudlet allocation policy with suitable load balancing technique that helps in distributing the cloudlets to the virtual machines (VMs) equally likely to their capacity which makes the system more active, alive, and balanced. This reduces the completion time of the cloudlet(s) as well as reduces the makespan of the VM(s) and the host(s) of a data center. Eventually, this proposed work improves the QoS. The experimental results obtained using CloudSim 3.0.3 toolkit extending few base classes are compared and analyzed with several existing allocation policies.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
June 2015, Volume 40, Issue 6, pp 1591-1605

Improving Similarity Measures for Publications with Special Focus on Author Name Disambiguation

- Muhammad Shoaib, Ali Daud , Malik Sikandar Hayat Khiyal

Abstract:

In many real-life text mining applications such as clustering academic documents, citation matching and author name disambiguation (AND), similar publications are grouped together by exploiting similarity among them. Most of AND approaches, especially unsupervised ones, focus on either proposing new/alternate algorithms and/or using new/alternate sources of information. Researchers from digital library community pay least attention to similarity measures. They try ready-made alternate measures to estimate optimum similarity among publications. These ready-made measures may not provide real picture of similarity among publications. In this work, we propose four similarity measures specially designed for author names, co-authors and short and long text segments. Our proposed measures provide more realistic picture of similarity among publications than previous measures. Our proposed measures can be applied in many real-life scenarios where either name entities (not necessarily human names) or text documents or both are compared in pairwise fashion. We compare our measures with Jaccard coefficient and state-of-the-art cosine measure based on vector space model. Experiments on synthetic and real data show that our proposed measures are more logical and realistic than baseline methods.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2015, Volume 40, Issue 8, pp 2345-2359

Multi-criteria Decisional Approach of the OLAP Analysis by Fuzzy Logic: Green Logistics as a Case Study

- Omar Boutkhoum, Mohamed Hanine , Abdessadek Tikniouine , Tarik Agouti

Abstract:

This study aims to propose a decision-making approach combining multi-criteria analysis and fuzzy logic within the online analytical processing data cube model (OLAP). Indeed, most decision-making systems are based on models of operational research. These models are often composed of quantitative data and postulate the existence of a single objective function (criterion) representing the preferences of decision-makers. However, in reality, we are faced with a more complex situation where several criteria (quantitative and/or qualitative) should be taken into account. It is therefore natural to consider different types of data (more criteria) in the design of OLAP cubes and decision-making systems. Multi-criteria decision analysis (MCDA) combined with fuzzy sets theory offers an efficient approach to solve complex decision problems. So we believe it is useful and necessary to envisage, for OLAP cubes, an optimized data model taking into account several criteria, on which we can apply new methods of MCDA. We end our contribution by applying the decision support process of this paper to propose a scheme of green logistics for large industrial zones in the city of Casablanca, Morocco.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2015, Volume 40, Issue 8, pp 2389-2406

Embedded Adaptive Fuzzy Controller Based on Reinforcement Learning for DC Motor with Flexible Shaft

- A. Aziz Khater , Mohammad El-Bardini , Nabila M. El-Rabaie

Abstract:

In this paper, we propose an adaptive fuzzy controller in which the scaling factors of the input/output membership functions are adapted in the real time using a *Reinforcement* Q-*Learning* algorithm based on a proposed reward function. The proposed controller is implemented practically using an Arduino DUE board to control a DC motor with flexible shaft. The practical results show that the performance of the proposed controller is significantly improved compared with the other controllers. Also, the results show better performance over a wide range of the measurement errors and load disturbances.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2015, Volume 40, Issue 8, pp 2407-2421

Solving Multi-objective Portfolio Optimization Problem for Saudi Arabia Stock Market Using Hybrid Clonal Selection and Particle Swarm Optimization

- Sara A. Bin Shalan , Mourad Ykhlef

Abstract:

The portfolio is a group of assets held by an institution or a private individual. Each asset has an investment share of the total investment. The investor tries to distribute the investment to these different assets. The main issue in portfolio optimization is the allocation of different assets for maximum return and minimum risk within a suitable time. These two objectives lead to the multi-objective portfolio optimization problem, which must be solved. Several previous studies have addressed this issue. In this article, we propose a new intelligence hybrid evolutionary algorithm that combines clonal selection with particle swarm optimization to optimize the portfolio's return and risk. We then show the results of the proposed solution through experiments that are conducted using stocks in Kingdom of Saudi Arabia stock exchange market (*Tadawul*). Moreover, we compare our hybrid algorithm, clonal selection and particle swarm optimization-based solution.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2015, Volume 40, Issue 8, pp 2361-2373

Efficient Cluster-Based Sleep Scheduling for M2M Communication Network

- Mohammed S. Al-kahtani

Abstract:

Machine-to-machine (M2M) communication networks comprise a large number of machine-type communication (MTC) devices such as sensors, radio frequency identification readers, and smart meters. Thus, M2M networks are becoming popular in real-time monitoring, surveillance, and security applications. Scheduling the active and idle states of MTC devices is significantly important to achieve a longer network lifetime and reduce collision during data transmission. Existing node sleep scheduling schemes are mainly designed to reduce the energy consumption of MTC devices. These schemes do not support mobility of MTC devices and thus cannot be used in mobility-centric M2M applications. Thus, we propose a cluster-based energy-efficient, mobility-centric node scheduling scheme for M2M (CENM) communication networks. The proposed CENM scheduling scheme provides (i) network coverage by keeping a minimum number of MTC devices in active state and (ii) fault tolerance by selecting alternative cluster heads and member nodes. Simulation results show that the CENM scheduling scheme is more reliable than the existing CCNS scheduling scheme since the first node in CENM scheme fails much later than that in CCNS scheduling scheme. Simulation results also show that the CENM scheduling scheme outperforms the CCNS, LEACH-M and LEACH-ME scheduling schemes in terms of network energy consumptions, network lifetime, and total message transmissions.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2015, Volume 40, Issue 8, pp 2375-2388

Privacy-Preserving Ranked Multi-keyword Fuzzy Search on Cloud Encrypted Data Supporting Range Query

- Jie Wang, Xiao Yu , Ming Zhao

Abstract:

It is a desirable technique for cloud users to make the fullest use of cloud encrypted data by searching what they need through input keywords. Exact keyword search schemes over encrypted data have been well tackled for better retrieval efficiency and accuracy. However, existing researches on fuzzy keyword search are mainly based on single-input keyword, where multi-keyword fuzzy search remains to be unsolved, and keyword-based search application expansion, i.e., range query based on fuzzy search, has not yet proposed. In this paper, for the first time, we propose a novel ranked multi-keyword fuzzy search scheme supporting range query called RMFSSRQ by exploiting order-preserving encryption and locality-sensitive hashing. Our scheme achieves ranked fuzzy keyword matching by algorithmic design to support retrieval ranking of returned encrypted files. It can also conduct fuzzy search without pre-defined keyword dictionary restraints and eliminate increasing computation and search overheads of multi-keyword fuzzy search compared with traditional fuzzy keyword search schemes. As an expansion of our scheme's application, range query can be achieved by building secure per file Bloom Filter (BF) index. So, the scheme can achieve ranked multi-keyword fuzzy search as well as range query on cloud encrypted data through two-layered BFs per document. Extensive security analysis and experimental results on real-world data set show that our proposed scheme can securely reach the design goals for keyword search on encrypted data. To the best of our knowledge, this is the first try to achieve ranking of retrieval results and range query based on fuzzy search over cloud encrypted data.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2015, Volume 40, Issue 8, pp 2323-2343

‘MaaS’: Fast Retrieval of Data in Cloud Using Metadata as a Service

- R. Anitha , Saswati Mukherjee

Abstract

In cloud era as the data stored is enormous, efficient retrieval of data with reduced latency plays a major role. In cloud, owing to the size of the stored data and lack of locality information among the stored files, metadata is a suitable method of keeping track of the storage. This paper describes a novel framework for efficient retrieval of data from the cloud data servers using metadata with less amount of time. Performance of queries due to availability of files for query processing can be greatly improved by the efficient use of metadata and its analysis thereof. Hence this paper proposes a generic approach of using metadata in cloud, named ‘MaaS—Metadata as a Service.’ The proposed approach has exploited various methodologies in reducing the latency during data retrieval. This paper investigates the issues on creation of metadata, metadata management and analysis of metadata in a cloud environment for fast retrieval of data. Cloud bloom filter, a probabilistic data structure used for efficient retrieval of metadata is stored across various metadata servers dispersed geographically. We have implemented the model in a cloud environment, and the experimental results show that methodology used is efficient in increasing the throughput and also by handling large number of queries efficiently with reduced latency. The efficacy of the approach is tested through experimental studies using KDD Cup 2003 dataset. In the experimental results, proposed ‘MaaS’ has outperformed other existing methods.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2015, Volume 40, Issue 8, pp 2309-2322

Combined Rotation- and Scale-Invariant Texture Analysis Using Radon-Based Polar Complex Exponential Transform

- Satya P. Singh , Shabana Urooj

Abstract:

Polar complex exponential transform (PCET) is superior to pseudo Zernike moment-based method in terms of kernel generation, numerical stability and easier implementation. Their performance degrades under additive noise such as white Gaussian noise. Moreover, these methods show poor performance against directional information of texture. In this paper, a new rotation- and scale-invariant method for texture analysis using Radon transform and PCET for textured image is proposed. Scale and translation invariance is achieved by normalization process in Radon space, and rotation invariance is obtained by combining Radon transform with PCET. A *k*-nearest neighbor classifier is employed to classify the texture. To test and evaluate the proposed method, several sets of textures were experimented with different scaling, translation and rotation in different noisy conditions. The correct classification percentage is calculated under the varying standard deviation. Experimental results show preeminence of the proposed method as compared to the existing invariant texture analysis methods.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
September 2015, Volume 40, Issue 9, pp 2555-2569

Schema Integration Based Merging and Matching Algorithm for Agricultural HDDBs

- Dharavath Ramesh , Chiranjeev Kumar

Abstract:

In any combination of database, a common agreement of the underlying instances concerned to a schema attribute may exist. A distributed database may therefore contain different schemas of same data attributes or different attributes classified from the same population. In this paper, we propose a common schema integration approach to integrating different autonomous agricultural databases of biorefining field of Miscanthus plants. We adopt a model, which is basically relational to some object-oriented properties. We describe methodologies to integrate heterogeneous distributed databases by using this model and show how attribute conflicts and missing attributes can be resolved. We also describe how a query on integrated global schema is managed in heterogeneous agricultural distributed database environment. We give a formal definition and perform extensive experiments to make this integration process strong enough.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
September 2015, Volume 40, Issue 9, pp 2515-2529

Reconfiguration-Based Defect-Tolerant Design Automation for Hybrid CMOS/Nanofabrics Circuits Using Evolutionary and Non-Deterministic Heuristics

- Sadiq M. Sait , Abdalrahman M. Arafeh

Abstract:

Recently, a shift from CMOS lithography to nanoelectronics chemical assembly has been under investigation. Nanoscale components are assembled into arrays of low-power and high-density nanofabrics, which can be integrated with conventional CMOS systems. The inability to achieve inexpensive defect-free mass manufacturing of nanoelectronics is the largest impediment of their adoption. Limited nanowire lengths and defect-prone nanodevices pose significant challenges for design automation tools. In this work, we propose a design phase for cell mapping and reconfiguration in novel hybrid CMOS/nanoelectronics architecture called CMOL. *Reconfiguration* consists of finding new suitable physical location for each gate such that the circuit becomes defect free. The novelty of this work is to engineer non-deterministic iterative search heuristics, namely simulated evolution (SimE) and Tabu search (TS), to find cell assignment around defective nano-components. Circuits of various sizes from ISCAS'89 benchmarks are used to evaluate the designed heuristics. Results show that SimE and TS yield successful reconfigurations in reasonable computation time when nanodevice defect rate is as high as 50 % and nanowire cut rate up to 70 %.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
September 2015, Volume 40, Issue 9, pp 2531-2553

CDPort: A Portability Framework for NoSQL Datastores

- Ebtesam Alomari , Ahmed Barnawi , Sherif Sakr

Abstract:

Cloud computing technology has been growing over the past few years. Currently, cloud providers provide their consumers with several cloud services. However, developers face many difficulties when they have to move their data or software from one cloud platform to another due to the lack of standards. This challenge is considered as one of the key obstacles that prevent many applications from moving to the cloud environment. In this paper, we focus on the challenge of data portability. We propose a common data model and a standardized API for SQL and NoSQL cloud databases. In particular, our approach hides the possible variations of the backend data storage models from the application layer. In addition, our framework is equipped with tools that support the conversion, transformation and data exchange between the different data storage models. The current implementation of our framework supports four different data storage systems: Amazon RDS, Google Datastore, Amazon SimpleDB and MongoDB. However, our framework is designed in a flexible way such that it can be easily extended to support other data storage systems. Moreover, we offer a standard query abstraction to enable automatic translation between NoSQL query patterns and their associated SQL queries (in both directions). The experimental evaluation of our framework shows that using our framework eliminates or minimizes the effort of rewriting the application code when the backend data storage system is changed. Further, the proposed transformation tool reduces the effort of maintaining data portability between the different data models that we have considered.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
September 2015, Volume 40, Issue 9, pp 2487-2501

Performance Analysis of Preemption-Based Call Admission Scheme for Macrocell Users in Multi-Operator LTE Picocellular–Macrocellular Networks

- Salman Ali Alqahtani

Abstract:

A heterogeneous network (HetNet) is one of the core features that have been introduced in the LTE-advanced standardization to meet the predicted requirements for higher data rates and capacity. An integrated picocellular–macrocellular networks is part of such HetNets. Most previous works have concentrated on solving the picocellular–macrocellular networks challenges, including optimal picocell deployment, interference coordination, cell association methods and frequency resource allocations. However, the resource allocation control issue for LTE macrocells integrated with underlying picocells owned by different operators that can allow macrocell user (MU) accommodation has not been investigated deeply. Therefore, this paper proposes and analyzes a new resource allocation control framework called a preemption-based call admission control scheme (PCAC) for integrating independent underlying picocells with macrocell networks. The proposed scheme aims to utilize the resource blocks (RBs) of picocells efficiently to improve MU performance by allowing its MU visitors to utilize unused picocell RBs without any degradation for picocell users. A developed simulation model and a multi-dimensional continuous-time Markov chain (CTMC) model are used to model and analyze the proposed PCAC. The analytical model developed considers a limited-size buffer to store MUs, buffer time out and resource reservation. The MU connection-level performance metrics, including dropping and blocking probabilities, are derived and studied. The results indicate that better connection-level parameters for MUs and higher throughputs are achieved by using the proposed PCAC.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
September 2015, Volume 40, Issue 9, pp 2503-2514

Real-Time ECG Noise Reduction with QRS Complex Detection for Mobile Health Services

- Chakchai So-In , Comdet Phaudphut , Kanokmon Rujirakul

Abstract:

Cardiovascular disease is a serious threat to human life, especially when a sudden attack occurs, so real-time patient monitoring is crucial. Recent advances in health care and technology have led to equipment such as mobile micro-electro-mechanical systems, which can be used for more accessible public healthcare services. Electrocardiogram (ECG) data are traditionally used to investigate and monitor heart activities. However, the necessary electronic logic tags and (wireless) signal transmissions in a mobile healthcare device are susceptible to noise, which can result in false interpretations. Consequently, this study proposed a novel, low-complexity method for generating an optimized ECG wave suitable for mobile architecture. We first apply a bi-quad, high-pass filter to adjust baseline drifts. Then, a Savitzky–Golay filter smoothes the raw ECG, and moving variance and integral filters with thresholds are used to determine the QRS complex. We compared the results of the proposed technique to those from the moving average, Savitzky–Golay, PRASMMA, and Pan–Tompkins algorithms, using the well-known QT and MIT-BIH databases, and human subjects. The method was implemented on a mobile device integrating an open ECG platform as a prototype for real-time ECG monitoring systems.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
November 2015, Volume 40, Issue 11, pp 3187-3196

FUDT: A Fuzzy Uncertain Decision Tree Algorithm for Classification of Uncertain Data

- S. Meenakshi , V. Venkatachalam

Abstract:

The classifications of uncertain data turned into one of the dreary procedures in the data mining domain. The uncertain data have tuples with distinctive probability distribution, which helps to find similar class of tuples. When we consider an uncertain data, the feature vector will not be a single valued but a function. In this paper, we proposed fuzzy entropy and similarity measure to characterize the uncertain data through binary decision tree algorithm. Fuzzy entropy is used to find the best split point for the decision tree to handle the uncertain data. Similarity measure is used to make the better decision for the uncertain data with high accuracy. Initially, fuzzy entropy for each feature vector is calculated to select the best feature vector. Then, best split is selected from the selected feature vector. With the help of trained uncertain data, the binary tree starts to grow. Once the split point is selected, then the constructed decision tree is evaluated by the testing phase of uncertain data. The testing data are subjected to the trained decision tree to obtain the classified data. The experimental analyses are made to evaluate the performance of the proposed FUDT approach. Proposed FUDT algorithm is compared with the existing classification algorithm UDT in terms of accuracy and running time. The experimental analysis finalizes that our FUDT algorithm outperforms the existing UDT algorithm.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
November 2015, Volume 40, Issue 11, pp 3161-3171

Fingerprint Image Segmentation Using Block-Based Statistics and Morphological Filtering

- Debashis Das, Susanta Mukhopadhyay

Abstract:

Fingerprint segmentation is meant to separate the foreground region of a fingerprint image from its background region. This paper presents a block-based segmentation scheme which is executed in two passes. In the first pass, two sets of regions of interest (ROI) are identified separately using (i) morphological open-close filters and (ii) a statistical measure namely coefficient of variation (CV). These sets of ROIs are combined together to identify the overall ROI. In the second pass, a block-wise region shrink–merge technique, which employs a sequential combination of parameters like CV and average gray value, is applied to construct the final segmented image. The proposed method has been implemented and tested on a set of real fingerprint images and the experimental results visually establish the effectiveness of the proposed method. Besides, a comparative study based on some quantitative measures is furnished to verify the accuracy of the proposed segmentation algorithm.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
November 2015, Volume 40, Issue 11, pp 3211-3232

Enhanced Arabic Document Retrieval Using Optimized Query Paraphrasing

- Abeer Al-Dayel , Mourad Ykhlef

Abstract:

Query paraphrasing aims to construct a better formulation of user queries in order to enhance retrieval. Formulating search queries remains complicated for a subset of Web users. In a typical situation, a user will not receive satisfactory results from the submitted search query and will subsequently attempt different query paraphrases. The Arabic vocabulary is rich in synonyms and hyponyms. Such richness of synonyms makes automation of the paraphrasing technique crucial for Arabic information retrieval systems in order to facilitate the process of paraphrasing synonyms. In this article, we propose an enhancement for Arabic information retrieval using a query paraphrasing technique. Furthermore, two query paraphrasing optimization techniques are proposed to overcome the time complexity and exhaustive calculation of existing query paraphrasing techniques. One of these techniques uses a genetic algorithm (GA–QP), and the other employs the artificial bee colony algorithm (ABC–QP). The performance of these two algorithms is compared. ABC–QP shows an improvement in Arabic information retrieval performance compared with the genetic algorithm query paraphrasing system.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
November 2015, Volume 40, Issue 11, pp 3233-3246

Adaptive Switching Non-local Filter for the Restoration of Salt and Pepper Impulse-Corrupted Digital Images

- Justin Varghese, Nasser Tairan , Saudia Subash

Abstract:

The paper presents an effective nonlinear adaptive switching non-local filter for the restoration of impulse-corrupted digital images by using distinct impulse detection and correction stages. The correction scheme of the filter adaptively switches between details-preserving non-local mode and signal restoration-based local mode to facilitate high fidelity in the restored image. The non-local filtering operation replaces impulses with a remote pixel that better suits the local image conditions. The algorithm works in this non-local mode only when there are sufficient uncorrupted pixels in the local neighborhood of the corrupted pixel to be replaced. Otherwise, the algorithm replaces impulsive pixels with the median of the uncorrupted pixels from the local neighborhood. Experimental results from various impulse noise levels support the improved performance of the proposed algorithm over other algorithms both subjectively and objectively.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
November 2015, Volume 40, Issue 11, pp 3197-3209

Test Time Reduction in Automated Test Equipment (ATE)-Based Mechanism of Network-on-Chip Communication Infrastructure

- Mona Soleymani , Midia Reshadi

Abstract:

Network-on-chip (NoC) has been proposed as a scalable communication infrastructure to establish connections between integrated cores which are increased on a single chip. NoC structure consisting of components and elements such as routers, processing elements and links that can be error prone. Therefore, to achieve the correct functioning of a network, test operation has been a major concern for chip designers. In offline test mechanism, the distance between test pattern generator and destinations has significant impact on the test time. Using multicast scheme, this paper proposed a new mechanism that tests all cores. Our proposed approach first divides the network to four parts and then locates one ATE with four ports in the middle of the network. Based on our method, test operations are manipulated in parallel on each partition, individually. A new method is proposed that distributes test packets and collects test responses, simultaneously. Simulation results were also compared with some prior works by means of the proposed mechanism indicating that delivering test packets' latency was decreased about 63% and the total number of hop counts to reach the specified destination was declined approximately 34%.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
November 2015, Volume 40, Issue 11, pp 3173-3185

Multi-resolution MRI Brain Image Segmentation Based on Morphological Pyramid and Fuzzy *C*-mean Clustering

- Hala Ali , Mohammed Elmogy , Eman El-Daydamony , Ahmed Atwan

Abstract:

Image segmentation is a vital step in many imaging applications, such as medical images and computer vision. Image segmentation is considered as a challenging problem, so we need to develop an efficient, fast technique for medical image segmentation. In this paper, we propose a new system for a multi-resolution MRI brain image segmentation, which is based on a morphological pyramid with fuzzy *C*-mean (FCM) clustering. In the first stage, we use a wavelet multi-resolution to maintain spatial context between pixels. Secondly, we use the morphological pyramid to fuse the resulting multi-resolution images with the original image to increase sharpness and decrease noise in the processed image. Finally, we use FCM technique to segment the processed images. We compared our proposed system with some state of the art segmentation techniques on two different brain data sets. Experimental results showed that the proposed system improves the accuracy of the MRI brain image segmentation.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article -- Computer Engineering and Computer Science
November 2015, Volume 40, Issue 11, pp 3135-3149

Cryptanalysis and Design of a Three-Party Authenticated Key Exchange Protocol Using Smart Card

- Ruhul Amin , G. P. Biswas

Abstract:

Three-party authenticated key exchange protocol *(3PAKE)* is used to provide security protection on the transmitted data over the insecure communication by performing session key agreement between the entities involved. Comparing with the *2PAKE* protocol, *3PAKE* protocol is more suitable for managing unrestricted number of users. Recently, several researchers have proposed many *3PAKE* protocols using smart card. However, we have scrutinized carefully recently published Yang et al.'s protocol, and it has been observed that the same protocol suffers from several security weaknesses such as insider attack, off-line password guessing attack, many logged-in users' attack and replay attack. Moreover, we have justified a serious security issue of the password change phase of the same scheme. In order to fix the above-mentioned shortcomings, this paper proposes an efficient *3PAKE* protocol using smart card based on the cryptographic one-way hash function. The formal security analysis proves that proposed protocol provides strong security protection on the relevant security attacks including the above-mentioned security weaknesses. Moreover, the simulation results of the proposed scheme using *AVISPA* tool show that the same protocol is *SAFE* under *OFMC* and *CL-AtSe* models. The performance comparisons are also made, which ensure that the protocol is relatively better than the existing related schemes. To the best of our knowledge, the proposed scheme should be implemented in practical application, as it provides well security protection on the relevant security attacks, provides relatively better complexities than the existing schemes, achieves proper mutual authentication along with user-friendly password change phase.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
November 2015, Volume 40, Issue 11, pp 3151-3159

Statistical Formant Speech Synthesis for Arabic

- Afshan Jafri, Ibrahim Sobh , Ashraf Alkhairy

Abstract:

This work constructs a hybrid system that integrates formant synthesis and context-dependent Hidden Semi-Markov Models (HSMM). HSMM parameters comprise of formants, fundamental frequency, voicing/frication amplitude, and duration. For HSMM training, formants, fundamental frequency, and voicing/frication amplitude are extracted from waveforms using the Snack toolbox and a decomposition algorithm, and duration is calculated using HMM modeled by multivariate Gaussian distribution. The acoustic features are then generated from the trained HSMM models and combined with default values of complementary acoustic features such as glottal waveform parameters to produce speech waveforms utilizing the Klatt synthesizer. We construct the text processor for phonetic transcription required at the training and synthesis phases by utilizing phonemic pronunciation algorithms. A perceptual test reveals that the statistical formant speech text-to-speech system produces good-quality speech while utilizing features that are small in dimension and close to speech perception cues.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2015, Volume 40, Issue 12, pp 3523-3544

A Mutation-Based Approach for Testing AsmetaL Specifications

- Jameleddine Hassine , Osama Alkrarha

Abstract:

The detection of specification errors can help reduce the cost and risk of software development because uncorrected defects in specifications will propagate to code, thus adversely affecting the quality of the end product. Mutation testing is a well-established fault-based technique for assessing and improving the quality of test suites. Mutation testing can be applied at different levels of abstraction, e.g., the unit level, the integration level, and the specification level. In this paper, we propose a suite of AsmetaL-specific mutation operators, classified into four categories. The proposed operators are used to assess the adequacy of test suites generated using the ATGT tool, according to various test coverage criteria. We demonstrate the applicability of our approach through eight publicly available AsmetaL case studies. The results of the case studies show that our proposed mutation operators can be used to compare different AsmetaL-based test coverage criteria and successfully detect inadequacies in test suites.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2015, Volume 40, Issue 12, pp 3555-3566

Efficient Machine Learning Technique for Web Page Classification

- S. Markkandeyan , M. Indra Devi

Abstract:

Web page classification plays a major role in information management and retrieval task. Feature selection is an important process for accurate classification of Web pages. Web pages contain several features, and more number of features reduce the classification accuracy. We propose a hybrid feature selection approach which is both efficient and effective for automatic Web page classification problem and also helps the Web search tool to get relevant results in the relevant category. Experiments were conducted by us with various feature selection methods for Web page classification and keyword search problem. From these experiments, it was found that some features present in the initial feature set (IFS) are irrelevant, redundant, and noisy, and they consume more memory space, increase computational time, and give a poor predictive performance. These features can be eliminated using evaluator methods such as principal component analysis, consistency subset evaluator, and search methods such as genetic search and rank search, resulting in minimal and more relevant features. We call these features as intermediate feature set (IMFS), and further optimization in this feature set gives more accurate results. Finally, attribute-selected classifier which is a part of machine learning meta-classifier was applied to the IMFS to get final feature set (FFS), and it was found that accuracy has increased up to 97% and computational time for all classifiers is minimized compared to IFS using WebKb (Faculty and Course) and ODP (Sports) benchmarking datasets. The proposed method yields better classification performance and reduces space requirements and search time in the Web documents compared with the existing methods.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2015, Volume 40, Issue 12, pp 3567-3582

An Integrated Framework for Predicting Long-Term Productivity of Pastures in the Kingdom of Saudi Arabia

- Ahsan Abdullah , Ahmed Bakhashwain , Abdullah Basuhail , Ahtisham Aslam

Abstract:

The population of Saudi Arabia is increasing so is the demand for food; however, the arable land that can support this demand is decreasing rapidly. To meet the increasing dietary (cereal, meat, milk, etc.), needs of people and the fodder needs of livestock require identification of additional cultivation regions and correspondingly suitable crop/grass varieties. The traditional methods to achieve these objectives are expensive, complex and time-consuming. Therefore, the exploration of novel and proven IT techniques and methodologies are needed to address this complex problem. In this paper, we propose a data-driven framework and present simulated results mapped to real data that show how predictive data mining, geographical information system and expert system can be integrated. This integration results in identifying promising cultivable regions for the long-term productivity of perennial pasture grasses in the Kingdom of Saudi Arabia. The proposed framework can ultimately assist in identification of promising rangeland areas, the identified areas subsequently explored as per necessary follow-up actions/procedures.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2015, Volume 40, Issue 12, pp 3583-3594

A Novel Intrusion Detection System Based on Trust Evaluation to Defend Against DDoS Attack in MANET

- M. Poongodi , S. Bose

Abstract:

With the increasing demand of data communication in Internet and electronic commerce environments, security of the data is the prime concern. Large-scale collaborative wireless mobile ad hoc networks may face attacks and damages due to harsh behavior of the malicious nodes. To protect the systems from the intrusion of the attackers, security of the system has to be improvised. In researches involving the designing of the intrusion detection system (IDS), performance efficiency of the system is bound to be compromised. For an effective data communication process in the secured system, there is a need for better IDS without reducing the performance metrics. Intrusion detection is the progression of monitoring node movements and data transmission events that occur in a system for possible intrusions. Distributed denial of service (DDOS) attacks are the primary threat for security in the collaborative wireless Mobile Ad hoc networks. The attacks due to DDOS are much severe when compared to the non DDOS attacks. So proper preventive measures are necessary to detect and revoke such attacks. Our proposed approach involves trust-based evaluation wherein the intrusion detection is done using secured trust evaluation policies. In this paper, a novel IDS is designed using the trust evaluation metrics. This is used for the detection of the flooding DDOS attacks in the networked architecture. The proposed system combines the existing Firecol-based security procedures with Dynamic Growing Self-Organizing Tree Algorithm in the trust evaluation-based environment. Simulation results show that the Trust-based IDS is found to be better in terms of Security metrics viz. Detection probability and Performance metrics viz. Packet Data Ratio, Average Delay, Throughput and Energy Consumption.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2015, Volume 40, Issue 12, pp 3545-3554

Integrating Fuzzy K-Means, Particle Swarm Optimization, and Imperialist Competitive Algorithm for Data Clustering

- Hojjat Emami , Farnaz Derakhshan

Abstract

In this paper, we proposed two hybrid data clustering algorithms that are called ICAFKM and PSOFKM. ICAFKM combined the advantageous aspects of Fuzzy K-Means (FKM) and Imperialist Competitive Algorithm (ICA), and PSOFKM makes full use of the merits of both Particle Swarm Optimization (PSO) and FKM algorithms. FKM is one of the most popular data clustering methods. However, this algorithm solves the problem of sensitivity to initial states of K-Means (KM) algorithm, but like KM, it often converges to local optima. The proposed ICAFKM and PSOFKM algorithms aim to help the FKM to escape from local optima and increase the convergence speed of the ICA and PSO algorithms in clustering process. In order to evaluate the performance of ICAFKM and PSOFKM methods, we evaluate these algorithms on five datasets and compared them with FKM, ICA, PSO, PSOKHM, and HABC algorithms. The experimental results indicate that the ICAFKM carries out better results than the other methods.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2015, Volume 40, Issue 12, pp 3507-3521

FPS-Tree Algorithm to Find Top-*k* Closed Itemsets in Data Streams

- Zahoor ur Rehman , Muhammad Shahbaz , Muhammad Shaheen , Aziz Guergachi

Abstract:

Frequent itemset mining has become a popular research area in the data mining community and has been applied in various areas over the last few years. There are two main technical hitches when searching for frequent itemsets. The first is to provide an appropriate minimum support value, and the second is the generation of a large number of association rules. In many cases, users are only interested in finding only top-*k* frequent itemsets with some defined threshold value. In this paper, we present an algorithm to mine top-*k* frequent closed itemsets from streaming data using a sliding window approach. A fast algorithm is proposed to find frequent closed itemsets with user-defined minimum and maximum lengths to reduce the number of frequent itemsets. Moreover, we have also incorporated a bitmap-based data structure to improve the performance by eliminating multiple scans. Different datasets have been used for experimentation and to benchmark the proposed technique and algorithm.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2015, Volume 40, Issue 12, pp 3483-3505

NeuroFuzzy Adaptive Control for Full-Car Nonlinear Active Suspension with Onboard Antilock Braking System

- Shah Riaz , Laiq Khan

Abstract:

In this paper, the dynamic behavior of the nonlinear full-car model having active suspensions with nine degrees of freedom including driver, passenger seats and antilock braking system (ABS) is analyzed. The comfort analysis of a driver and passengers of the full car with active suspension model including all forms of nonlinearities is very rare in the literature. The literature also lacks the comfort analysis of the driver and passengers, while the car accelerates and decelerates during cornering. The nonlinearities in the proposed model include the dry friction nonlinearities of the suspension dampers and the geometric nonlinearities of the four corners of the car chassis. Modified adaptive NeuroFuzzy Takagi–Sugeno–Kang (NFTSK) control strategies are presented for the vehicle active suspension control to improve the ride quality, road holding capability and vehicle stability. Separate control strategy is used for ABS to avoid wheel locking and slipping for providing better road–wheel contact. The paper also investigates the coordination of active suspensions and ABS to further enhance the performance of the ABS control. To validate the performance of the proposed intelligent control strategies, the response of the vehicle nonlinear model due to road irregularities is evaluated using various performance indexes. The results are then compared with passive control to verify the performance of modified adaptive NFTSK control.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2015, Volume 40, Issue 12, pp 3469-3481

Performance Evaluation of Joint Admission and Eviction Controls of Secondary Users in Cognitive Radio Networks

- Hasan Ahmed , Salman A. AlQahtani

Abstract:

In recent years, cognitive radio (CR) has been proposed to promote the efficient utilization of the spectrum by exploiting the spectrum holes. The fundamental issue in CR networks is the efficient utilization of radio resources. Call admission control (CAC), which controls the number of calls based on the available resources and bandwidth, is an important functionality to ensure the quality of service (QoS). Thus, in this paper, a new call admission and eviction control of secondary users (CAEC) is proposed. The proposed CAEC is a combination of three variant schemes. The main objective of this proposed scheme is to make admission and evictions decisions jointly in order to improve the spectrum utilization efficiency and ensure the QoS for secondary users (SUs) and to provide better balance between the required SU's QoS and primary users' protection. Performance evaluation of the proposed scheme with its variants is studied and compared with other two previous schemes, known as basic CAC (BCAC) and queue-based CAC (QCAC), in terms of the QoS requirements, such as useful utilization and loss probability. Results show that the proposed CAEC achieves higher admitted traffic for SUs than BCAC and QCAC. In addition, it ensures higher system utilization without degrading the primary users' performance.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
February 2016, Volume 41, Issue 2, pp 461–477

An Approach for Determining Trustworthiness of Individuals in a Web-Based Social Network

- Sarbjeet Singh, Jagpreet Sidhu, Sarbjeet Singh, Jagpreet Sidhu,

Abstract

The role of Web-based social networks is increasing in our personal as well as professional life. We come across persons of varied natures, personalities, attitudes, beliefs, feelings, etc. A combined effect of extent of various personality attributes of a person creates an impression in one's mind about the trustworthiness of that person. The level of trust that one assumes about the other determines future course of action with that person. This paper discusses the need and importance of trust when one interacts with others in a Web-based social network. Trusting an untrustworthy may pose dangerous consequences. It is not easy to precisely and accurately measure trustworthiness of persons interacting within a Web-based social network. The interaction is virtual rather than face-to-face. Not only individuals but even groups can act maliciously and adversely affect other individuals, groups or communities. Hence, it is imperative to have a trust determination technique which enables users to determine trustworthiness of others. The approach presented in this paper makes use of fuzzy logic to handle imprecise and uncertain information and determines trustworthiness by taking into consideration various personality attributes of individuals like their attitude, behavior, beliefs, honesty, responsibility. Final trustworthiness is evaluated by considering not only the individual's perception but also taking feedback from independent third party and asking recommendations from peers. This makes determination of trust more accurate and reliable. The proposed approach has been simulated and validated using synthetic data set, and results show that it is flexible, is robust and can be adopted for the use in a Web-based social network for determining trustworthiness of participating peers, groups or communities.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
February 2016, Volume 41, Issue 2, pp 479–493

Preventive Policy Enforcement with Minimum User Intervention Against SMS Malware in Android Devices

- Abdelouahid Derhab, Kashif Saleem, Ahmed Youssef, Mohamed Guerroumi

Abstract

In this paper, we propose MinDroid, a user-centric preventive policy enforcement system against SMS malware in Android devices. The design of MinDroid takes into consideration the user's little understanding of the Android permission system. This can be done by deriving the policy rules from the behavioral model of the malicious SMS applications rather than adopting user-defined rules. MinDroid requires user intervention only during the first *T* time units from the application installation time. The user during this time period is notified to accept or reject the SMS-sending operations. MinDroid execution is specified as a finite state machine, and its security properties are formally proven using Metric Temporal Logic. We also show that MinDroid is resilient against threats trying to compromise its correct functionality. In addition, an analytical study demonstrates that MinDroid offers good performance in terms of detection time and execution cost in comparison with intrusion detection systems based on static and dynamic analysis. The detection efficiency of MinDroid is also studied in terms of detection rate, false positive rate, and ROC distance. A prototype implementation of MinDroid is tested under Android emulator.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
February 2016, Volume 41, Issue 2, pp 495–511

Energy-Aware Workflow Scheduling in Grid Under QoS Constraints

- Ritu Garg, Awadhesh Kumar Singh, Ritu Garg

Abstract

In this study, we have considered the problem of scheduling precedence-constraint parallel applications (workflows) in heterogeneous grid-computing environment. Recently many heuristics have been devoted to grid scheduling typically restricted to optimizing the execution time (makespan) only without paying much concentration on energy consumption. Reducing energy consumption can bring various advantages like reducing operating costs, environmental perspective and increase in system reliability. This paper aims to develop energy-aware task scheduling algorithm in grid based on the dynamic voltage and frequency scaling (DVFS) technique. The user negotiates with the service provider on their quality of service (QoS) requirements along with green computing specifications to reach the service level agreement. With the use of DVFS, the algorithm minimizes the energy consumption of task execution while satisfying the QoS constraints (deadline). The proposed static scheduling algorithm works in three phases: deadline distribution, tasks ordering and then assigning the best services to tasks along with selecting the appropriate voltage levels while meeting its sub-deadline. The simulation results using randomly generated task graphs and task graphs corresponding to real-world problems exhibit that the proposed algorithm achieves energy efficiency and reduces energy consumption up to 68 % with the increase in 30 % of the execution time.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 759–771

A New Kernel-Based Classification Algorithm for Multi-label Datasets

- Lahouari Ghouti

Abstract

With the emergence of rich online content, efficient information retrieval systems are required. Application content includes rich text, speech, still images and videos. This content, either stored or queried, can be assigned to many classes or labels at the same time. This calls for the use of multi-label classification techniques. In this paper, a new kernel-based multi-label classification algorithm is proposed. This new classification scheme combines the concepts of class collaborative representation and margin maximization. In multi-label datasets, information content is represented using the collaboration between the existing classes (or labels). Discriminative content representation is achieved by maximizing the inter-class margins. Using public-domain multi-label datasets, the proposed classification solution outperforms its existing counterparts in terms of higher classification accuracy and lower Hamming loss. The attained results confirm the positive effects of discriminative content characterization using class collaboration representation and inter-class margin maximization on the multi-label classification performance.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 773–784

User Authentication Based on Quantum-Dot Cellular Automata Using Reversible Logic for Secure Nanocommunication

- Jadav Chandra Das, Debashis De

Abstract

QCA is a new nanodevice to achieve logic circuit at nanoscale level. User authentication is a key issue in nanocommunication, to allow only authorized user to access data. Excessive heat dissipation of irreversible process caused the circuitry bound of CMOS-based circuit. Reversible logic is an alternative to these problems. Reversible circuits have very low heat energy dissipation which is ideally zero. This paper illustrates an optimized design of Fredkin gate using QCA. The proposed Fredkin gate has outshined the existing circuits in terms of area, cell count, and latency. The design of reversible user password authenticator circuit has been explored based on Fredkin gate. The quantum cost of this authenticator circuit is five. For the first time, QCA layout of proposed user authenticator is also achieved in this paper. The quantum cost of QCA-based authenticator circuit is 0.041. All the QCA circuits are precise in terms of QCA cell, device density, and clocking zones, i.e., latency. Theoretical values are compared with simulation results that justify the design accuracy of the proposed circuits. The computational functionality of the circuit under thermal randomness is estimated which establishes the stability of the proposed circuit. The estimation of energy dissipation proves that the proposed circuit dissipates very low energy. To achieve low-power nanoscale authenticator circuit, QCA is used to implement the reversible logic.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 785–796

An 8-Bit Unified Segmented Current-Steering Digital-to-Analog Converter

- Leila Sharifi, Masoud Nazari, Meysam Akbari

Abstract

In this paper, an 8-bit segmented current-steering digital-to-analog converter (DAC) is presented where the digital and analog parts are unified using current mode binary to thermometer decoder, resulting in a smaller chip area and simple layout scheme. In addition, the latch and driver circuits which are the main blocks of conventional current-steering DACs are eliminated in this design. Thus, the number of transistors in the digital part of DAC is reduced and higher sampling rate is obtained. Furthermore, the proposed current mode decoder has lower output voltage variation and consequently lower dynamic power dissipation. Finally, the proposed DAC is simulated in 0.18 μm CMOS technology with the 1.8 V supply voltage. The post-layout simulation results show that differential nonlinearity and integral nonlinearity errors are 0.034 and 0.024 LSB, respectively. In addition, the spurious-free dynamic range is 51 dB over 94 MHz output bandwidth at 500 MS/s. Moreover, the total power dissipation of the designed DAC is only 5.7 mW and the active area is small equal to 0.02 mm^2.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 797–806

Providing Quality of Service (QoS) for Data Traffic in Elastic Optical Networks (EONs)

- Forough Shirin Abkenar, Akbar Ghaffarpour Rahbar, Amin Ebrahimzadeh

Abstract

With the growth of users' traffic demands, the need for a network to flexibly assign the existing resources to the demands becomes an important challenging issue. Therefore, a specific generation of optical networks called elastic optical network (EON) has been introduced recently. EON can assign the available resources proportional to the requested amount of arriving demands. However, one of the important issues in EON which has not been addressed is the provision of quality of service (QoS) for data traffic. Blocking probability (BP), loss rate, delay and jitter are known to be well-known QoS parameters. Based on QoS-aware classification, the data traffic is divided into high-quality (HQ) and low-quality (LQ) traffic. Accordingly, the QoS for the HQ traffic is preferred to be guaranteed. Among mentioned QoS parameters, BP is the most critical metric which has to be carefully taken into consideration. In this paper, we propose two novel algorithms in order to provide QoS for data traffic and alleviate the BP for HQ traffic as QoS provision based on squeezing (QPS) and QoS provision based on fragmentation (QPF). The proposed algorithms, respectively, use reservation and preemption mechanisms to provide better QoS. The numerical results confirm that the QPF and QPS algorithms are capable of alleviating the blocking probability of HQ traffic at the expense of slight increase in blocking probability for LQ traffic.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3

Community Detection Utilizing a Novel Multi-swarm Fruit Fly Optimization Algorithm with Hill-Climbing Strategy

- Qiang Liu, Bin Zhou, Shudong Li, Ai-ping Li

Abstract

The community detection methods based on evolutionary algorithm have become a hot research topic in recent years. However, most contemporary evolution-based community detection algorithms need many parameters in the initialization process and are characterized by complicated computational processes, which are puzzled for users to have a better understanding of these parameters on the performance of corresponding algorithm. In this paper, we first propose a new community detection method utilizing multi-swarm fruit fly optimization algorithm (CDMFOA), which needs only a few parameters and has a simple computational process. Moreover, we adopt the multi-swarm fruit fly strategy and hill-climbing method in community detection algorithm in order to resolve the premature convergence and improve the local search ability of CDMFOA. Meanwhile, we separately utilize modularity and modularity density as objective function in the framework of the CDMFOA, named CDMFOA_Q and CDMFOA_D, so as to check their detection abilities and accuracies in partitioning communities of complex networks. The experimental results on synthetic and real-world networks show that CDMFOA can effectively detect community structure in complex networks. Besides, we also demonstrate that the CDMFOA_D performs better than CDMFOA_Q and other traditional modularity-based methods.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 829–840

Case Retrieval Algorithm Using Similarity Measure and Adaptive Fractional Brain Storm Optimization for Health Informaticians

- Poonam Yadav

Abstract

Managing and utilizing health information is recently a challenging task for health informaticians to provide the highest quality healthcare delivery. Here, storage, retrieval, and interpretation of healthcare information are important phases in health informatics. Accordingly, the retrieval of similar cases based on the current patient data can help doctors to identify the similar kind of patients and their methods of treatments. By taking into consideration this as an objective of the work, a hybrid model is developed for retrieval of similar cases through the use of case-based reasoning. Here, a new measure called parametric-enabled similarity measure is proposed and a new optimization algorithm called adaptive fractional brain storm optimization by modifying the well-known brain storm optimization algorithm with inclusion of fractional calculus is proposed. For experimentation, six different patient datasets from UCI machine learning repository are used and the performance is compared with existing method using accuracy and F-measure. The average accuracy and F-measure reached by the proposed method with six different datasets are 89.6 and 88.8%, respectively.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 841–852

A Hybrid of BFO and MCS Algorithms for Channel Estimation of Cognitive Radio System

- R. Manjith

Abstract

In orthogonal frequency division multiplexing (OFDM)-based cognitive radio (CR) systems, the subcarriers occupied by the licensed users are deactivated to avoid interference with rental users, owing to which the portion of the active subcarriers can be used for transmission of data signals and pilot tones. Further, the position of the activated subcarriers may also be non-contiguous. In such a system, the conventional pilot design methods are no longer effective. In this paper, a new pilot design method for OFDM-based CR systems has been proposed. The pilot design is formulated as a new optimization problem, where a simple objective function related to the mean square error of the least squares channel estimation method is minimized. An efficient scheme based on hybrid of bacterial foraging and modified cuckoo search optimization has been proposed to solve the optimization problem. In comparison with the existing methods, the simulation results of the pilot sequence obtained by the proposed method have been shown to be far superior.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 853–881

Search-Based Test Data Generator for Data-Flow Dependencies Using Dominance Concepts, Branch Distance and Elitism

- Sapna Varshney,Monica Mehrotra

Abstract

Software testing is a complex and expensive activity of the software development life cycle. Software testing includes test data generation according to a test adequacy criterion. The use of search-based techniques has been the focus of researchers to automate the process of software test data generation for structural control-flow criteria. Automating test data generation remains a challenging problem for more robust adequacy criterion such as satisfying data-flow dependencies of a program. This study proposes a search-based approach that generates test data for data-flow dependencies of a program using dominance concepts, branch distance, and elitism. Genetic algorithm is used for the proposed approach and Gray encoding is used to encode test data. A set of subject programs is taken from the research literature to evaluate efficiency and effectiveness of the proposed approach. For the proposed approach, the measures considered are the mean number of generations and mean percentage coverage achieved. The performance of the proposed approach is evaluated by comparing the results with those of random search and earlier studies on data-flow testing. Over several experiments, it is shown that the proposed approach performed significantly better than random search and earlier studies with respect to data-flow test data generation and optimization. There is an increasing performance gap for more complex subject programs.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 883–896

EpiGenetic Algorithm for Optimization: Application to Mobile Network Frequency Planning

- Serdar Birogul

Abstract

Genetic algorithms (GA) has been used as a successful algorithm for many problems. GA has been redesigned with different methods or used in hybrid algorithms to solve different problems and improve solutions. In this study, epigenetic algorithm (EGA) design has been made by adapting epigenetic concepts to the classical GA structure. GA is counted as a heuristic research algorithm, and there is randomness in the function of genetic operators. However, owing to some serious research in medical field, it has been shown that through the epigenetics, randomness of crossover and mutation operators can be defined. With regards to this information in the field of medicine, in this study design of EGA, how epicrossover, epimutation operators, and epigenetic factors are made and how they do work and also how the epigenetic inheritance is possible have been told. Our designed EGA has been applied on base stations' BCCH frequency planning in GSM network that is a constrained optimization problem. Real base station's data have been used in solving the problem. EGA and GA coding have been made by using C# programming. In order to analyze the success of EGA than the classical GA, both algorithms have been used in solving of this problem. Because of this, EGA gave better results in a shorter time and less iteration than classical GA's.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 921–934

Computerized Liver Segmentation from CT Images using Probabilistic Level Set Approach

- Maya Eapen, Reeba Korah, G. Geetha

Abstract

Accurate segmentation of patient's liver from his/her computed tomography–angiography (CTA) images is the preliminary component for a reliable computerized liver evaluation system. Flawlessness in liver diagnosis relies upon the precision in the segmentation of liver region from all the slices/images in a given patient dataset. Nevertheless, with the challenges like intensity similarity, partial volume effect of liver with its adjacent abdominal organs and liver shape variability across patients, achieving automated optimal liver region segmentation from acquired CT scans is difficult. This paper proposes a semisupervised liver segmentation technique, which adjusts the segmentation parameters for each patient through continuous learning of patient's CTA dataset properties in a Bayesian level set framework to address all the aforementioned challenges. In this framework, Bayesian probability model with spatial prior is utilized to initiate the level set and to derive an enhanced variable force and edge indication function that helps level set evolution to reach genuine liver boundaries in reduced time. The proposed model has been validated on standard MICCAI liver dataset, producing accuracy score of 79.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 935–940

A New Approximation Algorithm for *k*-Set Cover Problem

- Hanaa A. E. Essa, Yasser M. Abd El-Latif, Salwa M. Ali

Abstract

In the set cover problem (SCP), a set of elements $X=\{x_1, x_2, \ldots, x_n\}$ X={x1,x2,…,xn} and a collection $F=\{S_1, S_2, \ldots, S_m\}$ F={S1,S2,…,Sm} of subsets of X, for some integers $n,m \geq 1$ n,m≥1 , are given. In addition, each element of X X belongs to at least one member of F. The problem is to find a sub-collection $C \subseteq F$ C⊆F such that $\bigcup_{S \in C} S = X$ ⋃S∈CS=X and C has the minimum cardinality. When $|S| \leq k$ |S|≤k for all $S \in F$ S∈F , the k-set cover problem (k-SCP) is obtained. For all $k \geq 3$ k≥3 , the k-SCP is an NP-complete optimization problem (Karp in Complexity of computer computations. Plenum Press, New-York, pp 85–103, 1972). It is well known that a greedy algorithm for the k-SCP is a h_k hk -approximation algorithm, where $h_k = \sum_{i=1}^{k} 1/i$ hk=∑i=1k1i is the k *th* kth harmonic number. Since the SCP is a fundamental problem, so there is a research effort to improve this approximation ratio. In this paper, the authors propose an approximation algorithm which accepts any instance of the k-SCP problem as an input. This approximation algorithm is a $(1+1/k)$ (1+1k) -algorithm with a polynomial running time for $k \geq 6$ k≥6 that improves the previous best approximation ratio $h_k - 0.5902$ hk−0.5902 for all values of $k \geq 6$ k≥6 .

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 941–950

Attack and Improvement of the Fidelity Preserved Fragile Watermarking of Digital Images

- Ming Li, Di Xiao, Yushu Zhang

Abstract

Recent fragile watermarking is applied to protect the content integrity, to detect and locate the tampered area, and to recover the tampered data of digital images. Since the watermark which is made up of a considerable amount of digital data distorts the protected image seriously, attention has been drawn to fidelity preservation of the watermarked image. A typical watermarking scheme with fidelity preservation was proposed by Lin et al., in which the superiority is that high fidelity of the watermarked image can be guaranteed while retaining the tamper-proof functionality. However, no recovery capability is provided in the original scheme; therefore it cannot meet the requirement of recent watermarking applications. In addition, the original scheme is insecure. Any part of the protected image can be replaced with an arbitrary image by some simple operations, and the illegal modification could not be detected. In this paper, we attack the original scheme first and then overcome the insecurity problem by using a modified weighted-sum function; we also design an improved scheme with recovery capability by using the vector quantization technology, while maintaining the superiority of the original scheme, i.e., fidelity preservation. Experiments verify the feasibility of the proposed method.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 951–964

Improving Text Classification Performance with Random Forests-Based Feature Selection

- Sameen Maruf, Kashif Javed, Haroon A. Babri

Abstract

Feature selection (FS) is employed to make text classification (TC) more effective. Well-known FS metrics like information gain (IG) and odds ratio (OR) rank terms without considering term interactions. Building classifiers with FS algorithms considering term interactions can yield better performance. But their computational complexity is a concern. This has resulted in two-stage algorithms such as information gain-principal component analysis (IG–PCA). Random forests-based feature selection (RFFS), proposed by Breiman, has demonstrated outstanding performance while capturing gene–gene relations in bioinformatics, but its usefulness for TC is less explored. RFFS has fewer control parameters and is found to be resistant to overfitting and thus generalizes well to new data. It does not require use of a test dataset to report accuracy and does not use conventional cross-validation. This paper investigates the working of RFFS for TC and compares its performance against IG, OR and IG–PCA. We carry out experiments on four widely used text data sets using naive Bayes' and support vector machines as classifiers. RFFS achieves macro-F_1 values higher than other FS algorithms in 73 % of the experimental instances. We also analyze the performance of RFFS for TC in terms of its parameters and class skews of the data sets and yield interesting results.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 965–986

Generating UML Sequence Diagrams from Use Case Maps: A Model Transformation Approach

- Yasser A. Khan, Sajjad Mahmood

Abstract

Use case map (UCM) is a modeling language designed to bridge the gap between requirements and high-level design artifacts. UCM graphical models describe functional requirements as scenarios using a structure of components. UCM specifies multiple scenarios abstractly in a single integrated view that facilitates understanding of the system-to-be and the early detection of inconsistent scenarios. However, once requirements have been expressed as scenarios, unified modeling language (UML) sequence diagrams are suitable for developing and presenting the details of interactions and help in the transition to a more formal level of refinement. Typically, system analysts are responsible for this transition, and they usually perform it manually, which makes subsequent design models prone to mistakes. As a result, system analysts may design an application that does not accurately realize the behavior specified in UCMs. There is therefore a need to develop a technique to transform UCM models to UML design artifacts. UML sequence diagrams are one of the most popular UML artifacts for dynamic modeling. In this paper, we present a model transformation approach from UCM notation to a UML sequence diagram to facilitate the transition from requirements to high-level design artifacts. We also present an application of the proposed model transformation to an elevator control system.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 987–996

A Multi-wall and Multi-frequency Indoor Path Loss Prediction Model Using Artificial Neural Networks

- Aymen Ben Zineb, Mohamed Ayadi

Abstract

Indoor radio propagation prediction modeling has been for a long time an important area of interest in research and development. In the literature, many propagation models are classified into empirical and deterministic models. The accuracy of both categories of models can be improved based on model calibration or tuning that uses real measurements collected in a given environment and frequency. Based on the availability of a huge measurement database, we aimed in this paper to develop a new propagation model using artificial neural networks. The new model is inspired from multi-wall one and will be available for the most used system bands, such as GSM, UMTS and WiFi. The model will be a multilayer perceptron and is trained with measured data using a back-propagation learning algorithm. Evaluated model performances show a high improvement in terms of accuracy compared to a calibrated multi-wall model.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 997–1014

Design and Application of New Quality Improvement Model: Kano Lean Six Sigma for Software Maintenance Project

- G. ArunKumar, R. Dillibabu

Abstract

The continual changes in requirements impact the expectation about the quality of the product as well as the process, namely software project. In this paper, the various limitations that still exist in the software development process are presented. It is aimed to develop a new quality improvement model to enhance software quality without increasing effort, cost, and time. To achieve a software project of expected quality, a new quality improvement model, namely Kano Lean Six Sigma model (KLSS), is proposed. The KLSS model is used to identify the exact requirements for the software project from the customer's perspective. KLSS helps to categorize the requirements based on the nature of the defect, to eliminate the requirements of non-value processes and to implement the main functionality to meet the expectations of the customer. As regards our proposed software maintenance project, the method of development has been suitably tested in a leading IT company. The model has shown greater improvement in quality, cost, and efforts.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 897–920

XSS-SAFE: A Server-Side Approach to Detect and Mitigate Cross-Site Scripting (XSS) Attacks in JavaScript Code

- Shashank Gupta, B. B. Gupta

Abstract

Nowadays, Web applications are considered to be one of the most ubiquitous platforms for providing the information and service release over the World Wide Web, particularly those deployed in health care, banking, e-commerce operations, etc. Boom of social networking sites and modern Web applications that transfer dynamic information to the client-side Web browsers has increased the user-generated and feature-rich HTML content on the Internet. This enhanced HTML content includes a malicious attack vector for Web-related attacks. Cross-site scripting (XSS) attacks are presently the most exploited security problems in modern Web applications and activated by an attacker to utilize the vulnerabilities of the poorly written Web application source code. Users across all over the popular social networking Web sites are exposed to XSS attacks. These attacks are generally caused by the malicious scripts, which do not validate the user-injected input appropriately and exploit the vulnerabilities in the source code of the Web applications. It results in the loss of confidential information such as stealing of cookies, theft of passwords, and other private credentials. In this paper, we propose a robust framework known as XSS-SAFE (Cross-Site Scripting Secure Web Application FramEwork), which is a server-side automated framework for the detection and mitigation of XSS attacks. XSS-SAFE is designed based on the idea of injecting the features of JavaScript and introduced an idea of injecting the sanitization routines in the source code of JavaScript to detect and mitigate the malicious injected XSS attack vectors. We repeatedly inject the feature content, generate rules, and insert sanitization routines for the discovery of XSS attacks. We have evaluated our approach on five real-world JavaServer Pages (JSP) programs. The results indicate that XSS-SAFE detects and mitigates most of the previously known and unknown XSS attacks with minimum false positives, zero false-negative rate, and low runtime overhead.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 1015–1030

A New Approach to Access Control in Cloud

- Mansura Habiba, Md. Rafiqul Islam

Abstract

Managing access control to data in an authorized and authenticated way is still one of the key challenges in cloud security. In a complex environment like cloud, data owners and cloud service providers need to continuously monitor all data access activities (who is accessing which data) in order to prevent unauthorized access. In this research, we have developed a dynamic access control system for cloud computing environment along with policy conflict resolution algorithm and several authorization validation processes. Our proposed system includes four models, namely access right model, policy model, access control management model and authorization model. The proposed system introduces a more efficient security scheme using an enhanced authorization scheme. Our experimental analysis depicts that the proposed model can efficiently deal with the access control management in the cloud environment.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 1031–1041

Light Condition Estimation Based on Video Fire Detection in Spacious Buildings

- Yang Jia, Gaohua Lin

Abstract

In industrial applications in spacious buildings, video-based fire detection system needs to endure the excessive incoming light, which makes the video overexposed. So an adaptive flame segmentation and recognition algorithm is proposed to promote the adaptability and detection rate of the video-based fire detection system for a spacious building. First, moving foreground in a video is found and luminance of the moving region is calculated to estimate the light condition. For different light conditions, different flame-color segmentation models are selected adaptively. After a series of post-processes of segmentation, the suspect flame regions are extracted for feature analysis. Then, a trained support vector machine is implemented to distinguish flame and non-flame regions. The performance of the proposed algorithm is verified on a set of videos containing flames and interference. The adaptive flame segmentation model promotes the flame segmentation resulting in different light conditions. The results are compared with those of three other methods used in the literature, revealing the proposed method to have both a better segmentation result and better precision. In flame classification, the performance of five other methods has been compared with that of the proposed SVM method, and the result shows that the SVM classifier has the best stability and the accuracy is higher than most of the other tests. The proposed method achieves average detection rate of 95.0 %. The result shows that both the accuracy and robustness of segmentation have been improved and it is appropriate for industrial fire detection in spacious buildings.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 1043–1051

A Hybrid Feature Extraction Approach for Human Detection, Tracking and Activity Recognition Using Depth Sensors

- Shaharyar Kamal, Ahmad Jalal

Abstract

This paper presents spatiotemporal hybrid features, human tracking, and activity recognition into a single framework from video sequences captured by a RGB-D sensor. Initially, we received a sequence of depth maps to extract human silhouettes from the noisy background and track them using temporal human motion information from each frame. Then, hybrid features as optical flow motion features and distance parameters features are extracted from the depth silhouette region and used in an augmented form to work as patiotemporal features. In order to represent each activity in a better way, the augmented features are being clustered and symbolized by self-organization maps. Finally, these features are then processed by hidden Markov models to train and recognize human activities based on transition and emission probabilities values. The experimental results show the superiority of the proposed method over the state-of-the-art methods using two challenging depth images datasets.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 1053–1065

SVM-Based Predictive Modelling of Wet Pelletization Using Experimental and GA-Based Synthetic Data

- Mohammad Nadeem, Haider Banka

Abstract

A soft computing-based approach to capture the influence of process parameters on wet pelletization is presented. Wet pelletization is highly susceptible to even the minute change in operating conditions that results in substantial changes in product characteristics. This sensitive nature inspired research towards the development of new models for forecasting pellet attributes and increasing process understanding. The present modelling approach is based on support vector machine (SVM), a soft computing technique, to predict wet pellet characteristics and to analyse the effect of individual variable parameters. Experiments are carried out on a laboratory scale disc pelletizer with changing parameter values. However, experimental data were insufficient to train SVM and afterwards to test its prediction accuracy. To accomplish this task, genetic algorithm is employed to generate synthetic data and its fitness functions are derived using multiple regression. SVM is trained and validated on synthetic data while original data are used for testing. The significance of process parameters on pellet characteristics is also examined by deliberately removing them one by one from the model and recording the corresponding variation in prediction accuracy. The study employing SVM for the first time establishes the predictive ability of SVM with precision in wet pelletization.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 1067–1076

Improved Particle Swarm Optimization Based on Natural Flocking Behavior

- Shailendra S. Aote, M. M. Raghuwanshi

Abstract

Nature-based particle swarm optimization (NBPSO) is a technique which improves the performance of particle swarm optimization by using happenings in nature. It utilizes the concept of mature particles, which has the decisive ability to find out the solutions. In this paper, NBPSO is used for solving multidimensional and multimodal problems very easily, which are difficult to solve by other techniques. This new technique is proposed to move the swarm out of the stagnation region, by avoidance of taking reference of the global best particle, which causes the stagnation. The proposed technique also considers the direction of randomly selected two particles, which gives better acceleration to move away from the stagnation region. The algorithm is tested for 300 dimensions on 13 unimodal and multimodal functions from the test suit provided in AGPSO. Performance of NBPSO is compared with AGPSO1, AGPSO2, AGPSO3, IPSO, TACPSO and MPSO. To test the scalability, the proposed method is compared with CCPSO2 upto 1000 dimensions. Results and analysis show that NBPSO is highly competitive algorithms on higher-dimensional problems.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 1077–1090

A Geospatial Decision Meta-Model for Heterogeneous Model Management: A Regional Transportation Planning Case Study

- Wei Wang, Pengfei Li, Nengcheng Chen

Abstract

Many geospatial decision models exist for city-wide decision-making processes. Because of the heterogeneous characteristic of the models, it is challenging to share and reuse the decision models. To facilitate model sharing and reuse among organizations while considering the management of a distributed regional transportation planning model management system, this study proposes a geospatial decision meta-model to describe geospatial decision models in a unified way and discusses the development of five basic metadata components. The study also entails the design of the eleven-tuple model information description structure and an extension of the discrepant information of diverse decision models. A prototype system, the GeoDecisionModelManager, is designed and implemented to provide a common tool for modelling, registering, discovering and executing decision models described by the meta-model. A regional transportation planning scenario is used to test the versatility of the proposed meta-model and the applicability of the model's formal expression based on the eleven-tuple metadata framework, which incorporates different geospatial decision models from various organizations and applies them in a distributed environment. The results show that the proposed meta-model is applicable for modelling and managing various sources of geospatial decision models and that it facilitates model discovering, sharing and reuse in a distributed environment.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 1091–1107

Adaptive Difference Expansion-Based Reversible Data Hiding Scheme for Digital Images

- Hala S. El-sayed, S. F. El-Zoghdy

Abstract

In this research paper, an adaptive difference expansion-based reversible data hiding technique with the capability of embedding either three bits or two bits or one bit for each pixel and which can deal with color image is presented. To embed and extract data, the proposed technique has some salient features such as its capability to control the embedding capacity by using three global embedding parameters. These parameters are computed using the statistics of the embedded pixel surrounding pixels. Also, the data embedding steps in the proposed scheme can be reversed to completely retrieve the cover image free from any deformation. Furthermore, in the proposed technique, no reference images or memorization of the embedded pixel positions are needed in the data extraction process. A course of experiments is conducted, and the results demonstrated that the proposed technique outperforms other similar techniques in terms of payload capacity and PSNR.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 1129–1143

A Novel Seamless Handover Scheme for WiMAX/LTE Heterogeneous Networks

- E. Prince Edward, E. Prince Edward

Abstract

Acquiring seamless handover in IP multimedia subsystem (IMS)-based heterogeneous internetworking environment still remains an unsolved issue. It is highly difficult to achieve seamless handover with the conventional session initiation protocol (SIP) due to its poor performance during vertical handover. In this paper, a novel SIP-based scheme called SIP Prior Handover with a cross-layer design utilizing Media Independent Handover Services is modeled to reduce the IMS session re-setup delay in a Worldwide Interoperability for Microwave Access (WiMAX)/Long Term Evolution (LTE) heterogeneous environment. The proposed scheme further reduces the IMS session re-setup delay by reducing the number of SIP messages exchanged during vertical handover. We have developed a simulating environment using NS2 for a WiMAX/LTE interworking architecture and evaluated its performance. We have also developed a mathematical model for the IMS session re-setup delay based on queuing theory. The simulation results are compared for handover delay, packet loss, SINR and throughput. The proposed design shows an improvement of 18 % when compared with previous approaches during vertical handover from WiMAX to LTE and vice versa and suits well for supporting real-time applications to mobile users.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 1145–1160

OntoDiabetic: An Ontology-Based Clinical Decision Support System for Diabetic Patients

- P. C. Sherimon, Reshmy Krishnan

Abstract

Clinical decision support systems (CDSS) assist medical practitioners in their daily work, thereby enhancing the quality of care given to a patient. It supports them in the decision-making process and suggests appropriate treatments. The use of the ontology to build knowledge-driven decision support systems is widely adopted. Ontology is best suited to encapsulate the concepts and relationships of terms associated with the medical domain. It is suitable for capturing medical knowledge in a formal way, allowing sharing and reusing it whenever necessary. All concepts and relationships detailed in clinical guidelines can be implemented using Web Ontology Language (OWL). The reasoning mechanism is vital in any knowledge-based system. Ontology can be reasoned to recommend the suitable treatment for a patient by considering the current medical status of the patient. OntoDiabetic, an ontology-based decision support system is developed to assess the risk factors and provide appropriate treatment suggestions for diabetic patients. This paper focuses on the modeling and implementation of clinical guidelines using OWL2 rules and the reasoning process of the OntoDiabetic system. The case study is conducted for patients having the risk of overt cardiovascular disease, diabetic nephropathy and hypertension in primary health centers of Oman.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 1161–1172

Detection of SYN Flooding Attack in Mobile Ad hoc Networks with AODV Protocol

- K. Geetha, N. Sreenath, K. Geetha

Abstract

Mobile ad hoc networks (MANETs) play a vital role in ubiquitous computing. Multimedia communication is the main aspect of MANETs in emergency networks. Security is the major concern in such networks. MANETs are prone to many security problems because of their dynamic changing nature. One of the main attacks that affect any communication in a MANET is the denial-of-service attack. In this paper, such an attack called SYN flooding attack and its detection method are discussed. The presence of the SYN flooding attack in networks may not be identified correctly at an early stage. This leads to the denial of legitimate services at the multimedia server. An algorithm is presented in this paper to detect the presence of the SYN flooding attack at an early stage. The malicious node, instead of launching the SYN flooding attack, may try to delay the communication. This algorithm also finds such malicious nodes which try to affect the multimedia communication in MANETs by introducing unnecessary delays. The solution method involves game theory to form a game between the malicious node and the multimedia server node. The performance of the detection algorithm is verified by analyzing the various quality of service parameters relevant to multimedia communication.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
March 2016, Volume 41, Issue 3, pp 1173–1181

Speech Rhythm in L1 and L2 Arabic

- Ghania Droua-Hamdani, Sid-Ahmed Selouani

Abstract

This paper examines rhythm speech metrics in Modern Standard Arabic using the ALGASD and West Point corpora. While ALGASD includes only native (L1) speakers, West Point includes recordings of (L1) and non-native (L2) speakers. To reveal differences in rhythm metrics, measures are calculated for L1 speakers from both corpora. The rhythm metrics computed for each sentence are three interval measures (*V*, Δ*V*, and Δ*C*), two time-normalized indices (Varco*V*, Varco*C*), two pairwise variability indices (nPVI- *V*, rPVI- *C*) and compensation and control indices (CCI- *V*, CCI- *C*). A second experiment assessed patterns in rhythm metric properties of L2 speech. Comparisons are made between L1 speakers and L2 speakers who have English as their first language. The effect of gender on rhythm metrics is also tested for both L1 and L2 Arabic speakers. A comparison of vowel lengthening between L1 and L2 speech was also investigated. Results show significant differences between native and non-native in terms of speech rhythm either in consonants and in vowels durations.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 2771–2785

Reliable Communication Protocol for Applications in Multi-Robot Systems

- Shahabuddin Muhammad, Mayez Al-Mouhamed

Abstract

Multi-robot systems (MRSs) have a wide variety of applications, such as search and rescue in disaster scenarios, where many robots coordinate with each other to accomplish a task. Such MRS applications use infrastructureless environment in which robots rely on inherently unreliable ad hoc network to communicate with each other. Reliable communication among the peers can greatly enhance the performance of a multi-robot system. This paper proposes a reliable communication protocol (RCP) for applications in multi-robot systems. RCP acts as an interface between MRS applications and the underlying communication framework. RCP accepts data from MRS applications and reliably delivers it to other peers. RCP is transparent to MRS applications as well as the underlying communication hardware. To evaluate its performance, we have implemented RCP on seven Stargate micro-controllers that communicate with each other using an ad hoc network. Further, to test the performance of RCP in MRS applications involving higher number of peers, we have also implemented RCP on laptops with Intel *i*7 microprocessors. The obtained results show that RCP achieves reliability while reducing packet delivery time as well as the number of retries needed to deliver a failed packet.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

August 2016, Volume 41, Issue 8, pp 2787–2800
Research Article - Computer Engineering and Computer Science

Using AHP and Interval VIKOR Methods to Gateway Selection in Integrated VANET and 3G Heterogeneous Wireless Networks in Sparse Situations

- Majid Fouladian, Faramarz Hendessi, Mohammad Ali Pourmina

Abstract

Integrating vehicular ad hoc network and 3G networks helps to use suitable characteristics of networks in exchanging information. In the proposed integrated network, mobile gateways are used as gateways between two networks. Selecting optimum network and gateway is the key point in the phase of vertical handover decision-making process. The multi-criteria algorithms provide simultaneous attention to several important aspects of vertical handover process which improves system efficiency in accordance with the objectives of the defined heterogeneous network. In the proposed method, analytic hierarchy process method is used to determine the weights of the criteria and the modified VIKOR (from Serbian: VIseKriterijumska Optimizacija i Kompromisno Resenje that means: Multi-criteria Optimization and Compromise Solution, with pronunciation: VIKOR) method is used for decision making in heterogeneous networks. The simulation results show that the proposed algorithm is suitable for selecting the optimum gateway in a heterogeneous wireless networks and it improves the average number of vertical handovers, average delay, and throughput in sparse vehicular networks.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 2801–2811

Efficient Processing of the Skyline-CL Query

- Zhenhua Huang, Juan Zhang

Abstract

Given a set of *k*-dimensional objects, the skyline-CL query returns all clusters over skyline objects according to their cardinalities. A naïve solution to this problem can be implemented in two phases: (1) using existing skyline query algorithms to obtain all skyline objects and (2) utilizing the DBSCAN algorithm to cluster these skyline objects. However, it is extremely inefficient in real applications because phases 1 and 2 are all CPU-sensitive. Motivated by the above facts, in this paper, we present Algorithm for Efficient Processing of the Skyline-CL Query (AEPSQ), an efficient sound and complete algorithm for returning all skyline clusters. During the process of obtaining skyline objects, the AEPSQ algorithm organizes these objects as a novel *k*-ary tree $SI^{(k)}$-*Tree* which is first proposed in our paper, and employs several interesting properties of $SI^{(k)}$-*Tree* to produce skyline clusters fast. Furthermore, we present detailed theoretical analyses and extensive experiments that demonstrate our algorithm is both efficient and effective.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 2813–2819

Contentionless Architecture for Optical Interconnect (CAOI) in Data Center Network

- Mohsin Fayyaz, Khurram Aziz, Ghulam Mujtaba

Abstract

Emerging web-based and cloud computing applications are creating the need for powerful data center networks (DCN). Optical interconnects are replacing their electrical counterparts due to their benefits. An optical interconnect that eliminates contention is proposed, hereafter called CAOI. It eliminates electronic buffering and virtual output queues which reduces the latency. Fixed data rate is guaranteed under any traffic pattern. A large class of DCN applications can be supported by this architecture. Benefits of optical wavelength division multiplexing, optical code division multiple access and optical space division multiplexing are exploited. All-to-one communication is worst communication pattern encountered in any DCN application. The performance of the proposed architecture is compared for many-to-many and all-to-one communication pattern.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 2821–2835

Construction of Mixed Covering Arrays for Pair-wise Testing Using Probabilistic Approach in Genetic Algorithm

- Sangeeta Sabharwal, Priti Bansal

Abstract

In a system with large number of input parameters, it is necessary to check for errors that can occur as a result of interactions between various input parameters. However, checking of all possible combinations of input parameters is often restricted due to time and budget constraints. In order to overcome the constraints of exhaustive testing, combinatorial testing has been employed to generate optimal and efficient test set that covers all *t*-way combinations of input parameters. Pair-wise testing, a combinatorial testing technique, tests all possible combinations of each pair of input parameter values. In this paper, we present an efficient algorithm pair-wise test set generator using genetic algorithm (PTSG-GA) for generating test set for pair-wise testing. PTSG-GA is an extension of our previous work that applies genetic algorithm (GA) to generate optimal test set for pair-wise testing. In this paper, combinatorial objects, namely covering array (CA) and mixed covering arrays (MCA), are used to represent test set. The major contribution of algorithm PTSG-GA is that it uses a probabilistic approach to generate initial population of CAs/MCAs to improve the performance of GA. The algorithm PTSG-GA is implemented using an open-source tool PWiseGen. We have reported experimental results that illustrate the effectiveness of PTSG-GA as compared to existing state-of-the-art algorithms.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 2837–2846

Optimizing Discriminability of Globally Binarized Face Templates

- Eslam Hamouda, Osama Ouda

Abstract

Biometric systems are being increasingly deployed in various applications such as smartphones, passports and visa control, health cards, and crime investigation applications. Storing individuals' biometric templates in the biometric system database makes it susceptible to threats. As a result, many biometric template protection schemes have been proposed in order to provide the protection for the biometric data against unauthorized use. Extracting binary templates from real-valued biometric data is an important stage in biometric template protection systems. Moreover, representing biometric data as binary template can speed up the biometric template processing and reduce the storage capacity needed to store the enrolled templates. Global binarization schemes binarize the original real-valued biometric template using a series of transformation functions applied to the entire template. The main defy of any global binarization scheme is the generation of such transformation functions which optimize the within-class variance and between-class variance for the transformed binary template simultaneously. In this paper, we propose a global biometric data binarization scheme that utilizes genetic algorithm to optimize the within-class variance and between-class variance for the transformed binary template simultaneously, which retains the discriminability of the binary template. Experimental results using face data sets demonstrated promising recognition performance without violating the security needs of the biometric system.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 2847–2862

Mouse Movement and Probabilistic Graphical Models Based E-Learning Activity Recognition Improvement Possibilistic Model

- Anis Elbahi, Mohamed Nazih Omri, Mohamed Ali Mahjoub

Abstract

Automatically recognizing the e-learning activities is an important task for improving the online learning process. Probabilistic graphical models such as hidden Markov models and conditional random fields have been successfully used in order to identify a Web users' activity. For such models, the sequences of observation are crucial for training and inference processes. Despite the efficiency of these probabilistic graphical models in segmenting and labeling stochastic sequences, their performance is adversely affected by the imperfect quality of data used for the construction of sequences of observation. In this paper, a formalism of the possibilistic theory will be used in order to propose a new approach for observation sequences preparation. The eminent contribution of our approach is to evaluate the effect of possibilistic reasoning—during the generation of observation sequences—on the effectiveness of hidden Markov models and conditional random fields models. Using a dataset containing 51 real manipulations related to three types of learners' tasks, the preliminary experiments demonstrate that the sequences of observation obtained based on possibilistic reasoning significantly improve the performance of hidden Marvov models and conditional random fields models in the automatic recognition of the e-learning activities.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 2863–2881

Managing the Impact of UML Design Changes on Their Consistency and Quality

- Dhikra Kchaou, Nadia Bouassida, Hanene Ben-Abdallah

Abstract

Depending on the phase in which they come up, changes induce modifications on various software models and may cause model quality deterioration—e.g., incoherence among models, increased complexity. To handle efficiently model changes, every software development project must have a means to manage the impact of every change in one model on the remaining models. Toward this end, we herein present an automated approach that analyzes the effects of changes on the different software models, while considering their impact on the models' quality. Our approach adopts a graph-based traceability technique to identify change impact in terms of the necessary updates the relevant models must undergo to remain coherent, and the effects of the change/updates on the quality of the resulting models. It uses intra and inter UML diagrams' dependencies, best-practice guidelines, and a set of quality metrics. Evaluated quantitatively on three cases, our approach showed an average precision of 0.88 and recall of 0.95 in identifying the impacts of different types of changes.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 2883–2891

A Rule-Based Subject-Correlated Arabic Stemmer

- Mahmoud El-Defrawy, Yasser El-Sonbaty, Nahla A. Belal

Abstract

Arabic is a derivational language that provides invaluable features. Arabic roots are basic forms that are used to formulate words. They are limited sets that encapsulate the word's linguistic features. The knowledge of roots' frequencies is a valuable additional feature, especially when it is bound to a specific topic. This paper utilizes collision resulting from the stemming process where two or more words may have the same root. It minimizes the number of extracted roots within a specific subject using roots' frequencies and explores its effect on multiple roots disambiguation.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 2893–2902

Generative and Recognising Devices for Biological Processes

- M. Rashith Muhammad, C. Pavan Kumar, R. Selvakumar

Abstract

Studies on biological processes in nature are of great interest to researchers as it involves modelling and understanding processes using different perspectives. The proposed model emphasises on Formal Languages and Automata Theory. A generative device and a recognition device are designed to monitor biological processes. It is shown that the proposed models are capable of recognising the biological processes by using glycolysis in pancreatic β cells and glycogen metabolism in astrocytes. The acceptance or rejection state of recognising device monitors the completion of the defined processes. Generative device produces strings that represent set of enzymes significant for initiating the biological process. Such generative and recognising devices assist in designing of biocomputing machines at molecular level.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 2903–2910

A Generalized Distributed Delegate Object Model for E-com and M-com Applications

- N. Shenbagavadivu, I. Bremnavas, B. Lakshmi

Abstract

There is a growing trend toward the usage of mobile computing for several applications, and it is important that the mobile systems are given adequate support at both system level and communication level. The main aim of the proposed distributed delegate object model is to reduce the round trip time (RTT) of huge number of transaction request in E-Com and M-Com applications. Delegate object is a shared object which acts as a place holder for all valuable mobile business information and updates business-related information to the customer automatically. In conventional model, all transaction requests are forwarded to the server directly, whereas in the proposed model, all the transaction requests are handled by delegate object itself which acts as a middleware component thereby reducing the RTT. The proposed model is simulated and tested in thin client and thick client test bed. The result shows improvement in RTT for both thin client and thick client environments.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 2911–2926

CAL: A Controlled Arabic Language for Authoring Ontologies

- Hanan Elazhary

Abstract

Authoring OWL ontologies is hard for both domain experts and ontology engineers unless they have good knowledge of mathematics and logic. Thus, controlled natural languages (CNLs) have been proposed for easier authoring of ontologies via statements that can be automatically translated to OWL. Unfortunately, most of these languages are controlled English languages. Though they typically allow using non-English identifiers for representing concepts, instances (of concepts), and relationships, keywords remain English. This makes statements awkward and both hard and slow to read and write. Besides, error messages are generated in English only. Thus, this paper proposes the first controlled Arabic language (CAL) for authoring ontologies using Arabic words only. CAL is accompanied by a tool to allow translating CAL statements to OWL. Detailed error messages are also generated in Arabic. Besides, CAL is based on and has a similar syntax as the controlled English language Rabbit, and thus, statements can be easily translated between both languages allowing the cooperation of Arabic-speaking and English-speaking domain experts and ontology engineers in ontology authoring and validation, a capability which is absent in other CNLs. The advantages of CAL have been empirically tested to support our claim regarding the need to develop a controlled language corresponding to each natural language other than English. Nevertheless, an additional layer, NCAL, allows developing ontologies in a more-natural CAL in comparison with CAL. Many linguistic challenges and specific features of the Arabic language have been considered when designing both CAL and NCAL.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 2927–2943

An Efficient Approach for Processing Skyline Queries in Incomplete Multidimensional Database

- Ali A. Alwan, Hamidah Ibrahim, Nur Izura Udzir

Abstract

In recent years, there has been great attention given to skyline queries that incorporate and provide more flexible query operators that return data items (skylines) which are not being dominated by other data items in all dimensions (attributes) of the database. Many variations in skyline techniques have been proposed in the literature. However, most of these techniques determine skylines by assuming that the values of all dimensions for every data item are available (complete). But this assumption is not always true particularly for large multidimensional database as some values may be missing (not applicable during the computation). In this paper, we proposed an efficient approach for processing skyline queries in incomplete database. The experimental results show that our proposed approach has significantly reduced the number of pairwise comparisons and the processing time in determining the skylines compared to the previous approaches.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 2945–2955

Low-Power Multimodal Switch for Leakage Reduction and Stability Improvement in SRAM Cell

- M. Kavitha, T. Govindaraj, M. Kavitha

Abstract

Memory block occupies most of the integrated chip area and an improvement in memory cell performance will enhance the overall system performance. Ever increasing levels of on-chip integration of static random access memory (SRAM) increases leakage and degrades cell stability. In this paper a low-power multimodal switch (LPMS) power gating structure is proposed to minimize leakage and improve data stability in SRAM cell. The proposed design provides maximum of 91% reduction in leakage power and 23.5% reduction in dynamic power over conventional methods. Read and write margins are enhanced by 4.7 and 7.5% respectively. Proposed LPMS technique offers good leakage reduction and stability even under different operating parameter variations.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 2957–2973

Optimal Synthesis of Linear Antenna Arrays Using Modified Spider Monkey Optimization

- Urvinder Singh, Rohit Salgotra

Abstract

This paper presents a novel optimization technique named as modified spider monkey optimization (MSMO) for the synthesis of linear antenna array (LAA). The proposed method is inspired from a recently developed spider monkey optimization (SMO) swarm intelligent technique. The competitiveness of SMO has been already proved using numerical optimization functions. To improve the performance of SMO, a MSMO algorithm based on dual-search strategy is proposed in this paper. This approach generates a new solution using a search equation selected randomly from a candidate pool consisting of two search strategies. The performance of the proposed method is tested by applying it to find the optimal solutions for standard benchmark functions. Further, the capability and effectiveness is also proved by using it for practical optimization problem, i.e., synthesis of LAA for three different cases. Experimental results show that MSMO outperforms other popular algorithms like particle swarm optimization, cuckoo search, firefly algorithm, biogeography based optimization, differential evolution, tabu search and Taguchi method in terms of reduced side lobe level and faster convergence speed.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 2975–2986

Formal Specification and Verification of Few Combined Fragments of UML Sequence Diagram

- Nazir Ahmad Zafar

Abstract

UML has become a de-facto standard for design and development of object-oriented systems. On the other hand, UML includes various diagrams and notations which are missing of formal semantics. There does not exist much work to transform completely UML models to executable codes by any of the computer-aided software engineering tools because of the hidden semantics under the UML diagrams. Moreover, UML models cannot be used for automated analysis for validation and verification of the systems. Therefore, an integration of UML and semantics-based techniques such as formal methods is required to overcome such type of issues. Further, proof of correctness of software models plays a key role to ensure the quality of the final system to be developed. This paper presents a systematic method for transformation and verification of UML sequence diagrams into Z specification. The method works by translating and analysing few important combined fragments of sequence diagrams using Z notation. At first, formal specification of primary constructs is provided by capturing the hidden semantics under the diagram. Formal analysis of interaction operators namely options, alternatives, loops and break of the fragments is provided. The combined fragments are important because it allows multiple scenarios to increase an expressive power of sequence diagram by various control flows. Finally, formal analysis is provided by Z/Eves tool to check the syntax, type and proof for consistency and correctness of the specification.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 2987–3001

Extracting Discriminative Parts with Flexible Number from Low-Rank Features for Human Action Recognition

- Shijian Huang, Junyong Ye, Tongqing Wang

Abstract

In this paper, we make full use of the complementarity between low-rank feature and part-based feature and present a novel method extracting discriminative parts with flexible number from low-rank features for action recognition. The proposed method avoids some intermediate processing steps (e.g., actor segmentation, body tracking) required by many traditional methods and can greatly avoid memorizing background information suffered by traditional part-based methods. In addition, traditional part-based methods usually set a fixed and identical number of discriminative parts for all action categories neglecting the differences of recognizing complexity among different action categories. On the contrary, we automatically extract discriminative parts with flexible number for each action category by introducing group sparse regularizer into our model, which is more reasonable and effective. In our method, we first extract low-rank features of all action sequences and transform them into corresponding low-rank images. Then, we densely sample each low-rank image into a large number of parts in multi-scale and represent each part into a feature vector. Afterward, our model automatically learn a set of discriminative part detectors with flexible number for each action category. We further define new similarity constraints to force the responses of detected parts from the same class more similar and consistent and that from different class more different. Finally, we define a corresponding recognition criterion to perform final action recognition. The efficacy of the proposed method is verified on three public datasets, and experimental results have shown the promising results of our method for human action recognition.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3003–3025

Uncertainty-Based QoS Min–Min Algorithm for Heterogeneous Multi-cloud Environment

- Sanjaya K. Panda, Prasanta K. Jana

Abstract

With the advances in virtualization technology, cloud has become the most powerful and promising platform for business, academia, public and government organizations. The cloud users do not require to maintain any IT infrastructure such as hardware, software and network resources in their premises. They can rent the services on demand from anywhere in the world just by paying for that service. In cloud computing, task allocation is a well-known problem. Many algorithms have been developed for the same. However, task allocation in a heterogeneous multi-cloud environment is much more challenging due to the dynamic nature of the cloud resources. In this paper, we present an algorithm, called uncertainty-based quality of service (QoS) Min–Min (UQMM) algorithm which considers QoS based on uncertainty parameters in heterogeneous multi-cloud environment. To the best of our knowledge, this is the first paper which deals with the task allocation problem with uncertainty-based QoS in a heterogeneous multi-cloud systems. We perform extensive simulations on the proposed algorithm using benchmark as well as synthetic datasets and measure performance in terms of various metrics. The results are compared with the popular cloud min–min scheduling, cloud min–max normalization and smoothing-based task scheduling algorithm to show the effectiveness of the proposed algorithm. Moreover, we evaluate the results using two statistical tests, namely *t* test and ANOVA.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3027–3034

The Universal Approximation Capabilities of Cylindrical Approximate Identity Neural Networks

- Zarita Zainuddin, Saeed Panahian Fard

Abstract

Universal approximation capability of feedforward neural networks is one of the important theoretical concepts in artificial neural networks. In this study, a type of single-hidden-layer feedforward neural networks is presented. The networks is called feedforward cylindrical approximate identity neural networks. Then, universal approximation capabilities of the networks are investigated in two function spaces. Whereby the notions of cylindrical approximate identity and cylindrical convolution are introduced. The analyses are divided into two cases: In the first case, universal approximation capability of a single-hidden-layer feedforward cylindrical approximate identity neural networks to continuous bivariate functions on the infinite cylinder is investigated. In the latter case, universal approximation capability of the networks is extended to the *p*th-order Lebesgue integrable bivariate functions on the infinite cylinder.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3035–3049

Exploring the Effect of LUT Size on the Area and Power Consumption of a Novel Memristor-Transistor Hybrid FPGA Architecture

- M. Hassan Aslam, Umer Farooq, M. Naeem Awais

Abstract

Field-programmable gate arrays (FPGAs) have come a long way from being used as glue logic to complete system solution. This is mainly because of their generalized reconfigurable nature, low non-recurring engineering (NRE) cost, and rapid time to market. However, their advantages come at the cost of larger area and higher power consumption eventually making them unsuitable for area and power critical applications. In this work, we propose a novel memristor-transistor hybrid FPGA architecture. Memristor-transistor-based building blocks of FPGA architecture are designed and simulated using HSPICE in this work. Results show that hybrid blocks on average take 30.3 % less area and consume 64.3 % less power compared to transistor-only blocks. Hybrid blocks are combined together to construct logic blocks [i.e., look-up tables (LUTs) and configurable logic blocks] and routing switches of hybrid FPGA architecture. Furthermore, a generalized exploration environment is developed to explore the effect of LUT size on the area and power consumption of memristor-transistor hybrid FPGA architecture. For experimental purpose, sixteen largest MCNC benchmarks are used and LUT size is varied from three to seven. Experimental results show that LUT-4 gives the best area and power results for memristor-transistor hybrid FPGA architecture.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3051–3060

Three Types of Moment Invariants for Color Object Recognition Based on Radon and Polar Harmonic Transform in $C\ell$ (0, 2) Space

- Satya P. Singh, Shabana Urooj, Satya P. Singh

Abstract

Three novel invariant moments for color object recognition based on Radon transform and hypercomplex polar harmonic transform (PHT) are proposed. Quaternion Radon transform is analyzed, and quaternion Fourier slice theorem is introduced. Better compact representation of the image with good numerical stability than that of radon-based complex PHT is accomplished. The proposed technique can handle the color image in both inter-channel and intra- channel in a comprehensive manner. Two experiments are conducted for root-mean-square error (RMSE) and correct classification percentage (CCP) with different rotations and varying Gaussian noise. It is concluded that the proposed technique performs reasonably good for color object recognition in terms of RMSE and CCP. The reliable image description is achieved with the proposed technique.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3061–3070

Lossless Compression Algorithm Using Improved RLC for Grayscale Image

- S. Anantha Babu, P. Eswaran, C. Senthil Kumar

Abstract

Image compression plays a major role in video and audio image processing. Lossless image compression is used to reduce the volume of image data without compromising the image data quality. Keeping this demand in mind, the researchers around the world are attempting to attain a high compression ratio to modern communication technology. In the network computing, resource sharing and storing the image data has been a great challenge to computer society. The existing run-length coding (RLC) supports only for binary image and fails to give the reasonable compression ratio of non-repetition pixels. The source symbols are reduced by applying improved run-length coding (I-RLC) algorithm to get a high compression ratio. The proposed I-RLC model gets the original image and converts into a matrix format. The large-size matrix is divided into a number of non-overlapping small size block matrix. The small size blocks are carried out to achieve the compression ratio. This same process repeats the whole image block size. The proposed I-RLC algorithm is applied for different image formats to find out which method gives better results and quality. Whenever the proposed I-RLC method is applied to the sub-block wise, the computation time for 256 × 256 blocks takes 1.31 ms, while the block sizes reduced to 4 × 4, its timing is 0.01 ms. The proposed I-RLC algorithm is implemented for gray scale image. Finally, the compression ratio table is generated. The proposed I-RLC algorithm is tested and implemented through various parameters such as MSE, SNR and PSNR by using MATLAB Version 2013a.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3071–3080

A Novel Approach by Injecting CCG Supertags into an Arabic–English Factored Translation Machine

- Hamdi Ahmed Rajeh, Zhiyong Li , Abdullah Mohammed Ayedh

Abstract

This study addresses the integration and incorporation of rich additional information into the phrase-based approach, aptly called factored translation, which is an extension of phrase-based statistic machine translation (PBSMT). This approach was proven successful when translating English into a morphologically rich language. PBSMT represents the baseline of this work. We extend the phrase-based translation approach by integrating additional linguistic knowledge, namely part-of-speech (POS) tags, to create a factored model. The main contribution of this study is the creation of a new approach for Arabic–English translation via the injection of the factored model into Combinatory Categorial Grammar (CCG) supertags to form an integrated model (POS + CCG). The system was trained on a freely available multi-UN corpus on Arabic–English language pairs. Moses decoder, which is an open-source factored SMT system, was used to integrate these data into the target language model and the target side of the translation model. Results showed improvements to the BLEU automatic score via various high *n*-gram language models (LMs). The integration of the featured factors (POS + CCG) of the translation has been successfully tested. Overall, the 3-, 5-, 7-, and 9-g LM evaluation with BLEU scores proved that our integrated model performed better than PBSMT. Compared with three other models (PBSMT, POS, and CCG models), the integrated model improved the translation quality by 1.54, 1.29, and 0.21 %, respectively, over the 3-g LM.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3081–3088

Net-flow Fingerprint Model Based on Optimization Theory

- Cheng Lei, Hongqi Zhang, Yi Liu

Abstract

Net-flow fingerprint technique provides better efficiency in areas such as stepping stones detection and anonymous network correlation. Carrier capacity, robustness and invisibility are important indicators of net-flow fingerprint systems. In order to compare the efficiency of different net-flow fingerprint systems and help designing a more efficient system by finding capacity bounds and judging robustness and invisibility level, a net-flow fingerprint model based on optimization theory is proposed. Firstly, the proposed model covers all possible attack effects on net-flow fingerprint by reducing net-flow transformation problems to mergence, substitution and insertion, which improves the applicability of the model. Secondly, the proposed model establishes unified analysis criteria for robustness and invisibility, which, combined with different attack intensities, helps to divide robustness and invisibility into three levels, and then effectively and accurately measures them by goodness-of-fit test. What is more, the proposed model converts robustness, invisibility and net-flow transformation problems into different constraints. The maximum capacity under different conditions can be figured out by layered superposing corresponding constraints. Experimental results have confirmed the correctness, feasibility and expandability of the proposed model.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3089–3097

Syllable-Based Text Compression: A Language Case Study

- Stephen A. Adubi, Sanjay Misra

Abstract

Compression of texts has been widely studied by various researchers and in the process, several algorithms have been proposed. However, compression of texts using the syllabic structure of words in syllable-based languages has emerged as another dimension to the compression of texts. An algorithm for syllable extraction from words should be designed based on the structure of a language due to the ineffectiveness of the presently existing "universal" algorithms. Several syllable-based methods of compression proposed by different authors are reviewed in this work, including the methodologies used in achieving text compression. Finally, an algorithm for syllable extraction from words in the Yoruba language is presented and compared with four universal algorithms, recording the best result (100 % accuracy) among the five; the significance of this is that a dictionary of common syllables does not need to be created to achieve syllable-based text compression on the Yoruba Language.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3099–3112

2S-FAT-Based DLS Model for Cloud Environment

- Sivakami Raja, Saravanan Ramaiah

Abstract

In the current era of technology, cloud computing is an indispensable jargon due to its theoretically boundless resources. But from consumer's point of view, knowing the trust level of cloud service providers is significant for privacy and security reasons. Toward trusted cloud computing, we first propose a Two-Stage Fuzzy and Ant colony optimization based Trust assessment model for a cloud environment which is then integrated with an existing Dynamic Level Scheduling (DLS) algorithm for scheduling and executing consumers' jobs. To demonstrate the effectiveness of our model, a benchmark is developed in Cloudsim and experiments are conducted against the metric-based DLS model. Results are analyzed in terms of trust index, undecidability, success rate, average schedule length, execution time, precision and recall values.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3113–3126

Recognition Framework for Inferring Activities of Daily Living Based on Pattern Mining

- Shamila Nasreen, Muhammad Awais Azam, Usman Naeem

Abstract

Ambient assisted living applications are very much dependent on robust activity recognition frameworks, which allow these applications to provide services based on the contextual information that has been discovered. Existing frameworks have generally focused on the application of traditional classifiers and semantics reasoning to recognize activities. Nevertheless, being able to recognize unexpected actions remains a challenge. The work in this paper presents an approach that is able to recognize activities that have been conducted in an unordered manner. The recognition framework extends an existing approach that recognizes activities by exploiting the different levels of abstraction within an activity. A frequent pattern mining algorithm has been applied to the recognition framework in order to find patterns within the stream of captured events, which in turn increases the adaptive learning ability of the proposed recognition framework. This paper also presents experimental results that validate the recognition ability of the recognition framework. The motivation of this work is to be able to detect the functional decline among elderly people suffering from Alzheimer's disease by recognizing their daily activities.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3127–3137

Multiclass ELM Based Smart Trustworthy IDS for MANETs

- Devendra Singh, S. S. Bedi

Abstract

The dynamic nature of MANET makes it susceptible to several security breaches. A system that observes these kinds of unwanted activities is known as intrusion detection system (IDS). An IDS is responsible to alert the network, in case of any threat observation. This paper broadens the scope of IDS by considering intrusion response also. The proposed work is organized into several phases such as feature selection, trust degree computation, classification and decision making. Intelligent agents are employed to handle all the aforementioned phases. Features of KDD Cup ’99 are reduced from 41 to 17 to minimize the training time and to improve the accuracy of the system. Feature selection is achieved by information gain ratio. The trust degree is computed by the combination of packet delivery ratio, behavior and available energy of a node. The trust degree parameters are vital elements in the classification and the decision-making phase. Extreme learning machine (ELM) is employed as the classifier to categorize nodes into trustworthy, partially trustworthy and malicious. The performance of the system is evaluated in different scenarios such as with/without feature selection and with/without trust degree computation, with respect to detection accuracy, misclassification rate and detection time. The classification accuracy of SVM, MLP, ELM and ELM with trust is also compared.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3139–3151

A Multi-functional Multi-precision 4D Dot Product Unit with SIMD Architecture

- Shiann-Rong Kuang, Chih-Yuan Liang, Ming-Fong Chang

Abstract

The floating-point (FP) four-dimensional vector inner product (4D dot product; DP4) is one of the most frequently performed operations in 3D graphics applications. Therefore, the hardware implementation of FP DP4 unit can be used in modern graphics processing units (GPUs) to speed up the performance. Unfortunately, the FP DP4 unit is power hungry and how to reduce its power consumption becomes very critical for the mobile GPUs. In this paper, a multi-functional multi-precision DP4 unit with single instruction multiple data (SIMD) architecture is proposed. Instead of additional discrete FP multipliers, adders, and multiply-add-fused units, the proposed architecture can perform not only one-way DP4 but also four-way multiplication, addition, and multiply-add-fused operations to decrease the hardware area. In addition, the proposed architecture can perform the above-mentioned FP operations with four precision modes (i.e., 23-, 18-, 13- and 7-bit modes) to reduce the power and energy consumptions when a little image distortion is allowable. The proposed design is fully pipelined with a latency of three cycles, a throughput of one cycle, and a cycle time of 2.8 ns in 90 nm CMOS technology. When compared with the one-precision DP4 unit, the proposed multi-precision DP4 unit can save about 7.2, 18.5, 32.2, and 49.6 % power consumption on average for 23-, 18-, 13- and 7-bit precision modes, respectively, at the expense of 3.7 % more area and 7.7 % longer delay.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3153–3161

A Novel Reversible Data Hiding Algorithm Based on Probabilistic XOR Secret Sharing in Wavelet Transform Domain

- Engin Avci, Turker Tuncer

Abstract

In recent years, a lot of data hiding algorithms have been proposed in the literature. Providing high payload capacity, high visual quality, and robustness is the main aim of data hiding algorithms. However, high visual quality and high payload capacity are inversely proportional. For this reason, we used a probabilistic method. Probabilistic method is one of the soft computing methods. In this paper, a new data hiding algorithm based on probabilistic XOR secret sharing (PXORSS) in lifting wavelet transform (LWT) domain is proposed for providing high capacity and high visual quality. Previous studies have used cover images as RGB images or multiple grayscale images. LWT is proposed to use secret-sharing-based data hiding algorithms with a single grayscale cover image. In the proposed method, we used low–high (LH), high–low (HL), and high–high (HH) high-pass filter bands as cover images, and the secret data are divided into three secret shares by using PXORSS scheme. The least distorted pieces of probabilities are embedded into the high-pass filter bands as the secret share of the host image. We obtained high capacity and high visual quality in LWT domain by using the proposed method.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3163–3176

Provably Secure Pairing-Free Identity-Based Partially Blind Signature Scheme and Its Application in Online E-cash System

- SK Hafizul Islam, Ruhul Amin, G. P. Biswas

Abstract

The blind signature scheme permits the user to acquire a signature from the signer; however, the message and the final signature are unknown to the signer. In any partially blind signature (PBS) scheme, the signer is allowed to explicitly incorporate the common information in the signature based on some agreements with the user, however, without compromising the blindness property. Recently, many PBS schemes have been designed by using either certificate authority-based public infrastructure (CA-PKI) or bilinear pairing along with map-to-point hash function. The CA-PKI-based PBS scheme needs huge computation and storage to keep the public keys and the certificates. Note that the pairing and map-to-point hash function are costly operations. Thus, the ID-PBS scheme without pairing is more appropriate for real environments and this paper has come up with an efficient pairing-free ID-PBS scheme. The designed scheme is rigorously examined in the random oracle model, which substantiated that it is provably secure. We also proposed an online e-cash system using our ID-PBS scheme, in which the bank agreed on a common piece of information with the customer and blindly signed some messages. Note that our e-cash system has the properties of unforgeability, unlinkability, non-deniability and prevention of double-spending of e-cash.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3177–3186

User Interest Detecting by Text Mining Technology for Microblog Platform

- Hongjian Guo, Yifei Chen

Abstract

In recent years, the popularity of the microblog platform has grown rapidly and through which many users are able to communicate. In this paper, we concentrate on automatic user interest detection, which is an important issue in personal information recommendation. Firstly, a dynamic topic model for user interest detection is presented. In this model, topics can be detected in different timestamps and the words with highest probability in each topic can be regarded as the user interests. Secondly, an algorithm for detecting user interest is proposed. The key ideas of our algorithm lie in that topics with the highest probability should be obtained in advance, and then, the words with highest probability in each topic can be extracted as user interests. Particularly, to promote performance of the topic model we present a density-based optimal topic number selection algorithm. Finally, performance evaluation experiments are conducted where a dataset is crawled from Sina Weibo from 6 months. The experimental results demonstrate that (1) our proposed algorithm can dynamically detect user interest with time changing and (2) user interest detection accuracy of our proposed method is higher than other methods.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3201–3213

Provably Secure Threshold-Based ABE Scheme Without Bilinear Map

- Arijit Karati, Ruhul Amin

Abstract

In several distributed environments, users can decrypt a secret message using a certain number of valid attributes or credentials. Attribute-based encryption (ABE) is the most promising technique to achieve such fine-grain access control. In recent years, many ABE schemes have been proposed, but most of them are constructed based on the concept of pairing and secret sharing scheme. This paper aims at presenting a pairing-free threshold-based ABE scheme (PT-ABE) over multiplicative group. The propose work is secured under the standard decisional Diffie–Hellman (DDH) assumption, and both error-tolerant and collusion-free. The scheme does not consider random oracle operation to prove its security. We compare the PT-ABE scheme with other relevant ABE schemes and find that our scheme is much more efficient and flexible than others. Besides, we propose a protocol based on PT-ABE scheme and show that PT-ABE is perfectly suitable in cloud environment to provide cloud security. To the best of our knowledge, the proposed scheme should be implemented in real- life distributed scenarios, as it is well secured, flexible and perform better than existing ones.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3215–3229

Practical Design of a Path Following for a Non-holonomic Mobile Robot Based on a Decentralized Fuzzy Logic Controller and Multiple Cameras

- Emad A. Elsheikh, M. A. El-Bardini, M. A. Fkirin

Abstract

This paper proposes an implementation of a practical model-free path planning and path following algorithm for a non-holonomic indoor wheeled mobile robot using multiple cameras and a decentralized fuzzy logic controller. The proposed algorithm is divided into three stages. The first stage uses the multi-stencils fast marching (MSFM) path planning method. In general, the path resulted from the direct implementation of fast marching methods does not guarantee to be safe or smooth. Subsequently, the robot can touch corners, walls and other obstacles. The proposed algorithm adds a preprocessing stage before the MSFM planning method, based on robot dimensions in order to solve such problem. The second stage uses the visual information extracted from the images captured by multiple cameras, in order to estimate the position and orientation of the mobile robot at each frame. The third stage uses a decentralized control strategy, with three identical proportional derivative-like fuzzy logic controllers (PD-like FLC) connected in parallel, as a path follower to keep up the robot on the desired path. The obtained experimental results in this paper show that the developed design is capable of estimating the shortest path efficiently, while avoiding obstacles and guiding the robot to follow the path in real time.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3231–3238

Bandwidth and Mutual Coupling Analysis of a Circular Microstrip MIMO Antenna Using Artificial Neural Networks

- K. Sri Rama Krishna

Abstract

A ground plane reduced circular microstrip antenna resonating at multiband of frequencies 3.5, 5.2, 6.3 and 8.4 GHz is developed. The proposed antenna gives a wide impedance bandwidth of 75% in the frequency range 3.2 to 7 GHz, covering a part of the UWB operating frequency range. The antenna is coaxially fed, supported by a rectangular strip above the ground plane. The effect of strip width on the variation in impedance bandwidth of the proposed antenna is studied using artificial neural networks, and a comparative study is made. A 2×2 2×2 multiple input multiple output system is designed using the developed antenna, and the mutual coupling of the proposed antenna system is analyzed for various separations and frequencies by using artificial neural networks.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3239–3253

A Novel Flow Regulation Protocol to Optimize the End-to-End Performance and Fairness Over LEO Satellite Network

- J. Govindarajan, G. Kousalya

Abstract

The major challenge in the utilization of satellite network for the Internet access is its differing nature with wired network. To increase the performance of TCP-based applications over satellite network, performance enhancement proxies (PEP) had been incorporated. However, the existing PEP solutions have violated the end-to-end semantics of Internet applications. To solve this problem and to meet the future needs of the communication network, next-generation transport architecture (Iyengar and Ford in flow splitting with fate sharing in a next-generation transport services architecture, 2009; in A next-generation transport services architecture, 2009. http://tools.ietf.org/html/draft-iyengar-ford-tng-00) has been proposed. In this architecture, flow regulation functions (flow regulation layer) are factored out from end-to-end best delivery (endpoint layer). As a contribution to this research direction, we propose a novel flow regulation protocol to control the flows in terms of congestion, error and fairness over the Low Earth Orbit satellite environment. Simulation results reveal that the proposed protocol can provide optimized end-to-end performance (high throughput, high goodput and high information efficiency) without violating end-to-end semantics, and it also meets the network-level objective of fairness among the flows.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3255–3266

A Novel Algorithm for Imbalance Data Classification Based on Genetic Algorithm Improved SMOTE

- Kun Jiang, Jing Lu, Kuiliang Xia

Abstract

The classification of imbalanced data has been recognized as a crucial problem in machine learning and data mining. In an imbalanced dataset, there are significantly fewer training instances of one class compared to another class. Hence, the minority class instances are much more likely to be misclassified. In the literature, the synthetic minority over-sampling technique (SMOTE) has been developed to deal with the classification of imbalanced datasets. It synthesizes new samples of the minority class to balance the dataset, by re-sampling the instances of the minority class. Nevertheless, the existing algorithms-based SMOTE uses the same sampling rate for all instances of the minority class. This results in sub-optimal performance. To address this issue, we propose a novel *genetic algorithm*-based *SMOTE* (GASMOTE) algorithm. The GASMOTE algorithm uses different sampling rates for different minority class instances and finds the combination of optimal sampling rates. The experimental results on ten typical imbalance datasets show that, compared with SMOTE algorithm, GASMOTE can increase 5.9% on *F*-measure value and 1.6% on *G*-mean value, and compared with Borderline-SMOTE algorithm, GASMOTE can increase 3.7% on *F*-measure value and 2.3% on *G*-mean value. GASMOTE can be used as a new over-sampling technique to deal with imbalance dataset classification problem. We have particularly applied the GASMOTE algorithm to a practical engineering application: prediction of rockburst in the VCR rockburst datasets. The experiment results indicate that the GASMOTE algorithm can accurately predict the rockburst occurrence and hence provides guidance to the design and construction of safe deep mining engineering structures.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3267–3277

Reconfigurable Hardware Accelerator for Profile Hidden Markov Models

- Atef Ibrahim, Hamed Elsimary, Abdullah Aljumah

Abstract

We propose a processor array accelerator for profile hidden Markov models of the Viterbi algorithm. The proposed processor array has the advantage that it can be modified to enable hardware reuse rather than replicating processing elements of the processor array on a cluster of FPGAs. Also, it has the advantage of reducing the area overhead of the FPGA compared to the previously published conventional processor arrays. This allows for increasing the number of processing elements and the system throughput. The proposed processor array and the previously reported conventional one are coded using the VHDL language and implemented using the FPGA technology. The implementation results showed that the proposed design achieves 1.31× to 1.75×speedup and saves area ranging from 24.4 to 34.0% over the conventional design for profile HMM query lengths ranging from 38 to 2295.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3187–3199

A Hyper-Geometric Trust Factor Based Markov Prediction Mechanism for Compromised Rendezvous Point in MANET

- S. Parthiban, Paul Rodrigues

Abstract

In Mobile Ad hoc Network, reliable communication during multicasting depends on the root node or the rendezvous point of the multicast tree. But, any compromised root node poses a significant threat to the network that affects the reliability of packet delivery as the packets relayed from the upstream nodes to the downstream nodes are dropped in large numbers. A Markov based prediction model that forecasts the possibility of a mobile node to get infected by a rendezvous point attack is examined.This paper presents a Hyper-geometric Trust Factor based Markov Prediction Mechanism (HTFMPM) for mitigating rendezvous point attack that quantifies the influence of this attack in the context of multicast routing activity. This HTFMPM mechanism utilizes a Markov process for predicting the possibility of a mobile node getting compromised through rendezvous point attack using hyper-geometric distribution. Extensive simulations were conducted using ns-2 simulator and the results indicate that the rate of detection of rendezvous point attack using HTFMPM is 32% more rapid than that of the existing three benchmark mitigation mechanisms like Co-operation Of Nodes Fairness In Dynamic Ad-hoc NeTworks, Correlated Node Behavior Model and Probabilistic Behavior Model. In addition, the proposed hyper-geometric approach identifies that a co-operative mobile node gets converted into a compromised rendezvous point node within an average time of 6.23 s.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
August 2016, Volume 41, Issue 8, pp 3279–3295

Scheduling of Parallel Tasks with Proportionate Priorities

- Muhammad Khurram Bhatti, Isil Oz, Konstantin Popov

Abstract

Parallel computing systems promise higher performance for computationally intensive applications. Since programmes for parallel systems consist of tasks that can be executed simultaneously, task scheduling becomes crucial for the performance of these applications. Given dependence constraints between tasks, their arbitrary sizes, and bounded resources available for execution, optimal task scheduling is considered as an NP-hard problem. Therefore, proposed scheduling algorithms are based on *heuristics*. This paper presents a novel list scheduling heuristic, called the *Noodle* heuristic. Noodle is a simple yet effective scheduling heuristic that differs from the existing list scheduling techniques in the way it assigns task priorities. The priority mechanism of Noodle maintains a *proportionate fairness* among all ready tasks belonging to all paths within a task graph. We conduct an extensive experimental evaluation of Noodle heuristic with task graphs taken from Standard Task Graph. Our experimental study includes results for task graphs comprising of 50, 100, and 300 tasks per graph and execution scenarios with 2-, 4-, 8-, and 16-core systems. We report results for average Schedule Length Ratio (SLR) obtained by producing variations in Communication to Computation cost Ratio. We also analyse results for different degree of parallelism and number of edges in the task graphs. Our results demonstrate that Noodle produces schedules that are within a maximum of 12 % (in worst-case) of the optimal schedule for 2-, 4-, and 8-core systems. We also compare Noodle with existing scheduling heuristics and perform comparative analysis of its performance. Noodle outperforms existing heuristics for average SLR values.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 4967–4979

Prayer Activity Monitoring and Recognition Using Acceleration Features with Mobile Phone

- Reem Al-Ghannam, Hmood Al-Dossari

Abstract

The increasing inclusion of sensors in mobile smartphones opens up new avenues for data mining applications for activity recognition. The objective is to detect the actions of one or more users from a series of observations regarding users' body movements. In this project, we introduces a mobile-based application to monitor and recognise prayer activities (i.e. standing, bowing, prostration and sitting) using mobile phone acceleration features to determine the correctness of the prayer (i.e. the completeness and order of activities). The accelerometer data were collected for six prayers, totalling 118 samples, representing four main prayer activities. The collected data were used to train and test supervised machine learning algorithms to extract and recognise the prayer activities. Our experiments show that the prayer stages can be extracted and recognised accurately using machine learning algorithms. The WEKA machine learning toolkit was used to test classifiers using the features extracted from the accelerometer data. Three different classifiers were tested: Naive Bayes, IB1 Algorithm and the J48 Decision Trees and their accuracy exceeded 90 %.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 4981–4993

Imputation of Discrete and Continuous Missing Values in Large Datasets Using Bayesian Based Ant Colony Optimization

- R. Devi Priya, R. Sivaraj, R. Devi Priya

Abstract

When preparing large databases, obtaining quality data for analysis without any missing values is almost impossible in many cases. Integration of raw data from multiple heterogeneous sources often results in some values missing leading to loss of valuable information. Even though many methods have been introduced by researchers, only less effort has been spent on handling missing values in heterogeneous attributes (both discrete and continuous) under Missing At Random pattern, the common scenario where missing values have dependency on covariates in the dataset. Also, only few techniques are capable of dealing with missing values in large databases and this demands immediate attention of researchers. This paper addresses both these problems by introducing a single technique called Bayesian Ant colony Optimization (BACO) which combines the searching capability of Ant Colony Optimization with probabilistic nature of Bayesian principles. The algorithm is designed in such a way that missing values in both discrete and continuous attributes in large datasets are efficiently imputed. BACO is implemented in six large real datasets, and it is observed that its imputation accuracy outperforms than that of existing standard techniques. The statistical tests conducted also prove the superior results of BACO in the imputation process.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 4995–5008

Frequency-Domain Backoff Mechanism for OFDM-Based Wireless LANs

- Sheeraz A. Alvi, Adeel Baig

Abstract

Modern wireless communication technologies enabled high data rate support which stands in need of proficient MAC protocols. In WLANs, the fair channel access and collision avoidance are achieved by employing contention. The contention period degrades bandwidth utilization and longer delays; the network performance worsens for high data rates. Previously, this problem is addressed by modifying or adaptively selecting contention time using the same time-domain-based backoff mechanism. In this paper, we propose a backoff scheme, FD-Backoff, in which backoff is taken in the frequency domain. Therein, an integer is assigned to every data subcarrier, and then, a random data subcarrier (integer) is chosen to transmit a RTS packet. Since OFDM-based data subcarriers are orthogonal, thus simultaneous transmission of multiple RTS packets is possible. Every nontransmitter node listens on the whole channel bandwidth to observe any active subcarriers. The transmitter who chose smallest subcarrier for RTS transmission wins channel access and receiver replies it with a CTS packet. Contrary to the IEEE 802.11 backoff mechanism, the proposed backoff scheme offers lesser and relatively fixed contention overhead. Performance analysis based on analytical and simulation study suggests that the proposed scheme promises lower contention overhead and higher efficiency gain (up to 35 %) as compared to standard channel access mechanism.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 5009–5025

Modeling and Analysis of Software Fault Detection and Correction Process Through Weibull-Type Fault Reduction Factor, Change Point and Imperfect Debugging

- Subhashis Chatterjee, Ankur Shukla

Abstract

Fault reduction factor (FRF) is one of the most important factors which plays a vital role in software reliability growth. In the past, few studies on the influence of different environmental factors into FRF have been carried out. In these studies, FRF has been defined using some particular functions such as constant, increasing, decreasing and inflection S-shaped. These functions may not be realistic and reasonable to represent the actual behavior of FRF. Therefore, in this study, it has been tried to represent the realistic behavior of FRF using Weibull curve. Moreover, a new approach of software reliability modeling has been proposed in which FRF has been incorporated in fault detection and correction process. Thus, in this paper, a general frame work of software reliability growth model (SRGM) has been proposed considering the fault detection and correction process. The concepts of imperfect debugging and change point have also been incorporated in the present study. Different parameters of the proposed SRGM are estimated using the SPSS and ‘R’ software. Different comparison criteria have been used for comparison of the proposed SRGM with other existing SRGMs. Chi-square goodness-of-fit test has been used for validation of the proposed SRGM.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 5027–5036

Robust Proportional Control for Trajectory Tracking of a Nonlinear Robotic Manipulator: LMI Optimization Approach

- Ali Hussien Mary, Tolgay Kara

Abstract

This paper proposes a new control configuration that is simple, model free and robust for trajectory tracking control of a multi-input–multi-output nonlinear robotic manipulator system. The proposed controller consists of two terms. The first term is a linear controller in proportional (P) control structure, and the second term is a nonlinear robustness term in sliding mode structure. This combined nonlinear controller exploits the simplicity and easy implementation properties of proportional-integral-derivative control and robustness properties of the sliding mode control (SMC) against system uncertainties and parameter variations. Important feature of the proposed controller is avoiding the need to determine the accurate dynamic model of the plant, which is a necessity in standard SMC. Stability analysis is performed, and stability in closed loop is proved for the proposed control method. A control problem is restated as a convex optimization problem based on linear matrix inequality technique, and optimal gain of P controller is obtained. A simulation model of the plant is built in MATLAB–Simulink environment for testing the proposed controller. Closed-loop system performances are observed for standard SMC, computed torque control, SMC with proportional-derivative control and proposed control. Simulation results reveal the effectiveness of proposed method in response to system uncertainties, random noise and external disturbance.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 5037–5047

An Experimental Evaluation of the EDoS-Shield Mitigation Technique for Securing the Cloud

- Saeed Alsowail, Mohammed H. Sqalli, Marwan Abu-Amara

Abstract

Security of cloud services is of utmost importance for contemporary cloud providers. In addition to the traditional malicious attacks that have targeted cloud datacenters in the past, new and persistent threats have changed the landscape of cyber-attacks in recent times. Economic Denial of Sustainability (EDoS) attacks are one of such variant attack types with serious implications and consequences. Such attacks exploit the scalability and elasticity characteristics of the cloud to enforce unwanted resource allocation with the aim of causing economic losses to the cloud service owner. In this paper, we present an experimental study to evaluate the effectiveness of the popular EDoS-Shield technique which is designed to mitigate EDoS attacks. The effectiveness of EDoS-Shield is studied in terms of the needed VM compute resources, response time, and CPU utilization.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 5049–5059

A Machine Learning System for the Diagnosis of Parkinson's Disease from Speech Signals and Its Application to Multiple Speech Signal Types

- İsmail Cantürk, Fethullah Karabiber

Abstract

Parkinson's disease (PD) is a neurodegenerative disorder that negatively affects millions of people. PD is usually diagnosed by a series of empirical tests and sometimes by invasive methods. Classifying People with Parkinsonism (PWP) from healthy people using speech signals may lead to innovative, noninvasive PD diagnosis. In this study, we developed a machine learning system to classify PWP using their speech signals. In the system, four feature selection algorithms, six classifiers, and two validation methods were employed for accurate classification of PWP. The system calculated the accuracy, sensitivity, specificity, and Matthews correlation coefficient of the results. Additionally, the execution times of the algorithms were computed. All utilized algorithms, classifiers, validation methods, and evaluation metrics are briefly reviewed in the article. The main innovative part of this study is developing a comprehensive machine learning system for classifying PWP and testing it on a PD dataset, which consisted of multiple types of speech signals. Applying feature selection methods greatly increased the accuracy of classification. The most significant and discriminative features of speech signals were obtained and explained with a medical background. The importance of the selected features is also evaluated from the medical perspective.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 5061–5076

CBISC: A Novel Approach for Colon Biopsy Image Segmentation and Classification

- Saima Rathore, Muhammad Aksam Iftikhar

Abstract

The morphology of epithelial cells plays a vital role in distinguishing malignant colon tissues from the normal ones. Epithelial cells have near elliptic shape in normal colon tissues, whereas they deform into an amorphous shape in malignant tissues. The information about the morphology of epithelial cells may be incorporated in order to obtain an effective segmentation of colon biopsy images. In this research study, we propose a novel colon biopsy image segmentation and classification (CBISC) technique that does so. The proposed CBISC technique comprises two main modules, namely, segmentation and classification. The segmentation module exploits the background information about morphology of epithelial cells, and detects elliptic and nearly elliptic epithelial cells in four orientations. It further calculates three novel features, namely, semi-major axis, direction, and area occurrence for each image pixel. Finally, it grows and merges regions based on these features, and demarcates final region boundaries. Genetic algorithm has been employed to optimize several parameters used in the segmentation process. A dataset comprising 300 colon biopsy images has been used for the evaluation of proposed segmentation module, and improved performance has been observed compared to previously reported techniques. To validate the effectiveness of segmentation, moments of gray-level histogram and gray-level co-occurrence matrix-based features have been extracted from 710 segmented patches of the images, and have been used for the classification of segmented regions into normal and malignant classes. Radial basis function kernel of support vector machines has been used for classification, and reasonable classification results have been obtained.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 5077–5092

Inclusion of Semantic and Time-Variant Information Using Matrix Factorization Approach for Implicit Rating of Last.Fm Dataset

- Nidhi Kushwaha, Shubham Mehrotra

Abstract

Linked Open Data provide an opportunity to employ openly available metadata for the use of various applications. Recently it has been received great attention from the Recommender System community, to incorporate this semantic data as side information for getting more accurate results. Despite the popularity of these Recommender Systems, it suffers from the problem of data sparsity and high dimensionality. Moreover, the utilization of semantic data becomes a bigger challenge, when user preferences are defined implicitly, instead of in a fixed rating scale. The above-mentioned challenges necessitate us to introduce a comprehensive framework that is able to leverage the additional source of information for boosting the accuracy of the existing systems. In this paper, we have proposed a modified Joint Matrix Factorization approach for incorporating semantic information related to items and tag-based information with an implicit user preference for boosting the accuracy of the overall system. The model adheres to the phenomena of time-variant Recommender System; thus, it also utilizes the time-related information of items. Experimental results show that our method gets more accurate recommendation results with faster converging speed than other existing Matrix Factorization-based approaches.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 5093–5109

A Flexible and Cost-Effective Heterogeneous Network Deployment Scheme for Beyond 4G

- M. Arthi, P. Arulmozhivarman

Abstract

The network capacity has to be maximized to support the ever-increasing data traffic demand. One of the potential outcomes to enhance the network capacity is to enhance the spectral efficiency per unit area by expanding the serving node densities. This is unreasonable on account of present Macro evolved node B (eNB) for which site acquisition is expensive. The idea of heterogeneous network (HetNet) and multi-hop relay (MHR) are extremely prominent in long-term evolution (LTE) standard, where small cells are deployed along with Macro cell. Small cells are more suitable solution for the coverage and traffic issues experienced by Macro cell users. Unfortunately, HetNet deployment is not specified in any of the standards. The network operators have been managing tremendous investments for cellular infrastructures. Because of the high cost and lack of radio resources, a precise and productive HetNet deployment seems uttermost important. In this work, a flexible four-stage fuzzy logic-based HetNet deployment scheme is proposed, which deploys mix of Macro-eNB, Micro-eNB and relay station (RS) by considering capacity, coverage and cost factors. The proposed scheme identifies the required number of eNBs, their types and deployment locations to offer the expected coverage in a cost-effective way. The simulation results demonstrate that our proposed scheme is more flexible and offers improved performance in terms of system cost and power ratio than the conventional HetNet deployment schemes.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 5111–5121

Lower Limb Action Recognition with Motion Data of a Human Joint

- Feng Liang, Zhili Zhang

Abstract

Human action recognition technology has been an international research topic for the past 20 years owing to its range of potential applications. To realize fast and accurate recognition of actions of human lower limbs, we propose an action recognition method for human lower limbs based on the dynamic Bayesian network (DBN) model. First, the hip joint was chosen as the recognition object, and then, its *y* coordinates were chosen to achieve motion information. Second, the coordinate, velocity, and acceleration information of the hip joint in the *y* direction were filtered based on wavelet transform and weak tracking Kalman filter. Third, the filtered coordinate and velocity were used to calculate human action characteristics based on wavelet transform, and K-means was introduced to mark the action characteristics quickly. Finally, an action recognition method based on the DBN model was introduced to realize the judgment of the actions of human lower limbs. The proposed action recognition method for human lower limbs only needs the motion information of a human joint and has a fast calculation speed. Experimental results proved the high recognition rate and good application prospect of the method.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 5123–5147

Chaotic League Championship Algorithms

- Harun Bingol, Bilal Alatas

Abstract

Classical optimization algorithms are insufficient in large-scale combinatorial problems and in nonlinear problems. Hence, heuristic optimization algorithms have been proposed. General purposed metaheuristic methods are evaluated in nine different groups: biology-based, physics-based, social-based, music-based, chemical-based, sports-based, mathematics-based, and hybrid methods which are combinations of these. Recently, a sports-based search and optimization algorithm entitled as league championship algorithm (LCA) has been proposed. LCA is a population-based, metaheuristic optimization algorithm that simulates a championship for general optimization with artificial teams and artificial league for several weeks. In this algorithm, according to the league program, a number is given to the couple of teams that will match and the result of match is determined as loser or winner. Winning or losing the game is closely related to power of teams. Teams are intended to improve the formation of the current team throughout the season to win the game in the coming weeks. Chaotic maps seem to improve the convergence speed and accuracy of optimization algorithms. Increasing global convergence speed and prevention of getting stuck on local solutions of LCA with chaos have been proposed for the first time in this study. In this paper, six different chaotic LCAs have been proposed and explained in detail. Comparative performance results have been examined in complex benchmark functions. Promising results have been obtained from the experimental results. Combining results appeared in different fields like LCA and complex dynamics can increase quality in some optimization problems and the chaos can be the wanted process.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 5149–5167

MagicDetector: A Precise and Scalable Static Deadlock Detector for C/C++ Programs

- Huaxiong Cao, Naijie Gu

Abstract

Existing static deadlock detectors suffer from either lack of precise interprocedural path- and context-sensitive analysis or lack of scalability. In addition, they only take a few of synchronous events into account and suffer from the lack of a united method to handle different synchronization events. To address these problems, we first present a static interprocedural analysis algorithm, named mixed procedure inlining and summary-based analysis (MPISBA), to produce feasible execution traces in C/C++ programs. The functions which call function pointers or virtual functions are considered as inlining functions to figure out callees in different context. Path-sensitive symbolic execution is also used by MPISBA to track synchronization events in different program paths guarded by path conditions. In order to do interprocedural context-sensitive analysis and avoid function re-analysis, the proposed algorithm generates a summary for each function and applies the summary at the function's call sites. Based on feasible execution traces in program, a translation algorithm called generic synchronization event translation is proposed to translate different synchronization events into unified Petri nets. A prototype detector named MagicDetector is implemented for these procedures. A suite of open-source and large-scale softwares are used to validate MagicDetector, and comparisons are made among JDAE, Magiclock, DADCP and MagicDetector. Experimental results demonstrate that MagicDetector scales well to programs with 2M lines of codes and is more precise than previous detectors, finding more real deadlocks and reporting less false positives.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 5169–5179

Efficient Utilization of Shared Caches in Multicore Architectures

- Amit Kumar Singh, K. Geetha

Abstract

Today most of the systems run general purpose applications which have non-uniform memory accesses. This work proposes a new technique for last level cache (LLC) organization, named as hashed cache using overuse distance for ways sharing (HCOWS), to reorganize the cache memory of a system to contribute better performance in multicore systems. The proposed HCOWS technique can be applied on multicore platforms, to improve performance of cache memory and hence of a system for myriad of general purpose applications. A new mapping technique is employed using universal hashing which is highly random. This scheme employs sharing of ways instead of set sharing. This work evaluates the performance of cache hierarchy using average memory access time. HCOWS scheme-based system has given better miss rate reduction when compared with the simple baseline system by 33 % in dual core, 37 % in quad core and 41 % in octa core, which substantiates the fact that increased number of cores dispenses better performance. The proposed scheme has high impact on miss rate reduction with the increase in size of LLC rather than the associativity of LLC.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 5181–5194

A Token-Based Solution to Group Local Mutual Exclusion Problem In Mobile Ad Hoc Networks

- Ashish Khanna, Awadhesh Kumar Singh

Abstract

The article presents a generalization of the group mutual exclusion (*GME*) problem, called group local mutual exclusion (*GLME*), henceforth. In *GLME*, the activities of neighboring nodes need to be synchronized; however, no such synchronization is required between non-neighbors. The neighborhood is defined based on the location of the shared resources. A token-based solution to the *GLME* problem has also been proposed. The solution satisfies the correctness criteria for group mutual exclusion, i.e., safety, starvation freedom, and concurrent occupancy. The illustration includes simulation extensive results to estimate message overhead, latency, concurrency, and session switch complexity. The simulation results prove that the proposed algorithm demonstrates better performance when compared with the closest work in the literature. The token loss problem has also been handled. To the best of our knowledge, the algorithm presented in the paper is the first token-based algorithm to solve the *GLME* problem in MANETs.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 5195–5204

A New Approach for Classifier Model Selection and Tuning Using Logistic Regression and Genetic Algorithms

- Walid Mohamed Aly

Abstract

Logistic regression is an efficient machine learning procedure, and it is applied to build a mathematical model for classifying a certain input to a certain class among a number of preset classes. One of the main limitations of the standard classification approaches is the sensitivity to model structure, and another limitation is the sensitivity to the chosen value of regularization parameter λ λ that affects the estimation of the generalization error of candidate model, as any wrong value might cause underfitting or overfitting. In this research, a new approach for building a classifier model based on logistic regression is proposed, and the new algorithm depends on genetic algorithm to choose the effective model structure and also utilizes a proposed procedure to tune the regularization parameter aiming to find better model parameters. A case study for prediction of a diabetic patient using Pima Indian data set is included, and results showed the high effectiveness of the proposed approach as it reached a simpler model with a higher accuracy.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Computer Engineering and Computer Science
December 2016, Volume 41, Issue 12, pp 5205–5214

Semantic Q&A System on the Qur'an

- Aimad Hakkoum, Said Raghay

Abstract

The Qur'an is considered the first source of knowledge and guidance for Muslims throughout the world. It is hard to understand and interpret without consulting domain experts and specialized Qur'anic books. Therefore we believe that a system based on simple questions written in Arabic and capable of retrieving answers from the Qur'an would be of a great interest to all those who want to study the Qur'an. In recent years, a number of researches have been conducted to facilitate the retrieval of knowledge from the Qur'an; however, most of the available researches are based on keyword search and do not rely on semantics. Building a semantic-based system has a number of challenges such as the lack of resources for the Arabic language and the difficulty to model the content of the Qur'an by fear of altering its right meaning. In this paper, we introduce a semantic-based search engine for the Qur'an, it is based on creating an ontology that represents the Qur'an knowledge in Web Ontology Language format, and a natural language interface that transforms user queries expressed in Arabic into SPARQL queries and then retrieves answers from the ontology.