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Forensic Application using Soft Computing Techniques for Process Control & It's Applications

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ABSTRACT

The aim of this paper is that with the increase of digital crime (signature forgery, image forgery, illegal transaction, etc.) and therefore the pressing need for methods to combat these sorts of criminal activities, there's an increasing awareness of the importance of data forensics for security applications. The emergence and evolution of latest digital technologies are dramatically changing how information is captured, processed, analyzed, interpreted, transmitted, and stored. Soft computing is based on natural also as artificial ideas. Soft Computing techniques are symbolic logic , Neural Network, Support Vector Machines, Evolutionary Computation and Machine Learning and Probabilistic Reasoning. Using image processing techniques, it's easy to tamper the first image by replacing an individual's face, and making the change difficult to detect. This paper explores the various areas of sentimental computing techniques viz. symbolic logic , genetic algorithms and hybridization of two and abridged the results of various process control case studies. it's inferred from the results that the soft computing controllers provide better control on errors than conventional controllers. Process control is a crucial application of any industry for controlling the complex system parameters. which may greatly enjoy such advancements. Conventional control theory is predicated on mathematical models that describe the dynamic behaviour of process control systems. thanks to lack in comprehensibility, conventional controllers are often inferior to the intelligent controllers. Soft computing techniques provide a capability to form decisions and learning from the reliable data or expert's experience. Moreover, soft computing techniques can cope up with a spread of environmental and stability related uncertainties. The present paper shows the techniques, applications and way forward for soft computing. The Soft Computing Techniques & applications is additionally highlighted within the paper.

KEYWORDS: *Soft Computing, Neural Network, FL, GA DTC Induction Motor, Turbine Compressor System, Dc Servo Motor*

INTRODUCTION

One of the issues in traditional control systems is that complex plants can't be accurately described by mathematical models, and are therefore difficult to regulate using such existing methods. Soft computing on the opposite hand deals with partial truth, uncertainty, and approximation to unravel complex problems. Dr Zadeh1 who is that the pioneer of symbolic logic quoted that "the guideline of sentimental computing is to take advantage of the tolerance for imprecision, uncertainty, and partial truth to realize tractability, robustness, low solution cost, better rapport with reality". due to its features like intelligent control, nonlinear programming, optimization, and deciding support, soft computing has become popular and has drawn research interest from people with different backgrounds. Soft Computing (SC) is an emerging field that consists of complementary elements of symbolic logic neural computing, evolutionary computation, machine learning and probabilistic reasoning. thanks to their strong learning and cognitive ability and good tolerance of uncertainty and imprecision, soft computing techniques have found wide applications. actually the model for soft computing is human mind. It refers to a set of computational techniques in computing , AI , machine learning applied in engineering areas like Aircraft, spacecraft, cooling and heating, communication network, mobile robot, inverters and converters, electrical power system, power electronics and motion control etc.

WHAT IS COMPUTING?

The discipline of computing is that the systematicstudy of algorithmic processes that describe and transform information: their theory, analysis, design, efficiency, implementation, and application. the elementalquestion underlying all computingis 'What are often (efficiently) automated?

WHAT'S HARDCOMPUTING?

Hard computing, i.e., conventional computing, requires a precisely stated analytical model and sometimes tons of computation time.Many analytical models are valid for ideal cases.Real world problems exist during a non- ideal environment

WHAT IS A SOFTCOMPUTING?

Soft computing differs from conventional (hard) computingtherein,unlike hard computing, it's tolerant of imprecision, uncertainty, partial truth, and approximation. In effect, the modelforSoft computing is that the human mind.

The principal constituents, i.e., tools, techniques, of sentimental Computing(SC) are–symboliclogic(FL), Neural Networks (NN), Support Vector Machines (SVM), Evolutionary Computation (EC), and – Machine Learning (ML) and Probabilistic Reasoning (PR).

IMPORTANCE OFCOMPUTING

The complementarily of FL, NC, GC, and PR has a crucial consequence: in many cases a drag are often solved most effectively by using FL, NC, GC and PR together instead of exclusively. A striking example of a very effective combination is what has come to be referred to as "neurofuzzy systems."Such systems are getting increasingly visible as consumer products starting from air conditioners and washing machines to photocopiers and camcorders. Less visible but maybe even more important are neurofuzzy systems in industrialapplications. What is particularly significant is that in bothconsumer products and industrial systems, the utilization of sentimental computing techniques results in systems which have high MIQ (Machine Intelligence Quotie Machine. In large measure, it's the high MIQ of SC- based systems that accounts for the rapid climb within the number and sort of applications of sentimental computing.

APPLICATIONS OF SENTIMENTAL COMPUTING

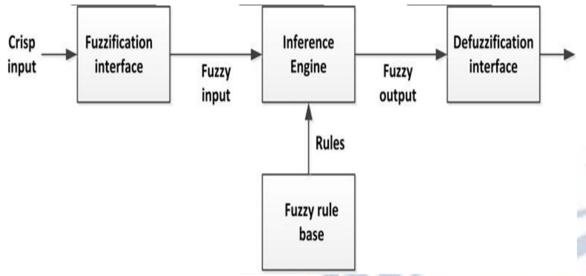
* HandwritingRecognition
* Image Processing and DataCompression
* Automotive Systems andManufacturing
* Soft Computing toArchitecture
* Decision-supportSystems
* Soft Computing to PowerSystems
* Neuro Fuzzysystems
* symbolic logicControl
* Machine LearningApplications
* Speech and Vision RecognitionSystems Process Control then SoOn.

FUZZYLOGIC

The concept of fuzzy logic was introduced by Zadeh3 as a way for representing human knowledge that's imprecise naturally . Fig. 1 shows the essential configuration of a symbolic logic system.

The fuzzification interface transforms the crisp input value into a fuzzy linguistic value. The fuzzification is usuallynecessaryduringasymboliclogicsystemsince the input values from existing sensors are always crisp numericalvalues. The inference engine takes the fuzzy input and therefore the fuzzy rule base and generates fuzzy outputs. The fuzzy rule base is within the sort of "IF-THEN" rules involving linguistic variables. The last processing element of a symbolic logic system is that the defuzzification which has the task of manufacturing crisp output actions.

Perhaps one among the most important advantage of symbolic logic is that it offers a practical way for designing nonlinear control systems which are difficult to style and stabilize



using traditional methods

Fig. 1 Architecture of a Fuzzy logic system

A. ARTIFICIAL NEURAL NETWORKS

Artificial neural networks (ANN), or neural computing is one among the rapidly growing fields of research, attracting researchers from a good sort of engineering disciplines, like electronic engineering, control engineering, and software engineering.

ANNs are information science systems that are inspired by the way biological systema nervosum and therefore the brain works. ANNs are usually configured for specific applications, like pattern recognition, data recognition, image processing, stock exchange prediction, weather prediction, compression , and security and loan applications. Neural networks aim to bring the normal computers a touch closer to the way human brain works. ANNS work best if the connection between the inputs and outputs are highly non-linear. ANNs are highly suitable for solving problems where therearenotanyalgorithmsorspecificset ofrulestobe followed so as to unravel the matter.

A neural network may be a large network of interconnectedelements,inspiredbythehumanne urons. Each neuron performs a touch operations and therefore the overall operation is that the weighted sum of those operations.

A neural network has got to be trained in order that a known set of inputs produces the specified outputs. Training is typically done by feeding teaching patterns to the network and letting the network to vary its weighting function consistent with some previously defined learning rules. the training can either be supervised, or unsupervised. In supervised learning the networkunderinvestigationistrainedbygivingitin puts and matching output patterns. i.e. the outcomes are known for specific inputs. In unsupervised learning the outputofthenetworkistrainedtoreplytoinputpatt erns. Some of the benefits and drawbacks of neural networks are:

x ANNs aren't universal tools for solving problems as there's no methodology for training and verifying an ANN.

x The results of an ANN depends upon the accuracy of

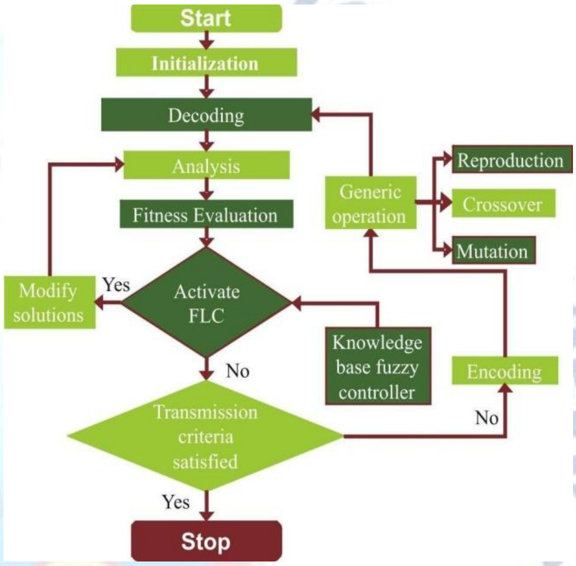


Figure 2: diagram of hybrid symbolic logic genetic algorithm

the available data

x Excessive training could also be required incomplex ANN systems

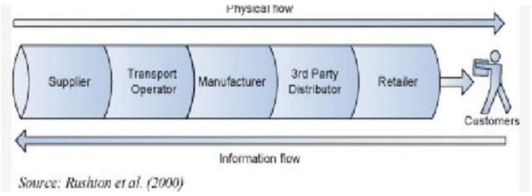
x ANNs can affect incomplete data sets

x ANNs are successful in prediction and forecasting applications15.

AnANNisessentiallycomposedofthreelayers:inpu t, hidden layer, and output, where each layer can have number of nodes. Backpropagation algorithm is employedinmostANNnetworksasawaytocoachth enetwork. Here, output of the neural network is evaluatedagainstdesiredoutput,andiftheresults aren't needless to say , the weights between layers are modified and therefore the process is repeated until a really small errorremains.

GENETIC ALGORITHMS (GAS)

CONTROLLERS



Analytical Genetic algorithms (GAs) are deployed for optimal selection of antecedents and consequents in fuzzysystems.Geneticalgorithms(GAs)areproven to be powerful in optimization, design and real time implementation. Genetic algorithms (GAs) which are modelled on natural evolutionary strategies are a strategy that has been introduced as a leaning and optimization technique for solving complex problems. Furthermore, genetic algorithm (GAs) search has inherent parallelism which enables rapid identification of high performance regions of complex domains without experiencing problems with high dimensionality. Thus, genetic algorithms (GAs) have foundexponentialgrowthinmanycontrolapplications especially while integrating the symbolic logic ,where they need applied to the method of learning control rules, selection of rules and their membership functions. the idea of genetic algorithms (GAs)ispredicated upon initialization of chromosomes, giving fitness value to the chromosome consistent with their performance criteria, reproduction supported probability, crossover which divides the binary coding of every parent into two or more segments then combines to offer a replacement offspring that has inherited a part of its coding from each parent,mutation process during which the coding of offsprings is completed with low probability.

These optimization algorithms perform a stochastic search by iterations of populations of solutions consistent with their fitness. on top of things applications, fitness is said to performance measures of the method controllers. Performance of symbolic logic controllers are often improved if fuzzy reasoningmodel is supplemented by genetic algorithm mechanism. The genetic algorithm enables us to get an optimal set of parameters for the symbolic logicmodel.

A.GENETIC ALGORITHM WITH PMSM

GA is implemented in PMSM to scale back flux and torque ripples better than other controllers as shown in diagram. This algorithm is coded by using MATLAB softwareandfedtothePMSMratherthanPID, PIanda symbolic logic controller to perform the PMSM during a betterway.

Figure 3: Basic Process Diagram of PMSM Genetic Algorithm

B.SUPPLY CHAIN MANAGEMENT

As the sub-process of supply chain management, logistics deals with planning, handling, and control of the storage of products between manufacturer and consumer as demonstrated in Fig.1, the concept of supply chain refers to the thought of developing a logisticspipelineapproachforfinishedgoodstotransfer through the availability chain. the availability chain highlights the close partnership from upstreamsupplier, transport operator, manufacturer, tothe downstream 3rd party distributor and retailer. Its objective is to supply and distribute the commodity within the right quantity, to the proper place, and at the proper time to attenuate overall cost while maintaining customersatisfaction.

APPLICATION

A. DIRECT TORQUE CONTROL OF INDUCTION MOTOR

In a conventional direct torque control method, voltage

is applied for the whole period, which successively produces high stator current and electromagnetic torque with a result high torque ripples are produced during motor operations.

An intelligent technique to research high performance decoupled flux and torque control are implemented duringthiswork.symboliclogicisemployedtopickan inverter state to realize the torque and flux reference values.

Gas turbines are highly non linear plants that have multiple inputs and multiple outputs thanks to high rotational and heat of gas turbines, operational parameters must be closely maintained and tuned. Turbine speed system is haunted to be controlled with artificial intelligent techniques because it's often encountered in refineries within the sort of turbinethat uses hydraulic governor to regulate the speed of turbine.

B.INTELLIGENT CONTROL OF DC SERVO MOTOR

Servo mechanisms are receiving wide attention for industrial applications due to their high torquedensity, highefficiencyandlittlesize[13].they'realsoreferred to as control motors. thanks to multivariate and non- linear in nature, it's difficult to realize the optimum speed of the motor. Conventional proportionalintegral (PI) controllers suffer from their inherent losses like maximum overshoot, high settling time and peaktime. The fuzzy control has been focus to regulate the speed of servo motor. The auto tuning for symbolic logic controller supported genetic algorithm fine tune the controllerparameters.

FUTURE SCOPE

The stability analysis of symbolic logic and genetic algorithms based non-linear controllers is discussed duringthisthesiswork.Experimentsonnon-linear and optimal control of AC drive, speed control of turbine compressor system and speed control of DC servo motoraresuccessfullyimplementedusingevolutionary hybridtechniquesandacomparativeanalysisisformed with the traditional techniques. A comparative improvement has been noted in controlling the torque andfluxerrorsofanon-linearACdriveusingsymbolic logic strategy and hybrid symbolic logic genetic algorithm techniques. Speed control of a typical turbine compressor system for controlling the outlet of gas is performed by using symbolic logic strategy and hybrid symbolic logic genetic algorithm techniques. in comparison to standard controllers, symbolic logic provides better control on transient and steady state errors and therefore the incorporation of genetic algorithms with symbolic logic further optimizes the controller parameters. DC servo motor is optimized usingsymboliclogicandhybridsymboliclogicgenetic algorithmtechniquesandcomparedwiththetraditional proportional integral controller. The novel symbolic logic and hybrid symbolic logic genetic algorithm techniquesoutperformthetraditionalapproachintermsof minimization of transient and steady state errors.

Softcomputingisprobablygoingtoplayanespecially importantroleinscienceandengineering,buteventually its influence may extend muchfarther. Soft computing represents a big paradigm shift within the aims of computing. A shift which reflects the very factthatthehumanmind,unlikepresentdaycomputers, possesses an interesting ability to store and process information which is pervasively imprecise, uncertain and lacking incategoricity.

CONCLUSION

As the development of sentimental computing progresses in several disciplines including physics, chemistry, biology and material science, computer scientists must remember of their roles and brace themselves for the greater advancement of sentimental computing within the future. This paper has outlined differentareasofsentimentalcomputing.Thesuccessful applications of sentimental computing and thereforethe rapid climb suggest that the impact of sentimental computing are going to be felt increasingly in coming years. It encourages the mixing of sentimental computing techniques and tools into both a day and advanced applications. it's hoped that this gentle review will benefit scientist who are keen to contribute their works to the sector of sentimental computing. Soft computing differs from conventional (hard) computingtherein,unlike hard computing, it'stolerant of imprecision, uncertainty, partial truth, and approximation. In effect, the modelforSoft computing is that the human mind. The principal constituents, i.e., tools, techniques, of sentimental Computing(SC) are–symboliclogic(FL), Neural Networks (NN), Support Vector Machines (SVM), Evolutionary Computation (EC), and – Machine Learning (ML) and Probabilistic Reasoning (PR).

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