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Abstracts

Planning a robot motion using a simple recurrent network

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Abstract

Recurrent neural networks have a capability to capture time and space in their structure, so they are suitable for modelling dynamic systems. Such a system could be a robot moving in a space with variable size, obstacles placing etc. Via neural networks we can plan a robot motion considering a current context. In this article we describe experiments with neural networks which we use for a motion planning of a robot. The scope of experiments is to verify the algorithms practically with Khepera robots.

pp 1 - 6

Classification of brain signals using neural networks

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Abstract

Models of neural networks were used in a classification of mind states. We used some simple electroencephalograph to get real data from brain signals of people they follow some sequence of pictures. Training of neural networks was realized using the data and the trained neural networks were applied in the classification of mind states of tested respondents. The results give us a starting point to a construction of a simple game which can be driven by signals from a brain.

pp 7 - 12

Coarticulation composite models in acoustic-phonetic decoding

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Abstract

The main problem of acoustic-phonetic decoding is to recognize base phonetic units. According to the research in previous years, the recognition rate could be improved by extending the modeled context of phonetic units. The advance from phonemes to diphones or triphones is remarkable. To obtain reliable models for triphones for the given language means to create high-quality corpus, which is very tough and expensive work.

This paper describes an alternative method for modeling wider contexts, without the need of gathering all existing triphones. The method is using the monophones as the base units. They are composed into more complex units composite models. The next base idea of this method is so called coarticulation effect. The first acoustic-phonetic decoders used phoneme as the base unit and they ignored the coarticulation effect. Extending the base units to diphones and triphones, the decoders took the effect of coarticulation into account. This brings a lot of problems with gathering corpus data. Further in the paper, we describe problems related with the decoding based on coarticulation composite models and we propose possible solutions for them.

pp 13 - 18

Optimization of random forests using the methods of computational intelligence

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Abstract

Machine learning methods, which are based on mathematical models, are used in prediction tasks namely regression, classification and time series prediction. One of these approaches is proposed in this paper. It is modification of Classification and Regression Tree (CART), which is used to form the collection of predictors. Final prediction is calculated from partial results of each CART tree. This collection of predictors is called Random Forest. Important problem in the construction of random forest is the random selection of parameters. The results can be improved with the evolutionary algorithms and also with the artificial neural networks.

pp 19 - 24

Evolutionary optimization methods in echo state neural networks training

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Abstract

“Echo State” neural networks, which are a special case of recurrent neural networks, are studied from the viewpoint of their learning ability, with a goal to achieve their greater prediction ability. A standard training of these neural networks uses pseudoinverse matrix for one-step learning of weights from hidden to output neurons. The advantage of one-step learning changes into a disadvantage, when we want to improve the predictive abilities of the given trained network. In this approach such learning was substituted by different optimization algorithms - Evolutionary Strategy, Simulated Annealing and SOMA algorithm. The main goal of this paper was to compare results achieved by optimization algorithms with results achieved by original one-step learning algorithm. These optimization algorithms were tested in turbojet gas temperature prediction, and the prediction error was substantially smaller in comparison with prediction error achieved by a standard training algorithm.

pp 25 - 36

Time series prediction models evaluation

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Abstract

There exist a lot of ways how to evaluate time series prediction models. Not all of them are equally appropriate in all situations. This paper discuss about criterions which is needed to consider when time series prediction models are evaluated and compared. The paper also explains why some commonly used metrics of model success are not able to compare two different models or evaluate model performance for any time series. Finally, there is suggest of appropriate metric for time series prediction models evaluation. Suggested criterion is able to evaluate an ability of different models to predict different time series.

pp 37 - 40

Communication networks and phase transitions

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Abstract

The article deals with various aspects of phase transition phenomenon, known especially from physical processes (like change of phase, emergence of superconductivity, percolation, etc.). Similar rapid changes in some of properties (e.g. success of message delivery) can be observed in communication networks, which can be modelled by random graphs. We give an overview and comparison of methods used to study the properties and behaviour of systems, where the phase transition occur. Particularly we mention some of the methods used in physics and their algebraic interpretation, the theory of random graphs and possibilities of their simulation, as well as some known results in the field.

pp 41 - 46

Kurt Gödel—life, results and their significance

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Abstract

Kurt Gödel is often regarded as the most remarkable logician of the XX century, especially for his famous Incompleteness Theorems. Besides the basic biographical and bibliographical data, the paper surveys his most important results and works that influenced mathematical logic and metamathematics (Completeness and Incompleteness Theorems, infinite-valuedness of intuitionistic logic), set theory (irrefutability of the continuum hypothesis and the axiom of choice, axioms for the theory of classes), philosophy of mathematics (the views presented in his essays), and other disciplines (a peculiar solution to Einstein's equations allowing time travel, a logical reconstruction of Anselm's ontological proof). In particular we focus on the consequences of Gödel's Incompleteness Theorems for computer science (Turing's results on algorithmic undecidability), artificial intelligence, philosophy, and other disciplines. Arguments are given to show why most applications of the Incompleteness Theorems to philosophy of science or philosophy of mind are inappropriate: first, the theorems only apply to ideal extrapolations to *all* natural numbers, while in reality we always have to deal with a finite part thereof; and second, since the proof of Gödel's theorems can be formalized in set theory (so a machine can prove it as well), and since we cannot be sure of the consistency of strong enough theories (like set theory), humans have no advantage over machines in seeing the truth of Gödel sentences.

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Significance of emotions for artificial beings

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Abstract

Although emotions are an essential part of human and very probably also other higher animal cognitive processes, they are rarely used in computer models of organisms. In this article we will investigate the role of artificial emotions in the models of organisms. We will introduce some psychological theories explaining the origin and importance of emotions. Then we will discuss the benefits of artificial emotions from the point of view of computer science. We will illustrate the proposed ideas in two projects – opponents from a 3D computer game, where emotions are used to increase their believability, and a virtual mouse, where we research the possible importance of emotions for reinforcement learning.

pp 59 - 66

Pogamut - a platform for prototyping bots in unreal tournament

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Abstract

In this paper, we describe one of the possible approaches to prototyping artificial intelligence of First Person Shooter computer game opponents. We will present a platform which allows the easy 3D visualization of a virtual environment and fast modeling of the behavior of virtual agents done by classical symbolical methods. The platform is based on the game Unreal Tournament, POSH architecture and the programming language Python. We will also discuss sample projects that we are currently building on this platform.

pp 67 - 74

Perspectives of studying memory activated out of context of the learned event and environment

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Abstract

Arguably, learning and memory belong among most important aspects of cognition. The information acquired by sensory inputs is filtered and processed in order to be retained by one or more memory systems (if not forgotten on the way). Basically, memorized information can be retrieved under either set of circumstances: **a** in the context or environment, in which the information has been acquired; **b** in independent situations, not resembling the original context. Most animal studies dealing with memory (in particular that kind of memory which is referred to as episodic) were traditionally restrained to conditions described as "**a**", as the methodical approaches available for studying the "**b**" cases were only suitable for humans (where it has been studied thoroughly). However, several papers from the last decade indicate, that out-of-context memory activation is in principle opened for studying in animals as well.

pp 75 - 78

RNA-like artificial life system

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Abstract

There are many Artificial life (Alife) systems which simulate replication of programs – „virtual organisms“. Function of these systems is analogical to „replication-first“ scenarios of origin of life, because, at least at the beginning of a simulation all what the virtual organisms do is producing new copies of themselves. But there is a difference between RNA (and similar molecules) which is usually assumed to be the first replicator, these programs lack any secondary or tertiary structure to which RNA owes its catalytic abilities. Their behavior is determined solely by sequence of program instructions which is an analogy of primary structure. There are also many models and evolutionary simulations based on secondary structure computation, but none of them is similar to „classic“ Alife system in which computationally universal programs replicate. To fill this gap a system was created which joins genotype to phenotype mapping via secondary structure with an interpretation of secondary structure as a program in an Alife system. Behavior of such system and its variants show in comparison to „classical“ system with equivalent operators, high evolvability and capability of „digital abiogenesis“ – spontaneous emergence of replicators among randomly generated programs.

pp 79 - 88

Hierarchical generalizing grammars

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Abstract

The paper introduces hierarchical generalizing grammars. They are a special sort of grammars, which are formed by extension of grammar word space, transformation of content grammar into parametric grammar and by generalizing of that grammar and by construction of hierarchy of these grammars. Presented novel approach to system modeling by grammars enables to describe variety of systems by these hierarchical generalizing grammars. These systems are known especially from the area of artificial intelligence and soft-computing; as production expert systems, qualitative models, neural networks, genetic programming algorithms and models of associative and metaphorical reasoning. Presented paper brings construction of hierarchical generalizing grammar, as well as construction of description of above mentioned systems by these grammars and it discusses their possible impacts on the field of computer science a cognitive science.

pp 89 - 96

Artificial intelligence techniques in strategic computer games

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Abstract

During past few years computer games has become a phenomenon, which can't be overlooked. One reason of its popularity is still improving level of computer driven player. Computer game designers are facing challenging tasks to create better and more human-like behavior of it's AI, that can entertain any fastidious player for a long time. In our speech we will define main issues and problems and also it's different solutions in turn-based and real-time strategies, which is, from the point of view of artificial intelligence, one of the most interesting genre of computer games. We will introduce turn-based strategy game "8 Kingdoms" and describe particular algorithms of artificial intelligence used in this game.

pp 97 - 106

Self-organization and cognition

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Abstract

This article examines the possibilities of methodical use of the theory of self-organizing and complex systems for the description of cognitive processes. In the beginning we define the notion of self-organization and self-organizing cognitive agent. The main topic of the article is analysis of different appropriate formal definitions of complexity as the main characteristics of self-organization. First we describe simple models of self-organization in the cellular automata, the complexity in these models emerge from interactions between localized structures and is characterized by fluctuation of entropy. Then we analyze the so called neural complexity based on mutual information between parts and the whole which is hoped to solve the dilemma between specialization and integration in the brain. Finally we analyze different structures describable by power laws. Power laws indicate scale-less, fractal, structures and represent another characteristic of complexity. Especially we concern with the scale-less networks of relations in the brain and with self-organized dynamics of cognitive processes describable in terms of the so called self organized criticality.

pp 107 - 118

P colonies

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Abstract

In this paper we present the results achieved in research of P colonies, a biochemically inspired formal model of a computing device. We show that P colonies with one or two objects inside each agent are computationally complete.
pp 119 - 124

Some possibilities of introducing artificial neural networks in teleinformatic practice

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Abstract

The paper presents some possibilities of introducing artificial neural networks in teleinformatic mostly in the efficient control of the processes and the optimization of the routing of the information flows in the net. It is the new perspective way of the exploiting of the artificial neural networks for the improving of the performance of the teleinformatic nets.
pp 125 - 128

Training recurrent neural networks – algorithms and implementation

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Abstract

Unlike feedforward neural networks recurrent neural networks can be used to tasks with time context. The paper deals with the training of recurrent neural networks using common gradient based approaches but also by more advances approaches based on Kalman filtration. Implementation details of representation of feedforward and recurrent neural networks are described as well as the training algorithms in pseudo-language.
pp 129 - 136

Esperanto as a meta-language in natural language analysis

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Abstract

A machine understanding of natural human speech is fundamentally based upon semantic analysis. It is a procedure which is performed by an intelligent machine to “mine” a meaning out of a speaker’s utterance. In the other words it builds an instance of a formalism which enables to record and further process relevant pieces of information included in the utterance. Considering current level of knowledge, the procedure is quite far from being optimal. On the one hand there is no suitable general formalism available (only few problem-oriented approaches), on the other there are only very unsystematic and not enough general methods for building its instances. An international artificial language Esperanto, created in 1880s by Polish physician L. L. Zamenhof, suggests itself surprisingly as an alternative formalism. It is suitable for recording both syntactic and semantic information included in the utterance. This article introduces some theoretical explorations on an extraction and storage of semantic information in a form of a language which is at the same time formal and natural. Advantages and limitations of such an approach are discussed. Examples are given showing how Esperanto can replace some contemporarily used formalisms.

pp 137 - 142

Self-organization as a driving force of dynamical patterns of activity in the brain and mind

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Abstract

The proposed view on mutual connections between brain and mind seeks an answer in self-organization as a dynamical process, whose effects are discerned on two levels: on the activity level - via emergence (bottom-up causality), as well as via top-down direction, and on the level of adaptation of both local and global parameters of the formal system. We offer a brief overview of evidence from the perspectives of cognitive neuroscience and formal models, that are claimed to support our view, and we emphasize the top-down effects that often remain unexplained in related models. We do not treat the question of subjectivity of mental states - this is considered an inherent property of a complex dynamical system operating on neural representations of entities grounded in the outer world.

pp 143 - 148

Cognitive paradigm of information science

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Abstract

Paper is focused on the evolution and the main bases of cognitive paradigm of information science. From the general point of view, information science is interested in the wide area of information communication in the society. The cognitive paradigm is aimed at processual aspects of information search and its components, users and information organization. The main motivation is to introduce information science and mention problems which are relevant for several fields and bridge the gap between information science and other disciplines within cognitive science. Paper analyses information behaviour approach, retrieval interaction models and information systems design.

pp 149 - 158

Modeling of socio-economic processes (economistic approach)

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Abstract

The paper describes a methodological conception for modeling of socio-economic systems. It will be use in a framework that we develop. The main features of this conception are: The application of the multi-agent paradigma and pure economistic approach (economical reductionism). It can be obvious to see by using micro-economical (in the sense of neo-classic economy) triad Subject-Need-Good(that satisfies the need) as the base of the whole conception. The framework will be used for simple design of an artificial population and an observation of their structure depending on properties of both the artificial world and subjects (agents) - the principle of emergence.

pp 159 - 166

Experience of episodic situations: Modalities and liminal cases

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Abstract

The theme of the study is a reflective analysis of human experience of complex episodic situations. Several modalities of experience are discussed (temporality, spatiality, scene structure, plot, etc.) and in each case the focus is on liminal experiences. The motivation for the study is searching for possible contact points between two different approaches in cognitive science, one based on the first-person perspective (phenomenological orientation) and the other based on the third-person perspective (typical in science).

pp 167 - 180

Evolution and learning of neural driven agents – A dynamical systems perspective

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Abstract

When developing neural controllers for artificial autonomous agents evolutionary or learning techniques (e.g. genetic algorithms / Hebbian learning, modifications of backpropagation) can be employed. The neural controllers themselves and even the whole agent-environment interaction can be viewed as dynamical systems [1]. This framework of R. D. Beer is brought into play on a concrete robot task: environment, robot's controller and body, their interaction, and fitness function are formalized. This perspective helped to clarify the difference between different architectures of the neural controller, identify the role of the researcher and shed light on the interaction of evolution and learning. Finally, this perspective also clearly revealed that resulting behaviour is a result of the agent-environment interaction and thus we should not concentrate on the agent neural controller only.

pp 181 - 188

Mutation influence on structure of organisms

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Abstract

The aim of the article is to examine properties of organisms in asexual evolution depending on various mutation rates. Organisms, dominating at high mutation rate, are not the fittest ones, but those, to which change in internal structure causes the lowest decrease of fitness [5]. Organisms evolving at medium mutation rate can temporarily sacrifice some property in order to acquire other, more beneficial property in future, and consecutively optimise their structure. Loss of even one property at low mutation rate would lead to extinction of organism before it could acquire new, more valuable property. Mutation rate thus actively influences the direction of evolution of organisms in environment.

pp 189 - 196

Robot controller based on LSTM network

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Abstract

A new type of recurrent neural networks called long short-term memory networks have been proposed recently. They provide some specific aspects in solving certain types of tasks where the common recurrent neural networks fail. In this contribution a long short-term memory network is used for a problem of robot navigation in a simple maze with several T crossings. The network controls the robot motion and turns the robot left or right on a crossing according to a command given in the beginning of a long hallway terminated by the crossing.

pp 197 - 204

Colonies of grammars and simple membrane structures

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Abstract

The paper presents an overview of results on the topic of colonies (of grammars) introduced in 1992. Following parts of the theory are discussed: sequential and parallel colonies, colonies with point mutation (PM colonies) and colonies of membrane structures (P colonies). We summarize typical results on the generative power and hierarchy, solutions of competence and conflicts in parallel models, influence of the position of agents in PM colonies to the development and forms and the role of simplicity of components in colonies of membrane structures. Actual trends and results on the topic are also included.

pp 205 - 212

Quantum game theory

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Abstract

A number of models of natural selection is based on game theory. In the last few years, game theory has been extended to quantum systems. This paper reviews quantum game theory and discusses its consequences for corresponding models of evolution.

pp 213 - 214

Principles of molecular cognition

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Abstract

Natural life (n-life), as arose on Earth and achieved the present state by natural selection, is a chemical system. Its dynamics is the dynamics of chemical interactions. In contrast to standard chemical reactions in solution, which are scalar (not running in space coordinates, but in the coordinates of the chemical composition), biochemical processes are vectorial. The discovery of the vectoriality of biochemical processes by Peter Mitchell is, with its importance, comparable to Darwin's discovery of evolution by natural selection. Standard chemical interactions are nomic, and so necessary and timeless; biochemical interactions are mainly teleonomic: they are outcomes of natural selection. The teleonomic biochemical interactions represent molecular recognition. Vectoriality of biochemical processes resides in the properties of proteins. Proteins exhibit molecular sentience. Sentience, a capacity to exhibit a variety of potential internal states, selected in evolution, and contingent upon the state of the immediate environment, appears to be the main characteristic of life.

pp 215 - 222

Structural properties of colonies in terminal derivation mode

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Abstract

There were introduced special classes of languages (Reachable, Unreachable, Alive, Dead, ...) in PM-Colonies in order to study its structural properties. In this paper we study these classes of languages for colonies with t mod derivation. We point out possible combinations of these language classes and other interesting structural properties of colonies with t mod derivation.

pp 223 - 228

Mathematical modelling of generalization

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Abstract

Generalization has been studied in philosophy at the beginning of the 20th century as eidetic generalization, where it was understood as a process of imagination of possible cases rather than observation of actual ones. Generalization also became subject of research in computational intelligence, which aims to develop learning methods for artificial neural networks guaranteeing that networks can recognize or classify also patterns that were not used for their training. For a mathematical modelling of such capability, in addition to a sample of correctly processed examples some a priori knowledge about network function should be assumed. Learning with a generalization capability can be modelled in terms of regularization, which has been developed for search of stable solutions of tasks from physics. In learning theory, generalization can be investigated as a certain kind of stability.

pp 229 - 232

Cognitive science, artificial intelligence, and theory of bounded rationality

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Abstract

The presentation is devoted to discussion of possibilities of cognitive science and artificial intelligence to tackle the problem of bounded rationality. The term „bounded rationality“ was coined fifty years ago by Herbert Simon in his seminal book „Models of Men“, where it was used as an expression of our bounded possibilities to solve complex and difficult problems. Cognitive psychologists Daniel Kahneman (Nobel prize winner for economy in 2002) and Amos Tversky have applied this approach to a study of behavior of rational economic agents. The main idea of this approach is that complex problems are solved in real time by simple and effective heuristics, which in many cases are not in accordance with laws of statistics, theory of probability and logic. By using standard test-bed problems from artificial intelligence (e. g. Tit-for-Tat strategy of cooperating agents, secretary-selection problem of sequential search, or El Farol bar problem in dynamically changing environment, etc.), we demonstrate that emerging heuristic rules – strategies are usually very effective in searching for a solution close to an optimal one.

pp 233 - 252

Reinforcement learning

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Abstract

The purpose of this article is to give a short overview about reinforcement learning. This approach is interesting mainly, because during learning phase it don't require pair question/answer. It is sufficient, when we can judge how well a system is solving a problem. In this article firstly components of reinforcement learning are described. After that we present learning approaches – value iteration, Q-learning and adaptation of neural network weights with TD(λ) algorithm.

pp 253 - 258

On generative power of positioned eco-grammar systems

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Abstract

Positioned eco-grammar systems (PEG systems, for short) were introduced in [5]. In this paper we compare generative power of PEG systems with generative power of PM colonies and Turing machine. We extend results mentioned in [5] and [6]. We also muse on possibilities of extension of generative power of PEG systems..

pp 259 - 264

Pattern recognition using a hybrid approach of neural networks and genetic algorithms

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Abstract

The paper presents possibilities of the use of the genetic algorithms for training the neural network for the pattern recognition. The used genetic algorithm and neural network are described and the results of the simulation are presented.

pp 265 - 266

Pedestrian recognition based on AOP

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Abstract

We report about our participation on particular project dedicated for pedestrian recognition organized by DENSO Research Lab. We deal with 3D scene reconstruction from video made by camera mounted in vehicle. We employ a specific method of software development – a kind of agent-oriented programming (AOP), which is coming from subsumption architecture by R. Brooks and which is close to society of mind by M. Minsky as well.

pp 267 - 272

Dynamical reservoir of echo state network

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Abstract

Echo state networks contain randomly initialized untrained layer formed of a huge number of units. The training process consists of simple adaptation of weights between hidden and output layers. Units with untrained weights in the hidden layer form a huge dynamical reservoir that can be used as a source of potentially interesting dynamics needed for creating a desired network output. Interesting properties of this untrained part of the network are studied on symbolic sequences processing tasks. Various possibilities of the reservoir initialization and the reservoir structure are considered in order to improve the network performance.

pp 273 - 282

Coding in human sound localization neural circuits

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Abstract

One part of the auditory pathway is the system for the sound localization. This is the only sensory system in human brain, where the duration of one processing step is comparable to the duration of one signal sample of a digitized sound. All the other sensory and cognitive systems of the brain are much slower, much more complex and much more parallel, compared to artificial and communication systems. All sound localization theories are constrained by the physical properties of the surrounding sound space. The encoding of sound in the first neuronal processing stages reflects these physical properties. We describe in detail the first group of neurons in these processing stages, which combines inputs from the two ears - the first binaural neurons. We compare the current theories with our alternative theories of sound localization. There is still much controversy among current experimental and theoretical studies and this leaves an open space for alternative theories to try to reconcile different opinions.

pp 283 - 288

Neural networks and chromosome recognition

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Abstract

We treat chromosome classification as an appearance-based object recognition problem. Chromosomes of the same class are usually identical in the biological sense. Each individual chromosome in the spread image is localized, segmented, rotated and straightened in the sequence. Next the banded profiles are used to extract features and all chromosomes are classified in the karyotype image. The ability of multi-layer neural networks trained with gradient descent to learn complex, high-dimensional, non-linear mappings from collection of examples makes them candidates for image recognition tasks. We introduce new approach for the robust feature extraction and chromosome classification based on the convolutional neural networks. Using of local receptive fields appears to be effective in cases complete band information in the input vector is unavailable. Experimental results on the chromosomes datasets show, that convolutional neural network approach is comparable with current performing methods.

pp 289 - 294

Semantic and episodic memory in relation to computerized processing of natural language semantics

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Abstract

A long-term memory is considered as a collection of individual memories including a context dependent memory (dependent on space and time) - an episodic memory, and a context independent memory - a semantic memory representing facts, concepts and meanings. These memories have an interesting relation to the modern methods and proposals of software products and computer systems. This relation can be found not only within modelling of specific software in the fields of artificial intelligence and processing of natural language but also within modelling of common software products. Then the main attention is paid to the possibilities of computer processing of natural language (semantic analysis and interpretation).

pp 295 - 298

Evolution and vortex-fractal structures

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Abstract

We would like to find some plausible unifying mechanisms for the explanation of vortex-fractal systems. This paper is an attempt to attain a new and profound understanding of the nature's behavior using a vortex-fractal theory. Scientists try to explain some phenomena in Nature that have not been explained so far. The aim of this paper is the vortex-fractal explanation of polarization, the diffraction grating, and an attempt to compare quantum electrodynamics (QED) with the vortex-fractal description. This new approach can be called physics of vortex structures (FVS). The vortex-fractal theory could possibly explain what the charge, the photon, the electron, the proton, the neutron, etc actually are.

pp 299 - 308

Amorphous computing: A model of a universal computer built from simple cooperating agents

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Abstract

Amorphous computing studies computing systems composed of a large number of the same working units (agents) that are randomly distributed in space. The agents may only use local communication (within a fixed communication radius) and have a severely restricted memory size. Amorphous computing is inspired by the ways in which the living cells communicate in multicellular organisms. A concrete implementation of an amorphous computer may take the form of an ad-hoc wireless network or that of a sensor network. The research aims at developing software and communication protocols for solving basic network tasks, e.g. directing the information flow through the network to some predefined base station.

We show that algorithm design can be approached at a more general level. Namely, we show that amorphous computing systems are programmable, i.e., they possess universal computational power and that effective simulation of known abstract computing machines (especially of Turing machines) is possible. For our results to hold, an amorphous system is only required to have a sufficient number of nodes distributed with a sufficient density in the plane.

pp 309 - 314

Decisions in social network

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Abstract

The paper treats a problem derived from a famous El Farol bar problem, when a bar has only a certain capacity smaller than the number of potential customers, and these must decide, whether to go or not to go to the bar. Ideally a number of actual customers would be equal to the capacity of the bar (the problem is similar to „*minority game*“ or „*Boolean game*“). Unlike the original definition of the El Farol bar problem, here we try to solve the problem under condition, that the capacity of the bar equals half the number of potential customers, customers do not know past numbers of visitors, but they can ask their acquaintances, whether they plan to go, and decide opposite to their majority. The decision process can be carried out for several rounds, while customers can change their decision according to the last planned decision of their acquaintances. Some customers however can decide fixedly immediately, others with a certain probability only after several rounds of decisions. Every agent has the same strategy; they differ in their neighborhood and randomly taken initial decision. We are solving a question, which strategy is suitable for all agents for a given type of the network of acquaintances. The paper measures an influence of the type of the network (complete, random, local, egalitarian and aristocratic small world network), the influence of the coefficient of changeability of decision and of the number of rounds of decision making to a decrease of the difference between ideal and real attendance of the bar. In majority of the cases our proposed heuristic decreases ten times the mean square error of the difference between capacity of the bar and the number of actual customers, compared to random decisions.

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Abstraction, comparison and generalization as a basic operation of humane thinking

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Abstract

Abstraction, comparison and generalization will be in focus of our contribution. They are a basic operation of humane thinking. We will to make use Kant's approach to these operation with special attention on the problem of abstraction. Several remarks will be devoted to matching between Kant and Husserl on reduction and its role when human thinking creates concepts.

pp 329 - 334

Parallel grammar systems and emergence

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Abstract

In this paper we will compare the efectivity (with respect to the complexity measure index) of the context-free language by the classical context-free grammar and its representation by the parallel communicating grammar system, working in the returning mode.

pp 335 - 342

Visual perception – optical illusions

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Abstract

Maybe it is a paradox but illusions are product of our intelligence. We seek out and study optical illusions (errors of perception) for better understanding how we see. Topics of this article are illusions connected with size constancy, shape constancy, seeing brightness and depth perception.

pp 343 - 346

Team strategy in multi-agent environment

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Abstract

This project aims to point out various aspects of artificial intelligence in combination with solving of coordinational, cooperational and planning problems in the frame of multiagent systems and the assets of artificial intelligence application by the development of intelligence's robots. The aim is to remain focused on simulation backgrounds from which only one multiagent system has been selected, robotic soccer RoboCup. The primary aspects selected from this complex system and from the various problems solved include teamwork, planning, recognition and the estimation of opponents.

pp 347 - 354

Dynamic logic programming and world representation in computer games

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Abstract

Computer games (especially role-playing and adventure games) offer an exact, coherent and relatively small and simple world description and are usually built on game engines, which provide scripting capabilities. A common task of game scripting involves evaluation of the world state in a game, usually to find out whether a player has already completed a task (game quest). In this paper we describe possibilities of integrating Dynamic Logic Programs (DynLoP) into computer game engines and the use of such representation in the development of a computer game. Dynamic Logic Programming is one of many formalism for knowledge representation based on Logic Programs. Its declarative nature allows easier and simpler queries and quest(task) characterization than current imperative scripting languages used in game engines. Furthermore, the world of a computer game provides an excellent environment for evaluation of DynLoP and its various semantics.

pp 355 - 362

Discrimination criteria based cognitive semantics

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Abstract

In this paper, we propose and formally define a new semantics suitable for representing concepts in dynamic and open environments, for cognitive models of language evolution and acquisition, BDI architectures and industrial multi-agent systems. The semantics is based on perceptually grounded conceptual structures - discrimination criteria enabling representation of objects, properties, relations, changes and situations in a simple and unified way. We further describe mechanisms of acquisition and continuous updating of the concepts by sensory-motor and linguistic interactions and analyze their pragmatic usability.

pp 363 - 372

Biological evolution versus evolutionary systems: comparison of rat and robot learning in similar dynamic spatial tasks

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Abstract

Ability to adapt to a continuously changing environment is inherent both to natural and artificial "intelligent systems". Our paper presents comparison of spatial learning in the living being (rat) and artificial object (autonomous mobile robot controlled by evolutionary system) using a similarly defined task. Individual chapters are given on rat and robot learning.

pp 373 - 392

Text correction with echo state networks

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Abstract

Much of the effort in building recognition systems is devoted to correct the corrupted sequences. In many optical and handwriting character recognition systems, the last stage employs natural-language analysis techniques to correct corrupted sequences. Echo state neural networks provide a new view on the recurrent neural network training. We analyse the possibility of using these easily trainable networks in the task of correction of the text from King James version of the Bible and compare its performance with the variable length Markov model approach.

pp 393 - 400

Symbol grounding in context of zero semantic commitment

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Abstract

In this article I overview and analyze recent approaches to symbol grounding problem. After short review of historical roots and analysis of particular processes or components of grounding I focus on general aspects of this process and demonstrate some problems in broader (and possibly) new context. This part is mainly polemic over zero semantic commitment (Tadeo, 2005) and its application in this area.

pp 401 - 412

EOL eco-colonies

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Abstract

In this paper we deal with generating power of one type of eco-colonies, EOL eco-colonies. This text engages in comparison of generative power of EOL eco-colonies with generative power of colonies, eco-grammar systems and OL eco-colonies.

pp 413 - 420

Would you like to be a brain in the vat, or on the role of embodiment and situatedness in the mental development of a cognitive agent

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Abstract

The modern theory of cognitive systems sees these systems as autonomous computational systems, which situate themselves in the environment with the help of their sensorimotor units. In spite of this especially in the circles of recursivity theorists one can repeatedly hear an opinion that cognition can still be seen from a classical viewpoint, i.e., as a problem of a specific data processing and thus, embodiment is not needed in order to capture the principles of cognition. We show that such a simplified view neglects one substantial property of cognitive systems - viz. their active participation in the selection and even generation of the input data. Without this feedback, the system cannot create its internal world model cognized via its own actions. In order to explain the essence of this problem we will make use of the computational model of a cognitive system, which was introduced by the author in his previous works. At the principal level, this model enables to think about functioning of the algorithmic mechanisms of imitation, communication, language acquisition, thinking, and consciousness.

pp 421 - 428

Cognition in visualization

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Abstract

Processing of visual information starts at the retina and is being further processed in subsequent parts of the brain. This process can be divided into lower cognitive functions like detection of edges and recognition of colors, and higher cognitive functions encompassing memory and logical reasoning. Knowledge of perception and cognition is essential in understanding the pitfalls of visualization and in designing effective visualizations. This article reviews the perceptual issues of visualization and shows how knowledge of them can be used in favor of the visualization process.

pp 429 - 434
