PREEMPTIVE SCHEDULING FOR TWO-PROCESSOR SYSTEMS

Andrzej Rowicki

Abstract. The purpose of the paper is to consider an algorithm for preemptive scheduling for two-processor systems with identical processors. Computations submitted to the systems are composed of dependent taks with arbitrary execution times and contain no loops and have only one output. We assume that preemptions times are completely unconstrained, and preemptions consume no time. Moreover, the algorithm determines the total execution time of the computation. It has been proved that this algorithm is optimal, that is, the total execution time of the computation (schedule length) is minimized.

LOGICS OF PROGRAMS WITH BOOLEAN MEMORY

Pawel Urzyczyn

Abstract. We discuss the computational power of programs with boolean (propositional) push-down stores and arrays, and the expressive power of logics based on these programs. In particular we show that over unary structures, the mentioned logics occur to be equivalent to their 'algebraic" counterparts.

MULTIRANGES AND MULTITRACKERS IN STATISTICAL DATABASES

Zbigniew Michalewicz, and Anthony Yeo

Abstract. The goal of statistical databases is to provide statistics about groups of individuals while protecting their privacy. Sometimes. by correlating enough statistics, sensitive data about individual can be inferred. The problem of protecting against such indirect disclosures of confidential data is called the inference problem and a protecting mechanism – an inference control. A good inference control mechanism should be effective (it should provide security to a reasonable extent) and feasible (a practical way exists to enforce it). At the same time it should retain the richness of the information revealed to the users. During the last few years several techniques were developed for controlling inferences. One of the earliest inference controls for statistical databases restricts the responses computed over too small or too large query-sets. However, this technique is easily subverted. In this paper we propose a new query-set size inference control which is based on the idea of multiranges and has better performance then the original one.

TOWARDS THE TEMPORAL APPROACH TO ABSTRACT DATA TYPES

Andrzej Szalas

Abstract. In this paper we deal with a well known problem of specifying abstract data types. Up to now there were many approaches to this problem. We follow the axiomatic style of specifying abstract data types (cf. e.g. [1, 2, 6, 8, 9, 10]). We apply, however, the first-order temporal logic. We introduce a notion of first-order completeness of axiomatic specifications and show a general method for obtaining first-order complete axiomatizations. Some examples illustrate the method.

AN ALGEBRAIC MODEL FOR COMMUNICATING PROCESSES

Józef Winkowski

Abstract. A new semantics for communicating processes is introduced which modifies the ideas of Milner (1980) and Winskel (1982, 1983, and 1986). This semantics, inspired by a model of Staples and Nguyen (1985) for non-deterministic data flow, allows one to avoid explicit representation of hidden events of processes, which simplifies the concept of observation equivalence of processes. It offers also a framework to cope with indivisible sets of communication events.

Keywords: process, state, event, configuration, communication, communication structure, sum, prefixing, composition, restriction, renaming, approximation order, fixed-point, equivalence.

FREE NET ALGEBRAS IN VLSI-THEORY

Paul Molitor   *117-142*

Abstract. We provide a simple and uniform calculus of networks which allows us to treat both functional and structural properties of the circuits. By factorizing the algebras according to suitable relations, we obtain representations of integrated circuits on different design levels. With that, we give complete characterizations of these levels, i.e., expressions describing the same net with respect to a certain level can be transformed into each other by applying the corresponding rules.

BASES AND LATTICES IN NON-SEQUENTIAL PROCESSES

Cesar Fernández, C. and Agathe Merceron   *143-170*

Abstract. In this paper, we introduce the notion of a basis to study non-sequential processes which are modelled by partially ordered sets. We show that – associated to lower sets and upper sets – this notion permits to characterise several properties of non-sequential processes. We show also that lower sets and upper sets with finite basis are the compact elements of the lattices of lower sets and upper sets.

AN ALGEBRAIC CHARACTERIZATION OF CONCURRENT SYSTEMS

Waldemar Korczyński   *171-194*

Abstract. In the paper a characterization of concurrent systems as algebras of a special kind is given. The algebras are defined by semi- equations in the first order language.

A COMPLEXITY THEORETIC PARADE OF NETWORK-FLOW-PROBLEMS

Christoph Meinel   *195-208*

Abstract. In the following we prove the p-projection completeness of a number of extremely restricted modifications of the NETWORK-FLOW-PROBLEM for such well known nonuniform complexity classes like

$$\mathscr{NC}^1, \ \mathscr{L}, \ \mathscr{NL}, \ \mathrm{co}-\mathscr{NL}, \ \mathscr{P}, \ \mathscr{NP}$$

using a branching-program based characterization of these classes given in [Ba86] and [Me86a,b].

LOGIC PROGRAMMING ON A TOPOLOGICAL BILATTICE

Melvin Fitting   *209-218*

Abstract. We investigate the semantics of logic programming using a generalized space of truth values. These truth values may be thought of as evidences for and against – possibly incomplete or contradictory. The truth value spaces we use essentially have the structure of M. Ginsberg's bilattices, and arise from topological spaces. The simplest example is a four-valued logic, previously investigated by N. Belnap. The theory of this special case properly contains that developed in earlier research by the author, on logic programming using Kleene's three-valued logic.

ON CORRECTNESS OF DECISION ALGORITHMS IN INFORMATION SYSTEMS

Anita Wasilewska 219-240

Abstract. The concept of an information system, with manipulation based on the rough set theory, was introduced by Pawlak in 1982.

The information system is defined by its set of objects, set of attributes, set of values of attributes, and a function, which maps the direct product of the first two sets onto the set of values of attributes.

We introduce here, after [Pawlak 1985(1)], concepts of the decision rule, decision algorithm, static learning and describe the automatic procedures of deciding whether a given decision rule or decision algorithm is correct.

Keywords: information system, decision rule, decision algorithm,static learning, syntactic decision procedure.

QUERY OPTIMIZATION IN THE DATABASES DISTRIBUTED BY MEANS OF PRODUCT EQUIVALENCE RELATIONS

W. Marek, and C. Rauszer 241-266

Abstract. In this paper, we address the problem of query optimization in distributed databases. We show that horizontal partitions of databases, generated by products of equivalence relations, induce optimization techniques for the basic database operations (i.e., the selection, projection, and join operators). In the case of selection, our method allows for restriction of the number of blocks to be searched in the selection process and subsequent simplification of the selection formula at each block. For the natural join operation, we propose an algorithm that reduces the computation of fragments. Proofs of the correctness of our algorithms are also included.

CHAINS OF FINITE AUTOMATA WITH BOUNDED NUMBER OF CHAINS

Miroslaw Kutylowski 267-274

Abstract. Chains of finite automata are considered. We show that if the lowest automaton in a chain controls movements of the common reading head then computing power of the chain is very limited. This is a generalization of Krohn-Rhodes theorem on one-way automata.

CONSTRUCTING DELAUNAY TRIANGULATIONS BY MERGING BUCKETS IN QUADTREE ORDER

Jyrki Katajainen, and Markku Koppinen 275-288

Abstract. Recently Rex Dwyer [D87] presented an algorithm which constructs a Delaunay triangulation for a planar set of N sites in $O(N \log \log N)$ expected time and $O(N \log N)$ worst-case time. We show that a slight modification of his algorithm preserves the worst-case running time, but has only $O(N)$ average running time. The method is a hybrid which combines the cell technique with the divide-and-conquer algorithm of Guibas & Stolfi [GS85]. First a square grid of size about $\sqrt{N}$ by $\sqrt{N}$ is placed on the set of sites. The grid forms about N cells (buckets), each of which is implemented as a list of the sites which fall into the corresponding square of the grid. A Delaunay triangulation of the generally rather few sites within each cell is constructed with the Guibas & Stolfi algorithm. Then the triangulations are merged, four by four, in a quadtree-like order.

Keywords: Voronoi diagrams, Delaunay triangulations, bucket methods, quadtrees.

ROUGH TOLERANCE EQUALITY AND TOLERANCE BLACK BOXES

Juhani Nieminen

Abstract. The rough equality concept of Z. Pawlak is modified and the rough top and the rough bottom tolerance equalities are given and characterized. The same tolerance idea is applied also to black box notion introduced by Novotný and Pawlak; the concept, thus obtained is called tolerance black box. Tolerance black boxes are characterized and their properties are described.

Keywords: Rough sets, tolerance relations, rough equalities, black boxes.

A TEMPORAL LOGIC FOR EVENT STRUCTURES

Wojciech Penczek

Abstract. A temporal logic for event structures based on a partial order frame of local states is presented. Two modalities, for causality and conflict, are introduced. Completeness of the axiom system is proved. The finite model property and decidability are discussed.

Keywords: and phrases: temporal logic, partial, order, concurrent system, inevitability, invariant, event structures.

COMPOSITIONAL SEMANTICS OF PURE PLACE /TRANSITION SYSTEMS

Abstract. The notion of synchronization of qualified pomsets (pomsets equipped with an alphabet) is introduced and some properties of this operation are given. It is claimed that the synchronization operation is a sufficient tool for composing complex concurrent systems from a set of simple atomic ones. As an example the behaviour of pure place/transition Petri nets is defined by means of qualified pomset synchronization.

Keywords: Compositionality, modularity, concurrency, pomsets, algebras, Petri nets, semantics.

BEHAVIOR STRUCTURES AND NETS

Abstract. Behavior Structures integrate causality and branching. Nets of Behavior Structures provide a unifying approach to different net models of Concurrency. The Theory is illustrated wrt Nets over automata in particular wrt Petri Nets.

EVENT STRUCTURE REPRESENTATION OF THE BEHAVIOUR OF PLACE / TRANSITION SYSTEMS

Abstract. It is shown how the nonsequential behaviour of marked Petri nets of places and transitions can be described with the aid of mathematical systems related to labelled event structures. The method of description is modular in the sense that the global behaviour is obtained by combining local ones corresponding to places and transitions.

Keywords: Place/Transition system, Petri net, marking, execution of transition, independence of executions, behaviour, configuration of events, labelled event structure, configuration system

A NON-INTERLEAVING SEMANTICS FOR CCS BASED ON PROVED TRANSITIONS

Abstract. When using labelled transition systems to model languages like CCS or TCSP, one specifies transitions by a set of structural rules. We consider labelling transitions with their proofs – in the given system of rules – instead of simple actions. Then the label of a transition identifies uniquely that transition, and one may use this information to define a concurrency relation on (proved) transitions, and a notion of residual of a (proved) transition by a concurrent one. We apply Berry and Lévy's notion of equivalence by permutations to sequences of proved transitions for CCS to obtain a partial order semantics for this language.