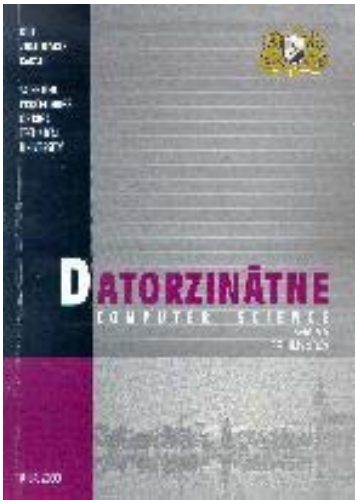

Scientific Proceedings of Riga Technical University in series "Computer Science", vol 25.

Riga: Riga Technical University,

2005. - 148 p.

("Boundary Field Problems and Computer Simulation";

47-nd issue). ISSN 1407-7493.

This volume is the current 47-th thematic issue of the Riga Technical University (RTU) collection of scientific articles "Boundary Field Problems and Computer Simulation" in series "Computer Science". The collection continues (since 1999, with slightly changed title) the lasting international series "Boundary Field Problems and Computers", issued by RTU since 1966.

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Abstracts

Madrane, A., El Boukili, A., Vaillancourt, R. A new overlapping unstructured grid algorithm.

The objective of this paper is to propose an efficient and robust algorithm to automatically localize the intermesh boundaries for the overset unstructured hybrid grid method. The intermesh boundaries are localized using the minimum wall distance concept proposed by Nakahashi et al. and the advancing front vicinity algorithm for the hole-cutting procedure. In such a case, since the elements are not deformed during the computation, the costly re-meshing part of conventional methods is prevented. This method relies on the inter-grid boundary definition to establish communication among independent grids in the overset system. At the end the Navier-Stokes equations are integrated on several overset systems to examine the capabilities of this method. (pp. 7-17)

Pelletier E.F., Vaillancourt R. Modelling instrument's sounds using Malvar wavelets.

An instrument's sound is the result of a collection of overtone frequencies (harmonics) that occur simultaneously when a note is played. This collection is responsible for the 'colour' of the sound or the 'timbre' of an instrument. A music note consists of three main parts, the attack, sustain and decay, which describe the beginning, middle and end of the sound-each of these has some positive duration, perhaps very short. We propose a mathematical model that takes into account an instrument's harmonic frequency features during the attack, sustain and decay like a synthesizer which attempts to imitate the sound of a particular instrument by replicating the amplitudes of its harmonics, a method called 'additive synthesis'. (pp. 18-24)

Hua X-H., Vaillancourt R. Dynamics of permutable meromorphic functions.

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Sharp P.W., Vaillancourt R. Error growth of some symplectic explicit Runge-Kutta Nyström methods for a simulation of the gas giants.

At one extreme of large stepsizes, the global error for symplectic explicit Runge-Kutta Nyström (SERKN) methods applied to a long simulation of the four gas giants, Jupiter, Saturn, Uranus and Neptune, consists entirely of truncation error and typically grows as time t. At the other extreme of very small stepsizes, the global error of SERKN methods for the same simulation consists entirely of round-off error and grows as t2. We use numerical testing to investigate how the global error grows for stepsizes between these two extremes. (pp. 32-38)

Sharp P.W., Vaillancourt R. Efficient order-five second-derivative explicit Runge-Kutta pairs with interpolants.

It is well known that six stages are needed to form an order-five explicit Runge-Kutta (ERK) formula, if all the stages are evaluations of the first derivative f. There are two ways this order barrier might be overcome. One is to using stage values from the previous step, giving rise to two-step ERK methods. The other is to use evaluations of second and higher derivatives. Ono {J. of Information Processing, , No. 3 (1989), 251-260] showed that if one of the stages was an evaluation of f' at the start of the step, it was possible to get an order five formula using four evaluations of f and one evaluation of f'. These new methods are particularly appealing for many problems where f' is easy to work out and inexpensive to evaluate. The usefulness of Ono's methods can be extended by making them variable-stepsize and by appending an interpolant. To this end, we present two families of pairs, consisting of formulae of orders four and five and construct the pairs in such a way that an order-five, globally C2 interpolant can be formed without using extra evaluations. Order five interpolants for conventional ERK pairs require eight evaluations and are typically just C1 globally. Thus the new interpolants offer a significant advantage when the interpolant must be evaluated frequently. (pp. 39-47)

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vectors. It is strictly proved that the new simple formula is equivalent to the previous formula used in literature. (pp. 67-81)

G. Burov. The Cyclic Structure of an Associative Matrix.

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G. Burov.

Combinatory models of inversion of special type matrices

In this article the problem connected to the increase of accuracy of operation of the inversion of badly conditioned matrices of a special type is considered. The algorithm of the inversion has been developed on the basis of principles of the combinatory analysis. It is offered to use address lexicographic combinatory configurations (ALCCs), which are formed on the basis of index matrix grids of associative matrices in such algorithms. The method of ALCC formation using the information-compressed lexicographic models of their description is developed. Algorithmically correct ALCCs for calculation of permanents of the inverse associative matrix are developed. The method of association of identical ALCC fragments in one address group is offered. Positional structures of ALCC of associative matrices are formed on hierarchical principles as a decomposition of independent blocks. This allows to create economic algorithms

with parallel properties for solving systems of equations. The majority of operations of information processing is carried out in the space of ALCC using the methods of monitoring. These methods are based on information interchange between numerical information space and ALCC space. Efficiency of the offered approach has been checked on a numerical example of the inversion of badly conditioned 20th order Hilbert matrix. Results have been received with 100% accuracy. Their credibility has been verified with the help of a special technique based on the use of ALCC, which allows to solve the problem of information processing programmatically with big accuracy for cases when the length of numbers exceeds the number precision limit of the computer. (pp. 94-107)

Spalvins A., Slangens J., Janbickis R., Lace I., Juhna T. The hydrogeological model of the Baltezers, Rembergi and Zakumuiza water supply complex.

The regional spatial hydrogeological model has been created for the Baltezers, Rembergi and Zakumuiza waterworks. Methodology of forming the model is described, especially, in part of simulation of infiltration flow. The model will be used for optimising regimes of the waterworks and also for predicting after effects

of contaminant migration endangering quality of groundwater supplied by the waterworks. (pp. 108-121)

Spalviņs A., Slangens J., Janbickis R., Lace I., Juhna T. Hydrogeological model for simulation of contaminant migration for the area of the 3rd and 10th infiltration pools of the Baltezers waterworks, Latvia

The local hydrogeological model has been created to simulate contaminant migration for the area of 3rd and 10th infiltration pools of the Baltezers waterworks. Migration of algae toxins from the pools for the worst case scenarious has been investigated by applying the MODPATH and MT3D systems. Due to dilution and bio degradation processes, the concentration of toxins in production wells is at least ten times lower than in the pools. Therefore, even in the case of short migration time and slow biodegradation, considerable decrease of the impact of the toxins may be expected. (pp. 122-133)

Spalvins A., Slangens J., Janbickis R., Lace I., Skibelis V., Eglite, I., Macans, A. Improved hydrogeological model for evaluating contaminant migration in groundwater polluted by sulphur - sludge pools at Incukalns, Latvia.

In 1998, a hydrogeological model for the contaminated Incukalns place has been created and rough prognoses of SO4 and surface active components migration in groundwater have been obtained. In 2004-2005, this model has been considerably improved in order to find the best methods of stopping pollution plumes and of lessening their impact on local environment. The improved model is described and new results obtained are presented. (pp. 135-147)