Jednota slovenských matematikov a fyzikov
Pobočka Košice

Prírodovedecká fakulta UPJŠ
Ústav matematických vied

Fakulta elektrotechniky a informatiky TU
Katedra matematiky a teoretickej informatiky

13. Konferencia košických matematikov

Herľany

23. – 24. marca 2012

Názov: 13. Konferencia košických matematikov

Zostavovatelia: Ján Buša, Stanislav Jendroľ, Štefan Schrötter
Vydavateľ: Fakulta elektrotechniky a informatiky TU, Košice
Rok: 2012
Rozsah: 22 strán
Náklad: 40 ks
Vydanie: prvé
Vydané v Košiciach, 2012
Elektronická sadzba programom pdfTEX

ISBN 978-80-553-0895-1

Predhovor

Milí priatelia,

vítame vás na 13. Konferencii košických matematikov. Túto konferenciu organizuje Jednota slovenských matematikov a fyzikov, pobočka Košice, v spolupráci s Ústavom matematických vied Prírodovedeckej fakulty UPJŠ, Centrom excelentnosti informatických vied a znalostných systémov UPJŠ, katedrami matematiky Technickej univerzity a pobočkou Slovenskej spoločnosti aplikovanej kybernetiky a informatiky pri KRVP BF TU v Košiciach. Konferencia sa koná, tak ako aj jej predchádzajúce ročníky, v útulnom prostredí Učebno-výcvikového zariadenia TU Košice v Herľanoch.

Cieľom konferencie je zintenzívniť stavovský život všetkých, ktorí sa v Košiciach a okolí profesionálne zaoberajú matematikou (t. j. učiteľov všetkých typov škôl, pracovníkov na poli matematických a informatických vied a aplikácií matematiky v priemysle, technike, bankovníctve a inde) a formulovať základné oblasti ich stavovských záujmov. Odborný program konferencie tradične pozostáva z pozvaných prednášok, prihlásených referátov a diskusií o stavovských problémoch. Na konferencii je vytvorený priestor aj na diskusiu o aktuálnych problémoch.

Priestor na získanie skúseností pri prezentácii svojich výsledkov je poskytnutý aj doktorandom a mladším matematikom. Je potešujúce vidieť, ako sa každým rokom zlepšujú ich vystúpenia. Veríme, že im vystúpenia na tejto konferencii pomôžu pri prezentovaní výsledkov na ďalších konferenciách.

Organizačný výbor konferencie pozýva významné osobnosti matematiky, ktoré v rámci svojich prednášok ukážu miesto matematiky v spoločenskom živote a súčasné trendy jej rozvoja. Viaceré z týchto prednášok mali taký pozitívny ohlas, že ich autori boli pozvaní predniesť ich aj na iných konferenciách. Toho roku pozvanie prednášať prijali: prof. RNDr. M. Bača, CSc. (KAMI SjF TU Košice), Mgr. J. Buša ml., PhD. (KMTI FEI TU Košice), prof. dr hab. M. Ciosek (ÚM PedU Krakow, Poľsko), RNDr. O. Hutník, PhD. (ÚMV PF UPJŠ Košice), doc. RNDr. Z. Kubáček, CSc. (FMFI UK Bratislava) a prof. RNDr. G. Wimmer, DrSc. (FPV UMB Banská Bystrica a MÚ SAV Bratislava).

Prajeme vám príjemný pobyt v Herľanoch

Organizačný výbor: Ján Buša
Stanislav Jendroľ
Štefan Schrötter

Zoznam účastníkov – List of participants

Bača Martin — Katedra aplikovanej matematiky SjF TU, Košice, SR, martin.baca@tuke.sk

Borsík Ján — Matematický ústav SAV, Košice, SR, borsik@saske.sk

Bukovský Lev — Ústav matematických vied PF UPJŠ, Košice, SR, lev.bukovsky@upjs.sk

Buša Ján — Katedra matematiky a teoretickej informatiky FEI TU, Košice, SR, jan.busa@tuke.sk

Buša Ján ml. — Katedra matematiky a teoretickej informatiky FEI TU, Košice, SR, jan.busa@tuke.sk

Ciosek Marianna — Instytut Matematyki Uniwersytetu Pedagogicznego w Krakowie, Krakow, PL, ciosek.maria@gmail.com

Coroničová Hurajová Jana — Ústav matematických vied PF UPJŠ, Košice, SR, jana.hurajova@student.upjs.sk

Doboš Jozef — Ústav matematických vied PF UPJŠ, Košice, SR, jozef.dobos@upjs.sk

Frič Roman — Matematický ústav SAV, Košice, SR, fric@saske.sk

Furcoňová Katarína — Ústav matematických vied PF UPJŠ, Košice, SR, katarina.furconova@student.upjs.sk

Haluška Ján — Matematický ústav SAV, Košice, SR, jhaluska@saske.sk

Hutník Ondrej — Ústav matematických vied PF UPJŠ, Košice, SR ondrej.hutnik@upjs.sk

Ižaríková Gabriela — Katedra aplikovanej matematiky SjF TU, Košice, SR, gabriela.izarikova@tuke.sk

Juhás Matej — Ústav matematických vied PF UPJŠ, Košice, SR, matej.juhas@student.upjs.sk

Kanáliková Andrea — Ústav matematických vied PF UPJŠ, Košice, SR, andrea.kanalikova@student.upjs.sk

Klešč Marián — Katedra matematiky FEI TU, Košice, SR, Marian.Klesc@tuke.sk

Invited lectures

Connection between α-labeling and Antimagic Labelings

Martin Bača

Department of Applied Mathematics and Informatics, Technical University, Letná 9, Košice, Slovakia

A labeling of a graph G is any mapping that sends certain set of graph elements to a certain set of positive integers or colors.

A *graceful labeling* of a (p, q) graph G is an injection

$$f : V(G) \to \{1, 2, \ldots, q + 1\}$$

such that, when each edge uv is assigned the label $|f(u)-f(v)|$, the resulting edge labels (or edge-weights) are distinct numbers from the set $\{1, 2, \ldots, q\}$. A graph that admits a graceful labeling is said to be *graceful*. A graceful labeling f of a graph G is said to be an *α-labeling* if there exists an integer λ such that for each edge uv of G either $f(u) \le \lambda < f(v)$ or $f(v) \le \lambda < f(u)$. A graph that admits an α-labeling is called an *α-graph*.

Graceful and α-labelings were introduced by Rosa in 1966. The Ringel-Kotzig conjecture that all trees are graceful is a very popular open problem.

An (a, d)-edge-antimagic vertex labeling on a (p, q)-graph is defined as a one-to-one map taking the vertices onto the integers $1, 2, \ldots, p$ with the property that the edge-weights (sums of endpoint labels) form an arithmetic sequence starting from a and having a common difference d.

We construct α-trees from smaller graceful trees and transform their labelings to edge-antimagic labelings.

Also we study the super (a, d)-edge-antimagic total labelings of graphs.

Program 13. Konferencie košických matematikov

Programme of the 13th Conference of Košice Mathematicians

Piatok – Friday 23. 3. 2012

8^{30} – **Otvorenie – Opening**

8^{40} – Bača M. (KAMI SjF TU) *Connection between α-labeling and Antimagic Labelings*

9^{30} – Polláková T. (ÚMV PF UPJŠ) *Some Constructions of Supermagic Graphs*

9^{50} – Kopperová M. (ÚMV PF UPJŠ) *Long Cycles in Distance Graphs*

10^{10} – **Káva – Coffee-break**

10^{40} – Hurajová J. (ÚMV PF UPJŠ) *The Constructions of Betweenness Selfcentric Graphs*

11^{00} – Škrabuľáková E. (KAM ÚRIVP FBERG TU) *On the Facial Thue Choice Index of Graphs*

11^{20} – Krajník F. (ÚMV PF UPJŠ) *Varieties with Compact Intersection Property*

11^{40} – Šupina J. (ÚMV PF UPJŠ) *Projectively Zero-dimensional Sets of Reals*

12^{00} – **Obed – Lunch**

14^{00} – Wimmer G. (MÚ SAV) *Calibration*

14^{50} – Juhás M. (ÚMV PF UPJŠ) *Some Characterization of Probability Distributions Based on Record Values*

15^{10} – Hutník O. (ÚMV PF UPJŠ) *Flett's Mean Value Theorem: A Survey*

16^{00} – **Káva – Coffee-break**

Generalization as a Mathematical Activity

Marianna Ciosek

Institute of Mathematics, The Pedagogical University of Cracow, Cracow, Poland

Generalization is one of the most important processes that occurs in the construction of mathematical concepts, discovering theorems, and solving math problems. Types of generalizations of theorems, according to the eminent Polish educator, A. Z. Krygowska will be presented.

These types will be illustrated by examples of generalization activity, disclosed in the author's research on solving open math problems by people at different levels of mathematical knowledge and experience.

References

[1] Ciosek, M.: *Proces rozwiązywania zadania na różnych poziomach wiedzy i doświadczenia matematycznego*, WN AP, Kraków, 2005.

[2] Krygowska, A. Z.: *Zarys dydaktyki matematyki*, PWN, Warszawa, 1979.

Flett's Mean Value Theorem: A Survey

Ondrej Hutník

Institute of Mathematics FSc, Pavol Jozef Šafárik University, Jesenná 5, 041 54 Košice, Slovakia

Mean value theorems of differential and integral calculus provide a relatively simple, but very powerful tool of mathematical analysis suitable for solving many diverse problems. Every student of mathematics knows the Lagrange's mean value theorem which has appeared in Lagrange's book *Theorie des functions analytiques* in 1797 as an extension of Rolle's result

- outer product estimator or quadratic least square estimator:

$$S^* = \frac{1}{n-r(X)}Y'M_XY + \frac{1}{n}M_{Z'}Y'YM_{Z'} - \frac{1}{n-r(X)}M_{Z'}Y'M_XYM_{Z'}.$$

On the Facial Thue Choice Index of Graphs

Erika Škrabuľáková

Division of Applied Mathematics, Institute of Control and Informatization of Production Processes, BERG Faculty, Technical University,
Boženy Němcovej 3, 040 01 Košice, Slovakia

Let G be a plane 2-connected graph with no two adjacent triangles. G is called $(A_m - B_l)$-edge-decomposable if its edges can be partitioned into 2 sets $\mathcal{A}$ and $\mathcal{B}$ such that
at the boundary of each face there are at most m edges belonging to $\mathcal{A}$
no two edges belonging to $\mathcal{A}$ are adjacent on one facial trail
on every facial trail of length $l+1>3$ there exists at least one edge $e \in \mathcal{A}$
on every at least 4-gonal face of G there is at least one edge $e \in \mathcal{A}$

For G being a plane graph a *facial non-repetitive edge-colouring* of G is an edge-colouring such that any *facial trail* is non-repetitive. Moreover if the colour of every edge e is chosen only from pre-assigned list of colours $L(e)$ we speak about a *facial non-repetitive list edge-colouring* φ_{fl} of the graph G, where $L : E(G) \to 2^{\mathbb{N}}$ is a list assignment of G. The minimum list length needed is the *facial Thue choice index* of G and it is denoted by $\pi'_{fl}(G)$. We show an upper bound for the facial Thue choice index of $(A_{\lfloor \frac{k}{2} \rfloor} - B_{\lceil \frac{k}{2} \rceil})$-edge-decomposable graphs (where k is the size of the largest face of graph) and some other subfamilies of plane graphs.

What Does the Textbook Author Think About? (A Sketch of Mathematical *Psycho*analysis)

Zbyněk Kubáček

Department of Mathematical Analysis and Numerical Mathematics, Faculty of Mathematics, Physics and Informatics, Comenius University, Mlynská dolina, 842 48 Bratislava, Slovakia

Why to teach mathematics on a higher secondary level? And, when it is already taught, how to teach it and what to fulfil this teaching by? Should we emphasise it´s logical construction with abstract aproach or application of mathematics in various human activities? Is a mathematics textbook destined to be a guide to discovery of the world of mathematics or should it become a school mathematics handbook? Should it be focused on a teacher or on a pupil? All these questions should be well answered before writing any textbook (usually, there is only one choice to be made among possible answers, otherways the textbook should extend 800 pages . . .). My lecture will open lot of similar questions, tough not so many evident answers

Calibration

Gejza Wimmer

Matej Bel University, Banská Bystrica &
Mathematical Institute SAS, Bratislava

Calibration is a complex of very significant technological, legislative, metrological, economic, but also mathematical-statistical problems, which are not satisfactory solved up to the present time. Progress in solving calibration problems is expecting from mathematical and statistical methods. The focal point here is obtaining the calibration curve (often the calibration line), indeed its estimate, and evaluating the measurements realized by the calibrated gauge. Some calibration models will be presented, namely

Varieties with Compact Intersection Property

Filip Krajník

Institute of Mathematics FSc, Pavol Jozef Šafárik University,
Jesenná 5, 041 54 Košice, Slovakia

We say that a variety $\mathcal{V}$ of algebras has the Compact Intersection Property (CIP), if the family of compact congruences of every $A \in \mathcal{V}$ is closed under intersection. We investigate the congruence lattices of algebras in locally finite, congruence-distributive CIP varieties and obtain a complete characterization for several types of such varieties.

Some Constructions of Supermagic Graphs

Tatiana Polláková

Institute of Mathematics FSc, Pavol Jozef Šafárik University,
Jesenná 5, 041 54 Košice, Slovakia

A graph is called magic (supermagic) if its admits a labeling of the edges by pairwise different (and consecutive) integers such that the sum of the labels of the edges incident with a vertex is independent of the particular vertex. A graph is called $(a, 1)-$ antimagic if it admits a injective labeling f of the edges by the integers 1, 2, ..., $|E(G)|$ such that the set of weights of the vertices consists of different consecutive integers and the first number is a. We will deal with magic and $(a, 1)$-antimagic graphs and we will present some constructions of supermagic graphs.

Acknowledgements. The present work was supported by the UPJŠ internal grant system VVGS 65/12-13.

Conference contributions

Visualization in Solving of Word Problems

Katarína Furcoňová

Institute of Mathematics FSc, Pavol Jozef Šafárik University,
Jesenná 5, 041 54 Košice, Slovakia

Mathematical visualization is the process of forming images (mentally, or with pencil and paper, or with aid of technology) and using such images effectively for mathematical discovery and understanding. Visualization provides a simple, elegant and effective approach to solve word problems in mathematics. In our contribution we explore the visualization in word problem solving, especially motion word problems. Practice and experience of teachers show that students have problems to solve word problems. We will divide the motion word problems in several categories. The types of visualization introduced by Berends and van Lieshout will be considered. Finally, we will focus on the following issue: What types of visualization do students most commonly use?

The Constructions of Betweenness Selfcentric Graphs

Jana Hurajová, Silvia Gago, and Tomáš Madaras

Institute of Mathematics FSc, Pavol Jozef Šafárik University,
Jesenná 5, 041 54 Košice, Slovakia

Centrality is a core concept for the analysis of social network. The most frequently used centrality indices are vertex degree, eccentricity, the sum of all distances from a vertex, and the betweenness centrality, which is defined

as the relative number of shortest paths between all pairs of vertices passing through given vertex.

We study the betweenness-selfcentric graphs (that is, the graphs with vertices having the same betweenness centrality), their properties and the constractions of such graphs.

Acknowledgements. The present work was supported by the UPJS internal grant system VVGS 65/12-13.

Some Characterization of Probability Distributions Based on Record Values

Matej Juhás and Valéria Skřivánková

Institute of Mathematics FSc, Pavol Jozef Šafárik University, Jesenná 5, 041 54 Košice, Slovakia

The contribution deals with characterization of some probability distributions using upper record values. Records are special case of extreme values with random character. Suppose that X_1, X_2, ... is a sequence of independent identically distributed random variables. Random variable X_n is an upper record if $X_n > \max\{X_1, X_2, \ldots, X_{n-1}\}$, $n > 1$. By convention X_1 is an upper record value.

The problem of characterization of probability distributions was opened by Ahsanullah who characterized the exponential distribution by some properties of record values. Korean mathematicians Lee, Lim and Chang dealt with the problem of characterization of Weibull and Pareto distribution by special transformations of records. We generalize their results for the exponential and Weibull distribution using a differentiable function $g(x)$.

Introduction of Real Numbers

Andrea Kanáliková

Institute of Mathematics FSc, Pavol Jozef Šafárik University, Jesenná 5, 041 54 Košice, Slovakia

This contribution deals with the Canadian research by N. Sirotic and R. Zazkis, which was oriented to real numbers understanding by prospective secondary school teachers. The students understanding necessity of geometrical representation of a real number is highlighted in that research.

This contribution describes application of such research in our conditions. Our research oriented on the university students of mathematics teaching as well as on the university students of a technical scope. The comparison of both researches and the description of the different results achievement are also presented in this contribution.

Long Cycles in Distance Graphs

Mária Kopperová

Institute of Mathematics FSc, Pavol Jozef Šafárik University, Jesenná 5, 041 54 Košice, Slovakia

A nonempty vertex set $X \subseteq V(G)$ of a hamiltonian graph G is called an *H-force set* of G if every *X-cycle* of G (i.e. a cycle of G containing all vertices of X) is hamiltonian. The *H-force number* $h(G)$ of a graph G is defined to be the smallest cardinality of an H-force set of G. Let $n \in N$ and $D \subseteq N$ is a set of parameters, then distance graph is a graph with $V(G) = \{0, 1, 2, \ldots, n-1\}$ and two vertices i, j are adjacent if $|j - i| \in D$. For a distance graph $G_n(d_1, d_2)$ we establish an exact value of H-force number if $d_2/d_1 \geq 2$, and an upper bound if $d_2/d_1 < 2$.

Acknowledgements. The present work was supported by the UPJS internal grant system VVGS 65/12-13.

- the classical (natural) regression estimator,
- the inverse regression estimator,
- a model using the maximum likelihood method,
- a metrological model (according to EUROMET),
- the replicated errors-in-variables regression model.

Some results concerning estimators of the calibration curve parameters will be also shown as well as mathematical-statistical procedures suggested for evaluating measurements using the calibrated measuring device (multiple use calibration).

References

[1] Brown, P., J.: *Measurement, Regression, and Calibration*, Clarendon Press, Oxford, 1993.

[2] Kenward, M., G., Roger, J., H.: *Small sample inference for fixed effects from restricted maximum likelihood*, Biometrics 53 (1997), 983–997.

[3] Kubáček, L., Kubáčková, L.: *Statistika a Metrologie*, Univerzita Palackého v Olomouci, Olomouc, 2000.

[4] Wimmer, G., Witkovský, V., Savin, A.: *Confidence region for parameters in replicated errors in variables model*, In: COMPSTAT, Proceedings in Computational Statistics, 16.th Symposium held in Prague, Antoch, J. (Fditor) Physica-Verlag, 2004, 1987–1994.

[5] Wimmer, G., Witkovský, V.: *Univariate linear calibration via replicated errors-in-variables model*, Journal of Statistical Computation and Simulation 77 (3) (2007), 213–227.

[6] Wimmer, G., Witkovský, V.: *Linear comparative calibration with correlated measurements*, Kybernetika 43 (4) (2007), 443–452.

Estimators of Unknown Parameters in the Growth Curve Model with a Uniform Correlation Structure for Different Estimators of Variance Matrix

Rastislav Rusnačko

Institute of Mathematics FSc, Pavol Jozef Šafárik University,
Jesenná 5, 041 54 Košice, Slovakia

The growth curve model is a generalized multivariate analysis of variance model, which is a useful statistical model for various areas of study. This model is defined as

$$Y = XBZ + \varepsilon, \quad \mathrm{vec}(\varepsilon) \sim N(0, \Sigma \otimes I),$$

where Y is matrix of observations, X is ANOVA matrix, B is matrix of unknown parameters, Z is matrix of regress constants, ε is matrix of random errors which has the normal distribution and Σ is variance matrix of rows of matrix Y. This matrix contains a lot of parameters, so it is useful to reduce their amount with consideration more simply structure. We will deal with one of the most commonly used structures namely uniform correlation structure, which has the form

$$\Sigma = \sigma^2[(1-\rho)I + \rho\mathbf{1}\mathbf{1}'],$$

where $\sigma > 0$ and $\rho \in \left(-\frac{1}{p-1}, 1\right)$ are unknown parameters.

We will explain estimators of these unknown parameters for different estimators of variance matrix Σ. We will deal with

- uniformly minimum variance unbiased invariant estimator (UMVUIE):

$$S = \frac{1}{n - r(X)} Y' M_X Y,$$

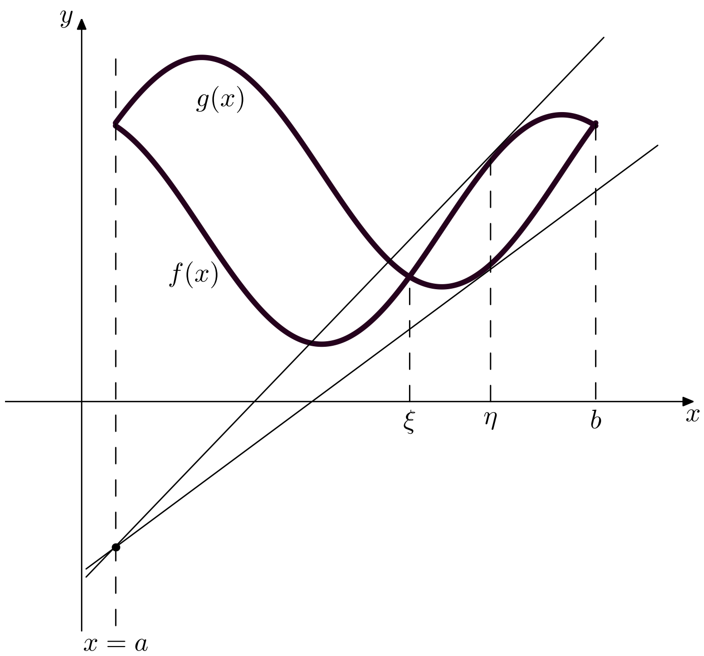
- maximum likelihood estimator:

$$S^M = \frac{1}{n}\left(Y' M_X Y + M_{Z'} Y' P_X Y M_{Z'}\right),$$

from 1691. More precisely, Lagrange's theorem says that for a continuous (real-valued) function f on a compact set $\langle a, b\rangle$ which is differentiable on (a, b) there exists a point $\eta \in (a, b)$ such that

$$f'(\eta) = \frac{f(b) - f(a)}{b - a}.$$

Geometrically Lagrange's theorem states that given a line ℓ joining two points on the graph of a differentiable function f, namely $[a, f(a)]$ and $[b, f(b)]$, then there exists a point $\eta \in (a, b)$ such that the tangent at $[\eta, f(\eta)]$ is parallel to the given line ℓ. Clearly, Lagrange's theorem reduces to Rolle's theorem if $f(a) = f(b)$. In connection with these well-known facts the following questions may arise: *Are there changes if in Rolle's theorem the hypothesis $f(a) = f(b)$ refers to higher-order derivatives? Then, is there any analogy with the Lagrange's theorem? Which geometrical consequences do such results have?* These (and many other) questions will be investigated in our talk in which we provide a survey of known results as well as of our observations and obtained results in cooperation with our student Jana Molnárová.



Projectively Zero-dimensional Sets of Reals

Jaroslav Šupina

Institute of Mathematics FSc, Pavol Jozef Šafárik University,
Jesenná 5, 041 54 Košice, Slovakia

A subset of the real line A is called projectively zero-dimensional set of reals if both A and $f(A)$ for any continuous real-valued function f on A are zero-dimensional. We present basic topological properties of projectively zero-dimensional sets of reals and their interaction with some set theoretic axioms.

Acknowledgements. This work was partially supported by the grant 1/0002/12 of Slovak Grant Agency VEGA.

Function of Proving – Different Levels of Mathematics Education

Anna K. Żeromska

Institute of Mathematics, The Pedagogical University of
Cracow, Cracow, Poland

Subject of my presentation is a report from the research on students' knowledge and intuitions about the mathematical proof and also on students' reasoning skills in justifying statements. The research is a part of more comprehensive study aimed to make the diagnosis of such skills of students at different levels of mathematical education, including university one. Theoretical basis for this diagnosis are (among others) the following scientific papers [1, 2] dealing with problem of the mathematical reasoning from theoretical and research perspective.

References

[1] Hanna, G.: *Proof, explanation and exploration: an overview*, Educational Studies in Mathematics 44, 5–23, 2001.

[2] Hemmi, K.: *Three styles characterizing Mathematicians' Perspectives on Pedagogical proof*, Educational Studies in Mathematics 75, 271–291, 2010.

Mathematics and Computer Modeling of Proteins

Ján Buša Jr.

Department of Mathematics and Theoretical Informatics, Faculty of Electrical Engineering and Informatics, Technical University, Letná 9, 040 01 Košice, Slovakia

One of the key elements in the process of modeling of proteins is the estimation of area and volume of the protein. This information is a basic one when estimating solvation energy, or studying hydration effects, molecular docking, etc. Algorithm for calculating area and volume of protein has to be exact and precise.

Traditional way of modeling proteins is using set of spheres representing individual atoms with given coordinates of their centers and their radii. The number of atoms can be high (several hundreds or thousands) and depending on the radius of sphere, dozens of spheres can intersect. In article [1] an analytic algorithm for computing area and volume of protein was introduced together with implementation of algorithm in FORTRAN.

With introduction of General-Purpose computing on Graphics Processing Units (GPGPU) a new possibility opened for speed-up the calculation of the area and volume of proteins. One of the ways to exploit the possibilities of GPGPU is to use open standard for parallel programming – OpenCL [2].

During the talk I will show the steps that were necessary to transform the program introduced in [1] from FORTRAN to OpenCL and present the speed-up obtained.

References

[1] J. Buša, J. Džurina, E. Hayryan, Sh. Hayryan, C.-K. Hu, J. Plavka, I. Pokorný, J. Skřivánek, M.-C. Wu, *ARVO: A Fortran package for computing the solvent accessible surface area and the excluded volume of overlapping spheres via analytic equations*, Computer Physics Communications, Vol. 165 (2005), 59–96.

[2] Khronos Group, *OpenCL – The open standard for parallel programming of heterogeneous systems*, online, `http://www.khronos.org/opencl/`, accessed March 2012.

16^{20} – Kubáček Z. (KMAaNM FMFI UK) *What Does the Textbook Author Think About? (A Sketch of Mathematical* Psycho*analysis)*

17^{10} – Buša Jr. J. (KMTI FEI TU) *Mathematics and Computer Modeling of Proteins*

18^{00} – **Večera – Dinner**

19^{00} – **Spoločenský večer – Party**

Sobota – Saturday 24. 3. 2012

7^{30} – **Raňajky – Breakfast**

8^{30} – Ciosek M. (IM UPed Krakow) *Generalization as a Mathematical Activity*

9^{20} – Żeromska A. (IM UPed Krakow) *Function of Proving – Different Levels of Mathematics Education*

9^{40} – Furcoňová (ÚMV PF UPJŠ) *Visualisation in Solving of Word Problems*

10^{00} – **Káva – Coffee-break**

10^{20} – Kanáliková A. (ÚMV PF UPJŠ) *Introduction of Real Numbers*

10^{40} – Rusnačko (ÚMV PF UPJŠ) *Estimators of Unknown Parameters in the Growth Curve Model with a Uniform Correlation Structure for Different Estimators of Variance Matrix*

11^{00} – **Záver – Conclusion**

11^{05} – **Obed – Lunch**

Obsah – Contents

Kopperová Mária — Ústav matematických vied PF UPJŠ, Košice, SR, maria.kopperova@student.upjs.sk

Krajník Filip — Ústav matematických vied PF UPJŠ, Košice, SR, filip.krajnik@student.upjs.sk

Kubáček Zbyněk — Katedra matematickej analýzy a numerických metód FMFI UK, Bratislava, SR, Zbynek.Kubacek@fmph.uniba.sk

Lukáš Stanislav — Ústav matematických vied PF UPJŠ, Košice, SR, stanislav.lukas@upjs.sk

Olekšáková Denisa — Katedra aplikovanej matematiky SjF TU, Košice, SR, denisa.oleksakova@tuke.sk

Polláková Tatiana — Ústav matematických vied PF UPJŠ, Košice, SR, tatiana.pollakova@student.upjs.sk

Rusnačko Rastislav — Ústav matematických vied PF UPJŠ, Košice, SR, rastislav.rusnacko@student.upjs.sk

Schrötter Štefan — Katedra matematiky a teoretickej informatiky FEI TU, Košice, SR, stefan.schrotter@tuke.sk

Skřivánek Václav — Matematický ústav SAV, Košice, SR, skrivanek@saske.sk

Škrabuľáková Erika — FBERG TU, Košice, SR, erika.skrabulakova@tuke.sk

Šupina Jaroslav — Ústav matematických vied PF UPJŠ, Košice, SR, jaroslav.supina@student.upjs.sk

Šveda Dušan — Ústav matematických vied PF UPJŠ, Košice, SR, dusan.sveda@upjs.sk

Wimmer Gejza — Univerzita Mateja Bela, Banská Bystica; Matematický ústav SAV, Bratislava, SR, wimmer@mat.savba.sk

Żeromska Anna — Instytut Matematyki Uniwersytetu Pedagogicznego w Krakowie, Krakow, PL, zeromska.anna@gmail.com

Editori: Ján Buša, Stanislav Jendroľ, Štefan Schrötter

ISBN 978-80-553-0895-1

Sadzba programom pdfTEX