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Teaching
Mathematics and
Computer Science

Report of Conference XXXVIII. National Conference on Teaching Mathematics, Physics and Computer Sciences August 25 – 27, 2014 Pécs, Hungary

The XXXVIII. National Conference on Teaching Mathematics, Physics and Computer Sciences (MAFIOK) was held in Pécs, Hungary between 25 and 27 August, 2014 at the Pollack Mihály Faculty of Engineering and Information Technology. It was organized by the Engineering Mathematics Department. The 65 participants – including 4 invited lecturers and 53 lecturers – came from 2 countries and represented 14 institutions of higher education. After the welcome speech of professor Péter Iványi, who is the vice dean of the Pollack Mihály Faculty of Engineering and Information Technology, the conference was opened by professor Ildikó Perjésiné Hámori, head of the Engineering Mathematics Department. She welcomed the participants and asked the first two invited lecturers to hold their presentations about the application of high-energy laser pulses and the nice geometrical patterns in science and art. After a short break, in the next plenary session, the chairman of which was Sándor Molnár – the president of the Programme Committee – the topics of the presentations were master level ICT education and the entrepreneurs, and the nuclear capacity maintenance in Hungary. On the second day of the conference educational and research experiences and results were presented by the participants, which were then discussed in small session groups of mathematics, physics and computer sciences, in the afternoon of the second day the participants were invited to take a guided tour at the Zsolnay cultural quarter, where they visited the “live manufacture gallery”, the Zsolnay mausoleum and the Kodály Conference and Concert Center. On the last day

the lectures and discussions continued in session groups. There were two plenary lectures before the closing ceremony. Professor József Kispéter – who is one of the founders of this conference and also the honorary president – presented a lecture about the history of the conference and his life, in honor of his 80th birthday. University of Kaposvár has undertaken the organization of the next conference; therefore the representative tutor received the itinerant cup of the conference, indicating that the host of the next conference will be Kaposvár. This report contains the abstracts of every lecture presented on the conference, grouped by plenary sessions and areas of interest: mathematics, physics and computer sciences, in alphabetical order of the names of the authors in each group.

List of abstracts from sections of Mathematics

SZABOLCS BAJÁK: *Computer assisted methods*

In the last few decades, the increasing performance of modern computers made the use of computer-algebra packages very effective in teaching and also in research. In this talk, we provide some examples how to utilize computer-algebra packages in teaching (using the Maple system), and through some problems stemming from the theory of discrete mean values, which require heavy computation, we show applications also in mathematical research.

VIKTOR BAKOS: *Determining knowledge state based on the associations of basic skills*

At the College of International Management and Business Studies of Budapest Business School full-time freshmen have to write a placement test in Mathematics. The placement test includes ninety such exercises from primary and secondary school Mathematics that include the necessary knowledge for Business Mathematics 1. Then based on the students' placement test results they are placed in the different groups of the catch-up course. The topics in the catch-up courses might be influenced by the students' results achieved in the placement test. We seek to measure the achievement of these freshly enrolling students by a modern method, namely, by the exploration of their knowledge state. We examine the relations between the basic skills by a measure of association based on positive and negative influencing. Prerequisite-relation allows us to determine the knowledge state. Examining the system of these knowledge state we can draw conclusions what to include in the syllabus of the catch-up course.

FERENC BALOGH - ÉVA OSZTÉNYINÉ-KRAUCZI: *Weighted quantile correlation test for the logistic family*

We summarize the results of investigating the asymptotic behavior of the weighted quantile correlation test for the location-scale family associated to the logistic distribution. Explicit representations of the limiting distribution are given in terms of integrals of weighted Brownian bridges or alternatively as infinite series of independent Gaussian random variables. The power of this test against some alternatives are demonstrated by numerical simulations.

ÁRPÁD BÁNHALMI: *How can we develop tests for the preliminary knowledge with the use of learning probability theories?*

In the present study, the use of Bayesian Network (BN), jointly Knowledge Space Theory (KST) and Formal Concept Analysis (FCA), is proposed to be verified with the predictive validity of tests measuring preliminary knowledge. We analyse what consequences the conclusions from the validity of test results may have on the development of tests themselves. The result is demonstrated by real empirical data. With the help of the database of students' preliminary calculus-related knowledge, the empirical knowledge space is defined through the method of FCA. The surmise relation is adequately transformed into a partial order, the covering relation of which will provide the acyclic directed graph, to serve as a basis of BN. The parameters of BN are estimated from the sample. We evaluate the validity of the items on the grounds of the BN assessment.

ZSOLT BIRÓ: *Stability of travelling waves for degenerate reaction-diffusion equations of kpp-type*

The aim of this paper is to investigate the asymptotic behaviour of the solutions to the Cauchy problem for a nonlinear degenerate KPP-type diffusion-reaction equation dependig some positive parameters. The result is similar to the corresponding one of Kolmogorov, Petrowsky and Piscunov; namely, we prove that for a wide class of initial functions, the solution approaches a travelling-wave solution with minimal speed.

RUDOLF CSIKJA: *Teaching differential equations using computer*

Differential equations play a central role in the modelling of dynamic systems. Every student of engineering, physics and mathematics learns about differential equations somewhere along their studies. The Mathematics Institute offers a number of courses where students can learn about differential equations. In the following, I will share my own experience mainly, but not exclusively about

teaching the course Differential equations using computer. This course is recommended to students who have studied or have been studying differential equations. Knowledge of any programming language is not required, which is partly due to the fact, that we use Mathematica. At the end of the semester every student must present their own work on a work-shop. Many of the students use and apply their knowledge in their thesis, or in their own research. I will present some of these works.

EDITH DEBRENTI - ZOLTÁN ZAKOTA: *Using different representations in teaching mathematics*

One mode of representation does not suffice for the conditions and requirements of solving a problem or managing a situation. Most often multiple representations is asked for. A parallel engagement of different modes of representation and the connection between these yields a more efficient activity. External representations can be: enactive, iconic and symbolic (written and spoken language, symbols). In this paper we are presenting an experiment done at the Partium Christian University. We asked students of the Department of Economics to solve a certain problem. The problem was presented in several ways, in order to evaluate their problem solving skills, their capacity to actively apply their knowledge and their ability to notice differences between several approaches of a certain problem.

LÁSZLÓ GAÁL: *János Bolyai and the magic squares*

A fragmentary notes can be found in the legacy of János Bolyai, in which he is concerned with magic squares. Here, he raises the question if a magic square can be filled with terms of harmonic or geometric sequences. Hereinafter I am searching for the motivation of János Bolyai’s raising of the question, and I also transmit the answers for this question as well as the results.

ÁGOTA H. TEMESVÁRI: *Hyperbolic geometry illustrated*

Hyperbolic geometry is not natural for the person, who had Euclidean geometry in the school (the negation of euclidean parallel axiom, the altitudes of a triangle do not intersect in a point in every case, etc.). In this lecture we visualize several notions and elementary theorems of hyperbolic geometry using the Poincaré’s hemisphere model. We show that proofs are very simple if we use the special properties of the model.

GÁBOR HORVÁTH: *On some corollaries of Hölder’s inequality*

We will apply Hölder’s inequality for functions and exponents choosing in appropriate manner such that the obtained corollaries are refinements of Hölder’s inequality.

JENŐ HORVÁTH: *Constructions and proofs on Poincare’s hemisphere model*

The Poincare’s hemisphere model is a model of hyperbolic plane geometry in the Euclidean space. A part of the constructions of hyperbolic geometry can be done using the Poincare hemisphere model. It is interesting question wheter the well-known elementar theorems of Euclidean triangle geomery (Feuerbach’s circle, Euler line, Simson line, Morley theorem, etc.) are true or not in hyperbolic geometry. We give simply counter-examples.

DÁNIEL HORVÁTH - BRIGITTA SZILÁGYI: *Becoming a contemporary supporter in the BME ElmeMater program*

The BME TTK ElmeMater program has been giving the opportunity for several years for talented students to deepen and extend their knowledge obtained in regular mathematics classes, not mentioning the introductory courses to applications that also helps the understanding of the material. Students from various departments can meet each other during classes like these, which give them the chance to introduce their own work for their classmates, just like providing the opportunity for a collaborative project work.

MIHÁLY KLINCSIK: *Approximation of a bimodal distribution*

The ”Old Faithful” geyser is one of the most famous geysers in the Yellowstone National Park of USA. Constructing the frequency histograms for the recorded duration time of eruptions and as well as the waiting time between the sequential eruptions are both of bimodal type, that is, obtained with two local maxima of the distributions. These statistical facts can be explained by acting two physical processes. In this presentation we discuss the approximation of a continuous bimodal type probability density function using the kernel density method. This method is based on averaging the simple kernel functions which are acting locally at the measuring points. This method is implemented in the Maple computer algebra system and so we can try easily in education. We can demonstrate also the mathematical foundations of the method and conducting experiments by varying the bandwidths.

ANNA KLINGNÉ-TAKÁCS: *Teaching of the series in economics education*

Traditionally, our students at Kaposvár University study Calculus in the first semester. For the foundation of differential calculus, it is necessary for them to understand the concept of limits. Our students face a problem in acquiring the bases of Calculus, that is why we decided for using computerized methods, representations in order to make them understand the concepts and check the results of traditionally solved problems. Why do we use Excel and GeoGebra? Because these programs are accessible for everyone, their application is simple. We show in this article, how traditional methods can be supplemented with computer algebra system in determining limits of series.

JUDIT KOLLÁR: *Increasing the efficiency of mathematics economic education*

Mathematics is a foundation course in terms of the goals of economics higher education; with its concepts, theorems, procedures, it provides the knowledge that is essential for learning the economic and business-related disciplines at appropriate level. In my presentation I analyse the differences of high school and higher education, and I present the effectiveness of a remedial training course. This research was supported by the European Union and the State of Hungary, co-financed by the European Social Fund in the framework of TÁMOP 4.2.4. A/2-11-1-2012-0001 'National Excellence Program'.

ISTVÁN BÉLA KOVÁCS: *Frames in Hilbert spaces*

Last year we learned finite frames. We would like to characterize frame sequences of Hilbert spaces now. We introduce fundamental results on Bessel sequences first, and give sufficient conditions on the existence of the lower frame bound. We present duality and means of creating new frames out of old ones. Finally we prove an elegant theorem of P. Casazza that requires only introductory knowledge in functional analysis.

PÉTER KÖRTESI: *Quick solutions for partial fractions*

Integration of fractions appears in many problems, and it is used even as a method for integrating other function like trigonometric, irrational, or logarithmic ones. The method of partial fractions – being an algebraic problem – has been introduced either in advance, or to present it during the integration lectures, anyhow the students seem to have difficulties in understanding it. The quick method to be presented has the advantage that especially for simple problems the time necessary to get the solution is much reduced, thus the students understand and apply it without much difficulties, in spite of the fact, that it needs a bit of extra time to understand it. We often experience that the students become

“experts” of the chapter by learning this quick method, and that helps them to understand deeper some of the basics the domain of functions too. Beside the further applications of the method one can mention the summing of some series, or the application of inverse Laplace transforms as well.

PÉTER LEIPOLD: *The performance of the environmental engineer and architect students with figures*

The educational experience and the literature on the topic in the recent years show that the internal motivation of the students’ learning is not always appropriate. A number of cases have been presented of so-called “disappeared” students during the academic year. Some of them did not even show up for the given make up opportunities. In my presentation, I will show what percentage of the total number of students “disappeared”. Based on personal interviews I present some of the possible causes that may led the students to the decision not to complete the subject and even ask for signature denial themselves. In the second part of my presentation, I would like to draw and analyse exam trends of the remaining students based on their performance at the exams.

EMIL MOLNÁR: *Nice patterns in the science and art*

M. C. Esher’s nice works were made on the knowledge of plane crystallographic groups. These called the attention nowadays to the natural periodic structures, so to the crystals and in general, to design of nice patterns. In 1980’s the theory of patterns had also been developed on the initiative of B. N. Delone (Delaunay) and finally of M. S. Delaney and A. W. M. Dress (and in the works of the Bielefeld school of Andreas Dress, so the present author as well). The term D-symbol expresses author’s honour to the three initiators. To a ($d = 3$ dimensional) spatial tiling (T, Γ) with symmetry group Γ we order a D-symbol $\mathfrak{D}(\sum^l; D; \mathfrak{M})$. This can be coded also to a computer (in the works of doctor students of the author: Lajos Boróczki and Rita Kós). In this presentation we illustrate this procedure. Vice-versa: To a D-symbol, satisfying certain axiomatic requirements, we can ask: whether a d -dimensional space and its appropriate tiling (T, Γ) exist to the given D-symbol? The topic provides several open questions, but we have obtained also nice new and attractive results (e.g. in the hyperbolic geometry of J. Bolyai as well).

BEÁTA NAGYNÉ-CSÓTI: *Geogebra: differentiating integrated knowledge*

EduTus College launched its full time and correspondent technical manager and mechatronics engineer study programs in 2010 and in 2012. In the curriculum a great emphasis was placed on being practice-oriented and using mathematical

softwares. From the instructor’s side, we can state that GeoGebra gave enormous help in introducing the basic concepts and approach in mathematics in courses Mathematics 1 and 2. Students had the same experience: the software provided help in the steps in solving problems and in checking the results. The aim in course Mathematics 3 is to gain deeper knowledge of GeoGebra, utilizing and developing its merits. The communication platform is Moodle. The basic and more developed functions of the software are presented in a short video on the tasks at the advanced level school leaving exam. As a home assignment, students have to demonstrate the solution of these kinds of tasks. They have to choose four tasks from the database, and one of them will have to be presented in the lesson. GeoGebra offers a creative, productive way of learning for the students as well.

JÓZSEF OSZTÉNYI: *The chromatic number of S-stable Kneser graphs*

In 1978, Alexander Schrijver defined the stable Kneser graphs as a vertex critical subgraphs of the Kneser graphs. Frédéric Meunier generalized Schrijver’s construction and formulated the conjecture on the chromatic number of the s-stable Kneser graphs. As a generalization of the result of Björner and de Longueville we shall determine the homotopy type of the neighborhood complex of the s-stable Kneser graphs and using Lovász’s topological lower bound we shall confirm Meunier’s conjecture.

MARGIT PAP: *A special voice transform of the Blaschke group and analytic wavelets*

In this talk I will present how can we construct analytic wavelets and multiresolution analysis in the Hardy spaces of the unit disc and upper half plane. The construction is an analogy of the discrete affine wavelet multiresolution, and in fact it can be derived from the discretization of the continuous voice transform generated by a representation of the Blaschke group. The multiresolution approximations can be used in system theory for the approximation of the transfer functions.

ÁKOS PILGERMAJER - MARGIT PAP: *Lebesgue function of rational interpolation*

Non periodic analytic signals can be represented more efficiently in some cases by special orthogonal bases. The Malmquist-Takenaka system for the upper half plane is one of them, which has the beneficial discrete orthogonal property. Based upon this property, interpolation operators can be constructed. We examine the properties of these operators.

ILONA SIMON: *Calculus exemplification*

Motivation is an often encountered challenge of instructing calculus for non-mathematician students. However, numerous descriptive examples are at hand, which might be able to sustain the inner motivation of the students either at the beginning of the semester or throughout the study process. In this talk, after enhancement of the importance of the inner motivation we will consider several illustrations and examples, which meet the range of interest of bachelor students in Biology and Chemistry and are suited to sustain the unbound interest for calculus.

SÁMUEL SZABOLCSI - BRIGITTA SZILÁGYI: *Variations for a rectangle*

Today’s lecture is about Sámuel Szabolcsi’s work, who is a student of BSc in faculty of Mechatronics. He has done quite adequate work during last semester’s facultative courses as a student of BUTE ElmeMater Program. He has completed the regular mathematics subjects with outstanding results. What makes Sámuel special is that he makes gorgeous forms from rectangles, as he follows the only rule to fold without any tearing or gluing. We commend his introduction as a brainstorm as well. However, we would be really happy to hear any further ideas that can help us create the pleasure of making beautiful forms with practical use.

ISTVÁN TALATA: *Demonstrating geometry problems with computer software*

At the Ybl Faculty of Architecture of Szent István University we use computer software during the course “Mathematics and Geometry in Architecture” in two ways: 1. During the classes the instructor demonstrates the examined mathematical problems with dynamic geometry software, 2. The students are asked to illustrate the solution of their assignment problems with computer software. I would like to share my educational experience that how the classes can become more interesting by using computer software to demonstrate geometry problems, and how geometry software can help students to understand geometry problems and their solutions better. I also demonstrate how the students were able to illustrate the solution of their assigned problems, and how the mathematical problem solving thinking can be helped by using geometry computer software.

LÁSZLÓ TÓTH: *How many subgroups does a finite Abelian group have?*

How many subsets does a set of n elements have? The answer is: 2^n . For the question in the title it is not possible to give such a simple answer. A first reason is that the order of a group does not determine the number of its subgroups. Let Z_n denote the group of residues (mod n). How many subgroups does the group

$Z_n \times Z_n$ have? In my talk I will give answers for these and for some similar questions.

ZOLTÁN TÓTH: *From the review of the mathematical curriculum of secondary school to the differential calculus*

During the last 20 years the weekly lecture hours decreased from 33 to 22 in higher education. Meanwhile the level of mathematical knowledge in secondary school also was decreasing. The student take part only in the compulsory part of 22 hour, because they are unmotivated. The big difference between the teaching level of secondary and higher education cause a shock for students. Instead of teaching of some kind of core zero I would prefer additional 2 lecture hours in compulsory form. In this increased time we can built into the teaching material the necessary knowledge from the secondary school and it causes a smooth transition to the higher education. I describe my suggested curriculum for function calculus at economical BsC. At the end I introduce the notion of derivative as the gradient of the function at a point. By the way this gradient will be the gradient of the tangent at this point.

ÁGNES VÍGNÉ LENCSEÉS: *Irrational numbers and proofing methods in public education*

In public education we define real numbers as infinite decimals. The methodical introduction of irrational numbers in public education is based on measurements, because the mathematical background for extending the matter of numbers belongs to the subject of the analysis studied at higher education levels. Thus establishing the real numbers covers the entire education during high school. Our experience in case of the set of the numbers shows that the mathematical acquisition process fails at the level of irrational number; students only have incomplete and formal knowledge. In my presentation I will try to show you the interlocking of two tasks of the teacher ? building the concept of irrational numbers and development of the proving-skills ? through various problems from different mathematical topics. As a side-effect of the problem-solving we can also observe the development of thinking, which is the most important task of teaching mathematics.

List of abstracts from sections of Computer Science

ÁGNES ACHS: *Fun – although it is an exam or Is it possible to make an exam joyful?*

The anonymous questionnaire concerning the latest exam period inquired about students’ reaction to the exam situation. 49.3% of the students selected the option ‘It was fun’ and nearly 75% said ‘I learned a lot from it’. I enjoyed the exams myself and I learned a lot from them, too. It would be very nice if every examination had a similar atmosphere. Unfortunately, I don’t have the Philosopher’s Stone, so I don’t know whether it is a realistic desire. Not likely. However, I’m lucky because I teach subjects, where the exam can be made compatible with joy. In my presentation I do not intend to touch upon pedagogical theories, I cannot give recipes, I only want to show you what makes my job so enjoyable. I will introduce our teaching syllabus (C #, Java) and the tasks that are designed to attract students’ interest. I’ll present some students’ work as well. My presentation will not be of scientific nature, but I hope to give you a few jovial moments.

KORNÉLIA AMBRUS-SOMOGYI: *How we can use the e-learning system at the exam of the information technology*

At our university we have the information technology as the theoretical subject at the engineering education. At previous conferences I have already explained the problems related to training and examination. We have been using the e-learning system for publications of presentations, for uploading homework and at laboratory tests for a long time, but until recently the theoretical exams were taken on paper. The Moodle system gives several options to choose activities. One of them is uploading files which we have been using for a while. When we use the possibility of Quiz we can choose from several question types: Essay, Multiple choice, True/False etc.

PÉTER DOBAY: *Masters and ICT entrepreneurs*

Since the two-stages Bologna system was introduced many students have had to face the decision problem of whether BSc or Master level studies would ever support a good job or a safe business activity. The lecture first will give an overview of challenges, requirements, costs and benefits of continuing studies on Masters’ level – especially in the ICT field. Second, we will describe a general framework of starting an ICT startup – as a business alternative instead finishing your higher education program. The job market needs and attracts competent

ICT practitioners in large numbers – even without a Master or BSc diploma: this is real challenge to students, families and institutes as well. What can the public media, the national economic policy, the EU support offer for the ”Z” generation of a free market economy? What can we do at universities to serve both of these career paths in classrooms, in case study – or practical placement– sessions? The lecture presents some proposals to have more successful ICT entrepreneurs, using their knowledge – instead of simply utilized manpower – to run a small ICT startup or participating in a real project.

ÁRPÁD HORVÁTH: *Variable excersises in the field of formal languages for the ec-sorter excercise varying program*

We have developed the program, called ec-sorter to create variations of the exercises, and to create test papers from the resulted exercises. The exercises have some parameters, and they can be loaded from simple LaTeX files. The program reads those LaTeX files, fetches the exercises we have chosen to the test paper, creates the variations of the exercises, and makes the printable test paper. The newer version of the program makes possible to get the parameters of an exercise from a table given in the text of the exercise itself and so we are even able to vary the labels of a state diagram of an automaton to make a lot of variation on an exercise.

SÁNDOR KACZUR: *The operation of the web application oraclehrjsp*

Distributed applications is the name of the subject in the IT engineer program in Dennis Gabor College. It contains advanced software development technologies related to the Java programming language. In the subject mainly described in case studies for students, such as using the Oracle HR sample database with Java Server Pages technology, web applications also require authentication. The article presents: the concept, the design of distributed applications aspects, UML diagram, the operation of the completed application.

IMRE KILIÁN: *Storytelling rather than strict teaching of computation theory*

Ariadne’s thread or cactoo? Graph traversal strategies: approaches of the lonely warrior and the Chinese army. Hansel and Gretel and seeds, breadcrumb and scree scattered behind. Marriage, divorce and the ordering relation over children of Genghis Khan. Who can break the data consistency? An independent bolt strike, or rather a friendly excavator? What if a persistent data is inconsistent, but sits like a rabbit in the grass, and turns over after decades? Washing ourselves without getting wet: how to cross a river with a wolf so that both the goat and the cabbage remain? Searching path in a finite state-space. The boot

of Mihály Apaffy, the Prince of Transylvania. The approach of Tamás Szitáry, a Transylvanian nobleman, to solve nondeterministic problems by a mixed strategy. The seven dwarfs, or the seven chieftains and the binary search trees. How much is the queen worth? How to tame a combinatorial terrorist?

LÁSZLÓ KISS: *An exam seating problem*

At our university, the exams for subjects titled Computer Science take place in multiple lecture rooms where the seating has to fulfill multiple pre-defined requirements. Coming up with a suitable seating plan requires focused attention every time. To simplify this work and minimize the possibility for error, the author has developed an application which, on the basis of data downloadable from the Neptun system, prepares the required seating plans using the capabilities of Excel VBA and the Solver macro. This application is reusable in other educational settings.

GYÖRGY MARÓTI: *Talent management with MAPLE T.A.*

The development of a mathematical talent management online question bank means multiple challenges for the developer. First of all one has to find non trivial exercises whose solution is not usual, based on nonstandard methods and requires innovation. Second challenge is the solution of the chosen exercise in Maple. This, however, does not finish the work, because one has to specify the syntax of student's response, to be able to compare this with the right solution, evaluate and score it properly. In this lecture we present the challenges occur in the different phases of development. We point out that there is an essential difference between the mathematical solution and Maple solution of the exercises. In the end we show an example for evaluation procedure and present how the online question works in Maple T.A.

LÁSZLÓ NYIRATI: *Use of visual elements in Excel*

The Office application include a Visual Basic interpreter. This gives you possibility to use macro language and OOP elements. In my presentation I'll give you examples how you can use the well-known visual elements like push buttons, text boxes, radio buttons. The exercises simulate a system, where the processes are represented by a function, and we would like to see the results, while modifying the parameters in a certain range. For example: The system can be visualized on a graph while the value of parameter x is represented by a scrollbar. With the help of a simple Visual Basic program the important parameters can be visualized on a new graph.

GÁBORNÉ ORSZÁG - RÉKA SZOBONYA: *Experiences of the education of the Statistic 1 subject with computer (Excel)*

In our previous studies, in the Budapest Business School College of Finance and Accountancy, we studied the students who attended the compulsory course unit Statistics I. in full-time courses on bachelor level. We analysed, how students' antecedents influenced their efficiency. In the II. semester of 2013/2014 615 students enrolled the subject Statistics I. The credits' value of the subject, the number of the lessons, the didacticism, and the method of exam (excel – using a computer) changed this year. In our presentation we compare the latest results with previous experiences. According to our datas, we separate the students in groups to characterize them by their achievements. We also cover the topic, that possibilities and problems arises due to education and examination with computer.

ETELKA SZENDRŐI: *Alone or in a team? Reflections on teaching software engineering*

In my presentation I am going to introduce the syllabus of the course titled Software Engineering and the courses prerequisite to it. It is very important for students to learn to use modern methods and technics which are essential in the software development work. Today software development is not about programming geniuses working individually. Instead programmers need to work together cooperating with each other. Successful software development is based on efficient teamwork. One of the requirements of the Software Engineering course is a project assignment to be done by groups of 4-5 students. In my presentation I would like to talk about the experience and results of these assignments.

LEVENTE SZABÓ: *From qubits to quantum cryptography*

The main goal of the talk is to emphasize the importantness of quantum information in the informatical education. This goal is mostly motivated by the recent solutions of quantum cryptography which are already usable for achieving some cryptographycal protocols. It is unnecesseary to mention that this evolution of quantum chryptography make us hold courses in quantum information to the students. In the talk I give a short insight into a beautiful and very interesting world which is the home of quantum information.

ZOLTÁN VAJNA: *Key competencies at mvmi development management*

The MVM Informatics Ltd. as the IT service provider of the MVM Holding is a determinative company in the Hungarian IT service market which offers more than 140 IT services for the member companies of MVM Group. The

changes which are generated by the business partners, the implementation of IT systems and the coordination of IT architecture development is managed by the development management, while the primary goal is the safety of operation and information. In 2013 the managers and the workers of the development management created the business model of the development management, which have served as a basis during the definition of the key competencies. The purpose of this presentation is to show this business model and to present the competencies that are essential for successful work.

List of abstracts from sections of Physics

JÁNOS HEBLING: *Application of high-energy terahertz pulses at ELI-ALPS in Szeged*

The ELI-ALPS international laser physics research center will start working in Szeged in 2016. The main aim of the center is to produce the shortest laser pulses, the only 10-18 s long attosecond pulses, and their applications in fundamental and applied research. Besides this, a practically important research filed is the acceleration of charged particles. This can enable laser-based hadron-therapy. At Institute of Physics, University of Pécs we develop terahertz pulse sources since more than a decade ago. During this period we increased the energy of terahertz pulses by eight orders of magnitude. By focusing these pulses, it is possible to achieve 1 MV/cm peak electric field strength. In my talk I will give an overview of the structure and main research topics of ELI-ALPS, and I will show how the application of high energy terahertz pulses will help these research fields.

GYÖRGY HUDOBA: *Analogue field study in the Sahara*

Between 01-28. February 2013, the Austrian Space Forum (Österreichisches Weltraum Forum, Innsbruck) – in partnership with the Ibn Battuta Center in Marrakesh - conducted an integrated Mars analog field simulation in the northern Sahara, in Morocco. Directed by a Mission Support Center in Austria, the field crew conducted experiments preparing for future human Mars missions in the fields of engineering, planetary surface operations, astrobiology, geophysics/geology, life sciences and other. We participated to the study with the HUNVEYOR-4 educational space probe. During this terrestrial analogue field study our aim was testing the Hunveyor-4 in various, real working situations, testing our concepts and the mainly student-built equipments.

JÓZSEF KISPÉTER: *Young-adult-old; 80 question-and-answer nearly from eight decade*

Professor László Tóth asked me to write a book on my life. Asked 80 questions to be answered from my eighty years, an easy to understand style. In my presentation I give a brief summary of the completed book.

SÁNDOR NAGY - KRISZTIÁN SZARVAS: *The long-term nuclear capacity maintenance in Hungary*

The topics of the lecture are: the Hungarian electricity system, the National Energy Strategy, the reasons of the nuclear capacity maintenance, the nuclear power world-wide, the nuclear power maintenance of Paks.

LÁSZLÓ NYIRATI: *Difficulties of photographing Fraunhofer lines*

If we look at a light emitting object (light bulb, candle, etc.) through a grating, the object itself is seen in the middle. On the two sides there are the spectra created by the grating. The spectrum looks like the object in different colors, those that the light consists of. If we put the grating in front of a camera a photo can be taken of this view. The light of the Sun travels through its atmosphere, which filters out some specific wavelengths. These wavelengths can be seen as dark lines in the spectrum, the so-called Fraunhofer lines. Taking a picture of these is difficult, because a really thin ray of light is needed, which can be created by a special and expensive tool. But using a small trick, similar result can be achieved easily. The pictures taken this way can be processed by software tools.

GERGELY NYITRAY: *A physics teachers's experiences*

In recent decades the role and importance of Physics highly eroded. While many countries have recognized the strategic importance of high level education, in Hungary we are witnessing a continuous decrease. The high level education are greatly affected by these problems. Firstly, a large amount of money diverted from the institutions, on the other hand a very high percentage of the admitted students do not have a prior knowledge, they are unskilled and unmotivated. They have no idea what to do with their lives. Today the situation is so serious that the function of the whole education system has become unclear. Nowadays, the quality of education and the institution of operation are mutually exclusive. The question arises. Is it possible to do any kind of teaching activity? That is the question I am trying to answer based on my experiences.

LÁSZLÓ PÁLFALVI - LEVENTE TOKODI: *Ray tracing softwares in the education of optics*

Because of practical reasons (cost efficiency, time optimization) before measurements with optical systems the careful, detailed design and modeling is necessary. Nowadays several ray tracing softwares exist for this purpose. With these many information can be obtained from the given optical system. In the talk the role of the ray tracing softwares in the education will be shown. Analytical solutions of problems from the field of geometrical optics will be given with TracePro demonstrations including topics such as resonator stability, imaging with thick lens, graded index media.

ERVIN RÁCZ: *Focusing Laser light using lens and off-axis parabolic mirror; connections in a laser light focusing process and optics education*

”Show me your laser focus and I tell you what your laser is and what it can do!” – We may hear it in laser laboratories. Why is it right? What is this mean? It is necessary to use laser focuses in many places in laser research. High laser intensities can be generated by focusing of laser pulses. In order to focus laser light lenses and mirrors can be used. In the publication I look inside the theoretical background of laser focus generation using lenses and parabolic mirrors, show advantages and disadvantages of these techniques, give practical examples for aligning lens and parabolic mirrors in order to get the best laser focus possible, and mention the investigation of laser focus. I list the specific parameters of a laser focus. Meanwhile, connection possibilities of the focusing process and the laser focus itself and the education of optics will be highlighted.

DOROTTYA SEBESTYÉN: *Notions in connection with an English physics course*

During the two previous school years I have got interesting experiences teaching physics in English at the Obuda University. There are Hungarian students whose studies run in English. In this case I could compare this course with the parallel Hungarian one. Hence, I am able to draw a parallel between the terms in the two languages. It is interesting to see that in some cases the English terms seem to be more correct, and in some other cases several names to the same concept can be found when it is used in different applications. Seeing these differences we can also call attention of the students, who pursue their studies in Hungarian to the possibility, which is offered by more exact interpretation in English; this way we can help the students understanding concepts and laws better.

DOROTTYA SEBESTYÉN: *A little Hungarian travel guide for physics teachers*

Let us look around in a town especially as a physics teacher. In this case we can find special sights which can not be discovered without such a viewpoint. Application of one of these sights at the lectures can be used as an illustration to a physics law, or at the history of physics course it can illustrate the life of a physicist. This “travel guide” would like to show some of the sights which can be discovered during national sightseeing. A building, sundials, sculptures, a fountain can be found among these sights, or anything else that can be related to physics. The selected sights can be found in different towns, like Budapest, Eger, Miskolc, and Győr. Showing similar examples at the lectures we can inspire our students to search and collect such sights in their town and in other Hungarian places. It can be a special task for them to create a report about the result of these researches, which can be completed by information from the Internet.

ZOLTÁN TIBAI - GYÖRGY TÓTH - MÁTYÁS ILLÉS MECHLER - JÓZSEF ANDRÁS FÜPÖP - GÁBOR ALMÁSI - JÁNOS HEBLING: *Proposal for carrier-envelope-phase stable attosecond pulse generation in the extreme-ultraviolet range*

Here, we propose a robust method for producing waveform-, and CEP controlled attosecond pulses in the EUV spectral range. In our setup the relativistic electron beam e.g. from a linac is sent through a modulator undulator where a TW-power laser beam is superimposed on it in order to generate nanobunches. The nanobunched electron beam then passes through a radiator undulator consisting of a single or a few periods. The simulated waveform of the generated attosecond pulse is closely reflects the magnetic field. For electron bunches with 1000 MeV energy stable single-cycle 40 attosecond pulses with as high as 14 nJ energy can be generated. These as pulse energies are high enough to use these pulses for example as pump pulse in pump-probe measurements.

ANDREA VARGA: *Production of solar system monitoring using Internet*

Nowadays, green energy plays an increasing role in our life. In the presentation a photovoltaic, i.e. a domestic-small-scale power generating system and some specific quantities belong to energy generation will be presented. I will give insights how to build such a system. (Operation of PV (photovoltaic) cells, types of solar panels, specific data.) As a next step a photovoltaic power system with 3.5 kWp solar power will be introduced. Energy generated by the system is loaded into the inner (domestic) electric grid using a Siemens inverter. Using the system it is possible to log in to a web-based internet page (REFUlog). With help of the homepage every energy generation parameter in the photovoltaic system

can be monitored 24/7. The PV system works at fair weather conditions. This way the effect of the actual weather conditions relative to the actually generated power can be investigated. Using the software and the internet page the teacher can introduce the PV systems to the education for students. The students are involved in the PV studies

List of abstracts from section of Poster

VIKTOR BAKOS: *Solving plane geometry problems in space geometry*

Is the following: there are three circles in the plane each of which can be substituted by a straight line or a dot – construct a circle that is tangent to all the three figures. During the solution, we use a non-linear projection between the plane and the space, i.e. a cyclography that creates a one-to-one mapping between the direct circles of the plane and the dots of the space. To imagine 3D figures, to see their relations to each other and to see the characteristics of these shapes, unfortunately, often give problems to the students. In order to give a good visualisation, geometric programs can be used nowadays. One of them is Capri 3D, which, beyond its visual representation, gives help in answering the questions that arise in the course of solving a problem as well as in analysing the solution alternatives of a problem. The poster displays the states and phases of the solution process of the Apollonius-problems, the cyclography, the Capri 3D and some connecting points.

ÁRPÁD BÁNHÁLMÍ: *The analogy of the association and correlation*

This poster shows the analogy between association and correlation measures of data interpreted in nominal and interval scales. The analogon – defined through dummy variables – of the linear regression function describing the relationship between variables measured on the interval scale can also be given and the equivalent of the regression parameters' relations are also met.

SÁNDOR KACZUR - BORISZ ISTVÁN LENGYEL : *Tutorial for the node selection algorithm using plnc data transmission*

The implemented network coding (PLNC) implemented in the physical layer is useful to improve traffic between nodes. The ARB unit is widely used for modeling PLNC. In this model, both the source Node A and B exchange data through a common node R. In the wireless network there are two stations called A and B, and one access point (relay node) called R. The PLNC transmits the

two messages in two phases. The authors planned, the tutorial program with a graphical user interface – which introduces the node selection algorithm PLNC data transfer – and implemented it in Java programming language. The poster will review the steps of the planning and implementation.

SÁNDOR KACZUR: *Students workshops about programming related to dennis gabor talentpoint*

The poster presents the operating of student workshops: topics, goals and organization. These student workshops related to Dennis Gabor Talentpoint in the Dennis Gabor College. It summarizes the experiences. These student workshops: Web Programmer Student Workshop, Android - Mobile Application Development Student Workshop, Objective-C Student Workshop, OpenGL Student Workshop, Microcontroller Programmer Student Workshop.

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