1. Jiri Zelinka

Simulation of Space Charge Effects in Electron Optical System Based on the Calculations of Current Density

Abstract

We present a numerical method for the iterative computation of electron optical systems influenced by space charge with an improved accuracy in the same calculation time. We replace the common algorithm for evaluating space charge distribution with a new one based on the calculation of the current density distribution from an aberration polynomial. We introduce a re-meshing algorithm which adapts the mesh used for the field calculation by the finite element method in each iteration to the actual space charge distribution. This keeps it sufficiently fine in all areas with non-zero space charge.

Comments

This is well written and clear. It would be useful to have a brief context of the project or study to see where the specific method you are referring to fits. This would give a balance of the specific details provided. Passive voice would make it more neutral and prioritise the processes, which are the important feature here.

2. Kristyna Adamcova

Molecular identification of bacteria in polybacterial specimens of urinary catheters and urine of cathetrized patients

Objectives: Complex bacterial colonization of catheters often causes catheterization-associated urinary tract infections (CAUTI) of a polymicrobial nature. Polymicrobial infections are difficult to interpret and treat. Conventionally used culture techniques for bacterial detection can fail in cases of fastidious bacteria, anaerobes or bacteria sampled under the antibiotic treatment. For this reason, polybacterial samples represent a methodological challenge for molecular approaches. The aim of this work is using of Denaturing Gradient Gel Electrophoresis (DGGE) followed by sequencing as a tool for detection of bacteria in catheters and urine.

Methods: A total of 98 specimens of urine and catheters were collected from 49 patients. Catheters were sonicated for bacterial disengagement from the biofilm. Isolated DNA was amplified using PCR targeting V3-V5 region (460 bp) of 16S rRNA gene. Multiple length homogeneous amplicons were separated by DGGE. Extracted amplicons were reamplified and sequenced under the same conditions. Obtained sequences were compared to the public databases.

Results: In total, we detected 231 bacteria of 29 genera in urine (n=115) and sonicates (n=116). In 12 samples from 6 patients (12,2%) we detected one bacterium in each material. The rest of the patients (87,8%) had 2-6 bacteria (median=3) in samples of urine (2-4) and sonicates (2-6). Ratio between G+ and G- bacteria were: 43,5% G+ / 56,5% G- in urine vs. 51,7%G+/48,3%G- in sonicates. Bacteria detected in samples of urine and sonicates differed by their prevalence. In urine, the most prevalent genera were: Actinobaculum, Escherichia, Enterococcus, Proteus and Enterobacter. In sonicates, the most prevalent genera were: Actinobaculum, Enterococcus, Proteus, Escherichia, Propionimicrobium.

Conclusion: By using of PCR-DGGE, we detected fastidious genera of bacteria such as Actinobaculum or Propionimicrobium in high prevalence, which is not easily detectable by

conventional culture techniques. PCR-DGGE seems to be an applicable technique for screening of microbial community composition in urine and sonicates of catheters.

3. Stanislava Kralova

Classification and typing of Aeromonas spp. isolated from water and clinical sources.

Abstract:

Genus Aeromonas consists of high number of valid recognized taxa, often showing unusual or atypical properties, which result in difficult identification of these bacteria to the species level. In this work, 84 strains of aeromonads isolated from water and clinical samples were identified and described. Identification was based on phenotyping using biochemical properties of these bacteria, as well as on genotyping based on multiplex-PCR and ERIC-PCR. Further description of isolated strains was based on detection of virulence factors, namely enterotoxin (Act) and flagellin (Fla). Only 40 % of all isolates was identified with phenotypic methods. The number of reliable identifications among clinical strains was twice as high as among strains from the environment (12 out of 20 clinical strains compared to 18 out of 64 environmental strains). The use of multiplex-PCR allowed identification up to 89 % among all analysed strains. Another method, ERIC-PCR, proved to be useful for detection of closely related or even identical strains. However, this method appeared to be inadvisable for the identification of Aeromonas spp. Further genetic description of virulence genes showed the presence of both these factors in 42% of all strains. Moreover, only 10 isolates possessed neither of these virulence factors and all these strains were isolated from environmental sources. This work confirms difficulties in the identification of Aeromonas spp. using one single approach. Results gained in this work show that proper combination of different approaches enables reliable identification of Aeromonas spp. Presence of specific virulence factors suggests pathogenic potential of these bacteria and the need for further studies to focus on virulence genes.

4. Palitha Lakshman Nugapitiya

A Grammar of Sinhala Gi Poetic Language During 12-13th Centuries

Abstract

The study of Sinhala 'Gi' poetic language is very important with regards to Sinhalese grammatical tradition as well as language history since many scholars believe that the classical Sinhala grammar book the Sidat Sangara, written in 13th century AD, to be based on this specific poetic language style called 'pure Sinhala.' This language style is different from normal written language which is replete with Pali, Sanskrit and Tamil language borrowings and translated borrowings which are accepted in prose writing. This study is a descriptive linguistic analysis of Gi poetic language and it includes three major aspects of language analysis, morphology, phonology and syntax. In phonological analysis two new vowels and four consonants were identified which were not included in the Sidat Sangara alphabet. A new case system is proposed to analyze Sinhala nouns according to case terminations of Gi language, which can be applicable even for contemporary Sinhala written language. Although, the Sidat Sangara, as well as contemporary Sinhala grammar, uses the meaning of nouns to categorize Sinhalese noun cases, this study is based on the diversity of noun suffixes. For this categorizing system the number Sinhalese cases can be reduced from nine to six for masculine and feminine and five cases for neutral nouns. Moreover, this study has revealed that three genders (masculine, feminine and neutral) can be identified when analyzing Gi language noun terminations instead of two genders (masculine and feminine) introduced by the Sidat Sangara. The subject verb agreement introduced by Sidat Sangara has to be changed according to the threefold gender system newly introduced by this analysis. In syntactic analysis new sentence structures are also identified in the Sinhala language and some of them are hereditary to the poetic language of Sinhala.

5. Sarka Jelinkova

This is an abstract for my next article, which does not have a title yet. It is based on my Diploma thesis with the topic “The effect of statins on human embryonic stem cells”.

Human embryonic stem cells (hESC) are a potential source of material for cell replacement therapy as well as a model for studying the development and differentiation of cells in healthy or diseased human bodies. Multiple technical obstacles will have to be solved to allow for the clinical use of hESC in future. First of all robust methods for reliable hESC differentiation onto the desired cell types will have to be developed. Also the signs of genome destabilization will have to be suppressed in long-term cultivated hESC.

We found that statins can reverse the effects of long-term cultivation of hESC. It includes recurrence of compact morphology in very late passages or alterations of cell cycle mimicking short-term cultivated hESC. Stabilization of Oct4 pluripotency marker protein level was observed, which is known to be connected with robust pluripotent state. Moreover, when statin treated hESC were used for cardiodifferentiation, higher percentages of cardiomyocytes were identified in the formed embryonic bodies (EB) and more of these EBs were able to beat.

This study has identified that statins rescue the phenotype of short-term cultivated hESC, which is usually lost due to prolonged in vitro cultivation. Thus, it is a novel approach to obtain long-term cultivated hESC without currently common abnormalities. Based on these cardiodifferentiation results, it is possible to implement statins into cardiodifferentiation protocol. This can lead also to higher yields of cardiomyocytes in hESC and induced pluripotent stem cell lines that are difficult to differentiate in order to ease the process of gaining cell material for disease modeling.

6. Marketa Novotna

Prediction models for the uptake of metals into various field crops

Abstract:
Field crops, among the food commodities, are one of the highest contributors to human metal exposure. The crop-specific prediction models are tools to estimate potential dietary risks across large areas. The aim of this study was to develop specific prediction models and to compare usability of other available models for the dataset.

We analyzed samples of potatoes, hop, maize, barley, wheat, rapeseed and permanent grassland from the Czech monitoring database collected by Central Institute for Supervising and Testing in Agriculture (CISTA) from 1992 to 2009 on 64 sites distributed across the Czech Republic. The influence of measured soil concentrations and soil factors such as pH, organic carbon and content of clay on the final concentrations in different agricultural plants for Cd, Cr, Cu, Mo, Ni, Pb and Zn was evaluated.

Bioconcentration factors (BCF) as well as specific prediction models determined in this study for 7 field crops and 6 metals using interaction terms of variables were calculated. The explained variability of prediction models was from 19 to 93 % and correlation of measured and predicted concentrations were between 0.47 and 0.98 depending on each field crop and metal. Hop and rapeseed prediction models were also developed which are comparatively new in this field. Available models from the literature showed inappropriate results beside models for Cd i.e. correlation of measured and predicted concentrations lower than 0.25. Sufficient amount of models for various plants and other metals was not found.

These findings reflect that regression models are very specific for different plants as for different metals and also environmental conditions. Very careful usage within range of site specific parameters is necessary. The addition of other parameters such as concentrations of metals in air, parameters of plants, interactions of metals or season specific variables is possible and mostly increases explained variability, but this could cause problems with the level of complexity of models and data requirements.

7. Dana Stverakova

Identification of phage encoded proteins in Staphylococcus aureus using mass spectrometry

Abstract

Most of the Staphylococcus aureus strains contain prophages in their genomes. Prophages encode specific proteins including toxins, which enhance virulence of Staphylococcus aureus. This study was conducted to find out if it is possible to identify specific phage proteins in S. aureus using mass spectrometry. Mass spectrometry has recently been used for diagnostics of bacteria. This study used matrix-assisted laser desorption ionization time-of-flight (MALDI-TOF) technology to identify specific proteins from 28 different phages in 60 S. aureus strains. All 28 phages were successfully identified using this method, regardless of the fact that they were integrated in different S. aureus strains. The results show, that MALDI-TOF can be used for phage identification in S. aureus. It may be also useful for identification of phages from different bacteria to track their spread in clinical strains and other bacterial strains in the environment. MALDI-TOF is a fast and accurate method and the results of this study make it a convenient tool for epidemiologists.

Comments

Very clearly written with only the need for minor editing. I would suggest use of passive voice to prioritise the study and its outcomes.

8. Veronika Vrbovska

Microorganisms inhabiting the midgut of ixodid ticks

Abstract:

Ticks are important vectors of viral, bacterial and protozoan pathogens. Non-pathogenic and endosymbiotic microorganisms can also be found in ticks. The aim of this work was to study microbial diversity of the midgut of ticks Ixodes ricinus and Dermacentor reticulatus and to compare diversity between individual developmental stages (nymphs, males, females). A total of 166 bacterial strains have been isolated, described and identified. Identification was based on 16S rRNA gene sequencing. Denaturing gradient gel electrophoresis (DGGE) was used to study differences in diversity. The most frequently isolated strains from both species of ticks belong to genera Bacillus and Paenibacillus. The results of the DGGE analysis demonstrated expected differences in diversity between I. ricinus and D. reticulatus, and also between different developmental stages of these ticks.

Comments

This is very well written. There are few comments to make other than those above.

9. Michal Jablonski

Title: Processing pipeline in jMRUI for a good clinical practice

Purpose:

To ensure reproducibility and automation of data processing in data processing software it is desirable to thoroughly document all processing steps. This is especially important in clinical practice and in medical research where it can be forced by granting organizations and/or government to provide processing history that cannot be modified by the user to avoid data fabrication. The documented history can be used for automation of processing in the form of macros, for reproducibility in the form of a processing protocol stored together with processed data, or it can serve as a database of all processing steps ever used and thus used as a scientist's note or as a bug tracking tool for software developers.

Methods:

To record the whole processing pipeline from time of data loading to their quantitation in jMRUI1 a robust database recording of every action performed in jMRUI was developed in Java. The recording process is based on the relational H2 database management system2 supporting the subset of the Structured Query Language3 (SQL) standard. In current implementation a single file database is used. The structure of the implemented database makes it possible to change to a centralised database located on an external server. Each processed data file is registered by its name and hash code. Since the hash code of the file depends only on its content, the same file in different locations will be recognised. By using the database it is possible to track the history of each file, including the files that were derived from already processed files (inheritance of processing history). Additionally the results of quantitation and other intermediate files are stored in the database directory with a unique identifier. The hash code approach also helps to save the storage space; the intermediate files are stored only once. Beside the storage of the processing history in the database, the history is also saved along with the processed data in a text log file.

Comments

This is well written and clear. There are almost no points to mention in the second section, but as a structured abstract, is it OK to have only two sections?

10. Veronika Kosarova

Advantages and disadvantages of handheld FTIR spectrometer for the analysis of cultural heritage

ABSTRACT

Portable handheld mid-Fourier transform infrared spectrometer ExoScan FTIR (Agilent Technologies) with diffuse reflectance (DR) and attenuated total reflectance (ATR) were used for analysis of reference samples of inorganic pigments in mixtures with organic binders with the aim to describe the analytical limits of the method on simple monolayer systems. In the second step the equipment has been tested on simple paintings on paper support and on coloured photographs. Handheld instruments have become very popular in recent years in different application fields, but in the case of handheld FTIR, only a few studies have been reported yet. The major limit for routine use still can be seen in the relatively heavy weight of instruments and the absence of any sighting system. When measuring by hand it is also not very easy to achieve a sufficient contact pressure to obtain reliable spectra with ATR holder. Further factors limiting any wider use of ATR system in handheld instruments include the very low penetration (several micrometres only) causing the analytical signal to be collected from the top surface layer only. On the other hand, diffuse reflectance holder produces good-quality spectra in general, and the drawbacks are roughly the same as in IR microscopes (deformations of spectra, increased noise, poor signal from dark materials etc.). This study compared the DR and ATR modes on model samples with very promising results, describing the detection limits for proteinaceous binders in selected inorganic matrices. I also searched for the most perspective application fields of the handheld FTIR in the analysis of fine arts. The method was used for distinguishing of paper treatment for painting technique descriptions in modern art (watercolour, wax crayon or oil painting) and for the materials investigation of coloured photographs.

11. Petr Zikan

PIC/MCC simulation of electron and ion currents to spherical Langmuir probe

Abstract:

The Particle In Cell/Monte Carlo Collisions (PIC/MCC) simulation was used for the calculation of electron and ion currents to a spherical Langmuir (electrostatic) probe. This simulation took into account the collisions of collected charged particles with neutral gas particles around the probe. It can calculate the probe currents at higher neutral gas pressures, where usual collisionless orbital motion limited (OML) probe theory is not applicable. The improvements of usual simulation techniques enabled an increase in simulation speed and calculation of the probe current even for neutral gas pressures above 1 kPa. The simulations were carried out for two cases: i) probe with radius of 0.5 mm in non-thermal plasma with high electron temperature, ii) probe with radius of 10 μm in afterglow plasma with low electron temperature. The influence of probe radius on electron probe current was also studied. The simulations showed that a thick sheath limit of OML theory provides incorrect values of probe current for probes with radii larger than 200 μm even at very low neutral gas pressures. This effect stems basically form the following two reasons: i) the thick sheath limit for the OML theory does not hold; ii) due to the creation of a large presheath in such probes and subsequent decrease of charged particle concentrations at the sheath edge. The probe characteristics were calculated for probes with 0.5 mm radius for pressures up to 500 Pa. At this end at higher pressures electron cooling was observed, which does not correspond to any real experimental conditions. In addition an external electrical field would have to be considered in the simulation in order to calculate realistic charged species currents. The probe characteristic for probes with 10 μm radius were calculated for pressures up to 3 kPa. The influence of collisions on electron and ion probe current was demonstrated and the procedure for electron and ion density determination from probe measurement at higher pressures was developed. The results from PIC/MCC simulations were compared with results from continuum theory.

12. Jiri Marek

Media Streams Planning with Transcoding using Local Search Heuristics

Abstract

Recent advances in processing capabilities of commodity hardware enabled deployment of high-performance collaborative environments in various application fields, where maximum image quality and interactivity are critical. In this paper, we focus on user-empowered collaborative environments that rely on information available to the users and that can be obtained from the end-nodes connected to the network. We build upon our previous work on scheduling strategies for multi-point data distribution, while utilizing partial network topology knowledge that may be provided by the users. The novelty introduced by this paper is improved scalability of the system by employing local search metaheuristics. This allows us to maintain systems comprising more than twice as many applications compared to the approaches of other studies.

13. Jakub

Abstract:

Therapies based on social constructionism and postmodern philosophy in the family therapy field have emerged over the last thirty years. These therapeutic approaches have been introduced in the context of therapies based on radical constructivism. The aim of this review was to find and describe similarities and differences amongst the therapies based on these theories of social constructionism (SC) and radical constructivism (RC). The most influential theoretical articles representing these approaches were identified and compared according to certain criteria. Theory of personality, aim of the therapy and therapeutic strategy were used as the criteria for the comparison. Contrary to the main discourse in the family therapy field it was found that there are some profound differences amongst researched approaches. There is strong emphasis on individualism in RC therapies while SC approaches are based on relational and social concept of personality. Also there is a clear strategy and preferred techniques in RC therapies, while the SC approaches conquer this idea and work with contextualism and philosophical orientation. While SC therapies emphasise the relation and the dialogical conversation as the aim of the therapy itself, RC approaches primary aim is to change the client. All these differences show that there are different implications for therapist and clients working with RC and SC therapies that have often been unnoticed in family therapy community. Continuing work on distinguishing these approaches is recommended.