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Linear Systems: Relook, Concise Algorithms and Matlab Programs

S. K. Sen and Sagar Sen

Abstract

A linear system consists of linear equations $Ax=b$ and/or linear inequalities $Ax\leq b$, where A is an $m \times n$ known matrix and b is a known $m \times 1$ vector. A and b could be real or complex with no sign restriction on their elements. Other possible inequalities, viz., \geq , \neq , $<$, or $>$ could also be there in each of the systems. Such systems happen to be mathematical models of numerous real-world problems and have been dealt with by numerous people over decades. Yet the search/research still continues. Presented here are some useful linear problems/systems and their solutions. Inversion-free as well as inversion-based $O(mn^2)$ procedures that include computing least-squares and minimum-norm least-squares solutions are described. The former procedure provides us the information whether the system is consistent (contradiction-free) or not as well as the rank (physical information content) of A . Also described are (i) rectifying in $O(n^2)$ operations an already computed inverse of a matrix whose elements in a column were wrongly keyed in or needed to be modified, (ii) computing the Moore-Penrose inverse (p – inverse) of a matrix using optimal iterative schemes, and (iii) determining the p – inverse of the matrix obtained when a column is removed from the p – inverse of the original matrix. Included are a concise mathematically direct heuristic algorithm to solve a linear program (LP) and a method for testing optimality of a given solution of an LP. Inserted are several concerned Matlab programs for quick verification of the algorithms. Discussed are the possibilities of the semi-numerical (numerical and symbolic) computation where division by zero/a too small number in an intermediate step could occur.

Keywords: Heuristic algorithm for linear programs, inversion-free algorithm, linear systems, Moore-Penrose inverse, optimal iterative schemes, semi-numerical computations.

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Bohmian Mechanics An Alternative to the Copenhagen Interpretation of Quantum Mechanics

Mathew Chandrankunnel CMI

Abstract

Physics today is at a crisis due to the difficulties in quantizing gravity and relativizing quantum. Many models are brought forth to unify them but they defy the continuous attempts of many physicists. The founders of quantum mechanics could not agree with respect to the diverse philosophical position adopted by the Copenhagen school led by Niels Bohr interpreting nature as indeterministic and phenomenal while a group led by Einstein held the strong view that nature is deterministic and objective. The completeness-incompleteness debate of Quantum mechanics led to new discoveries like transluminal transmission of information and nonlocality. The conceptual incoherence in Quantum mechanics led David Bohm to look the whole issue from a different perspective and developed an ontological interpretation which was highly appreciated by J S Bell and showed that Bohm's interpretation can bring together the diverse foundations of relativity and quantum mechanics. In this article, Bohmian Mechanics is discussed in detail and its extension to the many body problem. By rewriting the wavefunction in polar coordinates and manipulating with the Schrodinger equation, a quantum potential is obtained. According to Bohm, this quantum potential which is a mathematical term in Classical electrodynamics has physical features in quantum mechanics and that guides the particle. This concept is derived from the Ahronov-Bohm effect. Thus the Bohmian Mechanics has relevance for future research and can guide the present day physics from its self imposed crisis.

Keywords: Quantum mechanics, Ontological interpretation, Non-locality.

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Growth and Characterisation of Rare Earth Mixed Oxalate Crystals of Cerium, Lanthanum and Neodymium

Mercy V. John

Abstract

Silica gel method is a suitable technique for the growth of oxalate group of materials due to their low aqueous solubility and increased thermal decomposition behaviour. Experiments are conducted for evaluating the optimal conditions for growing good quality crystals of cerium oxalate (CeOx), cerium lanthanum oxalate (CeLaOx) and cerium neodymium oxalate (CeNdOx). Growth parameters like pH of the gel, density of the gel, concentration of reactants, acidity of feed solution, etc. in the case of cerium oxalate crystals were investigated initially. Ideal growth conditions of these crystals have been optimized from the above studies. All observations are supported with necessary explanations. Since reactivity of rare earths differ from element to element, a comparative study of the growth kinetics of CeOx, CeLaOx and CeNdOx crystals grown under identical conditions are done. X-ray diffractometry was employed to prove the crystalline nature and to find the lattice parameters. Infrared absorption studies confirmed the presence of water of hydration and oxalate group in the grown samples. Thermal analysis confirmed the proposed chemical formula. The percentage of incorporation of different rare earth ions in the crystals were determined using Energy Dispersive X-ray Fluorescence analysis. Micro hardness of the grown crystal is determined using Vicker's micro hardness tester. A qualitative study of the optimal absorption and emission studies of the grown crystals for different stoichiometric ratios are done. Magnetic nature of the crystals is examined using vibrating sample magnetometer. Paramagnetic nature of Ce³⁺ and Nd³⁺ ions and diamagnetic property of La³⁺ ions were investigated. Using a powerful optical microscope, habit modifications and surface features are studied. The surface study reveals the history of the growth process. Etching studies have been employed to investigate the dislocations. Square, hexagonal, rectangular and triangular etch pits were obtained on different faces.

Keywords: Crystal Growth, Oxalate Crystals, X-ray Diffractometry (X R D), Morphology, Thermal Analysis.

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Mixed Ligand Complexes of Chromium (III) with some Nitrogen Donor Ligands

Preeti Mangala and K.M. Prasad

Abstract

Synthesis of complexes of Cr(III) of the type: $[\text{Cr}(\text{IzH})_2(\text{NCS})_2][\text{Cr}(\text{IzH})(\text{NCS})_4] \cdot 8\text{H}_2\text{O}$, $[\text{Cr}(\text{PBzH})_2(\text{NCS})_2] \cdot 10\text{H}_2\text{O}$, $[\text{Cr}(\text{Bipyam})_2(\text{NCS})_2]\text{NCS} \cdot 4\text{H}_2\text{O}$, $[\text{Cr}(\text{Bipyam})_2\text{Cl}_2]\text{Cl} \cdot 3\text{H}_2\text{O}$, $[\text{Cr}(\text{Bipyam})_2\text{Cl}_2]\text{ClO}_4 \cdot \text{H}_2\text{O}$, $[\text{Cr}\{\text{sal}\}_2\text{en}\{\text{NCS}\}(\text{H}_2\text{O})] \cdot 3\text{H}_2\text{O}$, $[\text{Cr}\{\text{OHAP}\}_2\text{en}\{\text{NCS}\}(\text{H}_2\text{O})] \cdot 3\text{H}_2\text{O}$ [IzH = imidazole, PBzH = pyridyl benzimidazole, Bipyam = bipyridyl amine, sal = salicylidene, en = ethylenediamine, OHAP = ortho-hydroxy acetophenone] are described. These complexes have been characterized by elemental analyses, i.r. and electronic spectra, magnetic moment and molar conductance measurements. The complexes have been assigned nearly O_h symmetry on the basis of their physico-chemical properties.

Key words: Nitrogen donor ligands, Chromium(III), nearly O_h symmetry.

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Preliminary Study on Radioactivity in Building Materials of Bangalore City

Mary D'Cruz

Abstract

A great amount of research in the field of radiation hazard has been directed towards understanding the mechanism of radiation injury. Exposure to radioactivity remain almost unknown to the public as environmentalists keep quite because concern over radioactivity in houses would divert attention from their campaign against the nuclear industry at large.

The introduction gives the historical perspective of radioactivity, the importance of the knowledge in setting guidelines for future use and management of building materials. It is followed by the scope of objective of the present work. The study area and methodology gives an insight into the location at Bangalore from where the samples were collected and also the technique used to determine the levels. The results prove that granite has higher activity (60 Bq/kg) than most other building materials, followed by cement, brick, concrete and mosaic tiles and the least ^{226}Ra activity is shown by sand. The activity of ^{226}Ra measured in building material is about the same or lower than similar materials from other countries. The results also prove that the lowest activity was found in the largest particle size and granite being the most significant contributor to ^{226}Ra activity.

It may be suggested that simple techniques as part of normal processing like sieving the phosphogypsum and discarding the fines would be beneficial to reduce the levels of radioactivity and keep it within safe limits.

Keywords: Radioactivity, Building Materials, Bangalore houses.

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Probiotics – Health Assuring Microorganisms

Balasubramani S.P. and Senthil Kumar R.

Abstract

Probiotics are dietary supplements containing potentially beneficial bacteria or yeast, with lactic acid bacteria (LAB) as the most common microbes used. They not only provide the characteristics sour taste of fermented dairy foods such as yogurt, but acts as a preservatives, by lowering the pH and creating fewer opportunities for spoilage organisms to grow. Probiotic bacterial cultures are intended to assist the body's naturally occurring flora within the digestive tract to reestablish themselves. They are sometimes recommended by doctors, and more frequently, by nutritionists, after a course of antibiotics, or as part of the treatment. Many probiotics are present in natural sources such as lactobacillus in yogurt and sauerkraut. Claims are made that probiotics strengthen the immune system and reduces cholesterol content. This article provides information on various sources and mode of action of the probiotics.

Keywords: Lacto-bacillus, Probiotics, immunomodulation, nutrients.

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Unusual Neoteny in *Rana curtipes* (Jerdon) – The Tropical Bicoloured Frog

Josephine Chandy and Katre Shakuntala

Abstract

Studies on *Rana curtipes* (Jerdon) a common litter frog of the Western Ghat belt of Karnataka and Kerala suggests that this frog exhibits unusual “neoteny”, with an extended larval life, presumably ranging from 9-11 months. A comparison of the maximum live weights attained by tadpoles of different anuran species and those of *R. curtipes* shows that the size at metamorphic climax achieved by *R. curtipes* (15.4g) is enormous, thereby suggesting that these tadpoles achieve giant body proportions. The reason for this natural tadpole gigantism has been discerned to be consequent to the significantly- elongated larval life. Unlike the other anuran tadpoles which are known to be abnormal in lacking thyroid glands and therefore failing to metamorphose, the giant tadpoles of *R. curtipes* (from tropical waters) are quite normal with thyroid glands but completing metamorphosis in a significantly extended time frame.

Keywords: Tropical Anuran; Frog; *Rana curtipes*; Extended larval life; Unusual Neoteny.

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A Novel Method to Prolong the Shelf Life of Jamun Seeds – (*Syzygium cumini* (L) Skeels)

S. R. Ambika and K. Pratibha

Abstract

Jamun is cultivated extensively for its medicinal and economic value. It is also used in afforestation programme to restore the forest. The seeds are recalcitrant with a short life (5-6 days) and cannot be stored longer by any conventional methods. Here we report a novel method to prolong the life of the seeds by 8 months. The results also prove that 88-97% of water is necessary to affect 100% germinability.

Keywords: *Jamun*, medicinal, reforestation, recalcitrant, seed life and germinability.

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Clotheslines and the Deep Sea: Making Poetic Space for Grief in Australian Everyday Life and Artistic Practices

Gaylene Perry

Abstract

This paper is in two parts: an **introduction** exploring notions of immensity and intimacy in Western-style (and particularly Australian) grieving processes and the relation of artistic practices to those processes; and a **description** of a collaborative creative writing/ visual arts project between two Australian creative arts practitioners and theorists, including reflection on how aspects of grieving in everyday life and in artistic processes can be instructive in how a society and its individuals manage (or do not manage) to create poetic space for mourning. Images of some of the creative work mentioned are included with the paper.

Keywords: Clotheslines, Grief, Artistic Practices.

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Using the Classroom to Develop Start-ups in the Creative Industries.

Jennifer Redbourne

Abstract

This Paper examines a postgraduate university course in the business development of creative industries which is designed to bridge the gap between the learning and practice of cultural entrepreneurship. In the course, students of creative industries take a business subject where their creative concept is developed into a business model and tested with venture philanthropists and business angels. Feedback from students is that the 'live' experience of using an entire semester to work on the concept business model with the lecture as the facilitator of learning how to develop a start-up creative venture, is akin to an apprenticeship in the real world. Feedback from the investors / evaluators is that the process is a clear validation for shaping entrepreneurship in the creative sector while managing the exposure to the risks that challenge start-ups.

Keywords: Learning and practice, cultural entrepreneurship, business start-ups, creative industries.

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Teaching Language-oriented Courses at the Postgraduate Level: Aims and Objectives

Geetha Bhasker

Abstract

The paper examines the aims and objectives of teaching language-oriented courses in addition to literature-oriented courses at the postgraduate level in the Department of English, Bangalore University, keeping in view the roles and functions of English in India today. These courses include a grammar course, a speech and writing course and a Linguistics course.

Keywords: Teaching, Language oriented, Postgraduate level.

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Narrowing the Gap Between Precept and Practice

Lalitha Raman, N. Vedavathi and Dr. K. Ramachandra

Abstract

In the everchanging business scenario worldover, our country is faced with enlarging gap between academia and the actual industry needs. This article intends to stimulate debate and discussion rather than to formulate mere principles for narrowing the gap between precept and practice. Therefor the need of the hour is to chalk out ways and means for finding a permanent solution to this infamous problem of integration that is unique in our country.

Keywords: Industry, Institute, Interaction.

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The Enigma of Six Sigma

Kamini Dhruva and Anie Mathews

Abstract

Total Quality Management, is the essence of every organization. The aim of most organizations now is not only directed towards profit, but to attain quality standards. One of the methods to achieve this is through the Six Sigma method, which seeks to reduce the defects in the production process, thereby improving and raising the standard of the output of the organization. Until 1994, Six Sigma remained a closely guarded secret by Motorola, but after GE implemented it in its organization others followed suit. This paper makes an attempt to analyze the Six Sigma methodology followed by TCS, Chennai in its operations. Six Sigma is all about minimizing defects to the rare of 3.4 defects in one million. Around the world, quality obsessed CEO's are chasing that magic figure as they yield what could turn out to be the sharpest tool to please customers, pump out profits, and eliminate flaws. The various stages of Six Sigma are the analysis-where maps are created to close the gap between current and target performance is done, Improvement-the objective is to confirm the key process variables and quantify their effects. Control-where conditions are documented and frozen into systems so that the gains are permanent. To implement the Six Sigma, the teams are divided into: Champions, Master Black Belts, Black Belts and Green Belts.

Keywords: Quality Standards, Six Sigma Process.

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Accounting for Knowledge Capital-Need for Re-look

Lalitha Raman

Abstract

Organizations will be required to leverage the Knowledge capital of the company to increase revenue and reduce costs. Companies have market capitalization many times their book value, even as much as 99 times more than book values of traditional assets described on the company's balance sheet. A human asset in which the knowledge capital lies was not treated as an asset in the past. The article makes an attempt to cover the following aspects: Conceptual backdrop. Eventual background in India, human resource valuation models, cost based models, economic models, and behavior models, with a detailed illustration on the commonly used Lev & Schewartz model, relevant issues and relevant answers. The researcher is of the opinion that more and more companies should take to knowledge capital accounting. However, an appropriate model, which takes care of the changing business, needs, newer HR policies, newer compensation model and newer motivational practices needs to be followed. The well-known Lev & Schewartz model best fits the requirement but needs a re-look.

Keyword: Accounting, Knowledge, Human Resource Valuation.

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