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সমাজ

সংস্কৃতি

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ক্রেডপত্র ২। আনিসুজ্জামা

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‘ছড়া’ প্রসঙ্গে রবীন্দ্রনাথ

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রবীন্দ্রনাথ শুধু শিল্পী হিসেবেই নয়, একজন সংগঠক হিসেবেও বাংলা তথা বাঙালির ইতিহাসে বিশিষ্ট স্থান করে নিয়েছেন। সে শান্তিনিকেতনে ব্রহ্মচর্যাশ্রম প্রতিষ্ঠাই হোক, জমিদারি এলাকায় পল্লি উন্নয়ন কর্মসূচির রূপায়ণই হোক—সবোতেই তাঁর অনেককে দিয়ে কাজ করিয়ে নেওয়া বা নেতৃত্ব গুণের ছাপ রয়েছে। লোকসাহিত্যের প্রতি তাঁর আগ্রহ এবং লোকছড়া ইত্যাদি সংগ্রহের ক্ষেত্রেও তিনি গুরুত্বপূর্ণ ভূমিকা পালন করেছিলেন। তিনি শুধু নিজে নন, যোগ্য লোকেদের ওপর দায়িত্ব অর্পণ করে এই সংগ্রহ কার্য চালিয়ে যাওয়ার উৎসাহ প্রদান করেছিলেন। নবীন প্রজন্মকে এই সংগ্রহকার্যে উদ্যোগী করতে বস্তুতা দিয়েছেন। এক্ষেত্রে তিনি যেহেতু নিজেই সংগ্রাহক হিসেবে কাজ শুরু করেছেন, সেহেতু তাঁর আহ্বান অন্তত আরও গ্রহণযোগ্য হয়ে ওঠা স্বাভাবিক। এইজন্য বাঙালি আজও রবীন্দ্রনাথের কাছে ঋণী।

‘সাধনা’ পত্রিকায় ১৩০১ বঙ্গাব্দের আশ্বিন-কার্তিক সংখ্যায় ‘ছেলেভুলানো ছড়া’ প্রথম প্রকাশিত হয়। যদিও এটি প্রথমে ‘মেয়েলী ছড়া’ নামে মুদ্রিত হয়েছিল। এরপর ১৩০১ বঙ্গাব্দের মাঘ ও ১৩০২ বঙ্গাব্দের কার্তিক মাসে ‘সাহিত্য পরিষৎ’ পত্রিকায় ‘ছেলেভুলানো ছড়া-২’ প্রকাশিত হয়। ১৩০২ বঙ্গাব্দের জ্যৈষ্ঠ মাসে ‘সাধনা’ পত্রিকায় ‘কবিসংগীত’ প্রকাশিত হয়। ১৩০৫ বঙ্গাব্দে ‘ভারতী’তে ফাল্গুন-চৈত্র সংখ্যায় ‘গ্রাম্যসাহিত্য’ প্রবন্ধটি প্রকাশিত হয়। প্রসঙ্গত উল্লেখ্য এই প্রবন্ধগুলো পরবর্তীকালে ‘লোকসাহিত্য’ নামক গ্রন্থে অন্তর্ভুক্ত হয়।

এই ‘মেয়েলী ছড়া’গুলির বিশেষ সামাজিক ও ঐতিহাসিক গুরুত্ব রয়েছে। রবীন্দ্রনাথ নিজেও সে বিষয়ে সচেতন ছিলেন। তবু এই ছড়াগুলোর ‘সহজ স্বাভাবিক’ রসাবেদনকেই বেশি গুরুত্ব দিয়েছেন। ‘লোকসাহিত্য’ গ্রন্থের ‘ছেলেভুলানো ছড়া-১’ প্রবন্ধের সূচনাতেই রবীন্দ্রনাথ এ বিষয়ে তাঁর মনোভাব স্পষ্ট করে ব্যক্ত করেছেন। এমনকি তথাকথিত সমালোচনার রীতি অনুযায়ী তাঁর এই সমালোচনা সকল সমালোচকদের সন্তুষ্ট করতে পারবে না—তাও তিনি উল্লেখ করেছেন। সমালোচনার ক্ষেত্রে প্রচলিত ‘বাঁধা ওজন’ ও ‘বাঁধি বোল’-এর পুনরাবৃত্তিতে তাঁর অবুচির কথাও তিনি উচ্চকণ্ঠেই বলেছেন। এখানেই সমালোচক রবীন্দ্রনাথের দৃষ্টিভঙ্গি অনেকটা উঠে আসে। তাঁর স্পষ্ট ঘোষণা—

কাব্যসমালোচকও যদি যুক্তি তর্ক এবং শ্রেণি-নির্ণয়ের দিক ছাড়িয়া দিয়া কাব্য পাঠজাত মনোভাব পাঠকগণকে উপহার দিতে উদ্যত হন তবে সেজন্য তাহাকে দোষী করা উচিত হয় না।

শাস্ত্র পদাবলী : অষ্টাদশ শতাব্দীর পরিবার ও সমাজ জীবন

প্রতিম দত্ত

বাংলাদেশে শাস্ত্রসাধনার ইতিহাস নিয়ে দীর্ঘ গবেষণা হয়েছে। বঙ্গদেশের সাহিত্য ও সংস্কৃতিতেও শাস্ত্র প্রভাব পড়েছে। তন্ত্র, পুরাণ, উপপুরাণ, শাস্ত্র সংগীত ইত্যাদির মধ্যে দিয়ে সেই ধারা প্রবহমান। অধ্যাপক ড. শশিভূষণ দাশগুপ্ত তাঁর 'ভারতের শক্তি সাধনা ও শাস্ত্র সাহিত্য' গ্রন্থে এ প্রসঙ্গে বলেছেন—

যহুদিন হইতে ভারতবর্ষের অন্যান্য মন অশ্বলের তুলনায় বাঙলাদেশেই যে শাস্ত্রধর্মের প্রাধান্য একথা অস্বীকার করা চলে না। ফেরা প্রকৃতি দক্ষিণ অশ্বলে শক্তিপূজার প্রচলন আছে বটে, কিন্তু শাস্ত্রধর্ম সেখানেও সমগ্র জাতির সাহিত্য-সংস্কৃতিকে এমন করিয়া প্রভাবিত করে নহি।'

অর্থাৎ অধ্যাপক দাশগুপ্তের পর্যবেক্ষণ—ভারতবর্ষের অন্যান্য স্থানে শক্তিপূজার চল থাকলেও, বঙ্গভূমির সাহিত্য-সংস্কৃতিকে শাস্ত্রধর্ম যেভাবে প্রভাবিত করেছে, অন্যত্র তা করতে পারেনি। পূর্বোক্ত গ্রন্থেই সমালোচক মন্তব্য প্রকাশ করেছেন যে—“শাস্ত্রধর্ম বাঙালীর মধ্যে ব্যাপক ধর্ম রূপ ধারণ করিয়াছে খ্রীস্টীয় সপ্তদশ শতক হইতে।” যদিও এর পূর্বে শাস্ত্রধর্মকে বাংলাদেশে অন্যতম গৌণ ধর্ম হিসেবে উল্লেখ করেছেন। আপামর বাঙালি তন্ত্র গ্রন্থ না পড়লেও, এমনকি মঙ্গলকাব্যের নাম শুনে না থাকলেও শ্যামা-সংগীত শুনেছে। গানের এই এক সুবিধা। খুব সহজেই সকলের কাছে পৌঁছে যাওয়া যায়। আগ্রহ না থাকলেও হয়ত কানে চলে আসে। আবার ক্রমে সেই অনাগ্রহ আগ্রহের বিষয় হয়ে ওঠে। শাস্ত্র-সংগীতগুলো ঠিক সেই সূত্রেই সহজে সকলের কাছে পৌঁছতে পেরেছে। শুধু পৌঁছতে পারলেই কোনো শিল্প যে স্থায়ী প্রভাব রাখবে তা নয়। সেক্ষেত্রে প্রতিভাবান ভক্ত-কবি বা কেবলমাত্র কবিদের অবদান আছে। বাংলাদেশ এমনিতেই গীতিকবিতার দেশ। ফলত, এই নতুন ধারা যে সহজেই মানুষের মনে জায়গা করে নেয়। রবীন্দ্রনাথের পর্যবেক্ষণ—

চণ্ডীপূজা ক্রমে যখন ভক্তিতে রিশ্র ও রনে মধুর হইয়া উঠিতে লাগিল তখন তাহা মঙ্গলকাব্য ত্যাগ করিয়া খণ্ড খণ্ড গীতে উৎসারিত হইল। এই সকল বিজয়া-আগমনীর গীত ও গ্রাম্য খণ্ড কবিতাগুলি বাংলাদেশে বিক্ষিপ্ত হইয়া আছে।'

অর্থাৎ রবীন্দ্রনাথের মতেও, 'চণ্ডীমূর্তি'র বিবর্তনে ইতিহাসে এই শাস্ত্র পদাবলীর সৃষ্ণনের সময়টি একটি বাঁক নির্দেশক। দেবীর মূর্তি যে কোমল হলো তা নয়, তার মহিমা প্রকাশের মাধ্যমটিও কোমলতর হলো। মঙ্গলকাব্যের গড়ন ছেড়ে সে গীতিকবিতা বা বিশুদ্ধ গান হয়ে

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অবুঝ

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সম্পাদনায়

দীপঙ্কর মল্লিক • দেবারতি মল্লিক



দি. গৌরী কালচারাল অ্যান্ড এডুকেশনাল অ্যাসোসিয়েশন

Dalit Women Speak Differently: A Study of Bama's *Sangati***Abstract:**

As part of minority discourse a Dalit woman's life-stories are primarily designed to point out 'caste-deficiency' in Indian feminism and prevalence of interlocking system of domination in which Dalit women find themselves trapped. As a powerful mode of self-representation, Dalit women's autobiographies (life-narratives) too extend the discourse on marginalization, particularly in the context of Dalit protest movement's general apathy to gender issues in the community itself. Dalit woman's life-writing generally takes on the form of either one coherent narrative or a variety of collected works including letter, diaries, memories and interviews where the writer's self is either the primary subject or the principal object of verbal action. Women here place their personal experiences in more interpersonal contexts. In addition, their stories include more information about emotional aspects of events than do Dalit man's narratives. The last two decades have witnessed a spurt in the production of Dalit women's narratives. From Maharashtra, the birthplace of Dalit literature movement, the most notable figures are Shantabai Kamble, Baby Kamble, Kumud Pawde and Urmila Pawar. The South too can boast of a host of names but the one to have grabbed fame and titles is Faustiana Bama whose autobiography Karukku has won Crossword award for literature. Interestingly, in many ways, Karukku is an unusual autobiography. When it appeared the literary world was literally struck by its sheer energy, its newness, particularly its brilliant use of local dialect. More daring seems to be her next work Sangati- a generic muddle of sorts. Flouting received notions of what a novel should be, Bama weaves many narratives together to explore the social inequalities suffered by Dalit women. Does it signal a major shift with the promise of fresh winds for Dalit literature movement otherwise gone overly repetitive, monochromatic and clichéd? Through a reading of the novel Sangati, this paper seeks to examine how Bama ushers in a change in Dalit feminist writing and how she changes the quality and style of canonical narratives considered as literary so that they will accommodate the stories of silenced people articulated through a differentiated kind of aesthetics.

Key Words: Dalit fiction, life-narratives, Dalit feminism, form, aesthetics

"By Dalit literature, I mean writing about Dalits by Dalit writers with a Dalit consciousness. The form of Dalit literature is inherent in its Dalitness, and its purpose is obvious: to inform Dalit society of its slavery, narrate its pain and suffering to upper caste Hindus" (Limbale 18).

First published in Marathi in 1996 as Dalit Sahityache Saundaryasastra Limbale's book is a wide ranging exploration of a Dalit writer, of the history, controversies and considerations pertaining to the emerging literature of the Dalits. Indeed it is a brand of literature throwing up a counter aesthetics that challenges valorization of a cool, detached contemplation of life. Silenced for centuries by caste prejudices and social oppression, the Dalits of Maharashtra have only in the last 50 years, found a powerful voice in Marathi literature. The revolutionary social movement launched by their leader B R Ambedkar was paralleled by a wave of writing that exploded in poetry, prose fiction and autobiography of a raw vigour, maturity, depth and richness of content and shocking in its exposition of the bitterness of their experiences. One is jolted by a quality of writing by a group denied access for long to any literary tradition. The first Dalit literary conference happened in 1958. The twin events of Narayan Surve focusing on Subaltern issues and the little magazine movement taking root- both in the sixties- provided the real impetus. But the individuals who

Synthesis, Optical and Electrical Properties of Cubic La_{1-x}MoO₃ Containing Mo Based Oxide Ion Conductors

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Abstract. Nanocrystalline La_{1-x}(MoO₃)_{2.5} and La_{1-x}(MoO₃)₂ were prepared through solution combustion method. The Rietveld fit of the X-Ray diffraction pattern confirms the single phase of La_{1-x}(MoO₃)_{2.5} whereas La_{1-x}(MoO₃)₂ has some impurity. The FT-IR spectra depict the different chemical bonding of La_{1-x}(MoO₃)_{2.5} with some functional groups. The impedance spectroscopy shows that La_{1-x}(MoO₃)_{2.5} have better conductivity with respect to another one. The highest bulk conductivity of La_{1-x}(MoO₃)_{2.5} is found to be $1.27 \times 10^{-3} \Omega^{-1}\text{cm}^{-1}$ at 520°C without any grain boundary contribution.

INTRODUCTION

The rare-earth-doped Molybdenum oxide nowadays has generated much interest because of its high ionic and protonic conductivity and it exhibits excellent chemical and thermal stabilities which are connected with some unique physical properties [1]. In general, the cubic structure has more stability than the other type of structures in cooling and heating cycles. That is why this type of materials is of much use in SOFCs as an electrolyte [2]. Generally, lanthanum molybdate has two types of structures. Up to 1200°C it has cubic fluorite structure and beyond this temperature it changes into rhombohedral. But the formation of single-phase cubic or rhombohedral structure of La_{1-x}MoO₃ is quite rare and there are very few reported works about cubic La_{1-x}MoO₃. In this work we have tried to synthesize the cubic single phase of the samples and have measured the FT-IR and electrical properties to find a structure-property correlation of the samples.

EXPERIMENTS

The nanocrystalline La_{1-x}MoO₃ and La_{1-x}(MoO₃)_{2.5} were prepared through the solution combustion method. The starting materials Ammonium Molybdate Tetrahydrate [(NH₄)₆Mo₇O₂₄ · 4H₂O], Lanthanum Oxide [La₂O₃] and Anhydrous Citric Acid were used in proper stoichiometric ratio. For both the samples, first La₂O₃ was dissolved in deionized water in a beaker and stirred in the temperature range 70°C – 75°C with the addition of nitric acid dropwise until the solution becomes clear. Then (NH₄)₆Mo₇O₂₄ · 4H₂O was added into the solution under the constant stirring. The fuel material 'citric acid' in 1:2 molar ratio was added after the solution became transparent. Then dropwise aqueous ammonia was added to the solution for neutralizing the pH value and a white aqueous gel was formed. After some time, stirring was paused due to dryness of the aqueous gel. After drying of the gel, the whole beaker was put into the furnace at 200°C for 2h for complete ignition which produced the raw sample. The sample was collected, ground and again calcined at 400°C for 2h afterward the green-yellowish powder was formed. Some amount of powder was made into pellet by uniaxially pressing in a 10mm diameter stainless steel die. Both pellet and powder sample was sintered at 900°C.

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Structural phase transition and charge carrier dynamics in Dy containing La_{0.8}MoO₃ ionic conductor

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FTIR

ABSTRACT

The solution combustion method was adopted to prepare a single-phase La_{0.8}MoO₃ compound by doping 20% Dy in the La site and sintered at 800 °C, 900 °C, and 1200 °C temperatures. The X-ray diffraction pattern confirmed a phase transition of the samples from the cubic fluorite phase (Pm3m) to a complex rhombohedral structure (R3m) with increasing sintering temperature. The microstrain and particle size show the opposite behaviour to the case of 800 °C and 1200 °C sintered samples. The FE-SEM and XRD results corroborated the increase of particle size with sintering temperature. Elemental mapping confirmed the uniform distribution of elements in the compositions. Red and blue shifts in optical bandgap were observed with sintering temperature. All samples show a negative temperature coefficient of resistance (NTCR) behaviour. The sample sintered at 1200 °C has the highest ionic conductivity of $1.03 \times 10^{-3} \Omega^{-1}\text{cm}^{-1}$ at 540 °C. The reciprocal temperature dependence of conductivity followed the VTF equation. The dielectric loss tangent indicated that all samples have a single relaxation process. The time-temperature superposition principle has been verified from the scaling of the dielectric loss tangent.

Introduction

In recent years, solid oxide fuel cells (SOFCs) have played an important role in clean energy generation. More importantly, SOFC materials have attracted the focus of researchers due to their applications in various fields. Nowadays, the main effort is given to developing low-temperature SOFCs. For low-temperature SOFCs, unlike traditional fuel cell materials, semiconductor or heterostructure ionic materials are the new trends in this field [1–3]. In recent years, many researchers have been working on various ion-conducting materials to find low-temperature high ionic conductive electrolyte materials to increase the efficiency of SOFCs.

Among different compounds, La_{1-x}MoO₃ (La = lanthanides and M = W or Mo) has great built-in interest due to their complex phase diagram and wide applications as photoconductor, laser materials, mixed conducting membranes and also used as the potential electrolyte in SOFCs [4–13]. It is well reported [11] that the La_{1-x}MoO₃ does not form a single-phase compound at La/W = 6, but it can be prepared with some vacancies in the La site. In recent years, various doping strategies have been adopted to improve the ionic conducting properties of lanthanum

tungstate [11]. It has also been reported that when Mo substitutes W in the lanthanum tungstate, it increases hydrogen flux and gives exciting results in electrical conductivity due to the greater reducibility of Mo³⁺ than W⁶⁺ [11], and that is why recently, the compound La_{0.8}MoO₃ has generated a new interest as a SOFC material. The La_{0.8}MoO₃ compounds exhibit a rich polymorphism, another interest in this field [4]. Among all La_{1-x}MoO₃ compounds, the La_{0.8}MoO₃ is very interesting because of its different complex structures and high ionic conductivity. Its unit cell volume is large, and structurally it is very obscure [5–9]. Preliminary studies have shown that the compound La_{0.8}MoO₃ consists of two main phases. One is cubic-fluorite (Pm3m) for low temperature, and the other is a high-temperature rhombohedral (R3m) phase with different lattice parameters [4,13]. A. López-Vergara et al. [7] showed that all Nb and Zr doped La_{0.8}MoO₃ samples are cubic-fluorite (single-phase) even at a high sintering temperature (1500 °C). This shows that the sample's phase or structure depends on the sample preparation method. A. V. Shlyakhtina et al. [11] reported that the sample La_{0.8}Mo_{0.9}W_{0.1}O₃ was in the rhombohedral (R3m) phase with $a = 10.479 \text{ Å}$ and $c = 9.813 \text{ Å}$, fully occupying the La site. A. López-Vergara et al. [1], for the first time, using superstructure formulation and Rietveld-refinement of the neutron and

Structural, electrical, and dielectric properties of chemically derived Sm-Doped cubic lanthanum molybdate nanomaterials

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ABSTRACT

In this study, we successfully synthesized single-phase cubic fluorite structure La_{0.8}Sm_xMoO₃ ($x = 0.4, 0.6, 0.8, 1$) materials using the solution combustion method and demonstrated their structural and electrical properties. Rietveld refinement of the X-ray diffraction patterns provided detailed microstructural information for the prepared compositions. Field emission-scanning electron microscopy verified the uniform nature of the particles in all samples. The optical band gap obtained from the ultraviolet-visible spectra indicated a red shift up to a dopant concentration of $x = 0.8$ and a blue shift subsequently. Fourier transform-infrared spectroscopy confirmed the presence of different structural bonds in the compounds. The impedance spectra demonstrated the thermally activated non-Debye type nature of the compounds, and the electrical conductivity demonstrated their negative temperature coefficient of resistance behavior. The time-temperature superposition principle was verified based on the scaling of the impedance spectra. The dielectric constant was found to increase with the temperature and the dopant concentration.

1. Introduction

Rare-earth tungstates and molybdates have attracted much interest in recent decades because of their presence in many different compounds [1], and they have been used widely in applications such as high-performance luminescent materials, new pigments, catalysts, and materials for hydrogen separation membranes [2,3]. Rare-earth containing molybdates have also been investigated as mixed proton-electron conductors for solid oxide fuel cells [1].

The lanthanide molybdate (La_{1-x}MoO₃)_{2.5} system contains various common compounds derived as La_{1-x}MoO₃, La_{1-x}MoO₃, La_{1-x}MoO₃, and La_{1-x}MoO₃ [4]. In particular, the light (La = La-Sm) and heavy (La = Eu-La) rare earth molybdates La_{1-x}MoO₃ usually exhibit three different polymorphs with fluorite (Pm3m), rhombohedral (R3m), and bixbyite (I41/a) structures.

However, the equilibrium is a very difficult process to reach in these systems and contradictory results have been reported in different studies [5–7]. In addition, many compounds in this group were shown to be stable only at a particular temperature or oxygen pressure range [1].

X-ray photoelectron spectroscopy analysis has shown that Mo and some rare-earth elements have variable valency [1,4], which leads to

interesting conductivity characteristics in these materials. In general, it is considered that the fluorite (Pm3m) phases should be more thermally stable than the distorted and/or oxygen-ordered phases with rhombohedral, tetragonal, or orthorhombic fluorite-related structures [1].

Previous studies [2,3] have demonstrated that La_{0.8}MoO₃ has two phases comprising the low-temperature cubic fluorite phase with the Pm3m space group and the high temperature rhombohedral (R3m) phase. Very few studies have investigated these two phases [5–11] and to the best of our knowledge, none has considered the synthesis of pure single-phase La_{0.8}MoO₃ samples at both low and high temperatures [2, 10,12,13]. Savits et al. reported that rhombohedral La_{0.8}MoO₃ has a highest bulk conductivity of about $1 \times 10^{-3} \Omega^{-1}\text{cm}^{-1}$ at 400 °C in a wet air and Ar atmosphere [1]. They also reported that Zr-doped rhombohedral La_{0.8}Zr_{0.2}MoO₃ with some additional reflections in the X-ray diffraction (XRD) pattern has a highest total conductivity of about $2.5 \times 10^{-3} \Omega^{-1}\text{cm}^{-1}$ at 500 °C in wet air. The failure to prepare a single-phase La_{0.8}Zr_{0.2}MoO₃ composition was also reported in a previous study [10]. López-Vergara et al. found that La_{0.8}MoO₃ has both single-phase cubic-fluorite and rhombohedral structures but they failed to prepare pure La_{0.8}MoO₃ [13].

The single-phase La_{0.8}MoO₃ has not been prepared successfully in

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Research Papers

Structural and charge carrier dynamics study of Dy stabilized La_{0.8}MoO₃ ionic conductors

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ABSTRACT

Room temperature single phase stabilization of different metals (Zr, Gd, and Ce) doped La_{0.8}MoO₃ compound was achieved by incorporating Dy₂O₃ using the solution combustion method. Rietveld refined X-ray diffraction profiles showed cubic fluorite (Pm3m) structure for all the compositions. The optical bandgap, calculated from ultraviolet-visible spectra, exhibited blue shifts with decreasing dopant ionic radius. The photoluminescence spectra confirmed the charge carrier's various trapping or defect states. The complex impedance plot exhibited non-Debye-type relaxation with a negative temperature coefficient of resistance (NTCR). It also indicated that the dopant might act as an acceptor or donor depending upon its valency. The ionic conductivity was found to follow the small polaron hopping mechanism. A thermally activated single relaxation process was observed. The composition La_{0.8}Dy_{0.2}MoO₃ showed the highest conductivity, $1.05 \times 10^{-3} \Omega^{-1}\text{cm}^{-1}$ at 600 °C. The scaling of spectra indicated temperature and composition independent charge carrier mechanisms.

1. Introduction

The rare-earth-doped molybdenum oxides are significant inorganic materials for hydrogen separation membranes because of their mixed ionic-electronic conductivity [1,2]. In addition, this compound is also used in material fields like pigments or photoconductor, laser, optical fibers, catalytic membranes, and as electrolytes for solid oxide fuel cells [3–6]. Furthermore, the rare-earth molybdenum oxides contain a wide range of chemical compounds with different structures, which have received considerable attention in recent years due to the structure-property relationship of these compounds [3,4,7,8].

Because of its excellent proton conductivity, lanthanum tungsten oxide (La_{1-x}WO₃) has recently emerged as a material of considerable interest [3]. As a result, various strategies are being used to improve conductivity by doping both the La and W sites. In particular, Mo has been employed to replace W sites due to increased conductivity in recent years, as Mo has higher reducibility than tungsten [3,9].

V. S. Vishnu et al. [10] showed that the substitution of W⁶⁺ by Mo³⁺ in Sm_{0.2}WO₃ results in significant changes in optical characteristics, with the band gap energy decreasing as Mo³⁺ concentration increases. Again, La_{0.8}W_{0.2}MoO₃ compounds have both cubic ($x \leq 0.4$) and rhombohedral structures ($0.4 \leq x < 0.8$), and conductivity increased with

increasing Mo content [11]. A. López-Vergara et al. [12] observed that among all Ca, Sr, Ba, Nb, and Ti-doped samples, only Nb and Ti-doped La_{0.8}MoO₃ compounds have single-phase and secondary phases increase with increasing dopant ionic radii. However, Ca and Sr doped lanthanum tungstates were described as single-phase compounds and acted as proton acceptors, resulting in a lower conductivity than the undoped ones [13]. S. N. Savits et al. found a conductivity of $2.5 \times 10^{-3} \Omega^{-1}\text{cm}^{-1}$ at 500 °C in wet air for La_{0.8}Zr_{0.2}MoO₃, which decreased across the lanthanide (La) series from La to Er for both La_{0.8}WO₃ and La_{0.8}MoO₃ compounds [14].

The literature review indicates little information on the stabilization of pure cubic or rhombohedral La_{0.8}MoO₃ compounds. In our earlier work [15], we successfully stabilized the single-phase La_{0.8}MoO₃ compound in cubic-fluorite form by replacing La with Sm. Because the preparation of La_{0.8}MoO₃ compound with different metal-doped in the La site is quite problematic, we attempted to prepare the La_{0.8}Dy_{0.2}MoO₃ ($x = 0.2$), Gd, Ce, Ca, Sr and Na) compounds with a fixed site ratio (La/Mo = 6) using the solution combustion method. Because all doped ions have different ionic radii and valency, they will aid in determining the relationships between the structural, electrical, and optical properties with the dopant. Since La_{0.8}MoO₃ is a proton-conducting material, Zr⁴⁺, Cd²⁺, Ca²⁺, Sr²⁺, and Na⁺ will act as

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Making and Breaking of Bengali Hindu Women: Placing Partition Memoirs by Bengali Hindu Women against “Broto Katha”

PALLAB DAS

I

When one looks at the word “woman” from the perspective of gender, it always comes with some predefined notions, in most cases defined by the representatives of patriarchy, which also provides the whole thing with a flavour of social politics of gender. Even Tagore had to write that a “woman” is half her womanhood and half a man’s imagination. In her inaugural speech on 9th March 1989 at a seminar titled *Indian Women: Myth and Reality*, Ashapura Devi says:

“Women have always been misled by the imposed ideal of womanhood. Be it her gentle manners and natural tenderness, or her lack of physical strength, she has always found herself hidden behind a mist of illusions, fenced in on all sides and forced away from the real world into the seclusion of a helpless and dispossessed life. It is the unfair system that fostered the absurd notion - that she has no place in the world of work outside her home. Man is the maker of that world, and a woman’s duty is to make him a home.”¹

At the advent of civilisation, the texture was essentially matriarchal. Probably the priority was given to the fertile nature of womanhood. Gradually with the growing complexity, the patriarchy took control over society and the first thing it did was to prove its rival gender subordinate. This hypothesis falls fine with almost every civilisation in the world, including India. To confirm the superiority of the “man” they very cunningly defined religion and gendered its concepts in favour of them. From the Christian Bible to Hindu scriptures - every religious text shows women as subordinate and unfortunately opiumed by religion, the society accepts these gendered narratives as words from Gods, therefore, truth.

For Bengali Hindu women the fact is no different. Even modern poet like Tagore could not go beyond its influence. For example, in *Home and the World* he shapes Bengali women as yet unready to face the world outside the threshold. Though against it we have his Labanya in *Sesher Kobita*, Tagore places her as exceptional, in other word, rare. In *Dui Bigha Jomi* he clearly conceives the Bengali women as an embodiment of softness and sweetness. While searching for the stereotype that the “Bengali Hindu Woman” is, one may easily search the religious scriptures and works of literature. But often the process ends incomplete with only the search covering the mainstream Hinduism that affects the Bengali social practices. Instead, this article tries to search for the stereotype in a long-neglected² part of the socio-religious practice – namely the ‘Broto Katha’.

Jnanendramohon Das in *Bangala Bhashar Avbhidhan* defines Broto as rules, discipline, and pious ritualistic ceremony to be performed regularly to achieve wealth and other mundane comforts. Madhuri Sarkar in her *Broto: Samaj o Sanskriti* (Broto: Society and

দেশভাগের স্মৃতি ও ব্যক্তির সঙ্গে গোষ্ঠীর দ্বন্দ্বিকতা প্রসঙ্গ 'পূর্ব-পশ্চিম'

পল্লব দাস

দেশভাগের সাহিত্য নিয়ে দেবেশ রায় লিখেছেন—“সে সাহিত্যের উৎস এক নিরন্তর আত্মবিলাপ। সে সাহিত্যের মহত্ব... কোনও লেখাতেই কোনও দিক্কৃত প্রতিপক্ষ নেই, দিক্কৃত কেবল আমি নিজে, দিক্কৃত কেবল আমার নিয়তি, দিক্কৃত কেবল সেই ইতিহাস-নিয়তি যে ইতিহাসের আকার নিয়েছে।”^১ দেশভাগ নিয়ে দীর্ঘ নীরবতা, দেশভাগের ট্রমা, স্থানান্তরের ইতিহাস এই প্রবন্ধের আলোচ্য বিষয় নয়। এই প্রবন্ধের আলোচ্য বিষয় স্মৃতি। সে কারণেই দেবেশ বাবুর বক্তব্যটি খুব প্রাসঙ্গিক মনে হলো। কারণ এই যে আত্মবিলাপ, আত্মধিকার—সেগুলি কিন্তু স্মৃতি ও নস্টালজিয়ার সঙ্গে জড়িত অনুভূতি। বাংলা সাহিত্যে দেশভাগ নিয়ে লেখা ফিকশনকে মোটামুটি দুটি ভাগে ভাগ করা যায়। দেশভাগের সময়ে লেখা এবং প্রায় তিন বা চার দশক পরে লেখা। প্রথম ভাগে আমরা পাই প্রবোধকুমার সান্যাল, সাবিত্রী রায়, আবু ইসহাক ও অমিয়ভূষণ মজুমদারের মতো লেখকদের। তাদের সঙ্গে দৃষ্টিভঙ্গিগত পার্থক্যে প্রায় ভিন্ন গোষ্ঠীতে রয়েছেন আখতারুজ্জামান ইলিয়াস, মিহির সেনগুপ্ত, সুনন্দা সিকদার, হাসান আজিজুল হকের মতো লেখকেরা।^২ প্রথম ভাগের লেখকদের লেখায় সাময়িক অভিজ্ঞতা ও ট্রমার আধিক্য বেশি। অপরদিকে পরবর্তী লেখকদের মধ্যে অতিক্রান্ত সময় থেকে দূরে চলে আসার কারণে অভিজ্ঞতাজনিত স্মৃতি ও নস্টালজিয়ার আধিক্য বেশি যা অনেক ক্ষেত্রেই ব্যক্তিগত নির্মাণ হলেও ইতিহাসের অংশ হয়ে ওঠে।

দেশভাগ এবং সেই ক্রান্তিলগ্ন পরবর্তীকালে বাঙালি জীবনের বিবর্তন নিয়ে যে সার্থক সাহিত্য লেখা হয়েছে তার মধ্যে ব্যতিক্রমী ও বড়ো মাপের উপন্যাস সুনীল গঙ্গোপাধ্যায়ের ‘পূর্ব-পশ্চিম’। ধারাবাহিক ভাবে ‘দেশ’ পত্রিকায় প্রকাশিত উপন্যাসটি ১৯৭৮ খ্রিস্টাব্দে গ্রন্থের আকার পায় আনন্দ পাবলিশার্সের সৌজন্যে। চার পর্বে বিভক্ত এই উপন্যাসটি—‘সূচনাপর্ব’, ‘যৌবন’, ‘উত্তর পর্ব’ ও ‘উপসংহার’। বিশাল ক্যানভাসে চিত্রিত এই উপন্যাসটির ঘটনাপ্রবাহ একই সঙ্গে ছুঁয়ে যায় এপার এবং ওপার বাংলাকে। উপন্যাসটির ঘটনাপ্রবাহের সূত্রপাত বিগত শতকের পঞ্চাশের দশকের মধ্যভাগে। তারপর কীভাবে দুই বাংলার রাজনৈতিক, আর্থ-সামাজিক পালাবদলের ষোড়শ একে অপরের সমান্তরাল ভাবে এসে মিশেছে আশির দশকের মোহনায়, ‘পূর্ব-পশ্চিম’ তার এক জীবন্ত দলিল। দেশভাগের পর মালখানগরের পাট চুকিয়ে প্রতাপ মজুমদারকে জজিয়াতির চাকরি নিয়ে স্থায়ীভাবে বসতি গড়তে হয় কলকাতায়। আর ওপার বাংলায় থেকে যান তার প্রিয় বন্ধু মামুন। একজন হিন্দু ও একজন মুসলমান—দুই বাংলার দুই পরিবারকে কেন্দ্র করে এগিয়ে চলে উপন্যাসটি। উপন্যাসের অনেক চরিত্রই প্রাধান্য পেয়েছে ঘটনাপ্রবাহের প্রয়োজনে। তাই কোনও

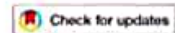
The Theme of Repetition in Amitav Ghosh's *The Hungry Tide*

Pallab Das*

Amitav Ghosh's *The Hungry Tide* depicts the life and living in the tide country that occupies a large part of the southern West Bengal, perhaps most vividly amidst the English fictions written by any author in Indian Sub-continent. Probably he is also the first Indian writer to focus on ecological issues in Indian English fiction with the publication of *The Hungry Tide* in 2004. It is quite natural from an author who had also worked as a journalist and had written extensively on different burning issues and post colonial problems of the third world. His works – *The Circle of Reason* (1986), *Shadow Lines* (1990), *In an Antique Land* (1994), *The Calcutta Chromosome* (1996), and *The Glass Palace* (2000) express an underlying consciousness of the subaltern. In *The Hungry Tide* also there is a detailed narrative of the subaltern experience, especially in the narrative of the struggle of the people of the 'bhaatir desh', a place which itself has received its name from a special type of tide, indicating that most of the islands in the tide country remain under water during the tide only to be seen again during the ebb, and obviously in the description of the homeless refugees of Morichjhapi and the government sponsored atrocities on them.

It begins at Dhakuria railway station in Kolkata and the journey leads to the tide country of the Sunderbans and then continues through past and present proceeding. Ghosh himself has divided the novel into two parts; 'the ebb' and 'the tide'. From another perspective the novel can be divided into two sections; the past narratives and the present proceedings. The novel develops around eight characters from two generations. Nirmal, Nilima, Horen and Kusum belong to a specific span of time and Kanai, Piya, Fakir and Moyna belong to another, but like the tide

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Solution of the symmetric band partial inverse eigenvalue problem for the damped mass spring system

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ABSTRACT

The structured partial quadratic inverse eigenvalue problem (SPQIEP) is to construct the structured quadratic matrix polynomial using the partial eigendata. The structures arising in physical applications include symmetry, band (tridiagonal, diagonal, pentagonal) etc. The construction of the structured matrix polynomial is the most difficult aspect of this problem and the research on structured inverse eigenvalue problem is rare. In this paper, the symmetric band partial quadratic inverse eigenvalue problem (SBPQIEP) for the damped mass spring system is considered. This problem concerns in finding the symmetric band matrices $M \in \mathbb{R}^{n \times n}$, $K \in \mathbb{R}^{n \times n}$ and $C \in \mathbb{R}^{n \times n}$ with bandwidth p from m ($1 \leq m \leq 2n$) prescribed eigenpairs so that the corresponding quadratic matrix polynomial $P(\lambda) = \lambda^2 M + \lambda C + K$ has the given eigenpairs as its eigenvalues and eigenvectors. In general, SBPQIEP is very hard to solve due to the additional band structure constraint. We propose a novel method, based on the matrix-vectorization and Kronecker product of matrices for solving this problem. Furthermore, explicit expressions for general solutions are presented. Numerical experiments on a spring mass problem are presented to illustrate the applicability and the practical usefulness of the proposed method.

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Symmetric band matrix; quadratic eigenvalue problem; quadratic inverse eigenvalue problem; finite element model updating

AMS CLASSIFICATIONS

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1. Introduction

Unforced vibrating structures are usually model by a system of second order matrix differential equations of the form:

$$M \frac{d^2 x}{dt^2} + C \frac{dx}{dt} + Kx(t) = 0 \quad (1)$$

where the matrices M , C and K are each of order n and M is assumed to be non-singular.

In general, these matrices have very often some special structures, such as they are symmetric, positive definite or positive semidefinite and banded.

The dynamics of such a system are governed by the eigenvalues and eigenvectors of the associated quadratic matrix polynomial $P(\lambda) = \lambda^2 M + \lambda C + K$. When M is non-singular

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which is true for most practical problems, the polynomial $P(\lambda)$ has $2n$ eigenvalues and $2n$ eigenvectors each of length n , assuming that all these are of order n . Theoretically, the quadratic eigenvalue problem for $P(\lambda)$ can be solved by transforming the problem to a



Nearest linearly structured polynomial matrix with some prescribed distinct eigenvalues 2/28

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ABSTRACT

In this paper, we address the problem of computing the nearest linearly structured polynomial matrix with prescribed distinct eigenvalues. The problem deals with the computation of the minimal structured perturbation to the coefficient matrices so that the perturbed polynomial matrix has the prescribed eigenvalues and is the nearest to the given polynomial matrix. In recent years, a series of papers have been published on the perturbation of polynomial matrices with prescribed eigenvalues; however, a linear structure-preserving result does not exist so far to the best of our knowledge. In this paper, we have proposed an optimization based approach where we have reformulated the problem as a constrained optimization problem. Towards the end, a few numerical case studies are presented which demonstrate the efficiency and usefulness of our proposed method.

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1. Introduction

The study of polynomial matrices plays a crucial role in many fields of theoretical mathematics and engineering science. In the recent years, the study of polynomial matrices has received significant attention and has found many applications in diverse fields of applied mathematics, such as boundary value problems, systems theory and control, vibrating and gyroscopic systems, wave theory, and stochastic models. A comprehensive survey of the theoretical developments and applications of polynomial matrices can be found in [1–5] and the references therein.

Let $\mathbb{R}^{n \times n}$ denote the real vector space of all $n \times n$ matrices. Let $\mathbb{R}^{n \times n}[s]$ denote the ring of polynomials in a single variable s with coefficients from the real $n \times n$ matrices. We consider the real structured polynomial matrix $P(s) \in \mathbb{R}^{n \times n}[s]$ of degree d in the following form

$$P(s) = P_0 + P_1s + P_2s^2 + \cdots + P_ds^d, \quad (1)$$

where each $P_i \in \mathbb{R}^{n \times n}$, for $i = 0, 1, \dots, d-1$, possesses the same or different linear structures, and $P_d \in \mathbb{R}^{n \times n}$ is non-singular.



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Solution of the linearly structured partial polynomial inverse eigenvalue problem

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ABSTRACT

In this paper, we consider the linearly structured partial polynomial inverse eigenvalue problem (LPPIEP) of constructing the matrices $A_i \in \mathbb{R}^{n \times n}$ for $i = 0, 1, 2, \dots, (k-1)$ of specified linear structure such that the matrix polynomial $P(\lambda) = \lambda^k I_n + \sum_{i=0}^{k-1} \lambda^i A_i$ has the m ($1 \leq m \leq kn$) prescribed eigenpairs as its eigenvalues and eigenvectors. Many practical applications give rise to linearly structured matrix polynomials. Typical linearly structured matrices are symmetric, skew-symmetric, tridiagonal, diagonal, pentagonal, Hankel, Toeplitz, etc. Therefore, construction of the matrix polynomial with the aforementioned structures is an important but challenging aspect of the polynomial inverse eigenvalue problem (PIEP). In this paper, a necessary and sufficient condition for the existence of solution to this problem is derived. Additionally, we characterize the class of all solutions to this problem by giving the explicit expressions of the solutions. It should be emphasized that the results presented in this paper resolve some important open problems in the area of PIEP namely, the inverse eigenvalue problems for structured matrix polynomials such as symmetric, skew-symmetric, alternating matrix polynomials as pointed out by De Terán et al. (2015). Further, we study sensitivity of solution to the perturbation of the eigendata. An attractive feature of our solution approach is that it does not impose any restriction on the number of eigendata for computing the solution of LPPIEP. Towards the end, the proposed method is validated with various numerical examples on a spring mass problem.

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1. Introduction

Consider the higher order system of ordinary differential equations of the form

$$A_k \frac{d^k v(t)}{dt^k} + A_{k-1} \frac{d^{k-1} v(t)}{dt^{k-1}} + \dots + A_1 \frac{dv(t)}{dt} + A_0 v(t) = 0, \quad (1)$$

where $A_i \in \mathbb{R}^{n \times n}$ for $i = 0, 1, 2, \dots, k$ and A_k is a nonsingular matrix.

Assuming the solution of (1) is of the form $v(t) = xe^{\lambda t}$, using separation of variables, Eq. (1) leads to the higher order polynomial eigenvalue problem

$$P(\lambda)x = 0, \quad (2)$$

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Symmetric band structure preserving finite element model updating with no spillover

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ABSTRACT

Two most important yet difficult characteristics of the finite element model updating problem are to preserve the finite element inherited structures in the updated model and maintain no spillover of the eigenvalues and eigenvectors that do not take part in the updating process. Finite element matrices which arise due to the discretization of a distributed parameter system using finite element techniques are in general symmetric as well as band structure (diagonal, tridiagonal, pentadiagonal, etc). In this paper, symmetric band finite element model updating problem with no spillover (SFEMUN) is considered for the undamped model. A necessary and sufficient condition for the existence of the solution of the SFEMUN is derived. This equivalence enables us to characterize the class of solutions to SFEMUN. Further, an explicit expression for the minimum norm symmetric band solution of the SFEMUN is also presented. Numerical experiments on a spring mass problem illustrate that our proposed method is accurate and efficient.

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1. Introduction

Vibrating phenomenon of a mechanical, electrical or civil structure in the absence of damping can be mathematically modeled by a system of differential equations of the form:

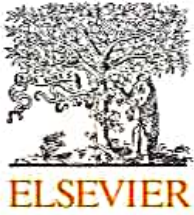
$$M_a \frac{d^2 y}{dt^2} + K_a y(t) = 0 \quad (1)$$

where $M_a, K_a \in \mathbb{R}^{n \times n}$. Eq. (1) is usually obtained by discretization of a distributed parameter system using finite element techniques. In the vibration literature, this system is known as the Finite Element Model (FEM). The matrices M_a and K_a are known as mass and stiffness matrices, respectively. In practice however, they are often very large and sparse; they have special structures, such as symmetric and band structure (diagonal, tridiagonal, pentadiagonal, etc). Also, the matrix M_a is a positive definite matrix.

Example 1.1. Consider a spring mass system without damping. Here we illustrate how the symmetric band finite element model represented in Eq. (1) arises in practical applications (see [10]). Here m_1, m_2, m_3 are the three masses of a serially

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Symmetric tridiagonal structure preserving finite element model updating problem for the quadratic model

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ABSTRACT

One of the most important yet difficult aspect of the Finite Element Model Updating Problem is to preserve the finite element inherited structures in the updated model. Finite element matrices are in general symmetric, positive definite (or semi-definite) and banded (tridiagonal, diagonal, penta-diagonal, etc.). Though a large number of papers have been published in recent years on various aspects of solutions of this problem, papers dealing with structure preservation almost do not exist. A novel optimization based approach that preserves the symmetric tridiagonal structures of the stiffness and damping matrices is proposed in this paper. An analytical expression for the global minimum solution of the associated optimization problem along with the results of numerical experiments obtained by both the analytical expressions and by an appropriate numerical optimization algorithm are presented. The results of numerical experiments support the validity of the proposed method.

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1. Introduction

Electrical oscillation, vibro-acoustics, signal processing, microelectronic mechanical systems, fluids mechanics and vibrating structures such as highways, bridges, buildings can be mathematically modeled by a system of differential equations of the form:

$$M \frac{d^2 x}{dt^2} + C \frac{dx}{dt} + Kx(t) = 0 \quad (1)$$

where M, K and $C \in \mathbb{R}^{n \times n}$.

Eq. (1) is usually obtained by discretization of a distributed parameter system using finite element techniques. The matrices M, C and K are known as respectively, the mass, damping and stiffness matrices. In practice they are often very large and sparse and they have some special structures: M is symmetric positive definite and C and K are symmetric tridiagonal.

The dynamics of the second order system (1) are governed by the eigenvalues and eigenvectors of the quadratic matrix pencil $P(\lambda) = \lambda^2 M + \lambda C + K$ which are related to the natural frequencies and mode shapes of the quadratic model (see [10]). A good survey of the quadratic eigenvalue problem can be found in the [8,18].

Very often an analytical model does not agree well with the model from a real life application. Thus, a vibration engineer needs to update an analytical model of the form (1) using a set of small number of eigenvalues and eigenvectors measured from a real life structure in such a way that

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An inverse eigenvalue problem in symmetric sparse quadratic model updating

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Abstract

In this paper, symmetric sparse quadratic model updating problem (SSQMUP) is considered from the perspective of an inverse eigenvalue problem. This problem attempts to update the analytical model (stiffness and damping matrices), so that it agrees with the measured eigendata and preserves the symmetric and sparsity structure of the original model. In this paper, a necessary and sufficient condition for the existence of solution of SSQMUP is derived. In addition, we present the expressions of the class of all solutions to this problem explicitly. Moreover, we proposed an optimization-based approach to find the solution of this problem which is nearest to the analytical model. Validity of the our proposed method is illustrated with results on numerical experiments on a spring mass problem.

Keywords Symmetric sparse matrix · Quadratic model · Inverse eigenvalue problem · Model updating problem

Mathematics Subject Classification 15A22 · 15A18 · 65F18

1 Introduction

Quadratic model arises frequently in the engineering application areas such as bridges, electrical oscillation, automobiles, fluid dynamics, aerospace engineering, signal processing, etc. It is well known that the models of these real-life structures lead to a quadratic matrix polynomial of the form:

$$P(\lambda) = \lambda^2 M + \lambda C + K, \quad (1)$$

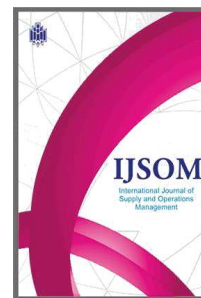
where $M \in \mathbb{R}^{n \times n}$ is the mass matrix, $K \in \mathbb{R}^{n \times n}$ is the stiffness matrix, and $C \in \mathbb{R}^{n \times n}$ is the damping matrix.

Very often, the matrices M , C , and K are large and sparse, but have some special structures. In general, these matrices M , C , and K are symmetric which come from the inherent

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Two-Echelon Supply Chain Model for Deteriorating Items in an Imperfect Production System with Advertisement and Stock Dependent Demand under Trade Credit

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Abstract

This article presents a two-echelon supply chain model for deteriorating items, consisting of a single manufacturer and a single retailer, where the customer's demand to the retailer depends on advertisement and the displayed stock level of the retailer. Due to the imperfect production system, the manufacturer produces a certain quantity of defective items with the perfect products. The manufacturer inspects all the products immediately after production and sells the ideal quality items to the retailer. To entice the retailer to purchase more products, the manufacturer offers the retailer a trade-credit policy so that the retailer can get a chance to settle his account before the payment for the products. We have developed a cost function of this model. Numerical examples have been presented to clarify the applicability of this model and the sensitivity analysis with respect to different parameters involved with the model has been performed to study the effect of the parameter change on the decision variables.

Keywords: Supply chain; Deterioration; Imperfect production; Advertisement; Stock dependent demand, Trade-credit.

1. Introduction

A common phenomenon, observed in almost any manufacturing organization is the imperfect production system. As a natural consequence, as production is proceeded in the factory, we find out that a portion of items produced is of imperfect quality. So, researchers in this era focus their attention on developing supply chain models with the imperfect production system. Chiu, Gong, and Wee (2004) presented an inventory model with imperfect production, where they assumed that the imperfect items produced are of two main categories, i.e. repairable and non-repairable. The repairable defective items are reworked after the termination of the regular production. Panda, Kar, Maity, and Maiti (2008) derived an imperfect production inventory model under budget and shortage constraints. Sana (2010) developed a production lot-size model by assuming that the production system may shift to an out-of-control state at any random time and produce a certain portion of defective products. Furthermore, Manna, Dey, and Mondal (2014) presented a three-echelon supply chain model consisting of a single supplier, a single manufacturer, and a single retailer. In this model, they considered the product reliability and the change of the defective items. Khalilpourazari and Pasandideh (2016) developed a multi-product economic production quantity model in an imperfect production system, where the non-conforming products produce at a random rate. In this model, they aimed to minimize the total inventory costs as well as the total warehouse space to keep the products. Khalilpourazari and Pasandideh (2018) also presented a multi-objective economic order quantity model, where the supply batches are inspected immediately after receiving the products and the total batch is rejected if it is found that the products are below standard. In the same year, Khalilpourazari, Pasandideh, and Ghodrathnama (2018) studied another model which considers the defective products. They used two metaheuristic algorithms, namely Whale Optimization and Water Cycle Algorithms to solve the model.

The main objective of any business is to increase the number of customers and expand itself as the only way to gain profit is the selling of the products. To fulfil this aim, the supply chain players offer various policies to their customers

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Two-Echelon Supply Chain Model in an Imperfect Production with Stochastic Demand Considering the Rework of the Defective Items

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Abstract. This article presents a two-echelon supply chain model consisting of a single manufacturer and a single retailer. Here, the manufacturer's production system is imperfect and produces a certain proportion of defective products with the perfect products. The manufacturer starts reworking the defective products at the end of the main production. It is assumed that the customer's demand to the retailer is stochastic in nature and the retailer's demand to the manufacturer depends on the customer's demand for the product to the retailer. Finally, we have derived a cost function of the system. Numerical examples have been presented to clarify the applicability of the proposed model and sensitivity analysis has been presented to study the effect of the change of the parameters on the optimal decision variables.

Keywords: Supply chain · Imperfect production · Stochastic demand · Rework

1 Introduction

The customers' demand for any product is the most crucial factor in any inventory management system. When reviewing the past literature, we observe that many inventory models have been formulated assuming the demand as constant [1, 2]. But, in the day to day dealing it is noticed that the demand for any physical goods hardly remains constant, we cannot estimate the demand pattern for any product in prior. To deal with such situation researchers developed supply chain models considering the demand as stochastic in nature. Mateen, Chatterjee and Mitra [3] presented a single vendor and multiple retailer vendor-managed model considering the customers demand as stochastic. Govindan [4] considers time-dependent stochastic demand while developing inventory model. In this model, they compared the performance of the traditional inventory system with the vendor managed inventory system and showed the difference between this two models.

A supply chain model under return policy considering refurbishment, learning effect and inspection error

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Abstract. This article presents a three-echelon supply chain model consisting of a supplier, manufacturer, and a retailer, considering the return contract between the manufacturer and the retailer. Here, the manufacturer has two adjacent production units – the main production unit and a refurbishment unit. The main production unit of the manufacturer is imperfect, which produces an admixture of perfect and defective items. He inspects all the products immediately after production and sells good quality items to the retailer. The retailer receives a proportion of faulty products from him due to his erroneous inspection process, which he returns after inspection. The manufacturer sends all the defective products received from the retailer and the main production unit to the refurbishment unit for reworking. Moreover, the learning effect of the employees on the production cost is considered. Under these circumstances, the cost functions of each of the supply chain players have been derived. Finally, the applicability of the proposed model has been shown using a numerical example. The sensitivity analysis has been presented to study the effect of the parameters on the optimum decision variables.

Keywords: imperfect production, inspection error, learning effect, refurbishment, return policy, three-echelon

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1. Introduction

In practice, almost every production system faces some inherent problems associated with the production system such as machinery fault, defective raw materials, lethargy of the production system for continuous work etc. As a natural consequence, when production is going on in the factory, it is seen that some quantity of items produced is of imperfect quality. Therefore, researchers in this era have considered the effect of imperfect production while developing supply chain production inventory models. [1] was among the first study, which considered the imperfect production while developing their model. In this model, they assumed that the system deteriorates in the production runtime when it produces a certain percentage of defective products with the good quality products. They showed that the optimum production cycle in this model is shorter than that of the traditional economic production quantity model. [7] extended the economic production lot size model considering that the performance of the production process deteriorates significantly with the increase in the production rate. In the later time, this model was extended by [14], incorporating the idea that the production system is in the in-control state at the beginning of the production process, where it produces all the perfect

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RESEARCH PAPER

A Multi-Storehouse Supply Chain Considering Systems' Reliability and Free Shipping

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ABSTRACT

This paper aims to frame a two-player supply chain model with a production system's reliability influenced products' defection rate. Upon generating and inspecting the products, the producer reworks the defectives and sells the perfect and reworked items to a retailer providing him free products' delivery. The retailer stores both types of commodities in the respective showrooms of finite capacities and keeps the excess conforming products in a leased warehouse. Eventually, the formulation of these two partners' profit functions performed, and a numerical illustration demonstrates this model's applicability. Results shows, hiring a storehouse is profitable for the retailer and the deterioration of the production system's reliability impacts adversely on the manufacturer's profit.

KEYWORDS: Supply chain; Inventory; Two-echelon; Imperfect production; Stochastic demand; Reliability; Warehouse; Pricing.

1. Introduction

Today's competitive marketing environment compelled businesses or manufacturing organizations to find out strategies for the better management of issues related to adequate production rate, warehouse limitations, smooth customer service, and so forth. In this regard, supply chain management (SCM) provides an integrated way to handle all such issues, becoming an area of interest of many researchers, as well as practitioners.[1]–[9].

Practically, most production systems yield a fraction of defective products in the production period, harming the profitability of the manufacturer. Considering this issue, a recent study [10] regarded an investment for the improvement of the generating system's condition, aiming to lessen the number of defectives. Again, Manna et. al. [11] assumed the production system can shifts to a non-controllable

state at any production point, generating a proportion of faulty outputs. An SCM [12] considered the regeneration of the returned and the defective products, intending to make them perfect. Another study [13] assumed that when the system transfers to an uncontrolled state, the production system's reliability can be enhanced using some standby elements the production system mostly depends on.

To reduce the imperfect production induced loss, manufacturers are noticed to rework the defective products to make these usable. In a study, Taleizadeh et al. [14] showed a decrease in the supply chain system's cost when the faulty outputs are reworked than scraping the defectives or selling these at a reduced price. A closed-loop SCM [15] considered rework of used products, including those with manufacturing defects, aiming to reduce environmental pollution. Again, another study [16] assumed two different strategies, the first of which uses the main production system for reworking the defectives and the second one employs a new reworking unit for the same purpose. Moreover, Khanna et al. [17] found the rework of most faulty items

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The impact of the undetected COVID-19 cases on its transmission dynamics

Sujata Saha · Sumanta Saha

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Abstract

Objective The COVID-19 pandemic is currently ongoing. Presently, due to the unavailability of a definitive vaccine to decrease its acquiring, it's essential to understand its transmissibility in the community by undetected cases to control its transmission. This study aims to study this context using mathematical modelling.

Methods A COVID-19 transmission model was framed that estimated the basic reproduction number R_0 (a measurement of disease risk) using the next-generation method. It explored the contribution of exposed and infected (detected and undetected) individuals, and environmental pathogen to the overall risk of infection spreading, utilizing the publicly reported data of this infection in Maharashtra between March 22, 2020, and May 4, 2020. A sensitivity analysis was performed to study the effect of a rising number of undetected cases to R_0 .

Results The estimated basic reproduction number is $R_0 = 4.63$, which increases rapidly with the rise in the undetected COVID-19 cases. Although the exposed individuals made the largest contribution to infection transmission ($R_1 = 2.42$), the contaminated environment also played a significant role.

Conclusions It is crucial to identify the individuals exposed and infected to COVID-19 disease and isolate them to control its transmission. The awareness of the role of fomites in infection transmission is also important in this regard.

Keywords Mathematical model · Coronavirus · Pandemics · Disease transmission · infectious · Basic reproduction number · Infectious disease outbreaks · India

1 Introduction

World Health Organization (WHO) declared the ongoing coronavirus disease 2019 (COVID-19) epidemic as a Global Public Health Emergency of International Concern on January 30, 2020 [1]. COVID-19 started from China in December 2019 [2, 3], which is caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2), an enveloped single-stranded RNA virus of zoonotic origin [1, 3].

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TOWARDS MORE EFFICIENT 3NF DETERMINATION USING REDUCED FUNCTIONAL DEPENDENCY SETS

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Abstract

3NF can reduce redundancies and anomalies from a relational database as far as possible while still observing lossless join and even dependency preservation properties. Obviously in spite of existence of higher order normal forms in theory, normalization into 3NF is widely viewed as necessary and sufficient for practical applications. Accordingly efficient determination of 3NF is a prerequisite for good database design. In this article the 3NF interpretation is strived to be reduced, yielding some more efficient 3NF determination techniques. One of the resulting interpretations is theoretically an optimal. Some prospective implications of the proposed interpretations are also discussed.

2010 Mathematics Subject Classification: 68P15; 97P30.

Keywords: Relational database, 3NF Determination, Prime attribute, Intractable problem, Optimal interpretation.

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A Framework of Software Defect Prediction By Data Mining Techniques Using Historical Data Set and Intelligent Agents

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Abstract— Defect prediction for a software system is a technique that is used extensively nowadays to predict defects from historical database. But only a good data mining model is not enough to extract defect from software bug record. Intelligent agents are helpful in this case by making the decision process easier at some point. This paper describes frame work to generate software defect from the historical database and also propose one algorithm that is used find policy to forecast software defects efficiently than the current methods.

Keywords— Cost, Classification, Intelligent agents ,Data mining, Database, Defect, Testing

I. INTRODUCTION

The main intend of software development process is to build high-quality software carefully. Getting a good quality software is the need of the hour. For this reason I need to reduce cost and improving the overall working of the testing process . Hence measuring software defects at early stage is extremely important. So if I guess early defects of software , then it will be helpful in increasing the software quality by minimizing the errors during the maintenance phases. Hence our aim should be to find an efficient method that can be achieved from getting knowledge from the previous mistake and making a newer and more correct system . In today's world various data sets are accessible which can be used in order to get clues regarding possible defects that may remain in the software system.

From early days data mining techniques are applied in constructing software fault prediction for improving the software quality. But that is not enough in some decision making process and hence the concept of intelligent agent comes in this regard which helps the mining algorithm in finding the right decision while splitting the data into training and test data. Also I need to identify high risk modules (having high number of faults) at the earliest which can be helpful in quality enhancement effort.

II. SOFTWARE DEFECT PREDICTION

A software defect [5] is a mistake or fault that team always want to produce a quality software with minimum defects. To increase the software quality, high risk components from the software project should be removed as soon as possible.

Software defects always incur cost in terms of quality and time. To identify and rectify defects is important in a software system which may create a wrong or unpredicted result, or prevent the software from getting a good quality . It is not possible to eliminate each and every defect in one software but it can be minimized and their adverse effects can be reduced.

By defect predictor, I mean, a technique that guides testing activities in software development lifecycle. According to Brooks[6], testing phase accounts for half of the total effort. Harold and Tahat[2] also at one with the view of Brooks. Hence the duty is mainly on the tester and they have to find where the defects might exist before they start testing.

It will help them to assign their limited resources in an effective way. One of the key use of the defect predictor is to create an order which is to be verified and validated by a team of experts. Defect predictors are also useful in finding defects efficiently in lesser amount of time. This process is very helpful, because it gives prior warning of what modules need modification, and giving them ample time to finish the rework prior to schedule.

III. ISSUES WITH THE EARLIER WORK

As per the current research all previously software prediction model can be useful if enough amounts of data is available to feed the model. Here for the lack of good data mining model, taking out of defects from large software bug repository is a very tiresome process and the desired result is not always possible. Existing prediction models[3] that are created previously using sampling and training dataset fails to give