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3.2.1 Number of papers published per teacher in the Journals notified on UGC website during the last five years (2020-2021)

Sr. No.	Title of paper	Name of the author/s	Department of the teacher	Name of journal	Publication Date	ISSN number & Year	Link to website of the Journal	Link to article/paper/abstract of the article	Is it listed in UGC Care list/Scopus/ Web of Science/other , mention
	Department of Chemistry								
1	Oxide ancillary ligand based europium Beta-diketonate complexes and their enhanced luminosity	Shri Bhagwan	Chemistry	Rare Metals	4-9-2020	1001-0521 & 2020	https://www.springer.com/journal/12598	https://link.springer.com/article/10.1007/s12598-020-01543-w	Yes
2	Rare earth doped phosphors and their emerging applications: A review	Shri Bhagwan	Chemistry	Journal of Ceramics international	5-4-2021	0272-8842 & 2021	https://www.journals.elsevier.com/ceramics-international	https://doi.org/10.1016/j.ceramint.2021.03.308	Yes

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3.2.1 Number of papers published per teacher in the Journals notified on UGC website during the last five years (2020-2021)

	Department of Mathematics								
3	An Empirical Approach to Study the Stability of Generalized Logistic Map in Superior Orbit	Vinod Kumar, Khamosh and Ashish	Mathematics	Advances in Mathematics: Scientific Journal	2020	1857-8365 & 2020	https://research-publication.com/?page_id=9	https://doi.org/10.37418/amsj.9.10.67	Yes
4	A Noval Feedback Control System to Study the Stability in Stationary States	Khamosh, Vinod Kumar and Ashish	Mathematics	Journal of Mathematical and comput. Science	7-7-2020	1927-5307 & 2020	http://scik.org/index.php/jmcs	http://scik.org/index.php/jmcs/article/view/4834	Yes
5	Discrete Chaotification in Modulated Logistic System	Ashish	Mathematics	Int. J. Bifurc. Chaos	14-3-2020	0218-1274 & 2020	https://www.worldscientific.com/worldscinet/ijbc	https://doi.org/10.1142/S0218127421500656	Yes

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3.2.1 Number of papers published per teacher in the Journals notified on UGC website during the last five years (2019-2020)

Sr. No.	Title of paper	Name of the author/s	Department of the teacher	Name of journal	Publication Date	ISSN number & Year	Link to website of the Journal	Link to article/paper/abstract of the article	Is it listed in UGC Care list/Scopus/ Web of Science/other, mention
	Department of Chemistry								
6	Intense Red luminescent materials of ternary Eu3+ Complexes of oxide ligands for electroluminescent display devices	Shri Bhagwan	Chemistry	Optik	19-12-2019	0030-4026 & 2019	https://www.journals.elsevier.com/optik	https://doi.org/10.1016/j.ijleo.2019.164111	Yes
7	Luminescene intensification of terbium(III) ion complex with dipivaloylmethane (tmhd)and monodenate auxiliary ligands	Shri Bhagwan	Chemistry	Optik	31-01-2020	0030-4026 & 2020	https://www.journals.elsevier.com/optik	https://doi.org/10.1016/j.ijleo.2020.164338	Yes
8	Synthesis & investigation of enhanced luminescence of Ln (III) complexes containing fluorinated B diketone & oxygen donor ancillary ligands for efficient advanced displays	Shri Bhagwan	Chemistry	Journal of Luminescence	26-3-2020	0022-2313 & 2020	https://www.journals.elsevier.com/journal-of-luminescence	https://doi.org/10.1016/j.jlumin.2020.117255	Yes

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3.2.1 Number of papers published per teacher in the Journals notified on UGC website during the last five years (2018-2019)

Sr. No.	Title of paper	Name of the author/s	Department of the teacher	Name of journal	Publication Date	ISSN number & Year	Link to website of the Journal	Link to article/paper/abstract of the article	Is it listed in UGC Care list/Scopus/ Web of Science/other , mention
Department of Mathematics									
9	Controlling chaos using superior feedback system and its applications in discrete traffic flow model	Ashish, Jinde Cao, Renu Chugh	Mathematics	International Journal of Fuzzy Systems	29-4-2019	1562-2479 & 2019	https://www.springer.com/journal/40815	https://link.springer.com/article/10.1007%2Fs40815-019-00636-8	Yes
10	A novel fixed point feedback approach studying the dynamical behaviors of standard logistic map,	Ashish, Jinde Cao	Mathematics	International Journal of Bifurcation and Chaos	7-8-2018	0218-1274 & 2018	https://www.worldscientific.com/worldscinet/ijbc	https://doi.org/10.1142/S021812741950010X	Yes
Department of Chemistry									
11	Electroluminescent materials: Metal complexes of 8-hydroxyquinoline- A review	Devender Singh, Shri Bhagwan, Vandana Nishal and Ishwar Singh	Chemistry	Materials & Design	19-6-2018	0264-1275 & 2018	https://www.journals.elsevier.com/materials-and-design	https://doi.org/10.1016/j.matdes.2018.06.036	Yes

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Rare Met. (2021) 40(10):2873–2881
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RARE METALS

ORIGINAL ARTICLE

Oxide ancillary ligand-based europium β-diketonate complexes and their enhanced luminosity

Devender Singh*, Shri Bhagwan, Anuj Dalal, Kapeesha Nehra, Raman Kumar Saini, Kapoor Singh, Anura Priyajith Simantilleke, Sumit Kumar, Ishwar Singh

Received: 11 August 2019 / Revised: 28 October 2019 / Accepted: 14 July 2020 / Published online: 4 September 2020

Abstract Ternary materials of europium complex with 2,2,6,6-tetramethyl-3,5-heptanedione (tmhd) ligand and aqua ligand as ancillary ligands have been prepared and characterized for various optoelectronic characteristics. Reactions of hydrated complex $[Eu(tmhd)_3(H_2O)_2]$ proceeded with triphenylphosphine oxide (TPPO) and pyridine-N-oxide (PNO) ancillary ligands were studied to develop novel complexes. The prepared complexes show good thermal stability. A comparative investigation of prepared materials $[Eu(tmhd)_3(H_2O)_2]$, $[Eu(tmhd)_3(TPPO)_2]$ and $[Eu(tmhd)_3(PNO)_2]$ was conducted for their luminescent behaviors in order to obtain the role of ancillary ligand in the enhancement of illumination amount generated from europium (Eu^{3+}) ion. Color coordinates of prepared ternary complexes such as $[Eu(tmhd)_3(H_2O)_2]$ with ($x = 0.54$, $y = 0.32$), $[Eu(tmhd)_3(TPPO)_2]$ with ($x = 0.56$, $y = 0.32$) and $[Eu(tmhd)_3(PNO)_2]$ with ($x = 0.57$, $y = 0.33$) indicated that these materials exhibited bright red emission in visible region spectrum. The complexes show a proficient energy transport pathway from the ligands to the innermost Eu^{3+} by means of an ancillary ligand-sensitized luminescence process. Interaction between the metal and ligand results in a distinguished effect on quantum efficiency (η) as well as on Judd–Ofelt intensity factor (Ω_2) of the prepared materials.

Keywords Ternary Eu^{3+} complexes; Red emissive materials; Photoluminescence; Quantum efficiency; Judd–Ofelt intensity; Optoelectronic devices

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1 Introduction

Lanthanide coordinated compounds with conjugated organic ligands have remarkable luminescence and magnetic properties such as high color purity emissions, long radiative lifetime, high luminescence quantum yields and large Stokes shifts [1–4]. The actions of their increasing number of photons have been explored, particularly when they are used as magnetically addressable liquid crystalline materials, component of emissive layers in multilayer organic light-emitting diodes (OLEDs) [5, 6], analytical sensors [7, 8], fluorescent probes [9, 10] and efficient light conversion molecular devices (LCMDs) [11]. Among all the lanthanide ions, Eu^{3+} and Tb^{3+} materials are of considerable interest because of unique narrow and line-like intra-configurational f–f transitions, versatility of their coordination sphere and symmetry around the metal ion [12, 13]. Europium-based organic materials are widely used due to their simple electronic structure, monochromatic emission (~ 612 nm), presence of magnetic dipole transitions, participation of both singlet and triplet excitons in luminescence, etc. [14, 15].

Unfortunately, intra-4f transitions are strongly forbidden by parity selection rules, and these absorptions have low molar absorption coefficients, making direct photoexcitation of the Ln^{3+} very difficult, unless high-power laser as

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Review article

Rare earth (RE) doped phosphors and their emerging applications: A review

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Abstract

The evolution of luminescent materials has witnessed rapid advancement in research and development. Solid inorganic light-emitting materials or phosphors are the optoelectronic material of the 21st century because of their power-efficient potential over various illumination sources, eco-friendliness and resourceful display perspectives. The inorganic phosphors have been extensively explored to meet the demand of low voltage stimulated lighting

FEEDBACK

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Advances in Mathematics: Scientific Journal 9 (2020), no.10, 8375–8384
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AN EMPIRICAL APPROACH TO STUDY THE STABILITY OF GENERALIZED LOGISTIC MAP IN SUPERIOR ORBIT

V. KUMAR, KHAMOSH, AND ASHISH[1]

ABSTRACT. The standard logistic map and its variants are one of the best and simplest form of a dynamical system which plays an important role in various fields of science like biology, engineering, electronics, cryptography, etc. The generalization of the logistic map is assumed with freedom of an extra degree of parameter β and then the variants of the logistic system are produced. This article is concerned about the stability of generalized logistic map with the help of superior orbit using time series representation. In literature of logistic map, it is observed that the stabilization in standard logistic map exists for the parameter $0 < r \leq 3.2$ in Picard orbit but in superior orbit, we examine that the range of stability in generalized logistic map increases for the larger range of the parameter r depending on the control parameter α and β.

1. INTRODUCTION

Chaos is a word which shows aperiodicity, unstability and sensitivity towards initial conditions and now it becomes a subject of study and is called "chaos theory". It is believed that this concept emerged when Poincare [17] studied the qualitative theory of non-linear dynamical systems on celestial mechanics. But, unfortunately, this subject was not researched much after his demise until Henry Lorenz picked it back up in 1960's. In 1960's, H. Lorenz [12] and R. May [14] took important arithmetical footsteps and after that, almost every scientific field

[1]*corresponding author*

2020 *Mathematics Subject Classification.* 37C25, 62J12.

Key words and phrases. Fixed point, Generalized logistic map, Superior orbit.

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A NOVEL FEEDBACK CONTROL SYSTEM TO STUDY THE STABILITY IN STATIONARY STATES

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Abstract. In the last few decades, the stabilization in stationary states has emerged as a new auspicious campaigner in chaos theory and found a celebrated place through various control techniques such as predictive control, delayed feedback control, constant proportional feedback control and oscillating feedback control system. Generally, it is accepted that the superiority of control systems is not only to quash the irregular distribution of stationary states, but also to illustrate its basin of attractions as large as possible depending on the numerical as well as analytical observance. In this article, the universal stabilization in unstable stationary states is studied through superior fixed point feedback control system for a family of one-dimensional maps. Further, it is interesting to know that the novel system provides freedom in the control parameter γ due to which the stabilization increases more rapidly for the lager range of parameter γ in $[0,1]$. The analytical as well as numerical simulations are demonstrated to examine the behavior of parameter γ for which the unstable stationary state admits universal stability.

Keywords: stationary states; fixed point feedback system; chaos; stability.

2010 AMS Subject Classification: 39A23, 39A28, 39A30, 39A33.

1. Introduction

The term stabilization plays a central role in the dynamics of nonlinear dynamical systems and especially in unstable systems and automation. It is believed that this concept was emerged

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Discrete Chaotification of a Modulated Logistic System

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In the last few decades, the discrete chaotification of difference equations has gained the considerable attention of academicians and scholars due to its tremendous applications in many branches of science, such as cryptography, traffic control models, secure communications, weather forecasting and engineering. In this article, a modulated logistic system is studied and superior chaos is reported through period-doubling bifurcation, period-three orbit and Lyapunov exponent properties. It is interesting to see that the modulated system admits the superiority in chaos due to the presence of an extra degree of freedom of an ordered parameter α. Analytical as well as numerical simulations are demonstrated to examine the period-doubling and Lyapunov exponent properties for some particular values of parameter α. Moreover, it is speculated that the superiority in chaos may be used in chaos-based cryptography, in the future.

Keywords: Discrete chaos; period-doubling; period-three orbit; Lyapunov exponent.

1. Introduction

The term "Chaos" a badge of irregular behavior is considered as a crucial part in human life and is widely used in nonlinear phenomena of nature and science which deals with the sensitive dependence, aperiodicity and instability of the dynamical systems. Poincaré [1899], was a great mathematician and physicist who first laid down the foundation of chaos and coined that an infinitesimal alteration in an initial arrangement of a nonlinear phenomena may produce huge difference in latter. In the 19th century, Lorenz [1963] officially announced the term chaos in the context of weather forecasting. But the modern chaos theory is owed to an excellent work of Feigenbaum [1978] who established an outline of period-doubling bifurcation which works as an efficient road map from regularity to chaos. The idea of Feigenbaum was based on

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Original research article

Intense red luminescent materials of ternary Eu^{3+} complexes of oxide ligands for electroluminescent display devices

Devender Singh[a,*], Shri Bhagwan[a], Anuj Dalal[a], Kapeesha Nehra[a], Kapoor Singh[a], Anura Simantilleke[b], Sumit Kumar[c], Ishwar Singh[a]

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ARTICLE INFO

Keywords:
Optoelectronic materials
Eu(III) ion
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ABSTRACT

Solid ternary compounds of Eu(III) with fluorinated β-diketone (4,4,5,5,6,6,6-heptafluoro-1-(2-thienyl)-1,3-hexanedione) (Hfth) and heteroaromatic monodentate ancillary ligands (aqua/tri-phenylphosphineoxide/pyridine-*N*-oxide/2-pyridionl-*N*-Oxide) were prepared for red color emissive materials. The luminescence characteristics of prepared compounds were illustrated using absorption and emission spectral measurements which specified that the β-diketone ligand could effectively sensitized the central europium ion meant for the improved emission of the light. Due to interaction metal complexes displays distinguished effectual on photoluminescence efficacy (η) as well as Judd Ofelt luminous factor (Ω_2). An extensive relative approach of enhancement in luminescent behavior of the synthesized metal complexes had been carried out by replacing aqua ligand in the inner coordination sphere of conventionally prepared parent aqua complex with others ancillary oxide ligands to make metal complex co-coordinatively saturated as well as suitable for fabricating electroluminescent display devices.

1. Introduction

Red light emitting europium(III) ternary complexes with organic ligands have receiving an increased interest in organic light emitting devices (OLEDs) as a novel unconventional option for flat-panel displays and backlighting systems [1,2]. An excellent and bright red photo-luminescent europium(III) complex with β-diketone was first reported by Weismann [3]. On the basis of investigation of the unique photo-physical properties of trivalent europium ion such as improved excited state decay time, high quantum efficiency, huge stoke shift and extreme narrowed emissive band, their complexes have been widely exploited as prime luminescent materials [4–8]. All these functional applications of europium(III) complexes are principally because of their distinctive optical characteristics that outcomes due to laporte forbidden f-f electronic transitions [9,10].

An effectual perspective to enhance the luminous efficacy is to reflux the compounds with dissimilar non-fluorescing lanthanide ions; this type of internal fluorescent enhancement is known as "co-fluorescence" effect [11,12]. Another way to modify the emission efficiency of the complexes is by the use of disparate ligands which absorbed intensely in broad band region. The probability energy transfer from ligand to metal (L→M) demands high resemblance among the energies of singlet and triplet level(s) of the coordinated ligand and the accepting levels of lanthanide emissive state(s), which is crucial for the careful design of high performance organic moieties.

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Original research article

Luminescence intensification of terbium(III) ion complexes with dipivaloylmethane (tmhd) and monodentate auxiliary ligands

Devender Singh[a,*], Kapeesha Nehra[a], Raman Kumar Saini[a], Anuj Dalal[a], Shri Bhagwan[a], Kapoor Singh[a], Anura Priyajith Simantilleke[b], Sumit Kumar[c]

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ARTICLE INFO

Keywords:
Luminescence
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ABSTRACT

The synthesis, structural analysis and photophysical properties of terbium with dipivaloylmethane (tmhd) and monodentate auxiliary ligands were reported. Aqua (H_2O), urea (H_2NCONH_2), triphenylphosphine oxide ($(C_6H_5)_3PO$), pyridine-N-oxide (C_5H_5NO) and 2-pyridinol-N-oxide (HOC_5H_5NO) were used as monodentate auxiliary ligands. For structural analysis, various spectroscopic techniques were used such as CHN elemental analysis, PNMR and FTIR. Both excitation and emission spectroscopy were used for probing optical characterization. For metal complexes, by examining the emission wavelength compatible with $^5D_4 \rightarrow {}^7F_5$ transition, luminescent decay time was also deliberated. A relative investigation of photoluminescent character of synthesized complexes were made as the function of monodentate subsidiary ligands in the enrichment of luminescence intensity formed by Tb(III) ion. The value of CIE color coordinates proposed that complexes exhibited dark green luminescence in visible region. The complexes generating green light in visible region play important role in construction of proficient display and lighting devices.

1. Introduction

Luminescent Ln(III) complexes fascinate abundant research consideration due to their extensive use as organic light emitting devices [1–4], information security [5], immune-fluorescent analysis, therapy [6], Ultra Violet light transforming to near infra-red (NIR) emission or visible [7]. Lanthanide metal ions, predominantly Eu^{3+} and Tb^{3+}, are prospective aspirants among other conventionally used organic fluorophores, as these have sharp emission on irradiation by UV radiation, elongated fluorescence lifetime period and high Stoke's shift [8–10]. Ln(III) ions exhibits small absorption because of Laporte forbiddance of 4f-4f transitions that consequences reduced emission from the direct excitation of 4f orbital (unless dominant lasers are used). One of the best method to overawed this restriction is complex formation of Ln(III) metal ions with organic ligands. In lanthanide complexes, organic ligands on irradiation by UV light are excited to vibrational level of first excited singlet state from ground singlet state. Through interaction with each other or with solvent molecules, the molecules undergo fast internal-conversion to the lower levels of first excited state. The first excited can be radiatively deactivated to the ground state termed as fluorescence or can undergo intersystem crossing to triplet state non-radiatively. The triplet state can be radiatively deactivated to singlet ground state termed as phosphorescence or can undergo non radiative transitions to the excited state of lanthanide ion. The lanthanide ion may endure radiative transitions from excited state

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Synthesis and investigation of enhanced luminescence of Ln(III)-complexes containing fluorinated β-diketone and oxygen donor ancillary ligands for efficient advanced displays

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ARTICLE INFO

Keywords:
Fluorinated β-diketone
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Sensitization
Photoluminescence
OLEDs

ABSTRACT

2,2-dimethyl-6,6,7,7,8,8,8-heptafluoro-3,5-octanedione (fod) fluorinated β-diketone had been used to prepare a series of Ln^{3+} (Eu or Tb) ternary complexes with monodentate ancillary ligands such as aqua, urea, triphenylphosphineoxide (TPPO) and pyridine-N-oxide (PNO). Prepared ternary materials $Eu(fod)_3.(aqua)_2$ (1), $Tb(fod)_3.(aqua)_2$ (2), $Eu(fod)_3.(urea)_2$ (3), $Tb(fod)_3.(urea)_2$ (4), $Eu(fod)_3.(TPPO)_2$ (5), $Tb(fod)_3.(TPPO)_2$ (6), $Eu(fod)_3.(PNO)_2$ (7), $Tb(fod)_3.(PNO)_2$ (8) were illustrated through various structural and photo-physical spectroscopic practices. Emission measurement showed characteristics strong emission in red as well as green spectral region accredited to the electric dipole $^5D_0 \rightarrow {}^7F_2$ and $^5D_4 \rightarrow {}^7F_5$ hypersensitive transitions of Eu^{3+} and Tb^{3+} ions respectively. An inclusive comparative investigation of enhancement features in the luminescence intensity had been carried out to determine the role of ancillary ligands. Improved luminosity was achieved as auxiliary ligands not only substituted the solvent molecules in coordination sphere but also indirectly sensitize metal ion through transfer of energy to emissive level of respective Ln^{3+} ion from triplet state of ligand. Decay curve specified uniformity in chemical environment around central metal ion. Efficient red and green light materials could be successfully used for fabricating OLEDs.

1. Introduction

Lanthanide ions (Ln^{3+}) exhibit long luminescence life-time, high quantum efficacy, large stoke's shift, narrow emission band and high color purity which makes them capable applicant for developing full color flat panel displays. Fascinating features of lanthanide ions have encouraged the exploitation of their coordination complexes in distinguished area as in LCMDs [1,2], OLEDs [3,4], immunoassay [5–7], bioimaging probes [8,9], luminescent sensors [10–12] and in telecommunications systems [13] etc. Unfortunately, the lower molar absorption coefficient of Ln(III) ion make direct excitation of metal center inefficient resulting in weak luminescence intensity [14,15]. Weak absorbance can be however ruled out through combination of highly molar absorptive ligand to the Ln^{3+} which, upon irradiation, transfers energy from triplet of ligand to emissive state of the respective Ln^{3+} called as "hypersensitive sensitization" or antenna effect" [16–19].

Well deliberated class of organic ligands is comprised of β-diketones (β-DKs). In terms of chemical durability, pronounced internal conversion [IC], extended π-conjugation, noticeable emission properties and efficient energy transfer (ET) to Ln^{3+} ion [20–23]. Moreover, β-diketonate ligand possess the extra benefits of having negatively charged chelating position that outcomes in creation of neutral, 1:3 (lanthanide: ligand) metal compounds. In neutral lanthanide tris(β-diketonates), the central lanthanide ions are bounded to six oxygen atoms and thus remain coordinatively unsaturated. This will result in the occurrence of water molecules around metal center to achieve the usual coordination number that act as emissive quencher owing to participation of non-radiative decays paths.

Another approach to overcome from difficulty is to substitute solvent through ancillary ligands used as "antennas" leading to formation of more luminescent metal complexes [24,25]. Enhancement of luminescence in lanthanide (III) complexes requires an adequate choice of both primary and ancillary ligands [26–29]. The selection of ancillary ligand is relying on ability to synchronize firmly to Ln^{3+}. Also, a combination of

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13

Controlling Chaos Using Superior Feedback Technique with Applications in Discrete Traffic Models

Ashish[1] · Jinde Cao[1] · Renu Chugh[2]

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Abstract In recent years, discrete chaos has found a celebrated place in various dynamical phenomena of nature and science, such as population dynamics in ecology, laser technology, traffic flow system, image encryption and decryption in cryptography, secure communication, etc. But as a recent discipline, control of chaos an important field of research related to chaotic systems has come into play with many scientific and technological advances. In this article, a superior technique to control chaos in a class of one-dimensional discrete systems is developed and the unstable fixed and periodic states responsible for chaotic behavior are stabilized. Due to an extra degree of freedom of an intrinsic parameter α in superior control technique, the stability performance increases rapidly than other techniques. Further, the several theoretical as well as numerical simulation results are studied for the efficiency and effectiveness of the superior control technique followed by theorems, examples, remarks, Lyapunov exponent property, and period-doubling bifurcation representation. Moreover, using this system following discrete traffic flow problem is also discussed, "How to impart an unstable traffic behavior into stable and non-traffic zone?".

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1 Introduction

The concept of controlling chaos has been widely studied along the years, as a central issue in nonlinear dynamical system modeled by one-dimensional difference and differential equations. One of the essential mechanisms of controlling chaos is the feedback techniques which consist in fixed and periodic reduction of the state variables. In twenty-first century, such type of mechanisms has attracted too much attraction of researchers in different areas of science such as biology, physics, electronics, social science. An idea of controlling chaos using feedback technique was first introduced by Ott. et al. [29] in 1990, which deals with the adjustment of intrinsic parameter of the system to stabilize an unstable periodic state embedded in chaotic systems. However, the modern research in control theory almost depends on the work of Pyragas [33] who established the theoretical as well as numerical simulation results using continuous and discrete dynamical systems. Afterward, several techniques to control chaotic systems were established such as analytical properties were studied in delayed feedback control systems [8, 18, 28, 34, 37], stabilization of fixed points in chaotic maps through entropy control techniques [36, 38], stabilization of unstable periodic orbits of chaotic maps in extended feedback control method [45], stabilization of chaos by predictive control [32], control of chaotic behavior using constant proportional feedback [5], and oscillating feedback method [40].

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A Novel Fixed Point Feedback Approach Studying the Dynamical Behaviors of Standard Logistic Map

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The standard logistic map is one of the oldest and simplest systems which has found a celebrated place in the dynamical systems and in different vital applications of science like image encryption in cryptography, secure communications and traffic control models. Generally, the dynamical systems are characterized by one or more control parameters that determine the dynamical behaviors of the system. Traditionally, the discrete logistic map allows only one parameter $\lambda \in [0, 4]$ to determine its complete behavior. This study takes one step forward, using the superior fixed point iterative technique to study the dynamical properties of the discrete logistic map. The proposed technique provides an extra degree of freedom on control parameters that renders superior dynamical properties and may increase the performance of many applications. Analytical analysis as well as numerical simulations are presented to show the effectiveness, flexibility and efficiency of new method.

Keywords: Logistic map; fixed point feedback system; fixed and periodic points; chaos.

1. Introduction

Since the pioneering works of Lorenz [1963] and May [1976], tremendous mathematical footsteps have been taken into account, and almost every scientific field has been flooded by the computations of nonlinear differential equations and difference maps [Hogan *et al.*, 2003]. The logistic map $\lambda x(1-x)$, a model of population growth was first established by Verhulst in the middle of the 19th century, which works as a role model in discrete dynamical systems [Holmgren, 1994]. The discrete version of Verhulst model is a milestone in the study of nonlinear dynamical phenomena. The dynamics of the logistic map was popularized with the article from the British mathematician, May [1976]. The analytical as well as experimental analysis of its basic dynamical properties has also been studied by Feigenbaum [1978]. For a brief review of the dynamics of logistic map one may also refer to [Holmgren, 1994; Devaney, 1948; Alligood *et al.*, 1996; Ausloos & Dirickx, 2006; Robinson, 1995; Block & Coppel, 1992; Wiggins, 1990; Diamond, 1976; Lloyd, 1995; Andrecut, 1998].

It was a major breakthrough in science and technology to study the nonlinear phenomena using logistic maps in the 20th century, leading to research and development of nonlinear science, which is also at the forefront of the 21st century. Chaos is an extreme form of nonlinear dynamical phenomena. In recent decades, the chaotic behavior has been used in modeling image encryption methods in cryptography using logistic maps [Baptista, 1998; Devaney, 1992; Feigenbaum, 1978; de Oliveira & Sobottka, 2008; Salarieh & Alasty, 2008; Song & Meng, 1996]. In 2010, Singh and Sinha [2010] introduced a secure communication system and generated chaotic signals through logistic map. Medina *et al.* [2009], designed the chaotic noise

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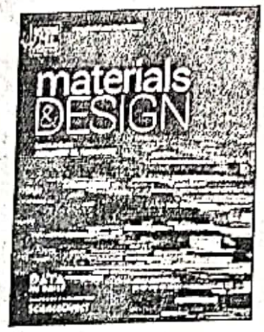

Electroluminescent materials: Metal complexes of 8-hydroxyquinoline - A review

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