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FECHA	16 de febrero de 2018

Por medio del presente documento le informo que el proyecto de investigación que lleva por título:

"Focus measure method based on the modulus of the gradient of the color planes for digital microscopy"

El resultado de este trabajo, ha sido publicado en una revista de alto impacto.

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Focus measure method based on the modulus of the gradient of the color planes for digital microscopy

Román Hurtado-Pérez
Carina Toxqui-Quitl
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J. Félix Aguilar-Valdez
Gabriel Ortega-Mendoza

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Por medio del presente documento le informo que el proyecto de investigación que lleva por título:

" Marangoni force-driven manipulation of photothermally-induced microbubbles "

Desarrollado en colaboración entre investigadores de la Universidad Politécnica de Tulancingo y el Instituto Nacional de Astrofísica Óptica y Electrónica, Puebla, México y la Benemérita Universidad Autónoma de Puebla; ha concluido de manera satisfactoria.

El resultado de este trabajo, ha sido publicado en una revista de alto impacto.

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Optics EXPRESS

Marangoni force-driven manipulation of photothermally-induced microbubbles

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Abstract: The generation and manipulation of microbubbles by means of temperature gradients induced by low power laser radiation is presented. A laser beam (λ = 1064 nm) is divided into two equal parts and coupled to two multimode optical fibers. The opposite ends of each fiber are aligned and separated a distance D within an ethanol solution. Previously, silver nanoparticles were photo deposited on the optical fibers ends. Light absorption at the nanoparticles produces a thermal gradient capable of generating a microbubble at the optical fibers end in non-absorbent liquids. The theoretical and experimental studies carried out showed that by switching the thermal gradients, it is possible to generate forces in opposite directions, causing the migration of microbubbles from one fiber optic tip to another. Marangoni force induced by surface tension gradients in the bubble wall is the driving force behind the manipulation of microbubbles. We estimated a maximum Marangoni force of 400 nN for a microbubble with a radius of 110 μm.

OCIS codes: (140.7010) Laser trapping; (140.6810) Thermal effects; (060.2310) Fiber optics; (160.4236) Nanomaterials.

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Por medio del presente documento le informo que el proyecto de investigación que lleva por título:

"Some computational aspects of Tchebichef moments for higher orders"

El resultado de este trabajo, ha sido publicado en una revista de alto impacto.

Se anexa al presente documento la evidencia de la publicación.

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Some computational aspects of Tchebichef moments for higher orders

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ABSTRACT

In this work, we propose a new algorithm for the computation of Tchebichef moments by means of a recurrence relation with respect to order and the Gram–Schmidt process, which reduces the numerical instability and the carry error caused by the computation of high-order moments. Results and comparison with other methods are presented.

1. Introduction

Tchebichef (Chebyshev) moments have been extensively used in the field of image analysis and pattern recognition. Mukundan et al. [18] introduced for the first time the moments of Tchebichef. The use of Tchebichef polynomials as kernel of moments, which eliminate the need for numerical approximation, satisfy the orthogonal condition in discrete domain of digital image [15,17,18]. The Tchebichef moments are used in many applications, such as: image watermarking [4,12,29], feature invariants in pattern recognition [19,28,31], vehicle logo recognition [20], image compression [7,16,21], speech recognition [5,6], image restoration [23,27], human action recognition [13], facial recognition [3], medical image registration [26], and texture-based image recognition [2].

Mukundan et al. [18] discuss some computational aspects of Tchebichef polynomials and moments, such as symmetry property, polynomial expansion, and recurrence relations with respect to n and x. However, one problem encountered in the calculation of high-order polynomial values is the propagation of numerical error while using the recursive relation with respect to n [30]. The recursive procedure used for polynomial evaluation can be suitably modified to reduce the accumulation of numerical error with the recurrence relation in x-direction proposed by Mukundan [15].

From the recurrence relations different strategies have been developed for the computation of Tchebichef moments. Wang and Wang [24] used Clenshaw's recurrence formula to develop recursive algorithms for the computation of the forward and inverse Tchebichef moments. Kotoulas and Andreadis [11] present a hardware architecture using FPGA which enables real-time processing of binary and grayscale images. Shu et al. [22] propose a new approach for fast computation through image block representation for binary image and intensity slice representation for grayscale images. Honarvar et al. [9] derive a simplified recurrence relationship to compute Tchebichef polynomials based on Z-transform properties. Recently, Abdulhussain et al. [1] propose a new method for computing high order moments, their algorithm is based on the integration in a sequential manner of two traditional recurrence relations (the x-direction and the n-direction algorithms) proposed by Mukundan [15]. Even so, the orthogonality of Tchebichef polynomials for higher orders is destroyed because of numerical approximation. This problem severely affects the quality of image reconstruction particularly in high resolution images. A solution can be devised to eliminate the carry error to compute high-order polynomials through the Gram–Schmidt process. On the other hand, to quantify the orthogonality error of the Tchebichef polynomials, we propose to use the universal quality index in order to know the size N and the order n that satisfies the orthogonality condition.

2. Tchebichef polynomials

The classical orthogonal polynomials are characterized by being solutions of the differential equation of the hypergeometric type defined as

$$0 = \sigma(x)\Delta\nabla t_n(x;N) + \tau(x)\Delta t_n(x;N) + \lambda_n t_n(x;N), \quad (1)$$

where $\Delta t_n(x;N) = t_n(x+1;N) - t_n(x;N)$, $\nabla t_n(x;N) = t_n(x;N) - t_n(x-1;N)$ denote the forward and backward finite difference operator, respectively. Hence $\Delta\nabla t_n(x;N) = t_n(x+1;N) - 2t_n(x;N) + t_n(x-1;N)$. Finally, $\sigma(x)$ and $\tau(x)$ are polynomials of at most

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Por medio del presente documento le informo que el proyecto de investigación que lleva por título:

"Double Magnetic Loop and Methods for Calculating Its Inductance"

Desarrollado en colaboración entre investigadores de la Universidad Politécnica de Tulancingo y el Instituto ITACA de la Universidad Politécnica de Valencia, España; ha concluido de manera satisfactoria.

El resultado de este trabajo, ha sido publicado en una revista de alto impacto.

Se anexa al presente documento la evidencia de la publicación.

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A T E N T A M E N T E

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Research Article

Double Magnetic Loop and Methods for Calculating Its Inductance

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Due to their simplicity and operating mode, magnetic loops are one of the most used traffic sensors in Intelligent Transportation Systems (ITS). However, at this moment, their potential is not being fully exploited, as neither the speed nor the length of the vehicles can be surely ascertained with the use of a single magnetic loop. In this way, the vast majority of them are only being used to count vehicles on urban and interurban roads. For this reason, in order to contribute to the development of new traffic sensors and make roads safer, this paper introduces a theoretical study to explain the design and peculiarities of the innovative double loops, how to calculate their magnetic field and three different methods to calculate their inductance. Finally, the different inductance values obtained by these three methods will be analyzed and compared with experimental measurements carried out by our research group in order to know which method is more accurate and if all of them are equally reliable.

1. Introduction

Magnetic loops are the most common sensors on roads around the world since they are an affordable and highly developed technology with a simple operation that is not affected by environmental conditions [1–7]. Although these ones imply to drill and work on the road for their installation and possible future repairs like the rest of intrusive sensors [8], in practice, magnetic loops still have a long future ahead. Even though they might seem outdated, these are actually a widely extended and well-known reliable technology that offers good performance at a low price. Proof of this is that today they continue to be installed on the roads and they are even fundamental elements in the new algorithms for traffic management [9–15].

Their operation is straightforward, since it is based on the impedance variation that is recorded in the magnetic loops during the passage of vehicles over them, and as shown in Figure 1, an entire system usually consists of three parts [16]:

(I) A magnetic loop formed by a wire with one or more turns superficially buried in the pavement.
(II) A cable that links the magnetic loop with the control booth, which is also buried in the pavement.
(III) An electronic unit located in the control booth that contains an oscillator and amplifiers to excite the inductive loop.

In order to have a better understanding of how they work, there are many publications and bibliography [1] since they are one of the most widespread sensors. However, a brief physical explanation is provided in the following points:

(i) The electronic unit together with the magnetic loop forms an oscillator circuit.

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"Modelado y Análisis de Sintonización de Velocidad de un MSIP con Presencia de Fisura Mediante Algoritmos Genéticos"

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Modelado y Análisis de Sintonización de Velocidad de un MSIP con Presencia de Fisura Mediante Algoritmos Genéticos

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Resumen

En el presente artículo se propone el modelado del sistema continuo correspondiente al motor síncrono de imanes permanentes (MSIP) con presencia de degradación en la inercia rotacional del rotor, mediante el mecanismo de fisura, lo cual permite la estimación de parámetros físicos, en el caso de análisis, el diámetro de la grieta presente en el rotor, disminuyendo con ello la incertidumbre en el modelado del MSIP. Se lleva a cabo la identificación en bucle cerrado de las ganancias mediante un análisis de sensibilidad, donde mediante el método computacional de optimización de búsqueda por algoritmos genéticos se obtienen las ganancias que logran converger el modelo propuesto al modelo de referencia.

Palabras Clave:
Modelado del sistema continuo, Estimación de parámetro, Incertidumbre en el modelado, Identificación en bucle cerrado, Método computacional de optimización, Degradación en Inercia, Mecanismo de Fisura, Sensibilidad, Algoritmo genético

Modeling and Analysis of speed tuning of a PMSM with presence of crack using genetic algorithms

Abstract

In this article, we propose the continuous system model corresponding to the Permanent Magnet Synchronous Motor (PMSM) with the presence of degradation in the rotational inertia of the rotor through the fissure mechanism, which allows the estimation of the physical parameters. We consider the diameter of the split on the rotor in the analysis of the model, and in effect, the decrease of the uncertainty of the PMSM model. The closed- loop identification of the gains is achieved by a sensibility analysis, whilst the gains obtained by the computational optimization method of search through genetic algorithms, allows the proposed model converge to the reference model.

Keywords:
Modeling of the continuous system, Parameter estimation, Modeling uncertainty, Closed loop identification, Computational optimization method, Inertia Degradation, Fissure Mechanism, Sensitivity, Genetic Algorithm

1. Introducción

Los Motores Síncronos de Imanes Permanentes (MSIP), además de aportar altos rendimientos en aplicaciones donde es necesario corregir el factor de potencia, aportan pares elevados y velocidad constante bajo cargas variables, lo que hace que los mismos sean cada vez más estudiados y utilizados en aplicaciones que, hasta hace algunos años estaban restringidas a los motores de inducción (Gieras J. F. et al, 2002a).

Una de las fallas de interés, sobre todo en motores eléctricos de tamaños considerables, es debida a problemas vibratorios, ocasionados por desbalanceo, los cuales a su vez son generados por degradación en el eje del rotor, esto es, fenómenos de fatiga que, finalmente, ocasionan fractura en el eje del rotor (Quiroz J. C. et al, 2018).

El comportamiento de la propagación de fisuras en materiales sólidos es un tema de gran interés en el campo de la ingeniería, ayudando con ello a preservar la vida de los dispositivos mecánicos (Bachschmid N. et al, 2010).

Buscando contribuir con el diagnóstico y control de MSIP sujetos a degradación temporal debido a los efectos de carga de uso, en el presente trabajo se analiza el comportamiento de MSIP con presencia de fisura en el eje del rotor, ocasionando con ello y de acuerdo a la dinámica de la fractura, degradación en el mismo, con el análisis y teoría propuesta se pretende

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