Universidad Politécnica de Tulancingo

Informe Timestral de Actividades

Dirección de Investigación y Posgrado

Trimestre	abril-junio	**Fecha**	23 de junio de 2022

Componente	3. Investigación	**Actividad**	3.1 Productos de Investigación
Nombre del Indicador	Porcentaje de productos de investigación científica y tecnológica realizados.		
Resumen Narrativo	Realización de productos de investigación científica y tecnológica de educación superior.		
Supuestos	Los investigadores participan en las convocatorias para el desarrollo de proyectos de investigación científica y tecnológica.		
Medios de Verificación	Informe trimestral de productos de investigación científica y tecnológica realizados generado y ubicado en la Dirección de Investigación y Posgrado adscrito a la Secretaria Académica de la Universidad Politécnica de Tulancingo.		

Metas Trimestrales			
Programada	3	**Alcanzada**	3

Descripción de Actividades

En el periodo abril - junio 2022 se programaron 3 metas, que derivan en 3 productos de investigación. Estos productos de investigación o artículos de corte científico tecnológico fueron presentados en revistas de corte internacional y son los siguientes:

1.-Nombre del artículo: **Improvement of Retinal Images Affected by Cataracts**

2.-Nombre del artículo: **Optical cavitation in non-absorbent solutions using a continuous-wave laser via optical fiber**

3.-Nombre del artículo: **Atlas of urban scaling laws**

Desarrollo de Actividades, Evidencia Documental y Fotográfica

1.-*Nombre del artículo*: **Improvement of Retinal Images Affected by Cataracts**

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Artide

Improvement of Retinal Images Affected by Cataracts

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Abstract: Eye fundus images are used in clinical diagnosis for the detection and assessment of retinal disorders. When retinal images are degraded by scattering due to opacities of the eye tissues, the precise detection of abnormalities is complicated depending on the grading of the opacity. This paper presents a concept proof study on the use of the contrast limited adaptive histogram equalization (CLAHE) technique for better visualization of eye fundus images for different levels of blurring due to different stages of cataracts. Processing is performed in three different color spaces: RGB, CIELAB and HSV, with the aim of finding which one better enhances the missed diagnostic features due to blur. The experimental results show that some fundus features not observable by naked eye can be detected in some of the space color processed with the proposed method. In this work, we also develop and provide an online image process, which allows clinicians to tune the default parameters of the algorithm for a better visualization of the characteristics of fundus images. It also allows the choice of a region of interest (ROI) within the images that provide better visualization of some features than those enhanced by the processing of the full picture.

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2.-*Nombre del artículo*: ***Optical cavitation in non-absorbent solutions using a continuous-wave laser via optical fiber***

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Optical cavitation in non-absorbent solutions using a continuous-wave laser via optical fiber

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ABSTRACT

Optical cavitation can be induced by short pulse lasers focused into a solution with a low absorption coefficient or using a continuous-wave laser focused into highly absorbent solutions. In this work, we report the generation of cavitation bubbles in ethanol using a continuous-wave fiber optic laser with emission at 450 nm wavelength. Silver and copper nitrate nanoparticles were immobilized on the flat end-face of a multimode optical fiber tip using the photodeposition technique and then immersed into the solution. Laser light transmitted through the optical fiber is strongly absorbed by both nanoparticles causing an abrupt increase in temperature around the tip of the optical fiber, reaching the spinodal limit of ethanol (−187 °C). At this temperature, an explosive phase transition (liquid–gas) occurs causing the generation of a microbubble, which grows until reaches its maximum radius (−1072 μm in 132 μs) and subsequently collapses, emitting a shock wave. The dynamic behavior of the gas bubble was studied as a function of the laser power using a high-speed video camera, and the shock wave emitted immediately after the bubbles collapse was detected by a microphone. The pressure of the shock wave was analyzed photodepositing different thin films of silver nanoparticles at the tip of the optical fiber, causing optical attenuations of 1, 3, 5, and 7 dB. The experimental results obtained showed that when a thin film of copper nitrate nanoparticles was photodeposited on a film of silver nanoparticles (5 dB), the pressure of the shock wave increases up to − 13-fold, in comparison, if we use only one film of silver nanoparticles. Energetic shock waves have potential applications in a variety of areas such as medicine, biological sciences, material processing, liquid microjets generation, among others.

3.-*Nombre del artículo*: **Atlas of urban scaling laws**

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PAPER

Atlas of urban scaling laws

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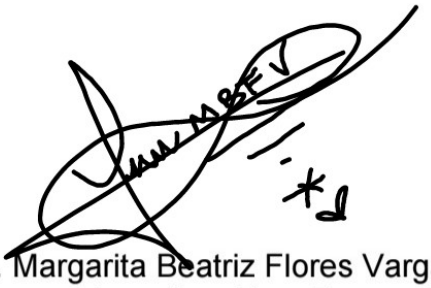
Abstract

Accurate estimates of the urban fractal dimension D_f are obtained by implementing the detrended moving average algorithm on high-resolution multi-spectral satellite images from the WorldView2 (WV2) database covering the largest European cities. Fractal dimension D_f varies between 1.65 and 1.90 with high values for highly urbanised urban sectors and low ones for suburban and peripheral ones. Based on recently proposed models, the values of the fractal dimension D_f are checked against the exponents β_s and β_i of the scaling law $Y \sim N^{\beta}$, respectively for socio-economic and infrastructural variables Y, with N the population size. The exponents β_s and β_i are traditionally derived as if cities were zero-dimensional objects, with the relevant feature Y related to a single homogeneous population value N, thus neglecting the microscopic heterogeneity of the urban structure. Our findings go beyond this limit. High sensitive and repeatable satellite records yield robust local estimates of the urban scaling exponents. Furthermore, the work discusses how to discriminate among different scaling theories, shedding light on the debated issue of scaling phenomena contradictory perspectives and pave paths to a more systematic adoption of the complex system science methods to urban landscape analysis.

Elaboró	Autorizó
	
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