R13

Analysis of large-gradient land subsidence in the Alto Guadalentín Basin (Spain) using LiDAR data

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Land subsidence is triggered by groundwater overexploitation in the Alto Guadalentín Basin (Spain) aquifer system. In this work, we propose a new commercial LiDAR differencing flow to detect land subsidence at basin scale, based on the multiscale model-to-model cloud comparison (M3C2) algorithm. This method is applied to two airborne LiDAR datasets acquired in 2009 and 2016, respectively. First the iterative closest point (ICP) algorithm is used for point cloud registration of both point clouds exhibiting a very stable and robust performance. LiDAR datasets capture information from ground and non-ground points. Therefore, a method combining gradient filtering and cloth simulation filtering (CSF) algorithm was applied to remove non-ground points. The internal edge connection errors in the different flight lines were also addressed by means of the smoothing point cloud method. The results show that vertical deformation rates are up to -12 cm/year in the basin from 2009 to 2016, in agreement with the displacement reported in previous studies. LiDAR results have been compared to the velocity measured by continuous GNSS stations and an InSAR dataset. The results show a good agreement between the vertical displacements obtained from the three different surveying techniques. Furthermore, LiDAR results were compared to the distribution of soft soil thickness showing a clear relationship. The study underlines the potential of LiDAR to monitor the distribution and magnitude of vertical deformations in areas prone to be affected by groundwater-withdrawal-induced land subsidence.

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Exploration of Fluorescence LIDAR for Remote Entomological Applications in Ghana

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Tropical climates provide a healthy ecosystem that favors rich biodiversity in atmospheric fauna, particularly insects. The insects play roles such as pollination, predation or as preys, pests, disease vectors, etc. In Ghana, conventional techniques such as sweep nets, pit falls, sticky traps continue to be used to study these insects. These conventional techniques are somewhat destructive, time consuming and laborious. Nowadays, complementary and alternatives to the conventional techniques are been offered by LIDAR techniques which can provide rapid, non-invasive, in-situ and remote measurement. Fortunately, relatively less costly systems for LIDAR operation are been developed and demonstrated by Brydegaard et al., [1, 2]. They (Brydegaard et al) have since 2009 organized regular workshops and training among some countries in Africa (Burkina Faso, Cameron, Cote D' Ivoire, Ghana, Mali, Senegal, Togo and Kenya). Through this program the Laser and Fibre Optics Centre (LAFOC) in Ghana at the University of Cape Coast has been has been provided with a Fluorescence Lidar for remote studies. The LIDAR is equipped with a Diode laser of 100 mW power and a wavelength of 401 nm. It also has a home-built telescope system which has most of the optical components held by 3D printed parts. The Lidar is arranged in the Scheimpflug configuration providing elastic and fluorescence echo of insects traversing the path of the light within a range of six (6) to hundred (100) meters. The Scheimpflug configuration is very conducive to obtain high resolution, temporal and spatial data from flying insects [2].
Currently, the LIDAR system is being deployed for field studies of some insects, particularly Bees, House flies and Mosquitoes, which have economic interest to the country. Bees contribute mostly to pollination, they produce honey and other products which are used in food, medicine and cosmetics as well as providing foreign exchange through exportation of bee products and tourism. Mosquitoes on the other hand are vectors of some of the most devastating diseases to humans particularly malaria which drains the country economically in the control and treatment. Similarly, houseflies a type of domestic pests that carry pathogens from place to place. Causing several diseases such as cholera, typhoid, food spoilage etc. Studies therefore to locally understand the general characteristics and behavior of these insects remotely to advance strategies for their control (vectors) and development (Bees) will be of great relevance. Meanwhile obtaining this important information about the insects remotely using this relatively low-cost Lidar system will be of great benefit in terms of cost, labor and time saving opportunities for insect studies, vector control, as well as a progressive research and development in the field of entomology and associated fields.

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R15

Optical design simulation of LiDAR for autonomous driving

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The Light imaging Detection And Ranging (LiDAR) system is a range-determining active imaging system [1-3]. An optical system projects a laser beam to enlarge it and aim it toward a subject to be recorded. LiDAR is an essential tool for autonomous driving. Autonomous driving is the future of transportation that uses cutting-edge technologies. It drives the massive potential for the latest application of high-end sophisticated devices and mythology. LiDAR is a powerful emerging autonomous driving technology, showing the direction and highest possible sensing technology.

In this work, I am reporting an initial optical design for the LiDAR. This initial optical design aims to determine how the spot size at the target changes when the input laser's source angle to the optics system changes. The difference between the input and output angles after the laser travels through the lenses is also determined. A wavelength of 1550 nm is used, which is widely used for communication systems.

Optics Studio (formerly known as Zemax) [4] is used to model the optical system. The Optics Studio lens data editor (LDE) is used to insert the required technical specification of the LiDAR system. A 0.03937008-inch aperture stop has been applied to generate the laser Gaussian profile. The laser has a 0.03937008- inch radian divergence, entered into the Field Data of the LDE, placing the tilt mirror in the proper location.

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Optical Sensing Instrument for Quantitative Estimation of Physical Variables of Flying Animals: Case Study in Senegal

In this work, a fixed-platform of two-optical telescope system for real-time detection and characterizing of flying animals is used. The detection system is based on the elastic backscattering of sunlight. The optical setup consists of two receiving telescopes fitted with three types of sensors: a high-speed camera, a charge-coupled device spectrometer and four silicon quadrant photodiode detectors. When an insect passes through the device's field of view, the sunlight it reflects produces a time-varying signal which is recorded by these sensors. Analysis of the signal provides quantitative estimates of three characteristics of the insect: its scattering spectrum, its wing-beat frequency, and its scattering cross-section. This passive remote sensing technique appears practical for monitoring, detecting and characterizing insects in their natural habitats with minimal disturbance.

R17

Assessment of the intense forest fire over a Southeastern Indian hill station: A case study using ground based and satellite remote sensing data.

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The historic forest fire raged in the third week of March 2014 over Seshachala forest range (13.7°N, 79.35°E) in the Southeastern India that last for several days devastating rare species of flora and fauna in around two thousand hectares of forest land has been analyzed using the Micro Pulse Lidar (MPL) observations made at S. V. University, Tirupati located at the foot hills of the forest range. Earlier studies [1,2] proved that Lidar observations are excellent tool to monitor the forest fire plumes to the surrounding regions. An intense thin smoke plume has been observed on 18 March at 3 km altitude in the lidar back scatter signal on which wide spread fire was identified. These fire has been extinguished using aerial water showers using choppers on 20 March and again the fire raged on 22 March. About 3.5km deep layer of intense lidar back scatter is noticed on 22 March after which it slowly dissipated till 27 March. In addition, the ground based in-situ observations of aerosol physical and optical properties and the Black Carbon (BC) concentrations measured at nearby station NARL, Gadanki (13.5°N, 79.2°E) is combined to investigate the environmental impact of this forest fire. MODIS observed total aerosol extinction and BC mass density show significant enhancement during 22-24 March coinciding with the lidar observations. The back ground wind circulation in the lower troposphere has been analyzed using the high resolution GPS based radiosonde data available at NARL during the fire event to understand the dispersion of the fire smoke. The effect of this fire smoke dispersion on the local environment has been investigated using the WRF-Chem simulations.

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R18

Student

Good Student

R19

Msc physics

Msc physics

R20

Msc physics

Msc physics

R21

M.sc physics

M.sc physics

R22

Laser-induced autofluorescence assisted by multivariate techniques discriminates a cataractous lens from healthy lens tissues of Sprague–Dawley rats

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Laser-induced autofluorescence (LIAF), combined with multivariate techniques, has been used to discriminate a cataractous lens from healthy lens tissues. In this study, 405 nm and 445 nm were used as excitation sources to induce the autofluorescence. Results show higher autofluorescence intensity in cataractous lens tissues than in healthy ones. Cataractous lens tissues show a red shift of 0.9 nm and 1.2 nm at 405 nm and 445 nm excitations, respectively. Using principal component analysis (PCA), three principal components (PCs) gave more than 99% variability for both 405 nm and 445 nm excitation sources. Based on the three PCs, Fisher's linear discriminant model was developed. An accuracy of 100% was obtained in classifying the lens tissues using Fisher's linear discriminant analysis (FLDA). The LIAF technique assisted by PCA and FLDA may be used for objective discrimination of cataractous lens from healthy lens tissues of Sprague–Dawley rats

R23

Synthesis and electrochemical characterization of Vanadate composites materials for Lithium ion batteries.

Transition metal vanadate, alkali metal vanadate and vanadium oxides for anode application will be synthesize though co-precipitation technique. This study will cover the stability, safety, reversible capacity, conductivity and cell performance of metal vanadates as an electrode material in LIBs. To study the grain size and crystalline structure of the materials X-ray diffraction will be used. Scanning electron microscopy will be used to study samples morphology. Reaction kinetics will be carried out by Electrochemical impedance spectroscopy (EIS). To investigate resulting current, capacity rate and voltage difference, following techniques will be employed i-e Potentiostatic cycling, cyclic voltammetry and galvanostatic cycling. To show better cyclic performance Transition metals, Alkali metals and vanadium oxides as anode are capable materials for future.

R24

Radar studies of atmosphere

I have use remote sensing to study space physics at equatorial and polar latitudes. The radar measurements include fluctuations of the responsible parameter of dispersion along the altitudes from Troposphere to top Ionosphere. I developed electronic RF solutions, array antennas, software development for signals analysis. I was part of team that developed MST radar in Peru and exported to Norway. At this moment I wan to use this expertise as for building a radar to measure low altitude wind velocities as part of University Research Institute activities, however RF represent challenges and LIDAR could be more feasible.

R25

Laguerre–Gaussian induced temperature and refractive index profiles in thermal lens effect

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Thermal lens spectroscopy (TLS) is based on the energy absorbed by the sample, generating a temperature gradient in the sample and consequently a refractive index gradient that causes defocusing of the probe laser beam passing through a liquid pre- excited medium. We present a theoretical model that describes induced temperature and refractive index profiles generated by the Laguerre–Gaussian (LG) excitation beam. It indicates that there is a decrease or increase around the optical axis in the refractive index by LG modes, thus enabling an enhancement of the refractive index gradient along the radial direction, which could enhance the sensitivity in photothermal lens detection. A comparison with the fundamental Gaussian beam TEM00 indicates that the temperature gradient in the vicinity of the axis can be increased substantially when using higher-order Gaussian modes but only if the steady state condition is reached.
However, for LG01 mode (having narrower Full Width Half Maxima), the refractive index gradient is higher than for TEM00 even at lower illumination times [1]. This fact can contribute to generate a high TL signal as well as high sensitivity in measurement.
In perspective, this result can be used for further development of a TL model based on non-Gaussian excitation beams such as LG, which can be easily generated using different optical elements. This work is in progress along with the correspondent experimental procedure.

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Lidar in landslide detection

The process of producing topographic information in the last three decades has witnessed the movement of technology, Data preparation, from traditional and terrestrial mapping to passive methods Measuring and recording surfaces (such as photogrammetry and remote sensing) and more recently One technique has been. such as radar and lidar. Active methods side Gathering information from the surface of objects based on distance measurement The laser works. Lidar measurement is based on the principle that the coordinates of each Point on the ground with the coordinates of the laser sending location, measuring the length Oblique distance between the pulse transmission point and the ground and measuring the wave transmission angle It can be calculated from the place of sending the pulse to the ground level.

R27

Electricity and magnitism

Ohm's law

R28

lctp

N/A

R29

Nothing

No

R30

Numerical investigation of an ultra-broadband coherent mid-infrared supercontinuum in a chalcogenide AsSe2-As2S5 multimaterial photonic crystal fiber

In this paper, we report on the simulation of an ultra-broadband coherent mid-infrared supercontinuum (SC) extending from 1.25 to 20 µm generated using a novel AsSe2-As2S5 multimaterial photonic crystal fiber (PCF). The proposed fiber is composed of a core made of AsSe2 glass and a surrounding cladding made of As2S5 glass. The hybrid PCF is designed to have a zero-dispersion wavelength (ZDW) of 3.3 µm with an overall highly engineered group velocity dispersion shifted to the mid-infrared wavelength region. The SC is generated by pumping 50 fs pulses at 4 µm emitted from an optical parameter amplifier with low energy of 0.625 nJ. The pumping wavelength is selected in the anomalous dispersion regime close to the ZDW. The widening of the SC is mainly based on the soliton effects in the anomalous dispersion region combined with self-phase modu- lation, cross-phase modulation, stimulated Raman scattering, four-wave mixing, and dispersive wave. The obtained SC shows a high degree of coherence and a 15 fs temporal compressed pulse is generated in only 5 mm long AsSe2-As2S5 hybrid PCF. The power proportion of the SC generated beyond 4 µm is 98% with its long wavelength edge up to 20 µm. To the best of our knowledge, the obtained SC is the first broadest spec- trum reported in the mid-infrared region with very low energy. Our results highlight the potential of the novel chalcogenide AsSe2-As2S5 multimaterial PCF to emit across the ultra-broadband mid-infrared atmospheric windows and the molecular fingerprint region.

R31

Anyone

My dream is reaching at international level

R32

Design and Investigation of Graded-Index Core Polymer Directional Coupler for Board-Level Optical Circuitry

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Due to the high bandwidth and low energy consumption, polymer optical waveguides have been implemented in various optoelectronic devices and shown their potentials in a short-reach arena with low propagation loss. In this research, we present a directional coupler splitter realized with organic-inorganic hybrid polymer materials (core: NP-005 and Cladding: NP-211 correspond to refractive indices 1.575 and 1.567, respectively at 1550 nm) because of their cost-effective in manufacturing, and easy integration on printed circuit boards (PCBs). We introduce this polymer directional coupler as follows: two waveguides having two input and output straight cores and they are connected to two S-bend segments, and these two S-bend cores are connected to another two straight waveguides in the middle with a separation distance between them. The index profile of this coupler is a graded-index (GI) type, and the core diameter was controlled within 10 μm. We design and analyze this polymer coupler by utilizing the beam propagation method (BPM) at 1550 nm. The power efficiency of this SI directional coupler is approximately 96% at 1550 nm. We also investigate the insertion loss and polarization dependency for practical use.

R33

Fraunhofer diffraction of a Laguerre-Gaussian laser beam by a combination of axicon and fork-shaped grating

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In this work we theoretically study Fraunhofer diffraction of a Laguerre-Gaussian (LG) laser beam with radial mode number n=0 and azimuthal mode number l, by a combination of fork-shaped grating with integer topological charge (TC) p and axicon. The axicon is attached with its base to the fork-shaped grating such that its optical axis passes through the origin of the fork-shaped splitting of the grating, and in the same time it coincides with the LG beam propagation axis. The LG beam enters with its waist in the plane of this composed optical element.
The analytical solutions for the diffracted wave field amplitude and intensity are derived. While the zeroth diffraction order carries the same TC as that of the incident beam, in the higher mth diffraction order the TC is an algebraic sum of l and the product mp; in a given negative diffraction order where l-mp=0 is satisfied the beam is chargeless. The transverse intensity profiles in different diffraction orders are numerically calculated, as well as the phase profiles which show the TC value and sign of the vortex beams. Also, we have analyzed how the axicon influences the diffraction patterns, as well as the radii of the central bright spot of the nonvortex beam and the central dark spot of the vortex beam.

R34

Optical Spectroscopic Detection of S-Target Molecules by Gold Nanostructures

The work presents an optical spectroscopic study concerning the detection of S-target molecules of cysteine and cystine type by gold nanostructures, in order to elucidate their bonding nature. Transmission electron microscopy (TEM) is used to emphasize these systems' tendency to form supermolecular structures.

R35

Production of Crystalline Si, New Binary, Ternary and Quaternary Materials for the Implementation of Alternative Renewable Energy, with the Manufacture of Solar Cells for the Photovoltaic Industry

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Abstract

The use of renewable energies for the generation of electricity leads to the anticipated conclusion that in the short term it is neither economically feasible nor competitive. Even when using the example of a country that invests in these energy sources, we would face different government policies between developed countries and developing countries like ours. Along with the above, it should be added that, unlike other countries, we have almost 60% of installed capacity in hydroelectric plants alone, which leaves 40% for thermoelectric or other generation. Of this percentage, which has been increasing in recent years, the "star" fuel has been Natural Gas with very competitive generation prices and installed kW, whose increase in this century is expected to be very auspicious and the depletion of deposits fossils. Fortunately, nature offers a wide variety of options for the generation of alternative energies that are derived directly (electromagnetic radiation) or indirectly (winds, waves, water currents, etc.) from solar energy. The theoretical energy potential offered by the sun is equivalent to several thousand of the world's energy consumption, for which the rest of the direct or indirect use of solar energy consists above all in the development of new economically profitable technologies. A high degree of progress has been registered in this field despite the adverse circumstances that renewable sources face in this field, such as climate change and the little knowledge of potential consumers about saving electricity. In the present investigation, the production of crystalline Si, new binary, ternary and quaternary materials, is carried out by direct fusion of its components, with characteristics suitable for the production and characterization of solar cells in our center.

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LIDAR applications in atmosphere, oceanography and archeology

Abstract

This paper is a review paper of lidar and it overviews Lidar technology contribution in different areas of today's modern world. Lidar invented in 1960 stands for light detection and ranging'. Lidar is a detection system that works on the same principal of radar but it uses laser light instead. It is based on a principal of targeting some object or surface using the laser light. The light is reflected back to the receiver and a 3D image is obtained. Lidar applications in atmospheric regime, oceanographic and archeological investigation are studied in this paper. Lidar has wide number of applications that includes terrestrial, storm surge modeling, air borne and mobile applications, topographic, map line shoring and coastal flood exposure.

Lidar has been largely contributed to study and investigate highly variable atmospheric parameters over the past few decades. These atmospheric parameters include measurement of ozone fluxes, water vapors, monitoring emission rates, concentration of trace gases etc.

The new and modern applications of lidar are now in the field of oceanography. It is used to find the intertidal zone, tidal flat and coastal zone using the lidar technology by acquiring three dimensional coordinates with high precision.

The signs of old civilization are mostly covered by vegetation, rain forestation, dust and storm. In order to uncover the hidden gems of theses archaeological sited, lidar is used which is relatively new technology for the archaeologists. Examples of these sites uncovered by Lidar are New England, Mesoamerican civilization and many others.

Keywords: Lidar, laser, Atmosphere, Oceanography, Archeology

R37

Researcher of PhD Programme

Currently, I am the student of PhD programme with research topics solar cells and optical instrumentations at Bandung Institute of Technology, Indonesia. LIDAR is an interesting topics to be applied in Indonesia as a maritime country because it can be applied in fisheries.

Physics

Physics

R39

Transverse shifts experienced by radio waves due to ionosphere

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A plane electromagnetic wave propagating through an interface can be described by the laws of reflection and refraction. However, corrections to these laws arise when we consider physical electromagnetic waves due to their finite transverse extent. These shifts, which can be spatial or angular in nature, are called Goos-Hanchen (GH) and Imbert-Fedorov (IF) effects [1]. In this study, we investigate the ionosphere-induced out-of-plane IF shifts of radio waves. We treat the ionosphere as a collection of electrons moving in a uniform magnetic field, as described by the Appleton model, and used the resulting dispersive expressions to calculate for the IF shifts [2]. We confirm that the ionosphere may behave like a dielectric, metal or epsilon-near-zero material depending on the value of the incident frequency of the radio wave and the plasma frequency of the ionosphere. We calculate the shifts for the three cases and find that the maximum shift can be observed when the ionosphere acts like an epsilon-near-zero medium. Finally, we discuss how the generated IF shifts can be used as a potential tool to profile the ionosphere using reflected radio waves.

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R40

Optical properties of $Na_2ZnP_2O_7$ compound: An ab-initio study

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Using density functional theory, the structural, electronic and optical properties of disodium zinc diphosphate $Na_2ZnP_2O_7$ compound are investigated. The calculated optimized lattice parameters of the $Na_2ZnP_2O_7$ compound, which are a = 7.75 and c = 10.20 Å is in good agreement with available experimental data. The calculated band structure and density of state indicates that $Na_2ZnP_2O_7$ compound is a wide gap semiconductor with a direct band gap of 4.2 eV. The different contribution of the electronic orbitals is discussed using the partial density of states and we obtained significant contribution from the Zn atom with minor contribution from the Na, P and O atoms. The optical properties such as dielectric function, optical conductivity, absorption coefficient, optical constants, reflectivity, and electron energy loss spectroscopy signals are discussed.