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Digital shear speckle pattern interferometry with holo-elements

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The paper discusses the theory of digital shear speckle pattern interferometry (DSSPI). DSSPI is used mainly for non-destructive testing but can also be used for quantitative evaluation of strains, slopes and curvatures. Use of holo- and/or diffractive elements due to their multi-function capabilities makes their use in DSSPI attractive. © Anita Publications. All rights reserved.

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Real-time amplification of light signals in photorefractive ferroelectric liquid crystals

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The photorefractive effect in ferroelectric liquid crystalline mixtures containing photoconductive chiral compounds was investigated. Ter-thiophene compounds with chiral structures were chosen as the photoconductive chiral compounds, and they were mixed with an achiral smectic C liquid crystal. The mixtures exhibit the ferroelectric chiral smectic C phase. The photorefractivity of the mixtures was investigated by two-beam coupling experiments. It was found that the ferroelectric liquid crystals containing the photoconductive chiral compound exhibit a large gain coefficient of over 1200 cm⁻¹ and a fast response time of 1 ms. Real-time dynamic amplification of an optical image signal of over 30 fps using the photorefractive ferroelectric liquid crystal was demonstrated. © Anita Publications. All rights reserved.

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Three-dimensional object recognition with joint fractional Fourier transform correlator using digital Fresnel holography

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Three-dimensional (3D) object recognition with joint fractional Fourier transform correlator is proposed in which the technique of digital Fresnel holography is used. Digital Fresnel hologram of a 3D object is synthesized and reconstructed digitally. Performance measure parameters, such as, discrimination ratio, peak-to-correlation

energy, and peak-to-sidelobe ratio have been computed to check the strength of the correlation scheme. © Anita Publications. All rights reserved.

Keywords: Digital holography; Fresnel diffraction; fractional Fourier transform; joint transform correlator.

Total Refs : 29

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Compact telephoto objectives with zero Petzval sum using varifocal lenses

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We present two non-conventional telephoto objectives that have zero Petzval sum. These devices employ two or three varifocal lenses, which may be implemented by using a pair of free-form optical elements. Every pair is here denoted as a vortex pair. To our end, we revisit the Gaussian optics of a zoom system having a single varifocal lens. Next, we unveil a telephoto system that uses two varifocal lenses with zero Petzval sum. This system does not require of any axial movement. The optical powers of the varifocal lenses are related by the condition $K_1 = -K_2 = q/K_0$. These lenses are separated by a distance $d = 1/QK_0$; where q and Q are positive real numbers such that $1 \leq q < Q$. We show that this optical system has extremely low telephoto ratios $M = 1 - q/Q$. Finally, we describe a 3-lens solution with zero Petzval sum, which uses three varifocal lenses and it requires an axial displacement. This latter solution may be useful for reducing other type of aberration rather than field curvature. We discuss what we believe to be the first formulas representing these imaging devices. © Anita Publications. All rights reserved.

Total Refs : 22

compact telephoto objectives with zero petzval sum using varifocal lenses.pdf

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Self-Similarity in the Farfield Diffraction Patterns of Annular Walsh Filters

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The set of annular Walsh filters can be classified into distinct self-similar groups, where members of each group possess self-similar structures or phase sequences. Annular Walsh filters are derived from the rotationally symmetric annular Walsh functions which form a complete set of orthogonal functions that take on values either +1 or -1 over the domain specified by the inner and outer radii of the annulus. The value of any annular Walsh function is taken as zero from the centre of the circular aperture to the inner radius of the annulus. The three values 0, +1 and -1 in an annular Walsh function can be realized in a corresponding annular Walsh filter by using transmission values of zero amplitude (i.e. an obscuration), unity amplitude and zero phase, and unity amplitude and π phase respectively. Pupil plane filtering by Walsh filters can be used to tailor the axial and transverse intensity distributions in the farfield diffraction pattern of these filters. The obscuration ratio of annular Walsh filters provides another useful degree of freedom in this venture. Self-similarity has been observed both in the axial and transverse intensity distribution in the farfield diffraction pattern of these self-similar annular Walsh filters. Results of our investigations on the same are reported in this paper. © Anita Publications. All rights reserved.

OCIS Codes: (050.1970) Diffractive optics; (050.1940) Diffraction; (050.1220) Apertures; (100.5090) phase only filters.

Total Refs : 33

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Development of a multiaperture imaging system using a microlens array

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Multiaperture imaging systems can achieve performance comparable to single aperture systems with reduced system volume and weight. This paper discusses the design and development of a multiaperture imaging system using Microlens arrays. The shift in the microlenses of the array is used to enhance the resolution of an image produced by a single microlens. © Anita Publications. All rights reserved.

Keywords: Microlens array, Multiaperture imaging

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Effect of pump intensity on Two photon induced UV Photoluminescence in PLD thin film of ZnO

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In the present work, high quality transparent ZnO thin film has been deposited on sapphire substrate via pulsed laser deposition (PLD) technique at room temperature.

Epitaxial growth of ZnO thin film on sapphire substrate was confirmed by Raman spectrum. The optical band gap was found to be 3.2 eV, which is in accordance with that of single crystal ZnO. A blue shifted two photon induced broad ultraviolet photoluminescence (UV-PL) having peak at 3.57 eV, was observed via pumping with a 30 mW He-Ne laser at 633 nm. Effect of pump intensity on UV- PL from the ZnO film was studied. The slope of linear fit of the log-log plot of PL intensity vs pump intensity, was found to be ~ 1.95 confirming the two-photon absorption phenomenon in the film. © Anita Publications. All rights reserved.

Keywords: ZnO thin film, Photoluminescence, Two-photon absorption, excitonic emissions.

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THz generation in DAST through DFG-Cherenkov phase matching

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Numerical simulation has been done to study the Cherenkov difference frequency generation (DFG) in the DAST crystal. Discrete regions of THz frequency in DAST have been identified to study the tuning characteristics. A maximum of 9.4 MW Cherenkov DFG power was obtained at 0.82 THz corresponding to which the Cherenkov angle was 32.76°. We have also simulated the spatial field distribution for 0.82 THz in DAST crystal, which clearly exhibits the wedged- shape phase fronts of THz radiation. The tuning characteristic of Cherenkov DFG has been compared with that of collinear DFG. A maximum of 2.6 W of collinear DFG power was obtained at 0.48 THz while at the same frequency the Cherenkov DFG power was found to be 5.17 MW. The variation of Cherenkov DFG power with the input beam spot size has also been investigated. It was found that Cherenkov phase matching was almost twice more sensitive towards spots size variation as compared to collinear phase matching. © Anita Publications. All rights reserved.

Keywords: Cherenkov phase matching, collinear phase matching, difference frequency generation, DAST.

Total Refs : 9

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Characterization of multichannel deformable mirror for adaptive optics applications

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Deformable mirror is used for correcting the aberrations of an optical wavefront in adaptive optics. In this paper, 97 channel deformable mirror having PZT actuation mechanism is characterized and results are presented. Performance of deformable mirror depends on the various parameters such as initial mirror surface figure, single actuator stroke, inter-actuator stroke, inter-actuator coupling and mirror response functions. These parameters are measured experimentally using an Interferometer and a Shack-Hartmann wavefront sensor. Results are discussed by analyzing the interferograms of the deformable mirror surface and phase data from the Shack-Hartmann wavefront sensor for various cases. © Anita Publications. All rights reserved.

Keywords: Adaptive optics, Deformable mirror, Shack-Hartmann wavefront sensor.

Total Refs : 35

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Design of long period waveguide grating filters using genetic algorithm optimization

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Global optimization properties of genetic algorithms (GA) have been utilized to design long period waveguide grating devices for the application specific spectra. Pre-defined target spectra corresponding to specific application have been considered. The grating parameters of corrugated grating have been obtained using GA optimization to achieve these target spectra. The simulation results show that the method is easy to implement and useful to design the grating for any pre-defined application specific spectra. © Anita Publications. All rights reserved.

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A cryptosystem for watermarking based on fractional Fourier transform using a random phase mask in the input plane and a structured phase mask in the frequency plane

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A watermarking scheme has been proposed in the fractional Fourier transform (FrFT) domain, using a random phase mask in the input plane and a phase mask based on the devil's vortex Fresnel lens (DVFL) in the frequency plane. The use of a structured phase mask based on the DVFL provides an advantage of extra encryption parameters, besides overcoming the problem of axis alignment associated with an optical set-up. The encrypted image resulting from the application of FrFT is attenuated by a factor and combined with a host image to provide a watermarked image. The decryption process is the reverse of the encryption. Digital implementation of the proposed scheme has been performed using MATLAB 7.1. The validity of the proposed scheme has been established by comparing the results of decryption with the input images. The performance of the scheme has been evaluated in terms of mean-squared-error (MSE). In addition, the sensitivity to encryption keys such as DVFL parameters and the FrFT orders has been studied. The proposed technique provides enhanced security. © Anita Publications. All rights reserved.

Keywords: Fractional Fourier transform, watermarking, devil's vortex Fresnel lens, mean-squared-error, peak-to-signal-noise ratio.

Total Refs : 64

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Periodically poled lithium niobate for Mid-IR tunable wavelength generation using nonlinear frequency downconversion

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In the present work, we demonstrate a high repetition rate mid-infrared tunable wavelength generation in a singly resonant Optical Parametric Oscillator (OPO). A multi-grating periodically poled LiNbO₃ (PPLN) fabricated in our laboratory has been used as a nonlinear converter. Multi-grating PPLN chip, which has been fabricated using electric field (E-field) poling technique, contained gratings with varying periodicity from 25.0 to 32.0 μm in the steps of 0.5 μm . The gratings have been observed to have around 45% duty cycle that is required for efficient parametric conversion. This period variation corresponds to the generation of signal beam from 1.3 to 1.9 μm and Idler beam from 2.4 to 4.8 μm , respectively for 1064 nm pump beam. A 1064 nm Q-switched Nd:YVO₄ laser at 10 KHz repetition rate and pulse width of 18.7 ns was used to pump the OPO. A maximum of 200 mW signal power and 150 mW of Idler power have been obtained with an input pump beam of power 2.6 W, for a period of 29.5 μm . A maximum optic-optic conversion efficiency of 14 % and 6 % in the idler has been observed. It has been observed that as we increase the period of the grating output power increases. © Anita Publications. All rights reserved.

PACS: 42.65.Ky, 42.65.Lm, 42.65.Yj, 42.65.Mp

Keywords: Optical Parametric Oscillator, PPLN, Parametric Generation, Frequency down conversion

Total Refs : 22

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Core technology for Terahertz applications

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The terahertz (10^{12} Hz) frequency range generation in condensed matter by asymptotic approaches from microwave side and from optics side needs to give way to the core Technology, which requires small device with low input power for the development and use of THz science for evolving technologies, which will take process monitoring and biological researches to high level of sophistication. © Anita Publications. All rights reserved.

Keywords: Terahertz, Harmonic oscillator/s, nonlinear interactions

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Wave propagation in ternary photonic crystal with metamaterials

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The photonic band structure of one dimensional ternary photonic crystal made of a conventional dielectric material, a negative permittivity and a negative permeability metamaterial is studied theoretically using the transfer matrix method. The proposed structure eliminates the Brewster's angle transmission resonance giving a complete photonic band gap, completely independent of polarization dependent weakly on angle of incidence. © Anita Publications. All rights reserved.

Keywords: Metamaterial, Complete band gap, Photonic crystals.

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Thermally actuated MEMS micromirror: Design Aspects

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The paper presents thermally actuated micro-mirrors with three degrees of freedom. The bimorph actuators are made of aluminum and silicon. The mirror and actuators are connected and thermally isolated through meander springs. Heaters with aluminum as the heater element were optimized using COMSOL simulation. The maximum actuator deflection is achieved at heater temperature of 106.59°C at applied voltage 0.2 V, with a response time of 0.9 ms. The resulting tilt angle of the mirror is ± 4.73 degrees. In piston mode the mirror displacement of 30 mm is achieved for the same applied voltage. © Anita Publications. All rights reserved.

Keywords: Bimorph, Spring, Micro-mirror, Heater element.

Total Refs : 12

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