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Simulation of Propagation of Sin-Gaussian Beam in powerfully Nonlocal nonlinear Media exploitation Paraxial cluster Transformation (SIMA)

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ABSTRACT:

In this paper, multiplication of Sinning e -Gaussian balance beam of light in strongly nonlocal nonlinear media has been stimulated by using paraxial group transformation. At first, Sin-Gaussian beam, nonlocal nonlinear media, critical power, transference matrix, and paraxial group transformation are introduced. Then, the extension of the Sin-Gaussian beam in strongly nonlocal nonlinear media is simulated. Results show that beam propagation has periodic construction during self-focusing gist in this typesetter's case . However, this simple sushisen method can be used for investigation of propagation of form of beams in RTM (Ray transfer matrices) optical media.

Keywords— *Paraxial group transformation, Nonlocal nonlinear media, Sin-Gaussian beam, RTM law.*

I. INTRODUCTION

Probe of extension of optical radio electron beam s in optical media is so important. Analytical answer is the common method acting of investigation of extension of optical electron beam. However, this result is an exact solution, but, it is complicated. Therefore, in this can use approximate solution instead of exact solution. One of the approximate solution methods is numerical solution. Furthermore, in this can use Christian Huygens -Fresnel integral to survey how the beam diffracts in the medium. This integral is modified by Collins integral and rewritten with respect to RTM matrix of the optical system of rules [1]. Along with it, presented the beam propagation method in the radicaling of symmetries of the paraxial wave equation, called paraxial group, and obtained closed form expressions for the propagation of any paraxial beam through misaligned RTM optical systems [II]. This method was used for propagation of Ince–Gaussian beams in strongly nonlocal nonlinear media successfully [3]. In this theme, at first, Sin-Gaussian beam, strongly nonlocal nonlinear media, and paraxial group transformation method are introduced. Then, the propagation of the Sin-Gaussian beam in strongly nonlocal nonlinear media is stimulated. Recently, there has been growing stake in the study of Hermite-sinusoidal-Gaussian (HSG) beams as a resultant of the works of Casperson and Tovar [4-5] and [6]. As a special case of the HSG beams, the Sin-Gaussian beams have many interesting applications such as optical telecommunication and improved pump laser with flat top beam shape for more efficient optical lasers and amplifiers [7]. This is because of its unique profile as a Gaussian beam that modulates with a Sin function. Also, strongly nonlocal nonlinear media is a media in which refractive index of the point depends on the beam intensity of the other points. Physical mechanism responsible for this type of nonlinear response includes various transport effects, such as warmth conduction in textile with thermal nonlinearity [8] diffusion of molecules or atoms accompanying nonlinear light multiplication in atomic vapors [9], drift and diffusion of photoexcited bursting charge in photorefractive materials [10], and it appears as a result of many body interaction processes in the verbal description of Bose-Genius condensates [11]. The propagation of optical beam of light in nonlocal nonlinear media have attracted considerable interest in recent long time . Therefore, in this investigate propagation of Sin fulness -Gaussian beam in strongly nonlocal nonlinear media by using paraxial group transmutation . Results appearance this method is simple and practical, and in this can use it for simulation of complicated optical ray in RTM optical media.

II. RESEARCH METHODOLOGY

Sin-Gaussian beam In this section, in this consider the optical distribution of the playing area of the Sin-Gaussian beam in free space which is expressed as [12]:

$$\sin\alpha \pm \sin\beta = 2\sin\tfrac{1}{2}(\alpha \pm \beta)\cos\tfrac{1}{2}(\alpha \mp \beta)\,/ZX \qquad (1)$$

Where w_0 is the beam width of Gaussian beam, A_0 is the amplitude, β_x and β_y are the beam parameters associated with the Sin part, and λ is the wavelength of beam. It consider a model of nonlocal nonlinear media that the refractive index change, Δn, can be presented in general form as [1]:

$$\Delta n(I) = \int R(x'-x)I(x',z)dx' \qquad (2)$$

Where x and z denote transverse and propagation coordinate, respectively. The function $R(x)$ is the response function that is real, localized, and symmetric of the nonlocal medium, and $I(x,z)$ is a light intensity. With increasing width of $R(x)$, the light intensity in the vicinity of the point x also contributes to the index change at that point. Nonlocal criterion defines as $\gamma = w_m/w_0$ where w_m is the width of response function. If $\gamma > 1$, medium is a strongly nonlocal nonlinear medium. Critical power, is a power in which Gaussian spot size remains constant during the propagation.

$$P_{cr} = \frac{1}{\gamma^2 z_0^2} = \frac{4}{k^2\gamma^2 w_0^2} \qquad (3)$$

Where k is wave number, and z_0 is Rayleigh distance. Propagation of paraxial optical beams in strongly nonlocal nonlinear media describe by nonlocal nonlinear Schrödinger equation:

$$2ik\frac{\partial\varphi}{\partial z} + \left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)\varphi - k^2\gamma^2 P_0(x^2+y^2)\varphi = 0 \qquad (4)$$

With due attention to governing equation of the nonlocal nonlinear media, in this can write RTM transfer matrix of media in terms of critical power, and Rayleigh distance as below:

$$\begin{pmatrix} A & B \\ C & D \end{pmatrix} = \begin{pmatrix} COS(\sqrt{\frac{P_0}{P_{cr}}}\frac{z}{z_0}) & -\frac{z_0}{\sqrt{\frac{P_0}{P_{cr}}}}\sin(\sqrt{\frac{P_0}{P_{cr}}}\frac{z}{z_0}) \\ \frac{1}{z_0}\sqrt{\frac{P_0}{P_{cr}}}\sin(\sqrt{\frac{P_0}{P_{cr}}}\frac{z}{z_0}) & \cos(\sqrt{\frac{P_0}{P_{cr}}}\frac{z}{z_0}) \end{pmatrix} \qquad (5)$$

A. PARAXIAL GROUP TRANSFORMATION

In paraxial group transformation method, in this obtain the output field after propagation through an arbitrary axially symmetric *RTM* system [2]:

$$E(r,z) = \frac{1}{A}\exp\left(\frac{ikCr^2}{2A}\right)E_{free}\left(\frac{r}{A},\frac{B}{A}\right) \qquad (6)$$

Where $E_{free}(r,z)$ is the field in free space, and A, B, C, D are the elements of transfer matrix. Therefore, If a closed-form expression for the free-space propagation of a paraxial beam is available, $E_{free}(r,z)$, in this model readily obtain the field distribution after propagation through an *RTM* optical system without solving Collins diffraction integral.

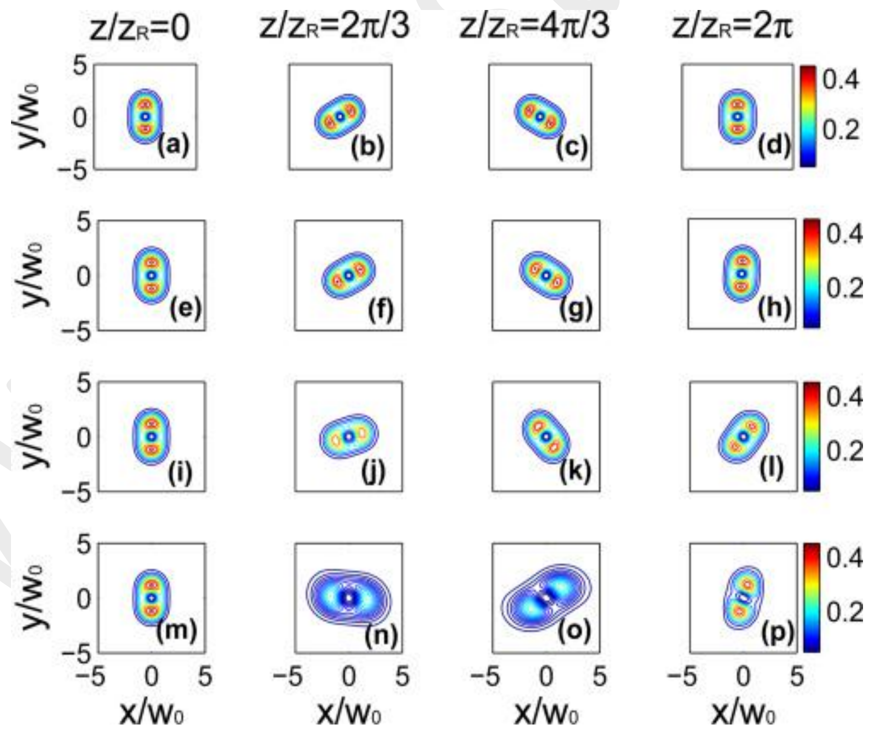

Fig.1 Propagation of Sin-Gaussian beam in free place.

B. SIMILARITY MEASURES

The second type of metric function used for comparing two feature vector s is the similarity measuring stick. The most commons physical body of the similarity measure is the vector inner product. Using our definition of vector A and B, the vector inner product can be defined by the following equation:

$$\sum_{i=1}^{n} a_i b_i = \left(a_1 b_1 + a_2 b_2 + \ldots + a_n b_n\right) \qquad (7)$$

This similarity measure can also be ranged normalized:

$$\sum_{i=1}^{n} \frac{a_i b_i}{R_i^{\,2}} = \left(\frac{a_1 b_1}{R_1^{\,2}} + \frac{a_2 b_2}{R_2^{\,2}} + \ldots + \frac{a_n b_n}{R_n^{\,2}}\right) \qquad (7.1)$$

Alternately normalize this measure by dividing each vector component by the magnitude of the vector.

$$\sum_{i=1}^{n} \frac{a_i b_i}{\sqrt{\sum_{j=1}^{n} a_j^{\,2}}\sqrt{\sum_{j=1}^{n} b_j^{\,2}}} = \frac{a_1 b_1 + a_2 b_2 + .. + a_n b_n}{\sqrt{\sum_{j=1}^{n} a_j^{\,2}}\sqrt{\sum_{j=1}^{n} b_j^{\,2}}} \qquad (8)$$

C. SUSHISEN ALGORITHM:

Input: avoid expanding NL-ONL already expensive
Output:Evaluation function f(n) = g(n) + h(n)

1. *Draw stick-man at the given angleg (n) = cost so far to reach n.*
2. *Identify the GIVEN sides (Opposite, Adjacent, or Hypotenuse) h(n) = estimated cost from n to goal.*
3. *Figure out which trig ratio to use f(n) = estimated total cost of path through n to goal.*
4. *Solve for the variable.*
5. *keep a single "current" state, try to improve it RTM>Cos X.*
6. *Very memory efficient (only remember current state) LRS<RTM;*
7. *A local minimum with h = 1.*
8. *Set up the EQUATION Best First search has f(n)=h(n).*
9. *Keep track of k states rather than just one=h(n) ≤ h*(n);*
10. *Start with k randomly generated states sin30=sin x = 0.8333.*
11. *At each iteration, all the successors of all k states are generated.*
12. *If any one is a goal state, where h*(n) is the true cost to reach the goal state from n stop;*
13. *Else select the k best successors from the complete list and repeat.*

II. SIMULATION

In this part, propagation of Sin-Gaussian beam in strongly nonlocal nonlinear media has been simulated. For this purpose, suppose $\beta_x = 4/w_0$, $\beta_y = 5/w_0$, $w_0 = 1$, and the optical wavelength is $\lambda = 800nm$. The Sin-Gaussian beam profile has been simulated in figure 1.

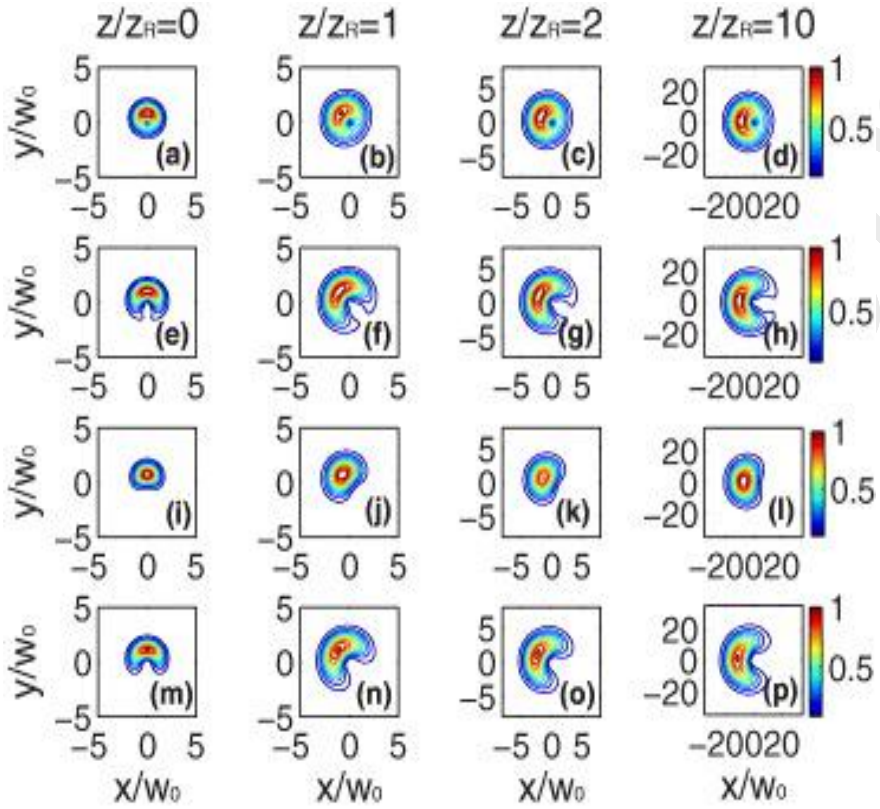

Fig 2. Paraxial group transformation methods RTM

In figure deuce extension of the Sin-Gaussian shaft of light in free people outer infinite for different extension infinite s is simulated. As it is seen, the balance balance beam diverges under extension and loss the original build as in this expected. With considering the equation of generation of Sin-Gaussian beam in free space, and transfer matrix of strongly nonlocal nonlinear media in paraxial group equation, propagation of Sin-Gaussian beam in strongly nonlocal nonlinear media can be simulated as display in figure 3. As mentioned before, Sin-Gaussian beam in free space has far field of battle divergence, but, in this media, because of reconciliation the linear diffraction and nonlinear direction , Sin-Gaussian beam has self-focusing and it no experience divergence, so the beam envelope periodically during propagation and return to original beam shape after proper distance and it seems more stable than free space. The effect of input power with respect to critical power investigates in figure 4. It can be seen from this figure for the same propagation distance. z, for $P_0/P_{cr} = 1.2$ the beam is more focused than $P_0/P_{cr} = 1$, and $P_0/P_{cr} = 0.8$.

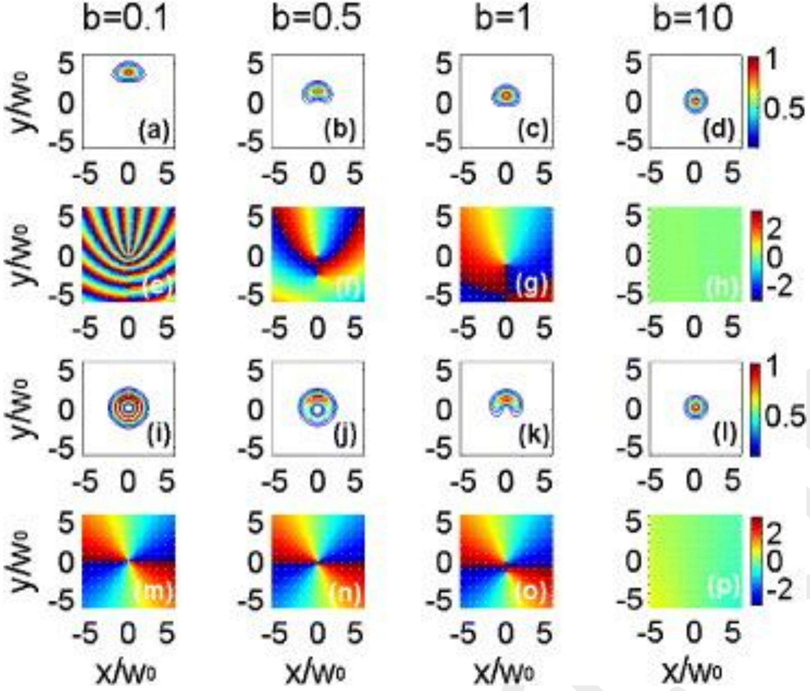

Fig. 3 Extension of Sin-Gaussian beam in strongly nonlocal nonlinear media with using paraxial group transformation methods Result

The physical excavation is when the stimulus force respect to the critical power increase , the catamenia of self-focal point lessening . One can obtain the same outcome by using William Wilkie Collins integral or by applying the numerical method acting acting on Wave equation, although the paraxial group method is easier. Intravenous feeding.

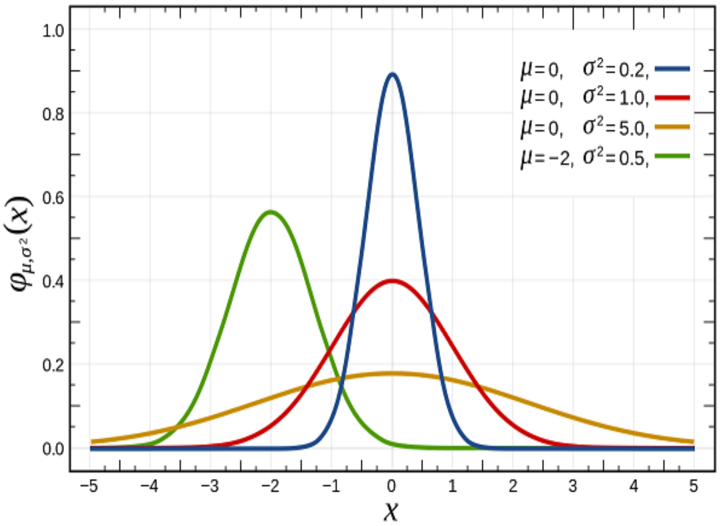

Fig. 4 Extension of Sin-Gaussian beam in strongly nonlocal nonlinear media Analysis

SYSTEM DESCRIPTION:

The experimental study has been conducted on a ASUS–X550C laptop with an Intel Core i3-3217U, 1.8 GHz CPU, and with the RAM of 4GB, running in Windows 8.1. All programs are coded in MATLAB.

III. CONCLUSION

In this paper, our investigate the lighter ray of light annex in strongly nonlocal nonlinear media. The radiation flight can be greatly affected by a strong nonlocal-nonlinearity. In this example , the annexe equivalence can be linearized, such as the electron balance shaft of light generation can be described by Collins chemical expression based on RTM matrix . Instead of it, in this attempt to describe radio shaft of light telephone extension using paraxial group hypothesis . In this method, if in this have equation of multiplication of the beam and transportation matrix of the media, by having free quad beam extension , in this can simulate the propagation of the beam in this media. So, by using this method, one can readily investigate propagation of complicated optical beams in RTM optical media. For this case, propagation of the sin -Gaussian beam in strongly nonlocal nonlinear media is simulated. Results show the Hell -Gaussian beam profile changes alternatively during propagation in this media and return to the initial shape after passing a geological period ic length. Also, by increasing the initial baron , the period of self-direction of the beam decreases as the self-focalisation event increases by increasing the stimulation might with respectfulness to critical power which is depended on nonlocality. As a result in this can control detergency of the beam by solidifying nonlocal nonlinearity of the cultivation medium . These results can be applied to many diligence prCommon fig . 3 Multiplication of Wickedness fulness -Gaussian beam in strongly nonlocal nonlinear media with using paraxial group shift methodogram such as optical communicating, optical qualifying and laser amplifier.

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REFRENCES

i. E.G. Gamaly, A.V. Rode,Physics of ultra-short laser interaction with matter: From phonon excitation to ultimate transformations,Progress in Quantum Electronics, Volume 37, Issue 5, September 2013, Pages 215-323.

ii. Antonmaria A. Minzoni, Luke W. Sciberras, Noel F. Smyth, Annette L. Worthy,Elliptical optical solitary waves in a finite nematic liquid crystal cell,Physica D: Nonlinear Phenomena, Volumes 301–302, 1 May 2015, Pages 59-73

iii. E.G. Gamaly, A.V. Rode,Physics of ultra-short laser interaction with matter: From phonon excitation to ultimate transformations,Progress in Quantum Electronics, Volume 37, Issue 5, September 2013, Pages 215-323

iv. Kaige Zhu, Xinlin P. Qing, Bin Liu,A reverberation-ray matrix method for guided wave-based non-destructive evaluation,Ultrasonics, Volume 77, May 2017, Pages 79-87

v. Lj. Janicijevic, S. Topuzoski, L. Stoyanov, A. Dreischuh,Diffraction of a Gaussian beam by a four-sector binary grating with a shift between adjacent sectors,Optics Communications, Volume 389, 15 April 2017, Pages 203-211.

vi. Saad, A. BelafhalA detailed study of internal conical refraction phenomenon of Flattened Gaussian beams propagating in a biaxial crystal,Optik - International Journal for Light and Electron Optics, In Press, Accepted Manuscript, Available online 16 March 2017

vii. Guanxue Wang, Yu Miao, Qiufang Zhan, Guorong Sui, Rongfu Zhang,Focusing of linearly polarized Lorentz-Gaussian beam with helical axicon,Optik - International Journal for Light and Electron Optics, Volume 130, February 2017, Pages 266-272.

viii. Senthil P. Image Mining Brain Tumor Detection using Tad Plane Volume Rendering from MRI (IBITA). Journal of computer science. 2016;2(Vol.1 Issue. 1, June- 2016, pg. 1-13):1-3.

ix. Senthil P. Enhanced of Image Mining Techniques the Classification Brain Tumor Accuracy (ENCEPHALON). International Journal of Computer Science and Mobile Compution. 2016;5(Issue 5):page-110.

x. Senthil P. Image Mining in Fuzzy Model Approaches Based Random walker algorithm Brain Tumor Analysis (Meningioma Analysis). International Journal of Computer Science & Engineering Technology (IJCSET). 2016 Aug 1;7(ISSN : 2229-3345 Vol. 7 No. 07 Jul 2016):303-TO.

xi. Senthil P. Image Mining Brain Tumor Detection using Tad Plane Volume Rendering from MRI (IBITA). journal of computer. 2016;1(Vol.1 Issue. 1, ISSN:2518-6205):Vol-1.

xii. Senthil P. Image Mining Base Level Set Segmentation Stages To Provide An Accurate Brain Tumor Detection. International Journal of Engineering Science and Computing, July 2016. 2016 Jul 28;6(Volume 6 Issue No. 7):DOI-10

xiii. Senthil P. IMAGE MINING EFFECT USING GAUSSIAN SMOOTH IN BRAIN TUMOR INCREASING THE SEGMENTING ACCURACY (I- MENINGIOMA). Journal of Computer - JoC, ISSN:2518-6205. 2016 Jul 26;2(Vol.1 Issue. 2, July-2016):pages-63.

xiv. Senthil P. IMAGE MINING USED SEGMENTATION TECHNIQUE MRI SCAN BRAIN TUMOR IMAGES ANALYSIS (IMUSA). Journal of Computer - JoC, Available Online at: www.journal.computer. 2016 Jul 22;1(Volume 1 Issue 1 ISSN:2518-6205):36-50.

xv. Senthil P. Image Mining Brain Tumor Detection using Tad Plane Volume Rendering from MRI (IBITA). journal of computer. 2016;1(Vol.1 Issue. 1, ISSN:2518-6205):Vol-1.