

Application of Endoscopic Holography

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ABSTRACT: *An endoscopic is an electronic device which does not involve any kind of surgical procedure. It is a device that involves light and a camera attached to it to visualize digestive track on a monitor. However, an endoscopic holographic is a procedure which is a combination of an endoscopy and holography, this technique display is contingent on a lively holographic approach. This holographic technique is utilized in visualizing an internal cavity of the body. In manipulation of an image the proficiency to capture pictures of an internal cavity with vigorous focal-distance, 3-D and high perseverance image will enhance the exposure of cavity. By recording the image of the cavity involving the holographic feature increase resolution to visualize and review meticulously. In this paper an endoscopic is premeditated using an optical fiber for elucidation wherein holographic is formulated at the outer end of the endoscope. With this technique the visualization of each individual cell increases its resolution and magnification. Particular pigments and color is utilized to enhance the picture of cavity captured by the holographic camera. The proficiency to accomplish evolution in holographic utilizing the phenomenon of an interference over optical fiber. In future this technique prompts more improvement in the medical fields.*

Key words: *Endoscopic, Holographic, Optical Fiber, 3D holograph, Resolution, Accuracy.*

INTRODUCTION

Endoscopic is a process of analysis by which the device gets inside through the mouth to take a look inside the esophagus, stomach etc. depending on the type of endoscope used. It can be divided into different types depending on scope, namely regular esophagogastroduodenoscopy(EGD) scope, operand endoscopy which involves a front viewing camera to visualize directly at the esophagus, stomach and small cavity. Then we have endo-holography which contributes the benefits of capturing the image of an intracellular in 3-D as well as high magnitude and resolution. In 1976 the first introduction of a holographic endoscope was fabricated by Hadbawnikl, which involve the above mentioned features of a holographic endoscope. From that time, itself a lot more research papers have been proclaimed involving enormous details. Endo-holographic tomography can be employed for transcription and recording of an intracellular cavity with high magnification, high resolution and also in 3-D pictography[1].

It is also possible to utilize holographic endoscopic involving multiple mode of optical fiber but with multi-mode of an optical fiber in endoscopic the resolution of the image decreases and the three dimensional picture quality lost. At current situation, there is not any veracious screening method which detect the infection earlier, these problem prompt hazardous to patients. Evolution of medical imaging equipment which is capable of aiding in the pre-detection of cavity which will decrease the growth rate of cavity by increasing rate of early

detection[2]. So to utilize multi-mode optical fiber which include capturing of image with an outer recording of a hologram a laser light can be installed for classification.

How Holography Performed:

To experiment an endoscopy, the transference pattern accomplishes two times i.e. in the beginning they elucidate the incoming of the fiber through different elucidation direction, so elucidating an object positioned exactly at the outlet on the other side well-established, dotted elucidation. Subsequent, on the alternative outlet the elucidated substance remit laser light back into the fiber, on the contrary the scuffled image which is already presented can be unscrambled by utilizing transmission pattern [3]. The dotted characteristics of the elucidation obtained from the single-core fiber (SCF) shows that the image obtained from them carries enormous noise. Even so, by varying the angle of elucidation many times by which the laser light inscribed inside the optical and combining the pictures, this dotted elucidation balance out, and the output parodies the resemblance of image by an unconnected reference. Thus a clear picture of the resemblance gets recovered, with a higher resolution. This technique also accomplishes enormous benefits such as it is constitutionally corresponding to arithmetical three-dimensional holography wherein the amplitude of the resemblance can be regained. So it is feasible to reconstruct the image in arithmetical and retrieving the image in digital holographic form without any scanning involvement of an optical fiber.

For proving the technique an experiment has been functioned where exploratory resemblance of matter from rabbit small intestine is viewed and established the image resolution of the matter, its outer view and also its capacity of visualization. Although the transference pattern of a multiple optical fiber is implemented by various applications and groups namely extracting, focusing, and luminescence imaging [4], this work demonstrates, for the first time, the use of a multimode fiber as a real endoscope, wherein in the transference pattern is that is nothing but the laser light is reflected and viewed in the form of image [5]. Clear visualizing process from a complicated image or object including visible antithesis and higher resolution is the major inventive step in the medical applications. In this new era of optics wave-front have laterally subsidized [6] forming in the form of radar and acoustics [7]. In this present time this similar approach is helping to enhance the endoscopy technique by modifying its shape and reducing its size. Further this similar technique will proceed with the new technique for gaining the resolution, less overlap imaging of tissue, great intensity which are currently not possible.

REVIEW OF LITERATURE

While going through the prior literature it was found that single mode fiber is utilized to carry single mode and it is found with less intensity and resolution because the characteristics is obtained while removing the noise from the image, among various research paper a paper titled “Endoscopic pulsed digital holography for 3D measurements by A. Tonatiuh Saucedo, Fernando Mendoza Santoyo, Manuel De la Torre-Ibarra discussed the different formula used

to performed the holography test, also explains the 3-dimension evaluation of the systems and shown diagram of the device, explains the Fourier spectrum consisting of three incoherently added digital holograms. Geometry of the illuminating beams, showing the unitary vectors of illumination, shows the wrapped phase map of three illumination directions[8].

A research paper titled “Performance of endoscopic holography with a multicore optical fiber” by Olivier Coquoz, Ramiro Conde, Fatemeh Taleblou, and Christian Depoursinge discussed the introduction of holography, explains different material and methods associated with the holography, simulation of holography circuit, also shown the schematic diagram of holographic setup also explains the reason behind experiment to be performed wherein disclose that experiment were performed to analyze and quantitatively characterize the different source of noise. Interference effects between the different modes of propagation in a fiber core could be evaluated by comparison of an image recorded in normal condition to an image in which vibration applied to the imaging multicore fiber provoked an averaging of the light pattern transmitted by the cores[9].

CONCLUSION

In this paper endoscopic holography and holographic method which utilize interference pattern for veracious mensuration through multi-mode optical fibers has been prosperously established. This technology comprises enormous benefits with each of the system. Here endo-holographic imaging system permits for one universal macro and the other microscopic analysis of the appropriate samples. This system can be utilized for the overall analysis of an objects along with the analysis of effective circumstances involving holographic interferometry for fluctuation and contortion mensuration. Whereas holographic interferometry over multi-mode optical fibers, extant endoscopes utilized by doctors can be appropriate for in-vivo endoscopic interferometric considerations subsequently, interference peripheral arrangement might yet be constructed along with the oscillation of the multi-mode optical fiber throughout and amongst divulgence. This technology is not circumscribed to in-vivo endoscopies analysis but are appropriate to fag and fissure analysis of substance also.

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