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STRUCTURAL ANYLYSIS AND CHEMICAL MAP OF PHARMACEUTICAL TABLET USING DIGITAL IMAGE PROCESSSING

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Abstract: Digital image Processing is a vast field in industrial world. But today's world is getting highly automated and technologically more advanced, so the analysis is one of the important factor for getting the things highly protected. so we need more sophisticated and reliable methods that will be easily operated. This paper describes the different methods related to the Structural Analysis and Chemical map of pharmaceutical tablet using digital image processing. In this, different methods for structural Analysis and Chemical map of pharmaceutical tablet are discussed ,so that we can have better method for analysis . Thus the results of this proposed technique will provide a system that will be highly efficient and effective in pharmaceutical fields.

Keywords: Pharmaceutical tablet, Structural Analysis, Chemical mapping

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INTRODUCTION

Image Processing involves techniques and algorithms for processing the digital images. Image processing provides greater contribution to science and technology as the digital images have a greater impact on modern society. Image processing includes many techniques like pattern recognition, feature extraction, template matching and edge detection to process digital images. They help in faster manipulation of digital images. Manual inspection is automated using image processing techniques. Automation of Visual inspection is very important in manufacturing industry for quality assurance of products. In pharmaceutical industry, drugs have to be inspected for defects and anomalies. The inspection process has to be effective to detect the foils with defects [1]. Pharmaceutical products are susceptible to several common flaws like incorrect sizes or color, dents, cracks, holes, bubbles and missing caps. To guarantee every tablet is free of defects, each capsule must be inspected individually. Also, since maintaining the high throughput of manufacturing is critical, all defects should be detectable in a single inspection The terahertz region of the electromagnetic spectrum has a unique combination of properties in that terahertz waves can propagate through most pharmaceutical materials; many experiments and active ingredients show characteristic spectral features in the terahertz region; and the radiation is no ionizing and is safe to use. We have previously demonstrated that terahertz pulsed imaging (TPI) can be used for nondestructive analysis of coated tablets. In this paper, we demonstrate further that the buried structure within a pharmaceutical tablet can be mapped non destructively using the TPI technique. Furthermore, the chemical identity of the buried structure can also be revealed by using its spectral signatures.

LITERATURE SURVEY

A. Terahertz pulsed imaging

Yao-Chun Shen and Philip F. Taday [1] used Terahertz pulsed imaging system to demonstrate further that the buried structure within a pharmaceutical tablet can be mapped non destructively using the TPI technique. Furthermore, the chemical identity of the buried structure can also be revealed by using its spectral signature. Most pharmaceutical tablets have curved surface therefore, a laser gauge employing a visible laser beam with a wavelength of 670nm was used to precisely model the surface shape/curvature of the tablet under investigation. The generated surface model was subsequently used for TPI measurement, thus ensuring that during TPI measurement, the sample is always at the terahertz focus position

with the sample surface always perpendicular to the terahertz probe (a six-axis robot system was introduced to handle the sample).

B. Detection of Broken Pharmaceutical Drugs using Enhanced Feature ExtractionTechnique

Ramya.S*,Suchitra.J*,Nadesh R.K+ [2] states that Image processing includes many techniques like pattern recognition, feature extraction, template matching and edge detection to process digital images. They help in faster manipulation of digital images. Manual inspection is automated using image processing techniques. Automation of Visual inspection is very important in manufacturing industry for quality assurance of products. In pharmaceutical industry, drugs have to be inspected for defects and anomalies. Drugs with defects are not advisable to be consumed. There may be side effects in consumption of broken drugs. The foil may contain broken tablets or missing capsules. The inspection process has to be effective to detect the foils with defect. Hardeep Kaur ,Er.Nidhi Garg[3] describes the Pharmaceutical products are susceptible to several common flaws like incorrect sizes or color, dents, cracks, holes, bubbles and missing caps. To guarantee every capsule is free of defects, each capsule must be inspected individually. Also, since maintaining the high throughput of manufacturing is critical, all defects should be detectable in a single inspection. The most common and currently affordable method of detecting these flaws is visually.

Emilia Dana SELEŢCHI [4] states The interactive tools allowed us to perform spatial image transformations, morphological operations such as edge detection and noise removal, region-of-interest processing, filtering, basic statistics, curve fitting, FFT, DCT and Radon Transform. Making graphics objects semitransparent is a useful technique in 3-D visualization which furnishes more information about spatial relationships of different structures. The operations for image processing allowed us to perform noise reduction and image enhancement, image transforms, colour map manipulation, colour space conversions, region-of interest processing, and geometric operation . One approach to extract the absorption coefficients of the sample is to introduce an additional phase shift ($e^{-jk(v)2\Delta x}$) into the reflection coefficient. This compensates the phase shift caused by the imperfection of the measurement, such as the rough surface of the sample. As the first approximation, we currently used a constant Δx value (at each pixel) to compensate for all frequency components. the extracted extinction coefficient from the measured tera hertz wave form before and after the phase shift compensation. Nevertheless, using a constant Δx value still provides satisfactory results for most samples studied.

Once the absorption and refractive index spectra are deter- mined, various spectral matching techniques can be used to generate chemical maps. We used the cosine correlation

map- ping (CCM) for chemical mapping. For this purpose, we define a pixel vector as p (terahertz spectrum measured for the sample under investigation) and a target vector as t (terahertz spectrum measured for the reference sample). The smaller angle means more similarity between the pixel and the target spectra. Note that both the absorption spectrum and the refractive index spectrum can be used for calculating the chemical map. A morphological operation like 'opening operator' is used to detect the defects. Image segmentation is done and the input image is filtered to remove the noises thereby making the input image fit for further processing. The image is subtracted by inscribing rectangles with morphological operation. Then the image is subtracted from the original gray image which identifies the broken tablets. Pseudo colouring is done and the pixel of the broken tablet is calculated. For capsules , corner detection and harris algorithm is used to defect the individual capsule with holes, incorrect size or colours and cracks. The input image undergoes pre-processing. Objects are extracted based on the region based properties. Corners are detected and it is compared with the template image. If the feature points match in the template image and the test image capsule is accepted otherwise rejected. The image is captured and given as input to the system. In the case of tablet, the gray scale image of the input is obtained. Gray Scale image is the conversion of the colour image to monochromatic shades of black to white. The gray scale is enhanced for further processing. Edge detection in digital image marks the regions where the brightness changes sharply. Image enhancement involves removal of noise from the image using thresholding. Conversion of gray scale to binary image is called thresholding.

PROPOSED SYSTEM

we propose a system in which the procedure for the analysis of pharmaceutical tablet are as follows .

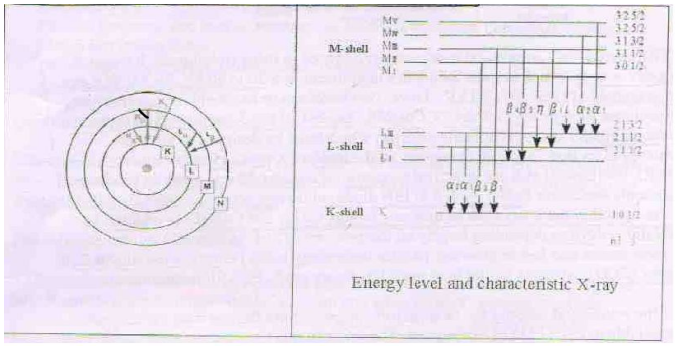

Figure1.Energy level and characteristic X-ra

A. Pre-processing

Image enhancement is used as Pre-processing tool, in this pharmaceutical application the best enhancement method is median filtering and it also do the denoising of the image.

B. Region Based Statistic

Region based Statistic like biggest area is computed from region based properties so that object from the image is extracted and further processing is done on it. Region based statistic include area, convex area, perimeter, centroid of the capsule

C. Energy Dispersive X-ray fluorescence

Using Energy Dispersive X-ray fluorescence we can calculate the spectrum of different elements in the sample tablet. using this spectrum we can say or determine the exact percentage of chemical present in the tablet.

we will compare the energy dispersive x-ray image and region based statistics and different methods. The efficient method results will be compared with the stored templates of energy level of different elements in the tablet and thus conclusion can be drawn.

CONCLUSION

After making a comparative study between different methods such as Tera- Hertz pulsed imaging, Region based statistics, Energy dispersive X-ray fluorescence of pharmaceutical tablet. It can be concluded that Energy dispersive X-ray fluorescence is more effective and efficient method for studying structural analysis & plotting a chemical map of pharmaceutical tablet.

Using this method we can study the chemical composition of tablet. The different chemical component or element present in the tablet give different energy dispersive x-ray spectrum. After studying these energy spectrum, we can calculate the percentage of the chemical elements in pharmaceutical tablet.

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