International Journal on Future Revolution in Computer Science & Communication Engineering ISSN: 2454-4248
Volume: 5 Issue: 5 40 – 44

A Study on Inspection of Defective Tablet Blister Using Image Segmentation Techniques

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Abstract –humansareaffectedfrom many kind ofdiseases**.** Proper Medicationistheonlywaytoovercome fromsuchdiseases**.**Somedicinesbecome most important part of human life.Manufacturing of medicines is done in very large scale. Duringmanufacturing**,** thereare many kind of defects in tablet blister, defects are likebreakage**,** cracksetcpresentin tablets or capsules.There may be side-effects of these defected tablets or capsules due to variation in dosage when consumed. The manufactured tablets should be properly inspected before reaching to the public, so that they do not cause any side-effects.Manual inspection of such defects in tablet blister may be very challenging task.Image segmentation is an important technique for automation of visual inspection. Hence, it is important to propose some approaches to detect these defects in tablet blister. In literaturesurvey many researchers have proposed multiple procedures for identifying defects in tablet blister. In this research work we review allthe methods used to identify defects in tablets blister.

Keywords:*Image Segmentation,Tablet blister,broken tablets, Missing tablets.*

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I.INTRODUCTION

Pharmaceutical industry produced drugs in very large scale. These drugs play most important role in human life. Medicines become part of human life. But during manufacturing there may be defects in tablets so it need proper inspection. Hand-operated inspection of these tablets that are manufactured on massive scale takes a lots of time and hence it is a very challenging task. So, here some methods for identifying defects in tablet blister using image processing are proposed. Image processing is a method which is used to perform some operations on an image, in order to get an enhanced image or to extract some meaningful information from it. Image processing is a type of signal processing where input is given as an image and output may be image or characteristics or useful features associated with that image. Image processing provides so many benefit to science and technology as on modern society digital images have a greater impact. Some types of image processing Techniques are used to detect defects in tablet blisters. First is image acquisition and second is image segmentation. Image acquisition is basically taking pictures from source of camera in real time. Also, we can edit these pictures and extract some useful features or parameters from the pictures. According to our requirement we can apply filters on the picture, this is called Image Enhancement. The size of the image can be reducing by reducing their pixels in the image, this helps in storage of more picture is called Image Compression. Image segmentation are used to partition an image into same types of segments. By using image cropping we can extract only some part of the image. Thus, image processing has anumber of fields with various techniques.

II. INSPECTION OF TABLETS

Blister Packing is used by pharmaceutical industry to package tablets and capsules. The need for good accuracy and flawlessness with regard to the products as well as the packaging in the pharmaceutical industry, these blister packs need to be checked correctly.A camerabasedinspection system is the most efficient way to inspect and verify all the defects of a tablet blister pack. This system inspect all the types of blister packs commonly used by pharmaceutical industry. Additionally, it performs reliable inspection of any kind of faults in the tablet or capsule.

Vision inspection systems can detect following defects:

1. Missing Tablets or capsules
2. Wrongly Shaped Tablets or capsules
3. Cracked/Broken Tablets
4. Color Differences (Bi-color, Tri-color Tablet/Capsule)
5. Tablets Oversized and Tablet Undersized Area
6. Misalignment of Tablet

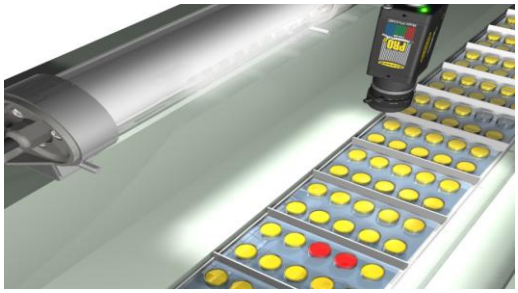

Fig.1:Inspectionoftabletsinindustries

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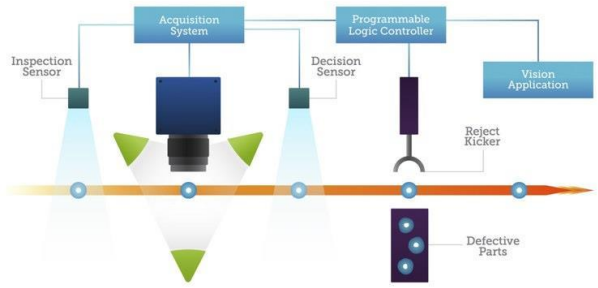

Fig.2:Tabletdetectingprocess

In the inspection system shown in fig.1 and fig.2 inspection sensor sense, every tablet blister. Camera is used for capturing the image of each of the tablet blister. Capturing pictures from the source of the camera is called image acquisition. Image of each blister are used to apply some operation of image segmentation to extract some useful features or parameter of the pictures. The programmable logic controller is used to rejecting the defective tablet blisters.

III. TECHNIQUES

Many researchers have proposed various techniques to detect the defects in the tablet blister. Some of techniques are:

1. Region-based bounding box properties: Sudharshan et.al [1] proposed median filtering used to remove noise while retaining edges and region based bounding box properties are used to exactly mark the boundaries of the tablets in the blister. The system is implemented in MATLAB which helps in automatic detection of defects that occur in tablet blisters after its production. The system uses a median filtering technique to remove noise from an image. It then uses thresholding to convert the gray image to a binary image of tablet blister. By using bounding box property of MATLAB, it draws a rectangular box around each tablet on the tablet blister hence detecting the boundary of each tablet. By using the region properties, the system helps in detecting foils in tablets like cracks, wrong color, missing tablets or size variance from one tablet with others. Finally, the system separates the defected tablet and non-defected tablet using if condition. Fig.3 represent input image of tablet blister and Fig.4 represent image after bounding box.

Fig.3: input image of tablet blister

Fig.4: image after bounding box

2. Enhanced Feature Extraction technique: Deepti and Rajiv [2] proposed Enhanced feature extraction technique which is implemented with the different type of tablet blisters and capsule blisters. There are so many methods for the detection of broken or missing tablets in tablet blister. here it uses two technique one is center of mass and other is color segmentation. In the Centre of Mass, we calculate the centers of each tablet in tablet blister, if centers are detected then the tablet is present in the tablet blister, if center is not detected then tablet is broken or absent.in the Color Segmentation Method, template matching are used Color Detection are applied on the blister of Capsules. There are two images of blisters, the first image of the blister with Missing Capsule and another image of the blister with all Capsules present in capsule blister. By applied matching operation on pixels of these two images, we concluded that there is a missing capsule or not. That is, if the pixel values are same then there is no missing capsule in capsule blister. If these values are different then capsules are missing. The number of capsules which are present is displayed in the results. The Center of Mass method easily detects broken and missing tablets in tablet blister. The color detection method can detect any color of capsules or tablets in the blister only by changing the value of color. Thus we can say that both the methods are easy to implement and shows their results of blisters precisely. Fif4 and fig5 reprent the input and output image for feature extraction. Fig.5 and Fig.6 represent input and output image for feature extraction.

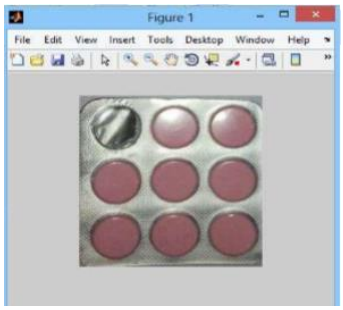

Fig.5: Input image for feature extraction

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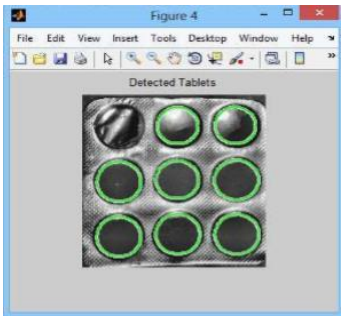

Fig.6: Output image for feature extraction

3. Entropy-Based Filtering And Histogram Processing: Shobha Rani et.al [4] proposed methodology performs the automatic inspection and verification of tablet blisters in three phases like pre-processing, segmentation, classification, and recognition. In the first phase, the pre-processing of the tablet blister is performed by applying various spatial filtering techniques and gray level intensity transformations to convert the input image into a gray image. The second phase focuses on the segmentation of tablet pills using horizontal and vertical histograms on a binarized image obtained from a well-pre-processed image. The third phase performs the feature extraction, classification and recognition of the segmented components of the image into either of classes like a valid tablet, broken tablet, unfilled tablets, and half-filled tablets by extracting correlation features of each segmented components. Once the classification is performed the tablet pill is considered to be a recognized one. Fig.7 represent gray scale image of broken tablet and Fig.8Entropy filtered image of broken tablet.

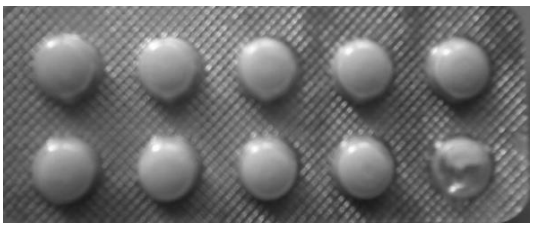

Fig.7:Gray scale image of broken tablet

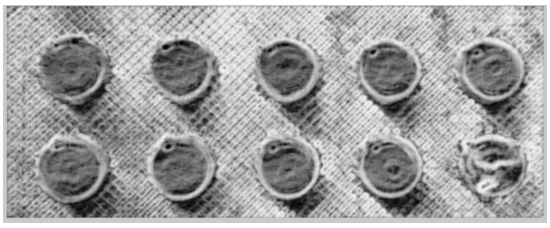

Fig.8:Entropy filtered image of broken tablet

4. Statistical method: Huvaidaet.at [5] proposed statistical method which used to find the defect in tablet blisters. RGB image of the tablet blister is converted into gray and then it converted to binary. The binary image has noise so in order to get a noise-free image of tablet blister, some morphology opening is used to remove the noise. Boundaries of the output are detected after preprocessing operations. After this preprocessing determine the roundness of each tablet in tablet blister, find the area and perimeter of each tablet. After calculating area and perimeter, find the metric of each tablet in the tablet blister. Metric which closer to 1 indicates that tablet is not broken or tablet is completely round.

Area $A = \pi r^2$

Where r is the radius of a circular tablet

Where d is the diameter of a tablet

Perimeter P = $\pi * d$

Therefore, metric M = $(4*\pi*A)/P^2$

So, the metric which closer to 1 indicates that tablet has not defected. Also, no. of tablets are calculated which helps to determine the correct figure in a tablet blister. Counting can also help to find a pharmaceutical company. They can simply reject the blister containing less or greater no. of tablets. Edge Detection using a Statistical Method can determine the defective tablets only if the tablets are circular in shape. The circular tablets have a particular fixed area. If the tablets are broken, they deviate from the roundness of the tablet. So in this way defect can be detected in the tablet blister. It is concluded that the whole process takes less than 2 seconds of time. Linux Debian 5 has greater speed, so it is recommended to use this machine for operation on blisters. Statistical method can detect the perimeter of each tablet in the tablet blister and also helps in the detection of edges for each tablet in the blister. Fig.9 and Fig.10 represent input and output image for statistical method.

Fig.9:Input image for statistical method

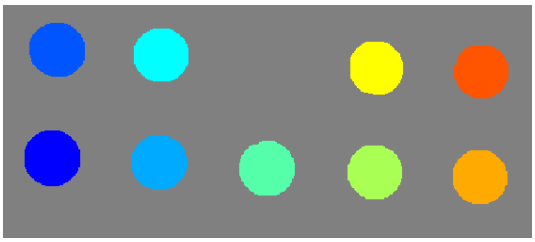

Fig.10:Output image for statistical method

5. Canny and RC algorithm: Munish et.at [6] propsod Canny Edge Detection and RC Algorithm which are used to find the defective tablets in the tablet blisters. It consists of the steps which include pre-processing, edge detection, and template matching and calculating the matching percentage. It was implemented with different samples of capsules and tablets blister. This approach covers all the aspects of the

defects related to shape, size of the tablets or capsules. This algorithm can be implemented in many digital Image processing environments and it can be a part of complex automated manufacturing and testing system of image. Canny and RC algorithm is the most powerful edge detection techniques and can easily detect the edges of each tablet in the tablet blister.

6.Center of Mass method: Shilpaand Arun[7] proposed The Centre of Mass (COM) edge detection technique with Prewitt Operator is used for detecting edges by knowing the center of the tablets in the tablet blister. This method can be used as a template for multi-scale edge detectors for processing with different types of images. From the experimental result and analysis, it is concluded that the COM with using Prewitt Operator Technique provides better results. Center of Mass method calculates the radii of each tablet in the tablet blister and hence helps in determining the edges of each tablet in the blister. The center of each tablet in the blister is detected by using Center of Mass if centers are detected then the tablet is present in the blister, if not then the tablet is broken or missing. Similarly, we applied the Center of Mass to count the number of capsules in the blister. We take an image of the blister with all Capsules present in the blister. Find the distance between the Center of Mass with all the pixels along the boundary for each tablet. Find out the range and select the object having greater than equal to the selected range. Thus Total no of capsules present in the blister is calculated.

7. Fourier Descriptors and Support Vector Machines: Pengand Shutao[8] proposed a novel approach for tablets vision inspection to find the defects in tablet blister based on Fourier descriptors for feature extraction and SVM for classification is proposed. The Fourier descriptors method is used to extract the boundary features of tablet image effectively and the SVM classifiers are very suitable for high-dimensional samples of tablet features extracted. Experimental results demonstrate the method's efficiency and application value in a tablet inspection system for the pharmaceutical industry.

8.Harris algorithm: Hardeep andNidhi [9]proposed Harris Algorithm which used for Feature Extraction and Pattern Recognition in the blister. Using this algorithm, the corners are efficiently detected. It finds the defects related to shape, size and surface types of defects in the pharmaceutical drugs. Harris algorithm can efficiently detect the interesting point in the tablet blister image. It can also help in comparison to a test image of the blister with the template image. The first step is the Pre-processing of the input image. Image enhancement is used as Pre-processing of the input image. The best de-noising method of the image is the median filtering. Harris Algorithm is used for feature extraction and Pattern Recognition of the tablet blister. The main components in this algorithm are detection, description, and matching. detection, identify the interest points and then to get the corner score of the pixel of the tablet image. The matrix for the tablet image is then computed. Points with larger corner response which is greater than some threshold are found. description, extract the vector feature descriptor surrounding each interest point that is Correlation matrix is determined around interested points in the tablet image. Then Take the points of local maxima and Perform non-maximum suppression. Finally, it finds the correspondence between the descriptor in two views by Auto-correlation. If there is a correlation mismatch then defects are detected in the blister. These work approaches detect all the aspects of defects related to the shape, size and surface defects of the pharmaceutical drugs.

IV.CONCLUSION

Identifying defects in tablet or capsule blisters is an automated visual inspection of pharmaceutical drugs. In The inspection system of tablet blister image processing techniques are used. There are so many image processing techniques which are used to detect defects in tablet or capsules blister. Detecting some defects in tablet blister is a major subject of industrial inspection that includes a large area of products. In this paper, we present a study on all the techniques for the detection of broken tablets using image processing techniques in an object-oriented image processing software. All The algorithms can be implemented in various digital image processing environments and can be a part of a complex automated manufacturing and testing system. The proposed methods easily detect broken and missing tablets. Thus we can say that all the methods are easy to implement and showing their results precisely. All these methods are implemented using different tablet strips and capsule blister. In all cases of inspection, they give good results.

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