

# Inspection of Defective Pharmaceutical Capsules using Harris Algorithm

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**Abstract-**The main application of image processing in industries is to inspect the products for wrong or missing parts. A vast amount of different pharmaceutical products that is tablets and capsules are produced, prescribed and consumed everyday worldwide. Visual inspection is a very challenging task, especially because capsules come in different sizes, shapes, colors and may have different visual defects. The proposed paper presents an application for detection of defective capsules using different image processing techniques.

**Keywords:** Image enhancement, Region Based Statistic, Corner detection, feature descriptor.

## I. INTRODUCTION

In pharmaceutical industry, zero defect quality products are highly required in competitive markets as it effects reputation of any manufacturing industry. So a very cost effective, high throughput and reliable quality inspection method is important in that industry. Detecting some anomalies is a major theme of industrial inspection that includes a large area of products.

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. The paper proposed the work on defect detection of capsules as no proper algorithm was applied for complete defect detection of capsules. In this paper, section 2 describes corner detection and feature extraction, section 3 describes

Simulation Results, section 4 describes the conclusion.

## II. PROPOSED WORK APPROACH

### 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. Harris algorithm

Harris Algorithm is used for feature extraction and Pattern Recognition. Using this algorithm Corners are detected where the window detect change in intensity in all directions. The main components are:

- 1) Detection: Identify the interest points.
  - Compute  $M$  matrix for image window surrounding each pixel to get its cornerness score.
  - Find points with large corner response that is greater than some threshold.
  - Take the points of local maxima, i.e., perform non-maximum suppression
- 2) Description: Extract vector feature descriptor surrounding each interest point that is Correlation matrix is determined around interested points.
- 3) Matching: Determine correspondence between descriptor in two views by autocorrelation. if there is correlation mismatch then defects are detected.

If feature points match in template and test image, capsule is accepted otherwise rejected. This algorithm detect all possible defects of the capsules like holes, cracks, scratches, broken cap, double cap and missing cap.

Fig1. Describe the flow of proposed work approach.

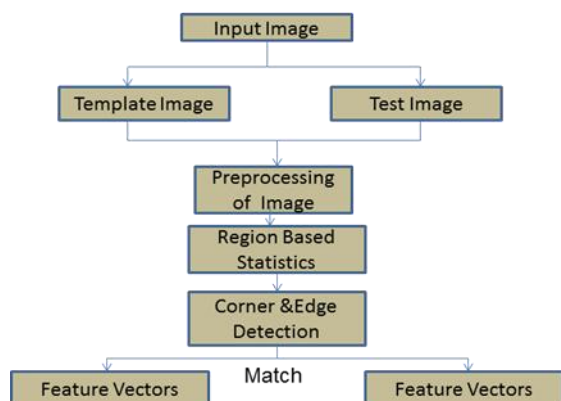


Fig1.Block Diagram

### III.SIMULATION RESULTS

The image processing techniques that are discussed in section 2 are simulated using Matlab 7.0.The best candidate for this pharmaceutical application is selected from the simulation results based on execution time and quality of the images after applying different techniques.

Fig. 2 Shows the Defects related to size, shape and surface defects of the capsules. Descriptor (+) shows the defects in the capsule. Every capsule is inspected independently of other capsule. The captured image of capsule is compared with template image that is the image of capsule that does not contain any defect.

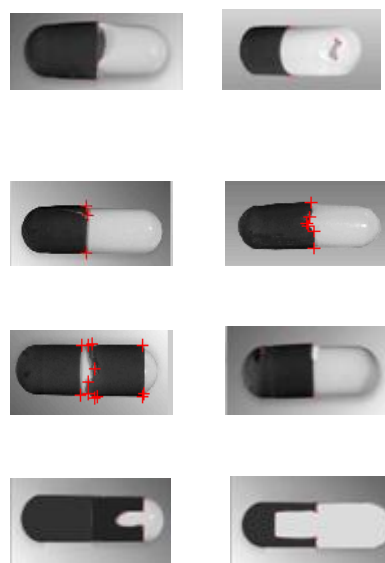
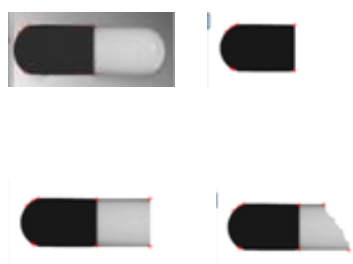


Fig.2

### IV.CONCLUSION

The manufacturing of two part gelatin capsules requires a quality inspection system that not only keeps up with the high production throughput, but also performs accurately and reliably. The Proposed work approach cover all the aspects of defects related to shape, size and surface defects of the pharmaceutical capsules. The algorithm can be implemented in various digital image processing environments and can be part of complex automated manufacturing and testing system.

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