



# QUALITY CHECK USING IMAGE PROCESSING

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**Abstract:** In traditional ways of quality control of hardware steel products (regular rectangular shape), the industrial experts use Vernier Caliper for error checking. Usually, this is done manually which takes a lot of time and cost, and this might have some error while checking. To avoid this problem, there should be an automated system which will not require any man power and perform this task fast as well as accurately. The proposed system will allow users to make accurate non-contact measurement detect a fault in product's shape and dimensions. The proposed system will measure dimension of hardware steel products. An image of the product captured from the specified height will be used to measure the dimension. The proposed system will use image segmentation, area detection and then size measurement. The dimensions obtain from the process is compared with the expected dimensions. Based on this, if the obtained dimensions and expected dimensions match, the product will be classified as correct else fault. The proposed system aims for fault detection process which will detect faults quickly and precisely.

**Keywords:** Fault Detection, Quality Check, Dimension Calculation

## I. INTRODUCTION

The industrial experts use Vernier Caliper for error checking. Usually, this is done manually which takes a lot of time and cost, and this might have some error while checking. For avoiding this problem, there should be an automated system which will not require any man power and which will perform this task fast and accurately. The image of the hardware product is captured using fixed(position and height) camera. Taking image as input from a specific height. Segmentation of the input image is done from RGB(Red,blue,green) color format to gray image and then increasing threshold. Edge contour extraction is applied on segmented object.

From the edge contour extraction the edges of the object are obtained and the dimensions of the object are calculated. The dimensions of the object obtained by the proposed system are compared with original(standard) dimension of the object. If the obtained dimensions match with standard dimensions then the object dimensions are correct else their is error in object dimensions. This proposed system will use fixed camera and system will be automated therefore human error will be avoided.

## II. METHODOLOGIES

The image of the hardware product is captured using fixed position and height of camera. All pixels in the image other than hardware products are concocted white. The boundary of the product in the image is bordered with black color. The height between camera and product is fixed. The product are calculated using the borders in the image. If the dimensions received from image are similar to the ideal product dimensions, product is marked as accurate otherwise the product is marked as faulty.

Take image input, show dimension of object up to 2 digit precision after decimal. The size of the input image is 3088 X 3088. The height of the camera from surface of object is fixed 20cm.

**Performance Parameters:** Accuracy will be measured with the help of actual dimensions of product and calculated dimensions of product. Actual(standard) dimensions of the object are known. Dimensions calculated by the system are fetched. Actual dimension and corresponding calculated dimensions are compared then find the amount of percentage change in calculated dimensions. Take the mean of the percentage change of all dimensions found by comparing the actual and calculated dimensions.



### System Architecture

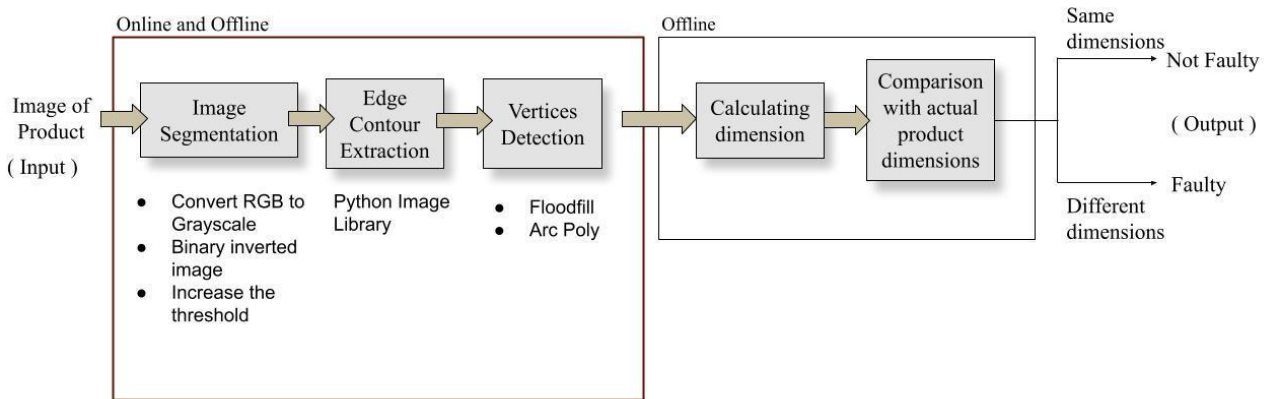


Fig. 1. Block Diagram

### III. ALGORITHM

#### A. Image Segmentation

We have used the open-cv Library in this project. OpenCV is the leading open source library for computer vision, image processing and machine learning, and now features GPU acceleration for real-time operation. First import the OpenCV library and then import the images from the system. Then open the image and convert the BGR(Blue,Green,Red) to RGB(Red,Blue,Green) format. After that, convert RGB(Red,Blue,Green) to Grayscale image. For better implementation, increase the threshold of the gray image (in two values, only 0 and 255). Finally, the last step of image segmentation binary invert the image.

#### B. Edge Contour Extraction

First we did the image pre-processing and afterwards performed the image segmentation and then stored the image in the system. Import Function Image and ImageFilter from Pillow Library. Then open the Segmented image obtained from image segmentation and call the filter function and specify the find edges function. Display the edge extracted image and store it.

#### C. Vertices Detection

First Import matplotlib and Python image Library. Open the Edge extracted image. Call floodfill function, Floodfill is a function which is used to fill an object in an image having closed shape. Then call Findcontour function which is used to find all possible vertices(all possible small small edges) of an object. Find maximum value from array of edges returned by findContours. Then Call function approxPolyDp, approxPolyDp function is used to detect the vertices of the object it checks the slope of the adjacent edge if there is change in slope then only it is considered as a new vertex of the object.

#### D. Dimension Calculation

Retrieve all vertices of an object returned by approxplyDp function. Find the distance between adjacent vertices with the distance formula(i.e the distance between two points). Repeat the previous step for all vertex points and store the number of pixel values between each adjacent vertices. Multiply the number of pixels between two vertices with specific constant values and get dimensions of the object. The dimensions of the object obtained by the proposed system are compared with the original(standard) dimensions of the object. If the obtained dimensions match with standard dimensions then the object dimensions are correct, else there is error in the object dimensions.

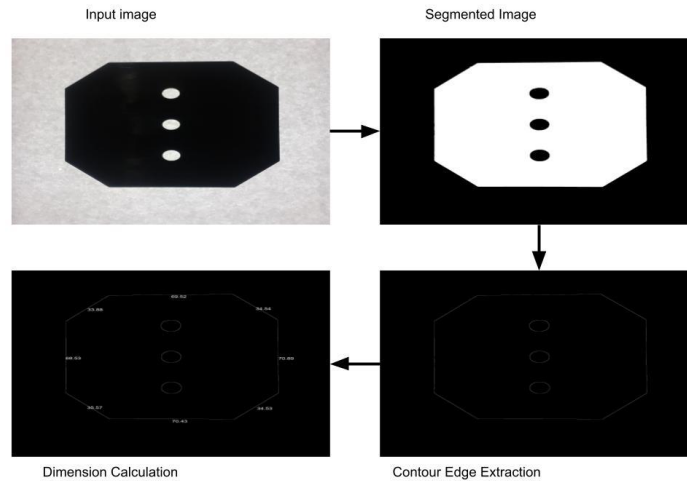


Fig. 2. Stages of Dimension Calculation

Following Table shows the Actual and Calculated Dimensions of the object and also calculates the percentage error.

<u>Sr.no</u>	<u>No.of Side</u>	<u>Actual Dimensions</u>	<u>Calculated Dimensions</u>	<u>Avg Error</u>
<u>1</u>	<u>4</u>	<u>100.60,100.60</u>	<u>100.83,58.54,99.03,59.22</u>	<u>1.38%</u>
<u>2</u>	<u>7</u>	<u>95.80,55.57,35.70,35</u>	<u>95.05,79.64,55.4,54.78,34.25,70.32,35.44</u>	<u>1.28%</u>
<u>3</u>	<u>6</u>	<u>59,59,59,59,59,59</u>	<u>60.18,58.46,59.25,59.59,57.88,58.03</u>	<u>1.31%</u>
<u>4</u>	<u>3</u>	<u>79,79,112</u>	<u>76.89,78.11,110.06</u>	<u>1.84%</u>
<u>5</u>	<u>4</u>	<u>80,35,80,112</u>	<u>77.82,34.81,77.17,108.96</u>	<u>2.37%</u>

Table. 1. Actual dimensions and Dimensions calculated by system

#### IV. CONCLUSION

The dimensions of the object obtained by the proposed system are compared with original(standard) dimension of the object. If the obtained dimensions match with standard dimensions then the object dimensions are correct else their is error in object dimensions. This proposed system will use fixed camera and system will be automated therefore human error will be avoided.

##### 1. Future Work

In future additional feature to calculate dimension for small circles and curves.

Decision to discard or repair the hardware product can be made based on required dimensions from user and obtained dimensions.

##### 2. Applications

The system can be used in industry for automated calculation of dimension of hardware object or product. As manually requires a lot of time for dimensions calculation this automated system can save huge amount of time as well as a lot of human resources.

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