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Research Paper

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## Detecting Specified Object from a Cluttered Data in a Live Video Using Rotation Invariant Detector and Descriptor

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**Abstract**— *This paper presents the detection of specified object from the cluttered data in a live video feed using Speed Up Robust Feature. In this method, for detecting an object point to point matching is done of the object to be detected with the cluttered scene. Computation and comparison made through SURF is much faster as compared to other algorithms proposed earlier. This is done by convolution of integral images, by using hessian matrix based measure for the detector and a distribution based descriptor and by simplifying these methods to perform the essential task. This concludes to new steps of detection, description and matching. This procedure is verified using a Logitech HD camera with Data Acquisition, Image Processing and Computer Vision toolbox in MATLAB(Trial Version). The experimental results show that this method works best for the objects that exhibits non-repeating texture patterns.*

**Keywords**— *SURF, Data Acquisition, Image Processing, Computer Vision*

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### I. INTRODUCTION

In this era of evolving technologies, real time video surveillance has become an important part of many monitoring system. Object detection in a live video is a challenging task now-a-days. However many algorithms have been proposed to detect the single object but most of them are based on the tracking and detection of a particular colour object. In the last few decades different techniques have been developed for detecting the objects using vision systems. Colour histograms were first proposed by Swain and Ballard [1] as a first approach for object recognition. Other features such as orientation, gradient magnitude were added to the histograms by Schiele and Crowley [2]. These inventions helped in changing the rotation, direction and deformation but did not help in object recognition. Schneiderman and Kanade [3] were first to introduce categorization of objects in natural scenes using wavelet transform coefficients. Wavelet transforms decomposes the image into a group of salient features wavelet transforms by reducing the redundancy of the pixels. When relationship between the parts of the object is considered rather than just the appearance, the most complex methods are used. Part based representation of objects detected in gray images was developed by Agarwal et al. [4] Keeping in view the techniques developed for object recognition MATLAB (Trial Version) has the most powerful tool box for image improving, enhancing and categorizing different images using different features such as colour, dimensions and texture of the object. Detecting an object in a live video by extracting its features independent of rotation variance is introduced in this paper.[5] Using the Computer vision tool box the detection of the single object detection in a simpler and faster way is achieved. The goal of this project is to detect an object in a live video in small time and at faster rate. In order to achieve this SURF function in MATLAB (Trial Version) is used, video is fed by a High Definition Camera.

### II. SYSTEM STRUCTURE

The proposed vision system for the single object detection from a live video is divided in two parts:

- A. Video processing
- B. Object detection

Firstly, the video is input by the High Definition Camera, which is then divided into Number of frames. These frames are then converted into RGB GRAY format. Image of the Object which is to be detected is predefined in jpg format. This image is also converted from RGB to GRAY pattern. Frames of the live video are compared with the predefined image. The images are compared using the SURF function i.e Speeded Up Robust Feature. This function extracts the feature of both the images irrespective of scale change or in – plane rotation. These features are matched in two steps outlier point matching and inlier

point matching is done. In outlier point matching strongest features of both the images are extracted and compared. In inlier point matching the strongest features of only similar pattern is matched. Once the pattern is matched a polygon is drawn around the detected pattern.

A. Video processing

Using the Logitech High Definition Camera live video is fed to the MATLAB (Trial Version) through the video input function. Making all possible arrangements in Image Acquisition tool box in MATLAB (Trial Version) the video is input. This live video is divided into certain number of frames to be compared in order to detect the predefined image. In order to get clear video a High Definition Logitech Camera is used.



Fig.1 Logitech HD Camera

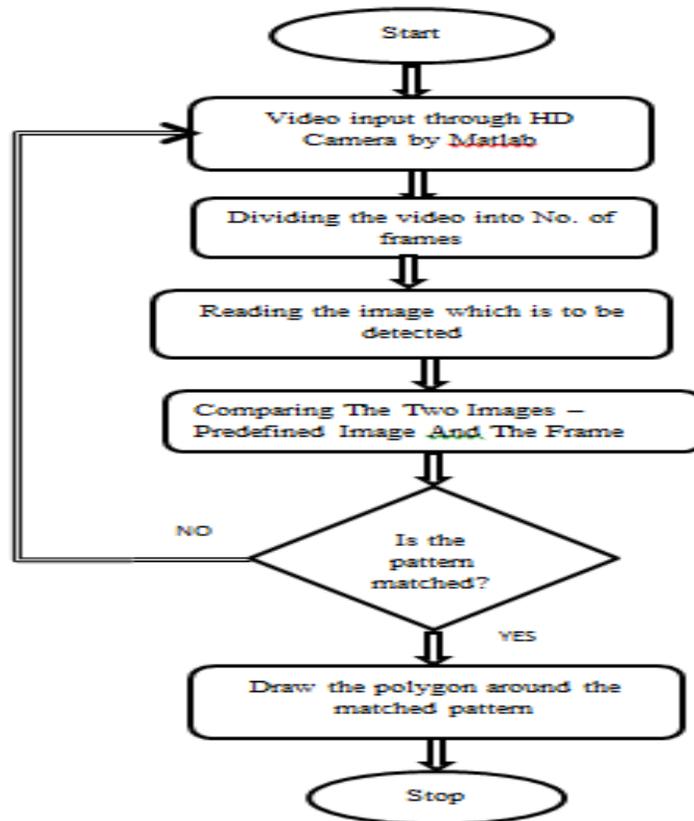


Fig. 2 Flowchart of the steps followed

### B. Object detection

To detect an object from the cluttered scene SURF function is used in the proposed method. SURF – Speed Up Robust Feature is based on Hessian matrix determinant because of its good performance in accuracy. More precisely it detect blob like structure where the determinant is maximum. Steps used by the Surf Function to detect the desired object are as follows:

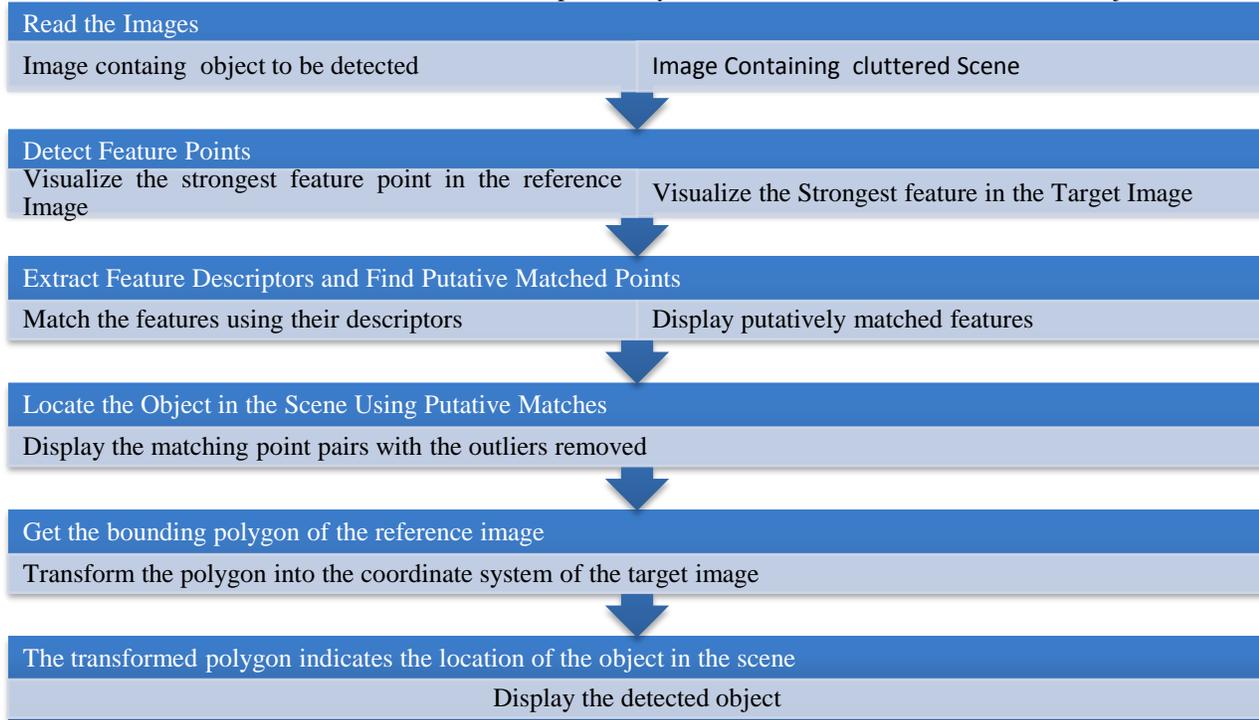


Fig.3 Steps used in SURF

### III. SOFTWARE DEVELOPMENT

The following Steps are involved in the development: *Coding*

Coding is done in MATLAB(Trial Version) using Image Acquisition, Image Processing and Computer Vision toolbox Functions (SURF function). *Debugging* Any errors that occurred during coding were removed by repetitive analysis of the code.

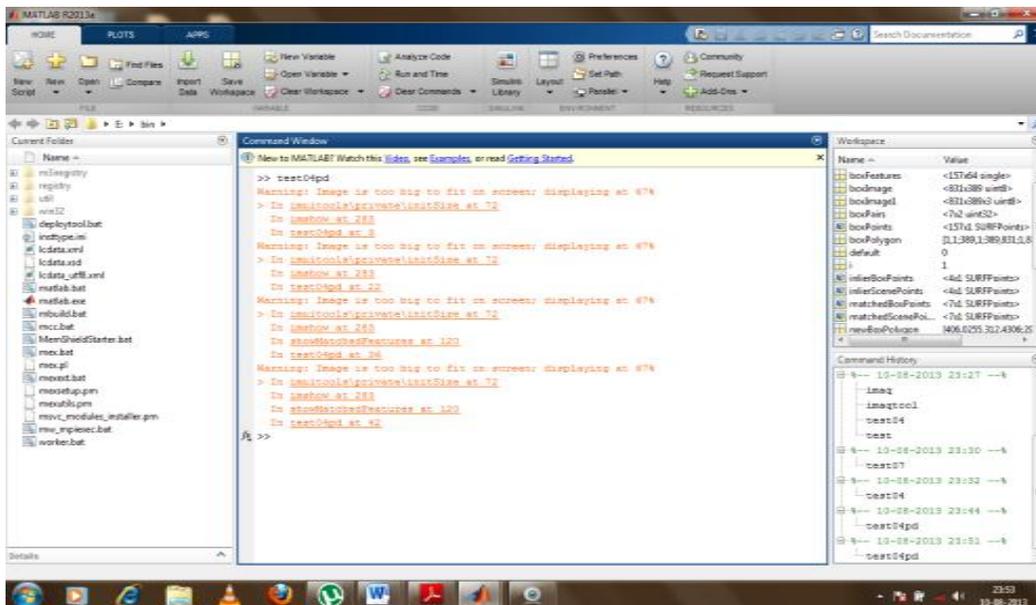
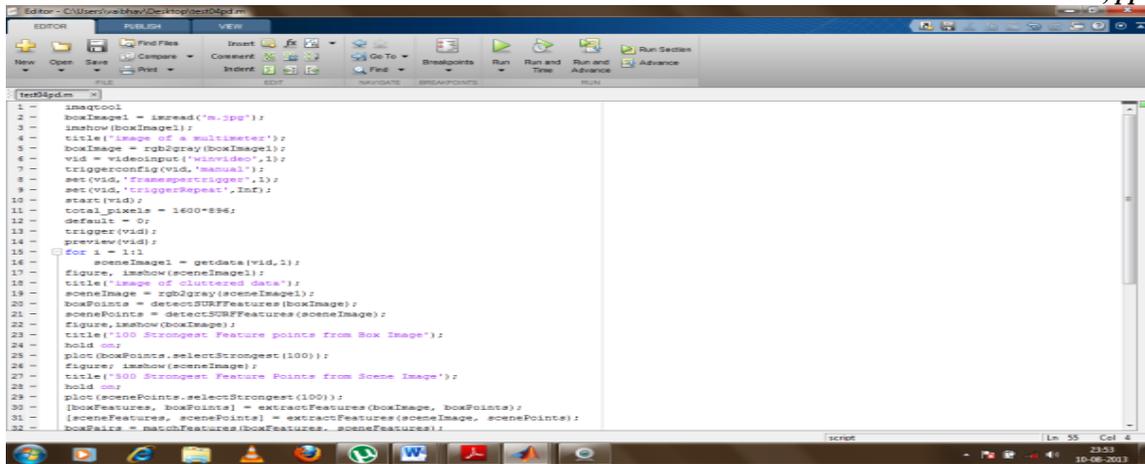


Fig. 4 MATLAB Window



```
1 - imageTool = imread('m.jpg');
2 - boxImage1 = rgb2gray(boxImage1);
3 - title('image of a multimeter');
4 - boxImage = rgb2gray(boxImage1);
5 - vid = videoinput('winvideo',1);
6 - triggerconfig(vid,'manual');
7 - set(vid,'triggerRepeat',1);
8 - set(vid,'triggerRepeat',Inf);
9 - start(vid);
10 - total_pixels = 1600*884;
11 - default = 0;
12 - trigger(vid);
13 - preview(vid);
14 - for i = 1:15
15 -     sceneImage1 = getdata(vid,i);
16 -     figure, imshow(sceneImage1);
17 -     title('image of cluttered data');
18 -     sceneImage = rgb2gray(sceneImage1);
19 -     boxPoints = detectSURFFeatures(boxImage);
20 -     scenePoints = detectSURFFeatures(sceneImage);
21 -     figure, imshow(boxImage);
22 -     title('100 Strongest Feature points from Box Image');
23 -     hold on;
24 -     plot(boxPoints.selectStrongest(100));
25 -     figure, imshow(sceneImage);
26 -     title('100 Strongest Feature Points from Scene Image');
27 -     hold on;
28 -     plot(scenePoints.selectStrongest(100));
29 -     [boxFeatures, boxPoints] = extractFeatures(boxImage, boxPoints);
30 -     [sceneFeatures, scenePoints] = extractFeatures(sceneImage, scenePoints);
31 -     boxPairs = matchFeatures(boxFeatures, sceneFeatures);
```

Fig.5 Coding Window

### III. RESULTS OF THE EXPERIMENT

#### A. Reading the reference Image:

image of a multimeter

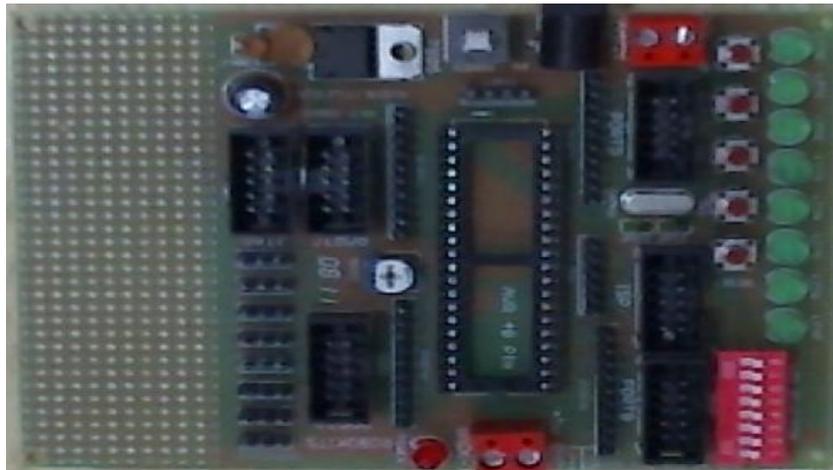


Fig.6 Object to be detected

#### B. Image of the Cluttered Scene:

image of cluttered data

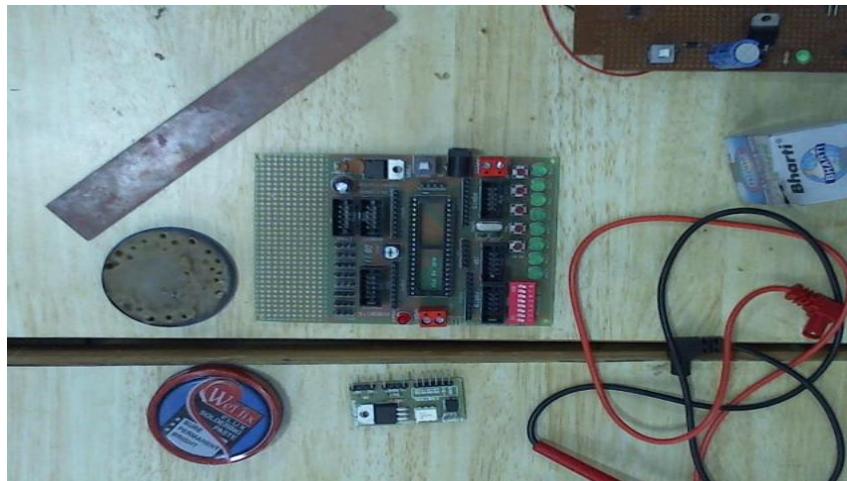


Fig. 8 frame divided from the Video

C. Detect Feature Point:

100 Strongest Feature points from Box Image

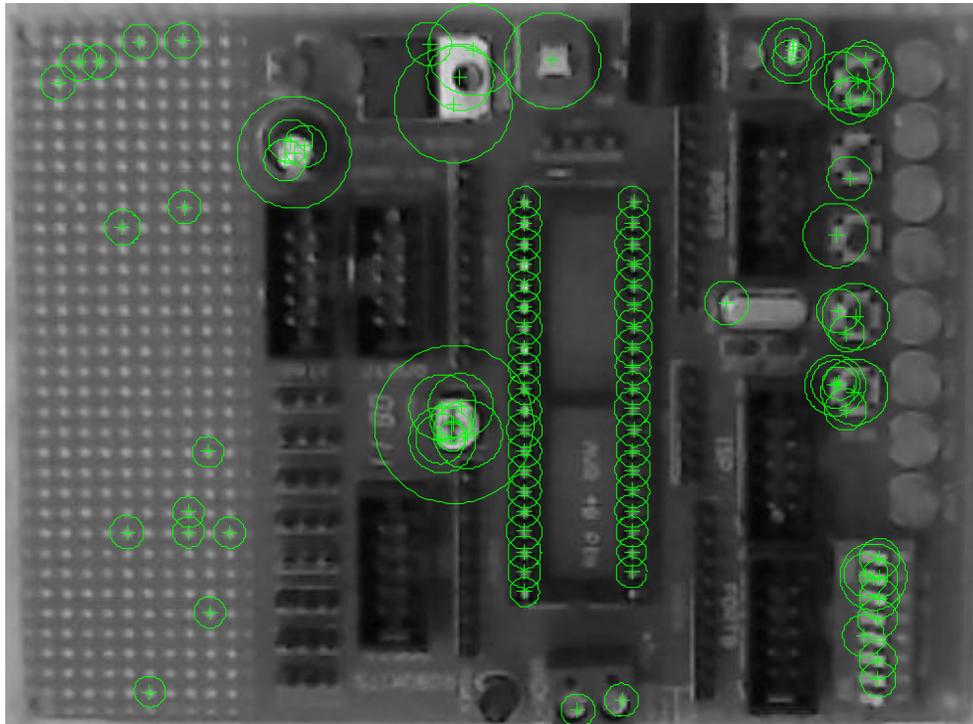


Fig. 9 Strongest Feature Detected in reference Image

500 Strongest Feature Points from Scene Image

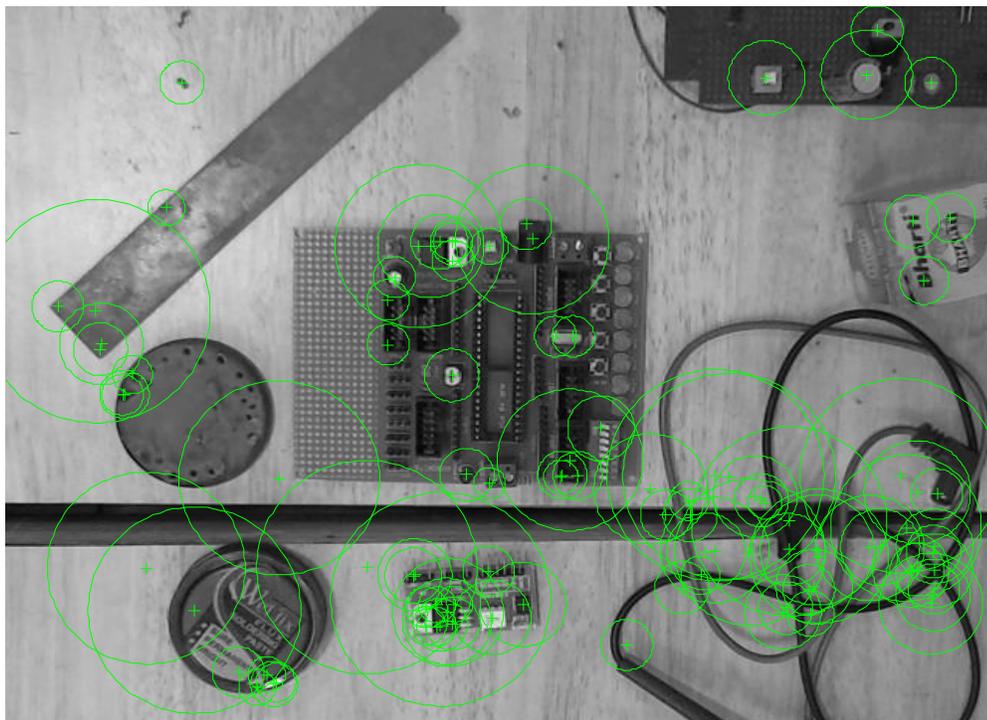


Fig. 10 Strongest Feature Detected in Target Image

D. Putative Matched Points:

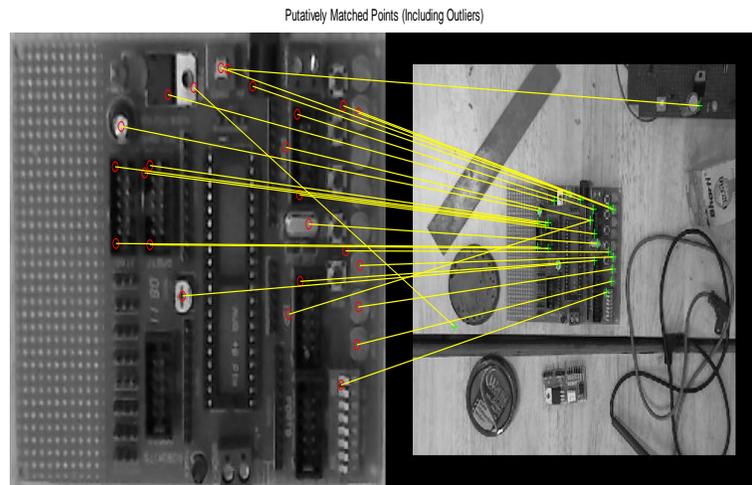


Fig. 11 Outlier Matched Points

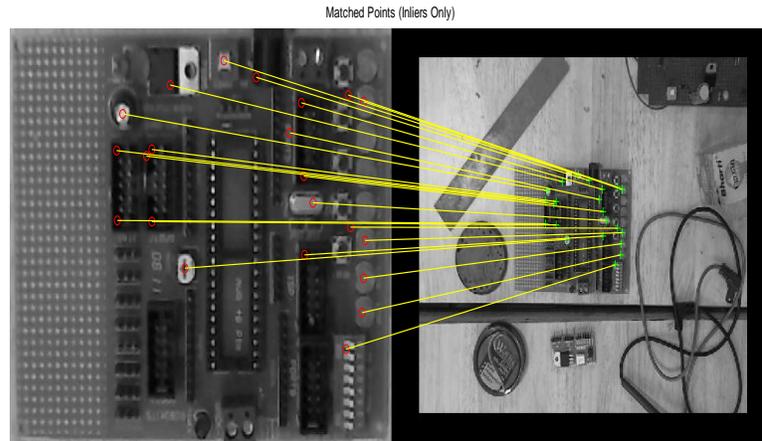


Fig. 12 Inlier Matched Points

E. Detected Image

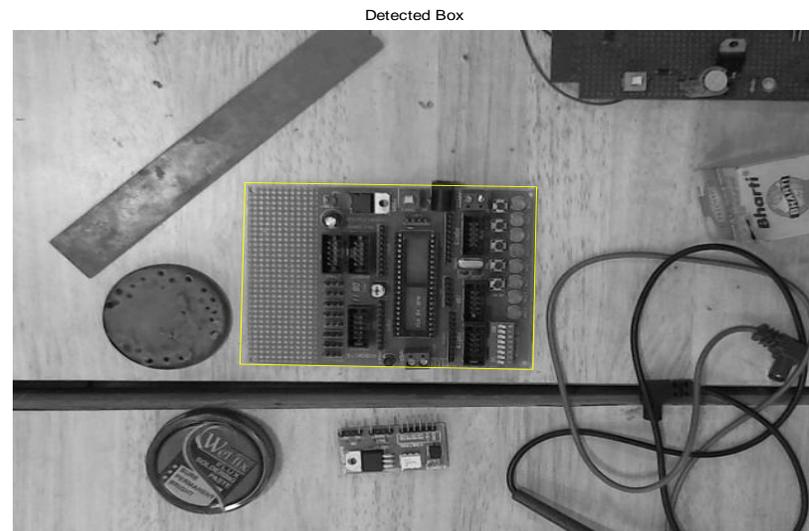


Fig. 13 Detected Pattern

#### V. CONCLUSION

The developed system is able to detect the single object in a cluttered scene. Further research would be done in detecting more than one object using this technique which is faster and precise. The proposed Method of detecting a single object Using SURF can be used for detection and tracking of a particular object, object sorting of an object in production industries. This system can be incorporated with aerial vehicles, industrial robots, Unmanned all terrain vehicles.

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