Conveyer Belt Inspection Device

Project Guide:

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***Abstract* – In many industries across India, the end product is inspected manually. It becomes a tedious work and can produce errors. In order to overcome this problem, a device should be designed which can be arranged on the conveyer belt. Image Processing can be used to solve the problem. The device will take an image of the component that is to be inspected as an input and will detect the component and also check if the parts of the component are present or absent.**

***Keyword* – Image Processing**

I. Introduction

In industries, the goods are produced in large quantity and each product needs to be checked before it is sent in the market. Manual checking is a time consuming process and also affects the production. This is not profitable to the company. There can also be some human errors while checking. To solve this problem, Image Processing can be used as a medium to inspect the components on the conveyer belt. To start with Image Processing installation of OpenCV is necessary. Knowledge of Python or C++ programming language is necessary.

The paper is structured as follows: in section 2, the various components and libraries used in the process are mentioned. In section 3, the methodology i.e. the code and the process done are explained. In next section, output/results acquired are mentioned.

II. Components and Libraries

The experiment set up consists of a web camera mounted on a stand at a particular height. The component which is to be inspected is placed at a fixed position below the camera.

A. **Camera**:

iBall Face2Face C8.0 webcam for capturing a real time input is used. Following are the speifications of the camera used:

- Video capture: Upto 2304*1728
- Image resolution: 3264*2448
- Built-in high sensitive USB microphone
- 30 fps rate
- High quality 5g lens

B. **Stand**:

The camera is attached to a stand of height of around 1.5-2 feet (50-60 cms). The downward facing camera focuses on the components placed below.

C. Python:

Python is a widely used high level programming language. The program can be made in fewer lines than possible in C++ or Java. The version 2.7 of python was

installed in order to code in Image Processing.

D. Pip (Package Manager):

In order to manage and install software packages written in python, **pip** (Package Manager) is installed. Major advantage of pip is the ease of its command line interface, which makes the installation Python software packages easy.

E. OpenCV:

OpenCV is a library of programming functions mainly aimed at real- time computer vision. OpenCV has many applications, namely:

- Motion tracking
- Facial recognition system
- Mobile robotics

The version 2.4 of the OpenCV library is installed.

F. NumPy:

Numpy is a library for python programming language. It adds support for large multi-dimensional arrays and matrices and also has a collection of large high level mathematical functions to operate on these arrays.

G. SciPy:

SciPy is an open source python library used for scientific computing and technical computing. It contains modules for optimization, linear algebra, integration, interpolation, special functions, FFT, signal and image processing and other problems common in engineering.

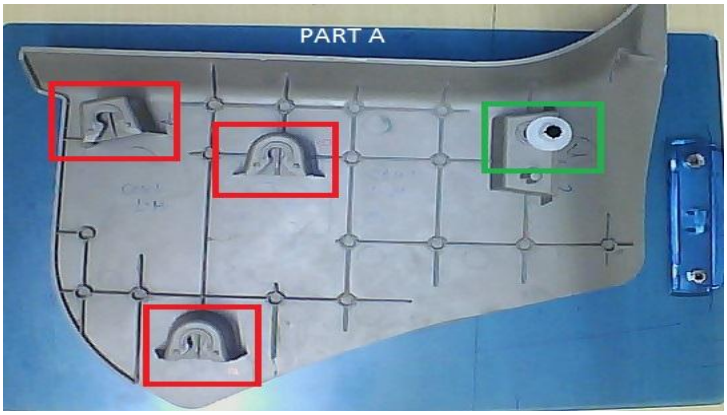
H. Matplotlib:

It is a plotting library for python. It provides an object oriented API for embedding plots into applications using general purpose GUI toolkits.

III. Methodology

In order to inspect the components, the code was developed in OpenCV using Python programming language. The technique of template matching was used. The camera detects the component placed below it. Separate templates of the screws present in the component were made. The code checks for the similar templates in the input given to it with the help of webcam. If the template matches with any part of the image, the screw is absent (as the templates made were of absent screws). If the template didn't match, it meant that the screw is present. The code gives a square border across the region were screw were located. The border is red colored if the screw is absent and green if the screw was present.

The screws to be detected are of white color. In the next method of color isolation, the input image given to the code is thresholded first. The HSV (Hue Saturation Value) value is given to the code. The ROI (Region Of Interest) was created around the location of the screw. As the screw is of white color, after thresholding it becomes white (255). The region of interest is inspected and if any pixel is found white (255), then the screw is present. If screw is absent, after thresholding, the ROI would be black (0). This would mean that the screw is absent. The ROI border becomes green if the screw is present and if screw is absent then it becomes red.



Output of the code

IV. Conclusion

The system detects the presence of white colored knobs using image processing. It can be easily calibrated to the new blocks of different shaped and sizes. It also provides the location where the knob is present and missing as well. Addition to this, it also detects the component.

V. References

1. Practical Python and OpenCV by Dr. Adrian Rosebrock.2. OpenCV with Python for Image and Video Analysis by Sentdex (video tutorial - https://www.youtube.com/watch?v=Z78zbnLlPUA&list=PLQVvvaa0QuDdttJXlLtAJxJetJcqmqlQq)

3. OpenCV Programming with Python on 64bit Linux Ubuntu by Francesco Piscani (video tutorial - https://www.youtube.com/watch?v=ubOa_tJDM_U&list=PLS1lqxOwNjObDAH-ymnep3XLljhb2pUL

VI. Acknowledgements

We are thankful to our seminar guide Prof. Jaishree Tawade (Asst. Professor,Dept. of Electronics and Telecommunications, VIT Pune) for her valuable guidance, encouragement and co-operation during the course of our Mini project.

We are also very thankful to Prof. Milind Patwardhan (Associate Professor, Dept. of Electronics and Telecommunications, VIT Pune) who went all of the way to provide us every possible facility and support, which resulted in our successful Mini project.

We are very graceful to Prof. (Dr.) Shripad Bhatlawande (Head of Department, Electronics and Telecommunications, VIT Pune) and Dr. Rajesh Jalnekar (Director, VIT Pune) for giving us this golden oppurtunity and using our potential to our maximum limit.

Last but not the least, the co-operation and help we recieved from staff and teachers of Dept. of Electronics and Telecommunications, VIT Pune.