International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 **Issue:** VI **Month of publication:** June 2017

DOI:

International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Design of Co-Ordinate Measuring System with Vision Inspection for Quality Control

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Abstract-Nowadays, image and video processing applications are becoming widely used in many domains including industrials, medical imaging, manufacturing, and security systems. Real time video processing is a very demanding task as it needs to perform high computations for a big amount of data represented by the image, and the complex operations, which may need to be performed on the image. We are going to design a system in which the dimensions are checked and compared of a connector according to the program given as input to the system.
The distance, angle, area and irregular shape measurement can be done to do the quality analysis on large scale and avoid customer problems and make it more feasible to usewithout procrastinating the quality measures.
Keywords- PLC, Automatic gain control, Image sensor.

I. INTRODUCTION

Visual inspection is generally the largest effective measure of Connector manufacturing. It is responsible for detecting both cosmetic and functional defects and attempts are often made to ensure 100% quality assurance for all finished products. There are two main processes in Connector inspection: defect detection and defect classification. Contact method tests the connectivity of the circuit but is unable to detect major flaws in cosmetic defects such as mouse-bite or spurious copper and is very setup-sensitive. Any misalignment can cause the test to fail completely. Noncontact methods can be from a wide range of selection from x-ray imaging, ultrasonic imaging, thermal imaging and optical inspection using image processing. Although these techniques are successful in detecting defects, none is able to classify the defects.

Human operators simply inspect visually against prescribed standards. The decisions made by them often involve subjective judgment, in addition to being labor intensive and therefore costly, whereas automatic inspection systems remove the subjective aspects and provide fast, quantitative dimensional assessments. Due to the following criteria, the sophistication in automated visual inspection has become a part of the modern manufacturing environment.

A. They relieve human inspectors of the tedious jobs involved.
B. Manual inspection is slow, costly, leads to excessive scrap rates, and does not assure high quality.
C. With the aid of a magnifying lens, the average fault- finding rate of a human being is about90%.
D. Production rates are so high that manual inspection is not feasible.
E. Tolerances are so tight that manual visual inspection is inadequate.

II. LITERATURE REVIEW

"Design of Automatic Vision-based Inspection System for Monitoring in an Olive Oil Bottling Line"[1] in this paper proposed a system which describes the different steps for dimensioning a machine vision system .The GigE vision is used to insure seamless integration within the production line. Image processing, fault detection and alarm generation are done on a common workstation.

A. Cheap Visual Inspection System for Measuring

Dimensions of Brass Gear Journal of Computer and Electrical Engineering, Vol. 5, No. 2, April 2013 [2] in this paper a visual inspection system was presented for dimensional control of brass gear that is a cheap visual inspection system and suitable for small industries.

Profile Projector is an existing technology which is used for quality control of connectors. A profile projector projects a magnified profile image of an areas or feature of a specimen on the screen and the Profile Projector can be connected to a computer for calculations and accuracy.

Volume 5 Issue VI, June 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

III. PROPOSED SYSTEM

Our proposed system consists The Video Inspection system will work with a video image to calculate the axis of the component. The component should be a type of technical component or mechanical component. The system will measure the X-Axis, Y-Axis and Z-Axis of the component.

The system is connected to a mechanical device which is known as Video Scope inspection, which will be connected through a PLC device.

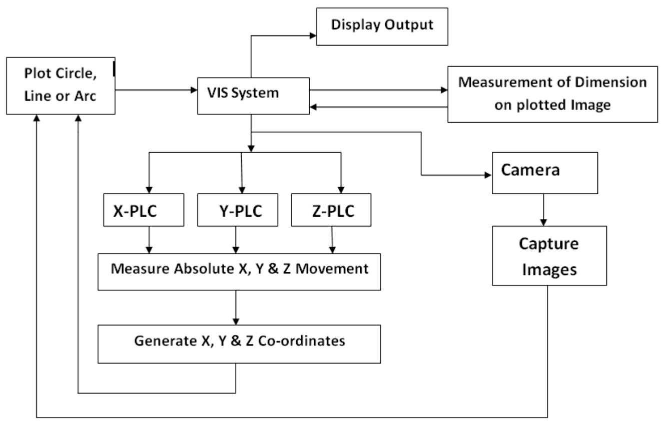

Figure **Error! No sequence specified. -** Proposed System Architecture

In this system, first the live video of the component is shown with the help of Video Scope. When component is seen properly as required by the user, then the snapshot of that video is taken. Once the snapshot is taken, then with the help of scope zoom the details of the component can be seen properly in small window and as the mouse moves, the snapshot image stretch the image and make zoom region also moves with it and the details of the component can be seen properly.

With the help of this zoom, the user can select the specified point on the component. By using the annotation tools, the user can plot points on image or draw lines or arc on image. The user can use the annotation tools to calculate or measure the length, angle, arc, Tangent, Distance, and Point to Point distance etc. of the component. This will help the user to note the details of the component on same screen. It will also give preview image of the selected component axis points on another panel of the system. The preview image will automatically locate to the point when we use the annotations and will detect the component faults or errors. The User will add the detection and measurement of the component to the database.

Accordingly, the reports of components can be generated and also the reports of specific shape will also be generated. The batch wise reports of the components will also be generated along the components which are accepted or rejected from the batch will have the reports. Complete report of batch will be generated along with accepted and rejected components and also the monthly reports of the components checked in a month will be displayed with the information of accepted and rejected components in a month.

Typically, an industrial inspection system computes information from raw images according to the following sequence of steps:

A. Image acquisition

Images containing the required information are acquired in digital form through cameras, digitizers etc.

B. Image processing

Once images have been acquired, they are filtered to remove background noise or unwanted reflections from the illumination system. Image restoration may also be applied to improve image quality by correcting geometric distortions introduced by the acquisition system (e.g., the camera).

C. Feature extraction

A set of known features, characteristic for the application domain, is computed, probably with some consideration for non-overlapping or uncorrelated features, so that better classification can be achieved. Examples of such features include size, position, contour measurement via edge detection and linking, as well as and texture measurements on regions. Such features can be computed and analyzed by statistical or other computing techniques (e.g. neural networks or fuzzy systems). The set of computed features forms the description of the input image.

D. Decision-making

Combining the feature variables into a smaller set of new feature variables reduces the number of features. While the number of initial features may be large, the underlying dimensionality of the data, or the intrinsic dimensionality, may be quite small. The first step in decision making attempts to reduce the dimensionality of the feature space to the intrinsic dimensionality of the problem. The reduced feature set is processed further as to reach a decision. This decision, as well as the types of features and measurements (the image descriptions) computed, depends on the application. For example, in the case of visual inspection during production the system decides if the produced parts meet some quality standards by matching a computed description with some known model of the image (region or object) to be recognized. The decision (e.g., model matching) may involve processing with thresholds, statistical or soft classification. At the last level of decision-making and model matching mentioned above, there are two types of image (region or object) models that can be used namely, declarative and procedural. Declarative models consist of constraints on the properties of pixels, objects or regions and on their relationships. Procedural models are implicitly defined in terms of processes that recognize the images. Both types of models can be fuzzy or probabilistic, involving probabilistic constraints and probabilistic control of syntactic rules respectively. A special category of models is based on neural networks.

Model-based approaches often require that descriptions (e.g., features) of the image at different levels of specificity or detail be matched with one of possible many models of different classes of images. This task can become very difficult and computationally intensive if the models are complex and a large number of models must be considered.

In a top-down approach to model matching, a model might guide the generation of appropriate image descriptions rather than first generating the description and then attempting to match it with a model. Another alternative would be to combine top-down and bottom-up processes. The above control strategies are simplified when one is dealing with two-dimensional images taken under controlled conditions of good lighting and low noise, as it is usually the case in industrial vision applications. Image descriptions and class models are easier to construct in this case and complex model matching can be avoided.

E. Software Requirement and Tools

1) Visual Studio 2012

IV. ADVANTAGES

A. It assures the quality of connectors as per customer requirement, we need the good equipment.
B. It checks the critical dimensions, so most Essential for product liability.
C. It avoids the customer returns for dimensional issue.

V. CONCLUSION

In this paper we have proposed system which designs a video measuring machine which will inspect the connector dimensions, distance between any two points, and angle between two edges, area and irregular shape measurement to enhance the quality of product in various applications.Also a system which provides a compact and robust environment for carrying out professional inspection of fine features.

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