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Applications of Vision System

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Abstract

Vision System (system vision) it's a apply computer vision in industry. While computer vision is focused mainly on image processing at the level of hardware, vision system most often requires the use of additional hardware I/O (input/output) and computer networks to transmit information generated by the other process components, such as a robot arm. Vision system is a subcategory of engineering machinery, dealing with issues of information technology, optics, mechanics and industrial automation. One of the most common applications of machine vision is inspection of the products such as microprocessors, cars, food and pharmaceuticals. Vision systems are used increasingly to solve problems of industrial inspection, allowing for complete automation of the inspection process and to increase its accuracy and efficiency. As is the case for inspection of products on the production line, made by people, so in case of application for that purpose vision systems are used digital cameras, smart cameras and image processing software. This paper presents the possible applications of vision system in the present.

Keywords: vision system; image processing; inspection

1. Introduction

The introduction of the automation has revolutionized the manufacturing in which complex operations have been broken down into simple step-by-step instruction that can be repeated by a machine. In such a mechanism, the need for the systematic assembly and inspection has been realized in different manufacturing processes. These tasks have been usually done by the human workers, but these types of deficiencies have made a vision system more attractive. Expectation from a visual system is to perform the following operations: the *image acquisition* and *analysis*, the *recognition* of certain features or objects within that image, and the *exploitation* and *imposition* of environmental constraints.

Scene constraint is the first consideration for the vision system. The hardware for this sub-system consists of the light source for the active imaging, and required optical systems. Different lighting techniques such as the structured lighting can be used for such purpose. The process of vision system starts with the image acquiring in which representation of the image data, image sensing and digitization is accomplished. Image sensing is the next step in order to obtain a proper image from the illuminated scene. Digitization is the next process in which image capturing and image display are accomplished. The last step in this process is the image processing in which a more suitable image is prepared. The first aim of this article is to show typical examples of the visions systems in the automated manufacturing systems.

2. Operation of a vision system

A visual system can perform the following functions: the image acquisition and analysis, the recognition of an object or objects within an object groups. The light from a source illuminates the scene and an optical image is generated by image sensors. Image acquisition is a process whereby a photo detector is used to

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generate and optical image that can be converted into a digital image. This process involves the image sensing, representation of image data, and digitization.

Image processing is a process to modify and prepare the pixel values of a digital image to produce a more suitable form for subsequent operations.

Pattern classification refers to the process in which a un- known object within an image is identified as being part of one particular group among a number of possible object groups.

3. The components of vision system

A typical vision system consists of several components of the following:

- one or more digital or analogue camera (black and white or color) with optical lenses,
- interface the camera to digitize the image (the so-called frame grabber),
- processor (this is usually PC or embedded processor such
  As DSP),
  (In some cases, all the elements listed above are included in the one device, the so-called smart cameras).
- device I/O (input/output), or communication links (e.g. RS-232) used to report the results of system,
- lens for taking close-ups,
- Adapted to the system, specialized light source (such as LEDs, fluorescent lamps, halogen lamps, etc.),
- software to the imaging and detection of features in common image (image processing algorithm) (fig. 2),
- sync-sensor to detect objects (this is usually an optical or magnetic sensor), which gives the signal for the sampling and processing of image,
- The regulations to remove or reject products with defects.

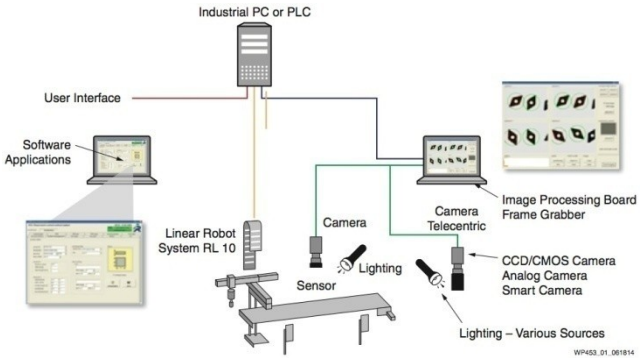

Fig. 1 *A typical vision system operation.*

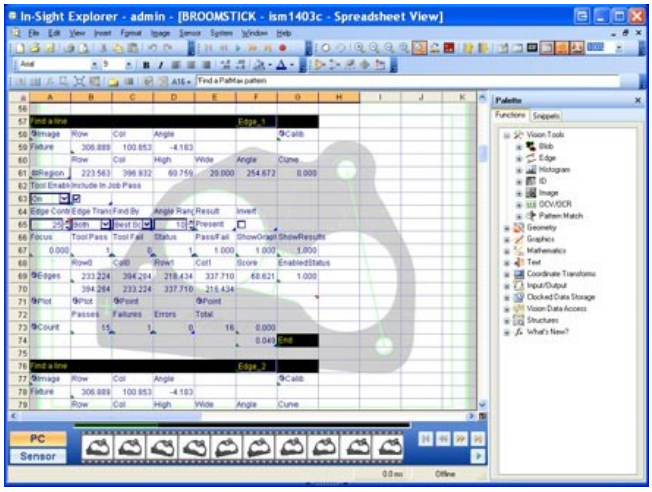

Fig. 2 *The latest software Spreadsheet (Cognex) for total analysis of image.*

The image from the camera is captured by frame grabber, which is a digitalize device (included in each intelligent camera or located in a separate tab on the computer) and convert image from a digital camera to digital format (usually up to two-dimensional array whose elements refer to the individual image pixels). The image in digital form is saved to computer memory, for its subsequent processing by the vision software.

Depending on the software algorithm, typically executed several stages, making up the complete image processing. Often at the beginning of this process, the image is noise filtering and colors are converted from the shades of gray on a simple combination of two colors: white and black (binarization process). The next stages of image processing are counting, measuring and/or identity of objects, their size, defects, or other

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characteristics. In the final stage of the process, the software generates information about the condition of the product inspected, according to preprogrammed criteria. When does a negative test (the product does not meet the established requirements), the program gives a signal to reject the product, the system may eventually stop the production line and send information about this incident to the staff.

4. Application of vision system

Vision systems are widely used in the Manu-facture of semiconductors, where these systems are carrying out an inspection of silicon wafers, microchips, and components such as resistors, capacitors and lead frames.

In the automotive machine vision systems are used in control systems for industrial robots, inspection of painted surfaces, welding quality control, rapid- prototyping, checking the engine block or detect defects of various components. Checking products and quality control procedures may include the following: the presence of parts (screws, cables, suspension), regularity of assembly, of the proper execution and location of holes and shapes (curves, circular area, perpendicular surfaces, etc.), correct selection of equipment options for the implementation of the quality of surface markings (manufacturer's numbers and geographical detail), geometrical dimensions (with an accuracy of a single micron) the quality of printing (location and color).

Beside listed above are other area to implement vision system. Figure 3 shows the simplest arrangement of the vision system measuring cold drinks bottles on production lines. The online defect inspection method based on vision system for cold drinks bottle (Level, Extra material, Seal cap) is shown in Fig. 3. Several digital line-scan monochrome cameras are laid above float glass to capture the bottle image. The red LED light source laid under the glass provides illumination for grabbing the image. High performance computers are used to complete the inspection task based on image process-sing.

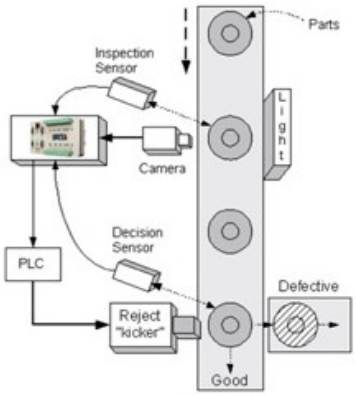

Fig. 3 *The simplest arrangement of the vision system measuring cold drinks bottles on production lines.*

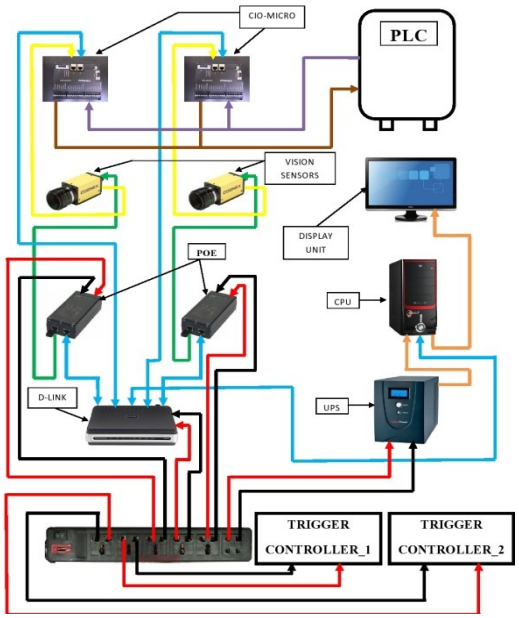

Fig. 4 *System configuration for validation testing of Cannula & Catheter.*

Another interesting proposition is use the vision system to validation of vehicle instrument cluster. The vision system (Fig. 4) consists of a camera, lighting, optics and image processing software. A Cognex In-sight CCD vision sensor was selected for image acquisition and processing, which offers a resolution of 1024 x 768 Pixels and 64 MB flash memory. The acquisition rate of the Vision sensor is 10 full frames per second.

The image acquisition is through progressive scanning. The camera can work in a partial image acquisition mode, which provides flexibility for selecting image resolution and acquisition rate. The image processing software provides a

Wide library of vision tools for feature identification, verification, measurement and testing applications. The PatMax™ technology for part fixturing and advanced OCR/OCV tools for reading texts are available within the software. The primary source of illumination is from LED ring lights with directional front lighting, which provides high contrast between the object and background. The selection of optical lens depends on the field of view and the working distance. In this setting, a lens with a focal length of 75 mm is used.

5. Conclusions

In the design and operation of a vision system, the image formation and visual process, computational methods and algorithms, depth information, image representation, and modeling and matching must be considered. On the other hand, the systematic consideration is important in the efficiency and the performance of the selected machine. The integration possibility, robustness, ease of operation, and adding intelligence into the system in order to make it a smart system are features of the advanced machine vision systems.

References

[1.] Tsai D.: A machine vision approach for detecting and inspecting circular parts. *Int. J. Adv. Manuf. Technology*, (1999).

[2.] Shahabi H., Ratman M.: Noncontact roughness measu-rement of turned parts using machine vision. *Int. J. Adv. Manuf. Technology*, 28 May 2009, published on-line.

[3.] Jian-hai H., Shu-shang Z., Wei S.: Research on subpixel detecting on-line system based on machine vision for inner diameter of bearings. Int. *Conf. on Robotics and Biomi-metics*, Sanya, 15-18 December 2007.

[4.] Taouil K., Chtourou Z., Kamoun L.: Machine vision based quality monitoring in olive oil conditioning. *First workshop on Image processing theory, tools and applications*, Sousse (Tunisia), 23-26 November 2008.

[5.] Peng X., Chen Y., Yu W., Zhou Z., Sun G.: An online defects inspection method for float glass fabrication based on machine vision. *Int. J. Adv. Manuf. Techn.*.

[6.] Huang Y., Mouzakitis A., McMurran R., Dhadyala G., Jones R.: Design validation testing of vehicle instru-ment cluster using machine vision and hardware-in-the-loop. Int. *Conf. on Vehicular Electronics and Safety,* Columbus (USA), 22- 24 September 2008.

[7.] Zhenzhong W., Guangium Z., Xim L.: The application of machine vision in inspecting position-control accuracy of motor control systems. Proc. of the *5th Int. Conf. Electrical Machines and Systems*, vol. 2, Shenyang, 18-20 August 2001, pp 787-790.

[8.] Davis M., Lawler J., Coyle J., Reich A., Williams T.: Machine vision as a method for characterizing solar tracker performance. *33rd Photovoltaic Specialists Conference*, San Diego, 11-16 May 2008, pp 1-6.

[9.] Lee W., Jeon C., Hwang C.: Implementation of the machine vision system of inspecting nozzle. *3rd Int. Conf. on Convergence and Hybrid Information Technology*, Busan (Korea), 11-13 November 2008.

[10.] Wang. M., Wei J., Yuan J., Xu K.: A research for intelligent cotton picking robot based on machine vision. Int. *Conf. on Information and Automation, Zhangjiajie* (China), 20-23 June 2008.

[11.] Lee J. H., Lee J. M., Kim H., Moon Y.: Machine vision system for automatic inspection of bridges. Int.

Congress on Image and Signal Processing, vol. 3, Sanya, 27-30 May 2008.

[12.] Zhang Z., Chen Z., Shi J., Jia F., Dai M.: Surface roughness vision measurement in different ambient light conditions. 15th Int. *Conf. Mechatronics and Machine Vision in Prac-tice,* Auckland (New Zeland), 2-8 December 2008.

[13.] Bhuvanesh A., Ratnam M.: Automatic detection of stamping defects in lead frames using machine vision: overcoming translational and rotational misalignment. *Int. J. Adv. Manuf. Technology*, 32 (2007).

[14.] Tsai M., Ann N-J.: An automatic golf head robotic welding system using 3D machine vision system. *Workshop on Advanced Robotics and Its Social Impacts*, Taipei, 23-25 August 2008.

[15.] See A.: Rapid prototyping design and implementation of a motion control integrated with an inexpensive machine vision system. *Instrumentation and Measurement Technolo-gy Conference*, vol. 3, Ottawa, 17-19 May 2005.

[16.] Cheng Y., Jafari M.: Vision-based online process control in manufacturing applications. *Trans. on Automation science and engineering*, 5(2008)1.

[17.] Yradley E.: New generation machine vision: coping with changes in light and surface quality. *Computing & Control Engineering Journal*, 16(2005)6.

[18.] Lee M, de Silva C., Croft E., Wu J.: Machine vision system for curved surface inspection. *Machine Vision and Appli-cations*, (2000)12.

[19.] Bhandarkar S., Luo X., Daniels R., Tollner W.: Automated planning and optimization of lumber production using ma-chine vision and computed tomography. *Trans. on Auto-mation Science and engine-ering*, 5(2008)4.

[20.] Dunn M., Billingsley J.: The use of machine vision for assessment of fodder quality. *14th Int. Conf. on Mecha-tronics and Machine Vision In Practice*, Xiamen (China), 4- 6 December 2007.