The Application of Industrial Inspection of LED

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왕 숙, 정길도
Wang Xi, Kil To Chong
Email: wangxi1126@hotmail.com, kitchong@chonbuk.ac.kr

Abstract - In this paper, we present the Q-learning method for adaptive traffic signal control on the basis of multi-agent technology. The structure is composed of sixphase agents and one intersection agent. Wireless communication network provides the possibility of the cooperation of agents. As one kind of reinforcement learning, Q-learning is adopted as the algorithm of the control mechanism, which can acquire optical control strategies from delayed reward; furthermore, we adopt dynamic learning method instead of static method, which is more practical. Simulation result indicates that it is more effective than traditional signal system.

Key Words : agent; cooperation; Q-learning; reinforcement learning; dynamic; practical;

1. Introduction

As we all known, a light-emitting-diode(LED) which is a semiconductor diode emits light when an electric current is applied in forward direction. LED which is used as indicator lights and illuminating lights, usually, is a very small area light and can emit different color. Furthermore, it can be used to sterilize water and disinfect devices and even promote photosynthesis. [3, 4]

LEDs are produced in a large number of shape and size. Most common case is a 2-5mm cylinder body with a dome-shape hat package in which the diode in the center of package. In our research, we need to distinguish several kinds of single-die LEDs.

This article mainly demonstrates the methods of the two kinds of faults, one is shallow&deep LED indicated in figure.1, the other is bubble LED indicated in figure.2

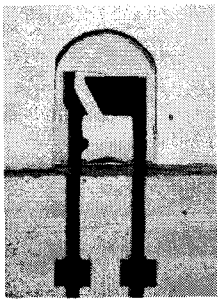

Figure.1 Shallow&deep case

Where the D is defined as shown in figure.1 D is the distance from top of the semiconductor chip to the bottom of the epoxy case. If D is out of the range of standard distance by 0.1 millimeter, this LED should be ranked to shallow&deep LED.

Figure.2 Bubble case

Bubble LEDs whose epoxy hat contain a bubble while the LED is packed as it shown in figure.2.

저자 소개
* 王 茜 : 全北大學 電子情報工學科 博士課程
* 丁吉道 : 全北大學 電子情報工學科 教授 · 工博

2. Methods

2.1 Shallow&Deep Case

Firstly, to load the prepared original image we need to use Simulate Acquisition step. Configuring this step to load an image then we experiment with preprocessing steps and gauging steps. Following figure.3 shows the inspection state diagram.

Figure.3 Inspection State Diagram

In the inspection part, first of all, we need to get the gray intensity image, choose the Vision Assistant controller, migrate into the window of vision assistant, choose the Extract Color Plane step to extract the green plane from the color image and then choose the Find Straight Edge step.

Typically, edge detection is the most common approach for detecting meaningful discontinuities in intensity values[2]by far. The basic idea behind edge detection is to find places in an image where the intensity changes rapidly, which means the first derivative of the intensity is greater magnitude than a specified threshold.

The Find Straight Edge step searches for a straight edge in a two-dimensional region of interest. We give a ROI by as it shown in following figure.

Figure.4 Find Straight Line

The object under inspection often appears shifted or rotated within the images in process. We need to define a sub-coordinate relative to a feature in the image. According to the two straight line, we can set a geometry point which is the point of intersection of two line and then set a coordinate system whose origin is locate on the geometry point.

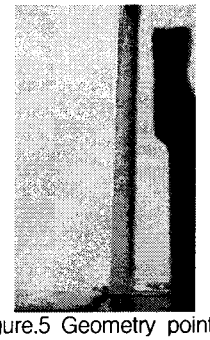

Figure.5 Geometry point

The next step is Find Straight Edge step. Choose a rectangle area around the reflective cup which is a tiny bowl on the top of semiconductor chip. Use the Find Straight Edge step again, get the middle point of the line, measure the distance from the point to the bottom line which the detected at the first find straight edge step. The final step is to calculate the pixel, which ranges from 250-260. When the D is out of this range ,the LED should be sorted out to be fault case.

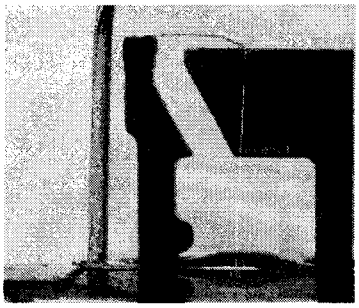

Figure.6 Measure the distance

2.2 Bubble Case

For the bubble case, we find that after edge detection procedure the bubble LED always shows more noise than good case. So according this character we design a algorithm to distinguish them.

First of all, we do a basic 'Prewitt' filter also a edge filter in order to extract the LED from the background. Apply the 'Find circular edge' function to locate the centre of the circular. Following image shows one of the location result.

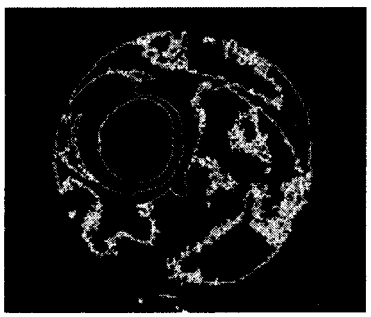

Figure .7 Find the center of LED of a planform

Secondly, get a subregion of the LED, do smooth function in this region, this procedure could remove much noise which will influence the distinguishing performance. Then do remove small objects twice after 'Sobel' filtering to extract the contour of bubble, of course some good LED will also contain noise, by usually they are not as much as the bubble case. Then Count the front pixel number in sub-region and calculate the rate of front pixel in the subregion. Threshold the rate at 2% , this means if the front pixel is much more than 2% the LED is rank to bubble case. Following imag (fig.8) show the last step of bubble detection.

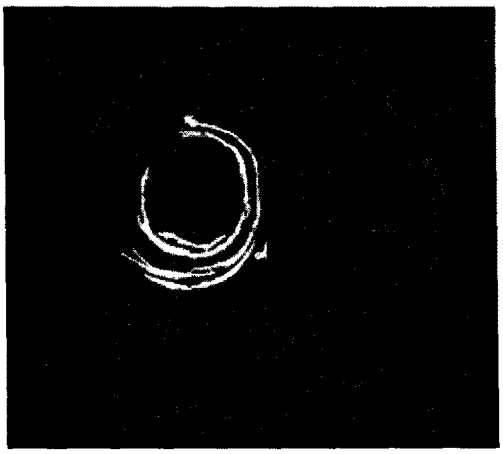

Figure .8

3. Experiment Device and Result

An simple device (Figure.9) for fixing LED and camera is made to get identical working distance. Test algorithm, all the shallow&deep fault and bubble fault can be distinguish successfully and this method showed good results to the designed inspection system and led to the increment of productivity in accordance with the reduction of elimination of poorly-made articles.

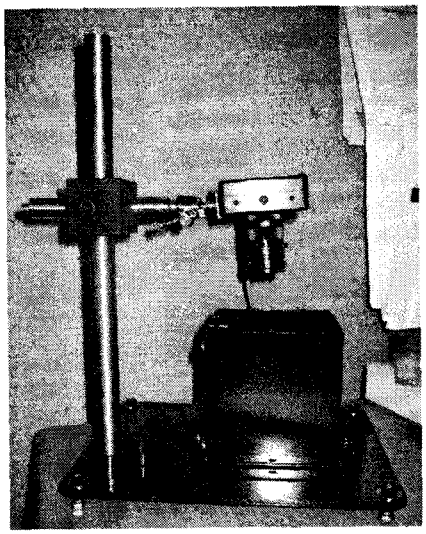

Figure.9 Inspection system

4. Conclusion

vision inspection system based on LabVIEW Vision Builder can run fast that can satisfy the application requirement. Experiment shows that Vision Builder 3.5 can help to develop optical system conveniently and efficiently. This paper only solve not only the outline problem of the LED, but also deal with the inside inspection of LED.

참 고 문 헌

[1] Thomas Klinger, "Image Processing with LabVIEW and IMAQ Vision," Prentice Hall

[2] Rafael C.Gonzalez, Richard E.Woods, Steven L.Eddins, "Digital Image Processing Using Matlab".

[3] MireiAkiko, AkiraMasayuki, NorikoSatoko, ToshitakaYutakaNakaya2, Masatakeand Yohsuke " Development of a new water sterilization device with a 365nm UV-LED", Medical and Biological Engineering and Computing, Volume 45,number 12,1997.12

[4] DanielEricand Thomas, "Light-emitting diodes as a light source for photosynthesis", Photosynthesis Research, Volume 39,number 1,1994.1

[5] National Instruments "NI Vision Builder for Automated Inspection Tutorial"