

Button Defect Detection System Using YOLO Algorithm

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Abstract: As an indispensable accessory in clothing, the quality of buttons will directly affect the sales of clothing. This research aims to realize the button defect detection system based on YOLO algorithm. After the implementation of the system, it is only need to collect a batch of button sample images, train the model, transmit it to the system, and call the button defect system, and the system will automatically identify the defects in the button. The use of button defect detection system can greatly reduce the labor force and detection error rate.

Keywords: Button Defect; YOLO Algorithm; Button Defect.

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1 Introduction

The traditional button defect detection method is generally manual detection, and the defect detection method based on artificial naked eye accounts for the vast majority. This traditional detection method has some problems such as low detection efficiency, large subjective error, contact damage, etc. The defect detection method based on YOLO (You Only Look Once) algorithm can not only reduce the cost, but also improve the production efficiency of products. The method based on YOLO algorithm has become the main research object of industrial defect detection methods. The study used Plastic double hole buttons are the research object. The common defects of the research object in the inspection process include gap, spot, abrasion, scratch and jam. Therefore, this research aims to implement a button defect detection system based on YOLO algorithm. After the implementation of the system, it is only necessary to collect a batch of button sample images, train the model,

transmit them to the system, and call the button defect system, and the system will automatically identify the defects in the buttons. The use of button defect detection system can greatly reduce labor force and detection error rate. The button defect detection system based on YOLO algorithm has a good development prospect.

2 Methodology

2.1 Research Design

This study employed the descriptive and developmental research design to describe the software quality characteristics of the developed button defect detection system to strengthen the management process and service of the button defect detection system.

For descriptive design, researcher used this method to collect data on the problems and challenges encountered in button detection. In the development and design, researcher applied the Scrum Method for System Development.

2.1.1 System Development Process

By developing and implementing the defective button detection system based on YOLO algorithm, the researcher improved the qualified rate of detecting buttons. The system was developed to address the problems and challenges encountered in the existing manual detection and improve the efficiency and qualified rate of button detection. The result of this research is a detection system.

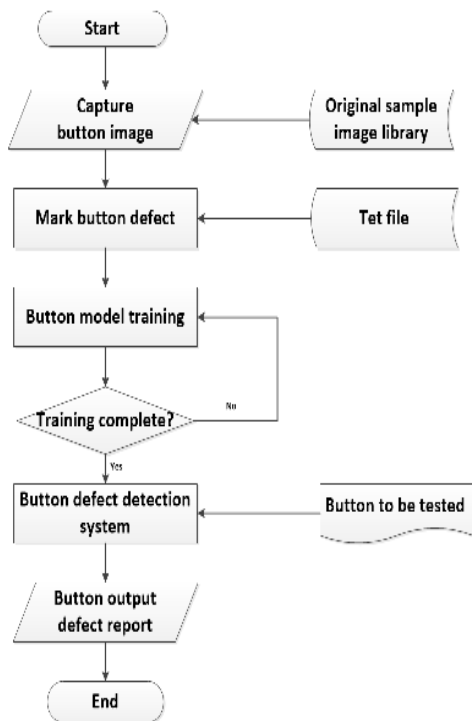


Figure 1. System Flow Chart

Figure 1 shows the system flow chart of button defect detection based on YOLO algorithm. The system integrates four modules: image acquisition module, image processing module, system call module and software management module.

The first module: the image acquisition module obtains the image of the sample button through the hardware equipment, simply cuts all the original sample button images, and marks the defects in the button samples.

The second module: image processing module. The labeled sample files are trained by YOLO algorithm.

The third module: system call module, which configures the connection between the platform and the

platform, and is used to configure the parameters required by the platform.

The fourth module: software management. The software part is divided into two parts: user page design and detection information output.

The developed system adopts agile method. The model provides guidance for researchers in the process of planning and managing the system, especially in planning, system analysis, system design, system development and system implementation.

2.1.2 Use Case Diagram

Use case diagram refers to a view composed of actors, use cases, boundaries, and the relationship between them, which is used to describe the function of the system. Use case diagram is a model diagram of system functions that can be observed by external users. The use case diagram is the blueprint of the system.

According to the functional requirements of the button defect system, the participants include administrators and employees. Use cases include login defect detection, adding button image to the system, selecting detection method, and confirming button defect. Figure 2 shows the general use case diagram of the button defect detection system. The ellipse represents the use case, and the upright man represents the participant (user).

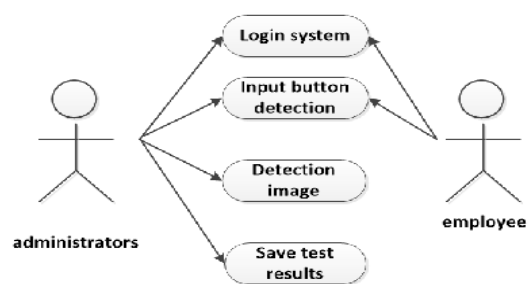


Figure 2. general use case diagram of button defect detection system

2.1.3 Hardware and Software Requirements

For the training and prediction of deep learning network, computer is a very important factor. The performance of computer directly affects the operation time of the model. Too low computer configuration

cannot even run the deep learning network. The computer configuration used in this subject belongs to a medium-performance computer in the field of civil computers. Its configuration is shown in Table 1 and Table 2 below. All the experimental data below are calculated on this computer.

Table 1. Main performance parameters of computer

| COMPUTER | HARDWARE PARAMETERS |
|-----------------------|---------------------|
| CPU | Intel i7-8700 |
| GPU | 1050ti |
| OPERATING SYSTEM | WIN10 |
| RAM | 16GB |
| HARD DISK | 128GB |
| GPU ACCELERATION TOOL | CUDN10.0、 CUDNN7.6 |

Table 2. Hardware and Software Requirements for Training

| | |
|----------------------------|----------------------------|
| Operating System | Windows 10 |
| Processor | Core i7 |
| Graphical Processing Units | NVIDIA CUDA Cores GTX 1050 |
| Random Access Memory (RAM) | 16 GB |

The following software is required for the development of defect detection system: Microsoft Visual studio 2019; OpenCV 4.1.0.

3. Results

The button defect detection system of this subject is designed and implemented based on OpenCV machine vision technology. It takes Microsoft Visual Studio as the interface development platform and MFC + OpenCV as the development tool of image processing and analysis.

The user interface of button defect system is designed with Microsoft basic class library MFC in Visual Studio platform. Double click to open the system and enter the login interface. In the login interface, you can select administrator or user login, as shown in the figure 3:

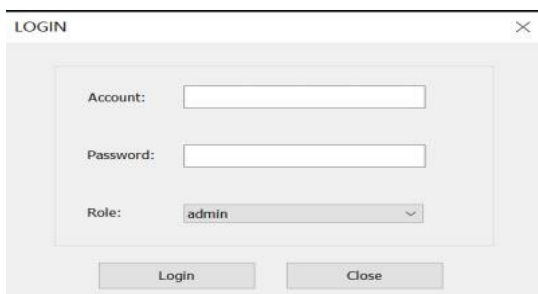


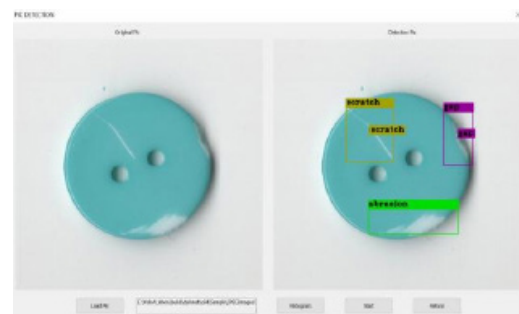
Figure 3. Login Module

After successful login, you will enter the system home page. The system home page has five views namely: User Module, Training Data Module, Offline Detection Module, Online Detection Module and Exit Module, as shown in the figure 4.



Figure 4. System Home Page

The system detection effect is shown in the figure 5 below.



(a) Multiple defect detection effects



(b) Online Real-Time Detection

Figure 5. Single Picture Detection Effect

4. Conclusions

The system runs through the hardware platform, detection algorithm, software environment and interface respectively. On the basis of hardware platform construction and defect detection algorithm, windows program is developed. The algorithm design based on YOLO and the software interface development based on C++ are adopted. Through the software, the functions of

user management, button online and offline detection and so on can be realized. The innovation of this paper is that the training stage of the model is also integrated into the system to realize a complete set of system from training to detection. Using YOLO target detection algorithm to detect button defects can obtain good defect detection results.

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