

Image Acquisition and Processing system based on USB

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Abstract. We use USB camera and IMAQ vision to program on LabVIEW platform. We process the continuous acquisition of image, include adjusting the brightness, contrast, gamma value of image, and cut the image with a specified path. The design is low cost, easier implementation and flexible operation. It's have good prospects for development.

Introduction

Image can help human perception to the outside world, is an important tool to obtain information, especially the video image is very convenient for people's life. With the popularization and development of USB interface, USB camera is widely used as high speed, portable image acquisition equipment. However, image acquisition process has some shortcomings such as long development cycle, poor universality, higher cost and so on. So, we need design a strong commonality and high performance of image and processing system is very important. In order to meet the above requirements, the design adopts LabVIEW as the software editor, which is mainly used for data collection, analysis, display and control and other fields.

We program with graphical programming language LabVIEW, through IMAQ USB module and USB camera to finish real-time acquisition and processing, system structure diagram is shown in Fig. 1. The design is divided into two parts, the first part is including a computer equipped with LabVIEW software, mainly for video image display, processing and preservation, the second part including a common USB camera, focus on real-time image acquisition^[1].

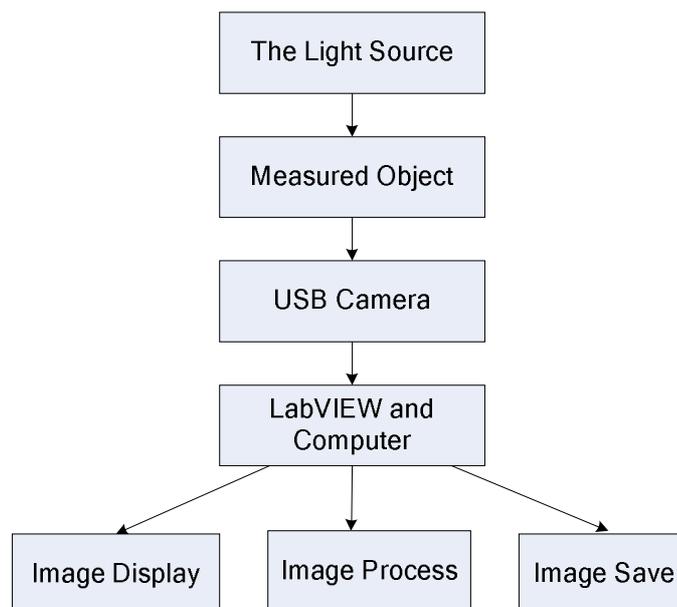


Fig. 1. system structure diagram

For image acquisition and processing technology of LabVIEW platform, NI company provides powerful software IMAQ VISION, which contains more than 400 image processing functions and interactive image processing windows, including statistics, filtering, image processing, such as geometric

transformation shape matching, spot analysis and calculation and measurement application^[2]. It can process one-dimensional or multidimensional image and also customize according to the requirement of design personalized features.

We use USB module of IMAQ VISION and USB camera to realize the video acquisition, design control image operation panel, adjust the brightness of the image, contrast the gamma value, capture image at a certain moment and save the specified directory. The System is simple. The cycle is short, and operation is flexible.

The System Design Process

The front panel Process. The front panel as the labview software user interface, can effectively collect video image and display on the computer. We can adjust brightness, contrast and gamma value, at the same time, we can capture the image and save it under the specified path. The front panel design is shown in Fig.2.

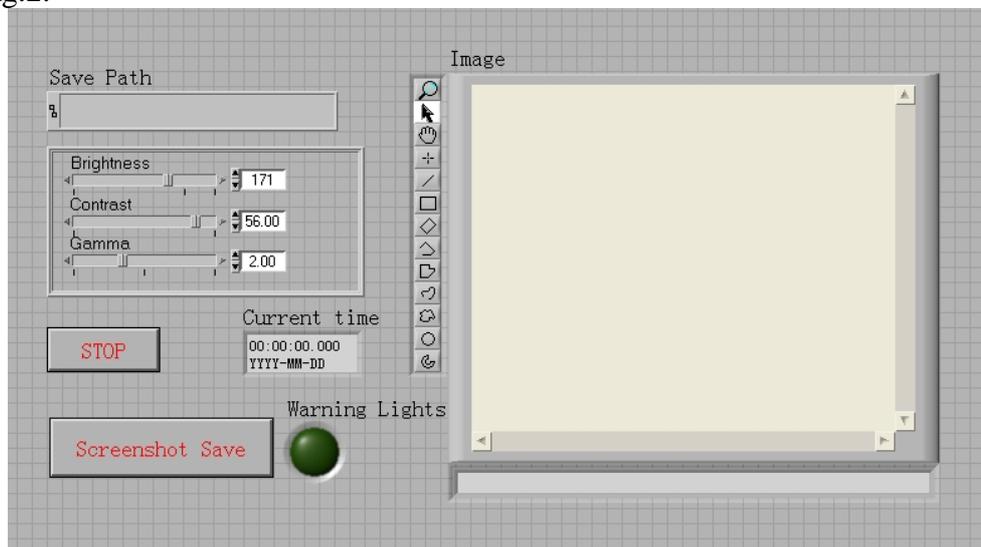


Fig.2. The front panel design

The diagram Design. The program block diagram is used to implement vi logic functions, is the graphical code, as shown in Fig.3. We use attachment to corresponding function such as program, controls, constants and variables. It's compared with the traditional text type code, not only the development is simple, but also the program is easy to understand^[3].

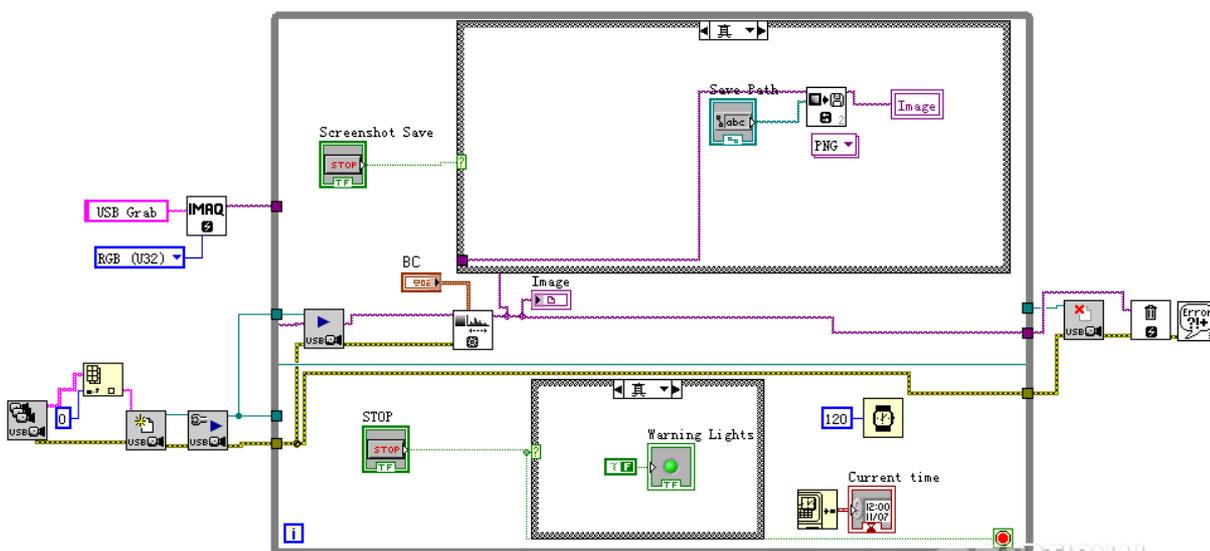


Fig.3. The program panel design

The program block diagram of the process as shown in Fig.4.the program block is divided into four main function moduled,including image acquisition module,image processing module,image saving module and other functional modules^[4].

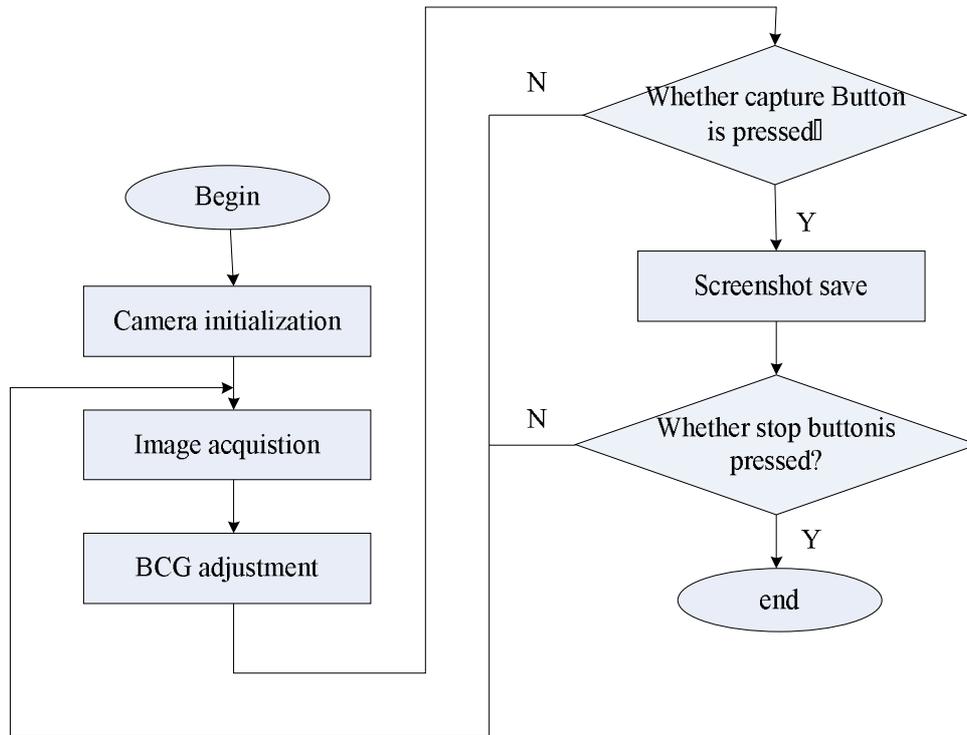


Fig.4 The program block diagram

(1)Image acquisition module:Firstly,we use the output of the IMAQ USB Enumerate Cameras.vi connected to the strings array of usb camera,open the USB camera with IMAQ USB Init.vi,and by IMAQ USB Init.vi to open the usb camera. Secondly,we use while loop and IMAQ USB Grab Acquire.vi to collect the image continuous,and IMAQ Create can set the buffer space of IMAQ USB Grab Acquire.vi.Finally,we use IMAQ USB Close.vi to close the USB camera.The whole process,the image real-time display by Image Display.

(2)The Image processing module:We use the while loop to acquire the continuous image.We use IMAQ ColorB-CGLookup, Image Src and Image Dst Out to connect input image and output image. Red BCG Values , GreenBCG Values and Blue BCG Values are used to change the brightness,contrast and gamma value,which can adjust the visual effect of image.

(3)The save function:In the while loop,the conditional structure is used to judge whether we need screenshot.We use IMAQ WriteFile to set the save image type to PNG format.,The users can choose the storage paths,including the select folder or new folder.Boolean controls the choice of control condition,if true,the system automatically pop-up save dialog box,you can customize the image name,and save the current video image;if false,we must continue to collect images.In addition,if you select the cancel button in the dialog box,the system immediately to exit the save box,restore image acquisition function ,does not affect the program run.

(4) Other modules: In the while loop,we can set the program to display the current time and ms timer.It is convenient for users to observation time by the current time mode.We can control code execution speed and reduce the CPU usage by ms timer.In addition,as long as the program runs,the red light has been bright,which can remind the user the program is using.

Image process. Firstly, we process the image such as gradation transformation and smoothing filter. Secondly, we separate the target from the background.Thirdly, we produce template and match template image.Finally, we calculate the center of the target location^[5].

Dynamic image recognition. The static image has nothing to do with the time,it is the function of the position,but only a static image can't describe the movement of objects.The moving target is image

sequence, each image is called a frame, The different image contains of relative information of camera and scenery. The image sequence usually can be expressed as $f(x,y,t)$, It add a time parameter t compared with static image. Because of time interval of all image is equal, so the image sequence can be expressed as $f(x,y,i)$, It means the number of frame. We can analysis image sequence and get the motion parameters. we can use a algorithm which compare two different frame of the target image and we can know the differences because of the movement of objects. In the actual calculation process, we need subtracte the two frame target image, according to difference pixel can detect the moving object, calculate the movement of the target direction.

Conclusions

Compared with traditional USB camera to collect video image, the system can not only realize the basic functions, and when the image is darker, it is can adjust the brightness; the image is not clear, it is can adjust the contrast; g value also can help to adjust the image color information, improve the image quality, making it easy for users to observe. At the same time, the system has good development and application scenarios.

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