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Design of Color Sorter System by Using Arm Processor

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Abstract - The color sorting of grains up until the 1990s was performed manually. Experimental work on machine grading of grains was done under laboratory conditions. In 1985 an automatic bruise detection system was proposed by Taylor. But the size of the machines is very huge more power consuming and having very high cost. Also when processing color images, the following problems (amongst others) have to bedealt with: The images are vectorial, lighting conditions this can be overcome by using mini2440 FriendlyARM9 kit. For scientific work, the camera and lighting should be calibrated. The color sorting system using arm processor on wince environment. This system consists of 3 main sections: electric control system; image processing system; grains sorting mechanism. Picking of grains is achieved through pick-up arm drive, for color sorting the image processing technique is used. The wince operating system is installed on ARM processor. The image processing and color sorting is done using CMOS camera and sorted color will be picked.

Keywords **- MINI 2440 Friendly ARM9 kit, CMOS Camera, Visual basic 6.0, Pick-up Arm**

1. Introduction

The color sorting of grains up until the 1990s was performed manually. Manual inspection is labor intensive, slow and can be inconsistent due to fatigue and due to the relatively large staff turnover caused by boredom**.** Experimental work on machine grading of grains was done under laboratory conditions. In 1985 an automatic bruise detection system was proposed by Taylor. Majority of primary systems were mostly based on grey scale or monochrome images. Color image processing based system have more recently been used in color sorting, however, they have been mostly applied to assessing grains. Environmental data collection became very popular with the rapid development and Progress in sensor technologies, embedded computing, and the availability of inexpensive CMOS cameras. The MINI 2440 ARM9 controller is a single board computer based. The board is ideal for learning about ARM processor, embedded operating system. And the ARM9 processor is specially based on the SAMSUNG S3C2440 microprocessor; it embodies professional table CPU core power source chip and reset chip to ensure the ability of the system operating. The PCB on the MINI2440 board is designed to be 4 layered boards. It supports Linux and Wince operating system. In this project a color image processing based vision system for sorting of grains. The image processing algorithm first extracts the grains area from image background and then calculates its color ratio, which is the key feature in sorting of grains.

2. Literature Survey

In 1985 an automatic bruise detection system was proposed by Taylor. This series machines are equipped with 512 pixel camera and is capable of providing more quality output in less number of channels. 2048 pixel double side camera with 4.5 Meters per second scanning speed. This series is available in two specifications like 90 channels and 120 Channels.

This machine is optimum for rice mills of capacity 1 to 2 tons output per hour. The other commodities that can be sorted using CHROMA are Little Millet (Bagaur), Cluster Bean (Guargum), Sugar, Coriander, Gum etc. It his machine is designed unique with the powerful software that makes billions of right decisions to identify shape and size of defect, spot defect and watershed algorithm to arrive the area of every product pass through our high tech CCD camera in a mille second.

Fig. 1. Shows color sorter system

Fig. 2. Different types of grain

3. Problem Definition

There are many industries in the world having color sorting operation. But the size of the machines is very huge more power consuming and having very high cost. Also when processing colour images, the following problems (amongst others) have to be dealt with:

- The images are vectorial → 3 numbers are associated with each pixel.
- The colours recorded by a camera are heavily dependent on the lighting conditions.

Lighting conditions- The lighting conditions of the scene have a large effect on the colours recorded. Dealing with Lighting Changes- Knowing just the RGB values is not enough to know everything about the image.

This can be overcome by using mini2440 Friendly ARM9 kit. For scientific work, the camera and lighting should be calibrated.

4. Objective

The main objective is to sort color using image processing on Arm Processor. Sorting different commodities with defects of specific size is made easy. The machine is designed unique with the powerful software that makes billions of right decisions to identify shape and size to arrive the area of different grains pass through our high tech CMOS camera in milliseconds. To design an intelligent grain sorting system, which can carry out various shapes of grains: Masoor, Mot, Mug etc., and can pick and sorting procedure automatically. This system consists of 3 sections: electric control system; image processing system; grains sorting mechanism. Picking of grains is achieved through pick-up arm drive, are installed on arm kit.

5. System Architecture

Fig. 3 MINI2440 appearance

The MINI 2440 Friendly ARM9 kit using on wince environment. The CMOS camera interface with the arm9 kit. Using the CMOS camera image sensing will done. That image is then send to the ARM development board where by using image processing it will sort the color of the particular grain & then instruction will give to the pick-up arm . The pick-up arm will pick that specified grain and sort.

6. Methodology

This system consists of 5 sections: Wince installation; electric control system; CMOS camera test; image processing system; grains sorting mechanism.

6.1 Implementation the Wince Operating System on ARM Processor

Wince binary image file is on image/wince folder. Connect MINI2440 board with USB cable and power on the board to enter supervivi main menu. Watch indicator on DNW title bar to check if USB connection success:

Major steps for:
(1) Zoning
(2) Install bootloader
(3) Install Eboot
(4) Install Windows CE Kernel Image

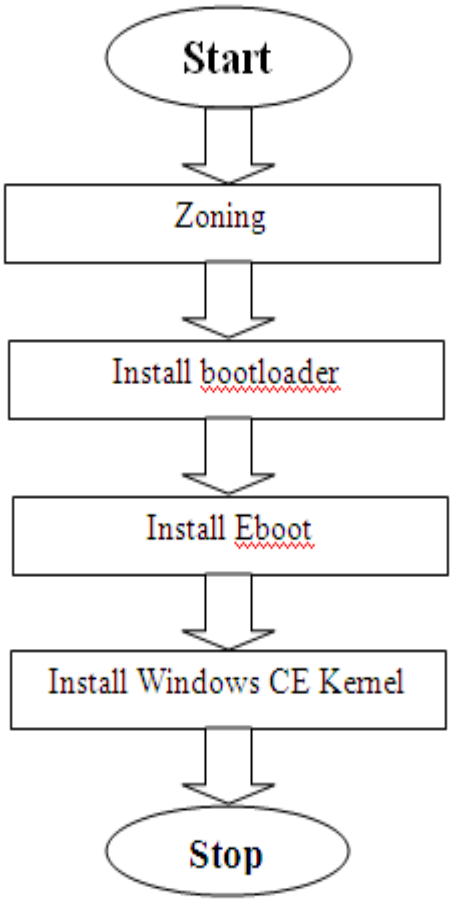

Fig. 4. Flow chart of Wince installation

6.2 Electronic Control System

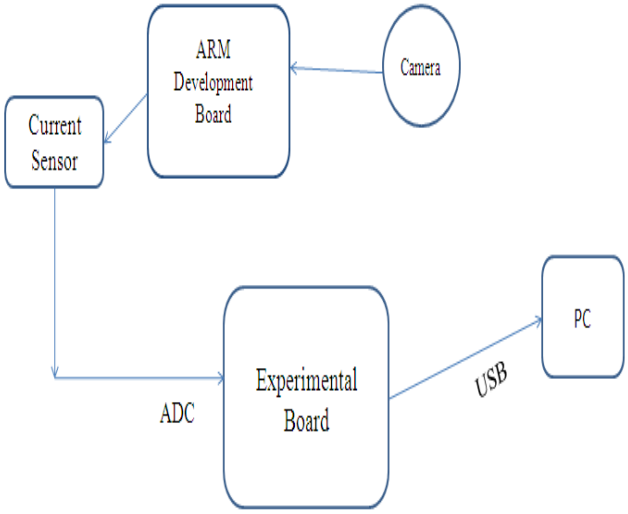

Fig. 5. Data Processing

6.3 CMOS Camera Test

The CMOS camera is interfaced on ARM kit. Which capture the image. An image data processing apparatus for comparing images based on color feature information of images. The image data processing apparatus has a color group sorting that stores information for sorting colors to a
plurality of color groups. The image data processing apparatus counts color elements of each pixel of the image for every color group With reference to the color group

sorting. The image data processing apparatus obtains a representative color of each color group based on values of the color elements of pixels in every color group and an occupancy ratio of pixels counted for every color group to all pixels of the image, there by extracts the color feature of the image. The image data processing apparatus compares images based on the color feature and searches desired images from an image database. For image processing the VB language will be used.

6.4 Image Processing System

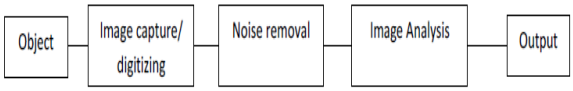

Fig. 6. Block Diagram Of Image Processing

Visual basic 6.0: It is software tool which supports the wince operating system on ARM processor. It allows the user to easily create a program in VB.NET to sort the color using ARM processor.

6.4 Grain Sorting Mechanism

This tool is interfaced with the ARM processor to perform various grains sorting function. As the system recognize the specified color of grain then it send its exact location details to the control system and then pick arm will pick that specific grain.

7. Conclusion

A complete method for color sorting is given in this paper. All the function that is present in industrial color sorter system that all are present in this system. We design color sorter system using ARM processor and using image processing for capturing and detection were done and for synchronizing its all operation ATmega16 IC is used which perform its accurate job. VB is use as tool through which programming is to be done.

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