A NEW HORIZONTAL CURRENCY SORTER

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ABSTRACT
At present, most currency sorters are vertical. Limited by their height and bulk, the quantity of bank notes are not enough, and the efficiency has been reduced. On this account, we designed a horizontal one to solve the problems mentioned above.

Keywords - currency sorter, CIS image sensor, microcontroller

I. INTRODUCTION
Nowadays, currency sorters occupy an important position in businesses which have dealings with a large amount of cash such as banking, supermarkets and transportation because of their high efficiency comparing with manual labor. However, most of them are vertical, and this structure greatly limits its efficiency. To improve the efficiency of most existing currency sorters, we designed a horizontal one with 7 bank notes, and it can sort 7 different kinds of paper money at the same time, moreover, it can also separate out forged money and worn money from other good used money.

II. THE DESIGN OF CONSTRUCTION
The currency sorter is comprised with 3 parts: the currency part, the detection part and the pick-out part, and the currency sorter takes the horizontal layout.

i. THE CURRENCY PART
The major function of this part is to divide the money in into a single layer, and it will be very helpful for the next step-- to put the money into the detection part. The theory to divide money is the friction force. We take advantage of several rubber wheels, and put these wheels in upper and lower two layers, and make the lower layer fixed. In this way, when money is put in, the machine can divide the money easily.

ii. THE DETECTION PART
The major function of this part is to identify money of different denomination, and translate the result into electrical signals. The realization of this function mainly uses CIS (Contact Image Sensor) image sensor, thickness sensor, magnetic sensor and fluorescent sensor.

iii. THE PICK-OUT PART
The major function of this part is to let the divided-money out from the corresponding exit. We utilize the electromagnetic spring picking device as the sorting device, and this mechanism is fast enough to meet the requirements.

Fig.1 is overall configuration diagram. 1 is Entrance of Notes. 2 is Thickness Sensor. 3 is Fluorescent Sensor. 4 is Magnetic Sensor. 5 are Rubber Wheels. 6 is Image Sensor. 7 is No. 1 banknote outlet. 8 is Electromagnetic Spring. 9 is No. 7 banknote outlet.

III. THE DESIGN OF CONTROL SYSTEM
The hardware of the currency sorter is mainly composed of each module as shown in Fig.2. As you can see, 5 sensors are used to achieve functions of discriminating, identification and sorting. Due to the need for fast processing speed, we choose the Model AT89C51ED2 microcontroller, which have fast enough access and computing speed, and can save the system parameter setting, power failure without loss of data, supports ISP programming support features UART, SPI interface, fully meet the needs of the sorter control system.

IV. THE DESIGN OF SIGNAL PROCESSING SYSTEM

Blackfin® series DSP is ADI and Intel jointly developed a high-performance architecture embodies’s first fourth-generation DSP products are very suitable for image, sound and a variety of telecommunications Internet applications.

Demand for sorter signal processing, ADSP-BF533 having sustained work at 600MHz, is conducive to the banknote recognition algorithm for real-time, a large number of bills that can be cached image data, faster data access and other features.

V. THE DESIGN OF SOFTWARE SYSTEM

To meet the high efficiency at high speed complete detection, software design master control program using assembly language ASM51 way.

Flow chart shown in Fig.3, in the design algorithm, according to the bill that we can identify the characteristics of the machine, through several experiments made in the image data standard bills, thickness, magnetic, optical and other identification points, and save the data into the data processor. In use, each of the sensor data acquired with the standard comparison of the data, the identification results obtained recognition bill.

REFERENCES