Automatic Detection Of Mismatched Pattern In Punched Cards For Small Scale Power Loom Applications

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Abstract: In this paper a novel design to detect pattern mismatch in the punched cards which are widely used in power loom industries is proposed. Punching machines are used to print design pattern in the form of holes in cards. Any changes in the pattern punched in the card leads to modification in actual design. Hence the verification of the punched pattern becomes essential. An embedded system based solution is given to detect errors in real time at the outlet of each card from the punching machine. The light sensors are used to retrieve data from the card and the retrieved pattern is compared with actual design pattern.

Index Terms: Punched card, Punching machine, Power loom, Mismatch pattern, Hole, Sensor, Embedded system

1. INTRODUCTION

Image processing techniques are mostly taken to retrieve information from the card. The retrieving system presented [1] has a camera connected in the system to the get the image of the punched card and the images are processed to collect the information present in the punched card. The collected information is stored and reused in the designing process. In the paper [2] the image of the card is obtained and it is converted into gray scale image and image processing techniques are applied to the data.

1.1 PUNCHED CARD

The punched cards are stiff paper that holds the information about the design in the form of presence and absence of holes. These cards are available in various sizes. Cards of 8 rows and 53 columns size is shown in fig 1. is used. This size of card is widely used for saree weaving. A card contains lacing punch, peg holes and design holes. Lacing punch is used to connect a card with another card while peg holes are used to fit the card in the system. Before imprinting the design into clothes, that particular design has to be printed in the punched cards. A single card contains the information about the first row of the design. Several hundreds of punched cards are used for a single design. These cards are laced continuously for weaving cloths. The presence and absence of pattern holes in punched cards creates pattern in the cloths. The machine can handle most complicated designs.

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A deck of blank cards will be passed over the machine with the

***Fig. 1**. Punched card*

design to be printed. A design is converted into a binary file and it is given as an input the system. An array of eight needles will punch the card based on design pattern. The machine reads the input from the system column by column and cards are also punched in that manner. The presence and absence of holes represents the binary value '0' and '1' respectively. At certain situations there may be fault in the needles of the punching machine such that needles may broke or it may be hold strictly in that position. In such cases it leads to no punching or continuous punching in that column of the card. If it is not noted at the earlier stage, series of cards are punchedwrongly. This results in wastage of cards or sometimes wrong design printing in the clothes. In the existing system the number of sensors required to retrieve the information from the card depends on the card types. For a 420 hole type card, 420 sensors are used. Basically that information is retrieved for the purpose of retrieving design from the old punched card. In small scale power loom, these cards play a major role. Weavers verify the punching pattern manually. It is a tedious as well as a time consuming process. A real time automatic verification of pattern in the card is proposed in this paper.

Fig. 2. Design

Fig. 3. Punching machine

Fig. 4. Binary pattern of design

2 PROPOSED METHOD

For real time processing of punched card after punching from the machine an array of eight sensors are fitted in the in outlet of the card in the machine itself. The original design is converted into series of binary values and loaded into the microcontroller. At regular interval of time the sensors sense the card for a particular row and send the output to microcontroller. The delay will depend on the speed of the machine. The microcontroller compares the stored design data with sensed data. In case of any mismatch in the pattern, an alarm will be produced to indicate the user. Block diagram for error detection is shown in fig 5. The microcontroller act as a central unit of the system. It takes input from the sensors and compares the data with the preloaded design data. If any mismatch arises between these two data it activates LCD and buzzer to stop the machine. Fig 6. represents the flow of the process. The controller compares patterns continuously till the end of design to detect the error pattern.

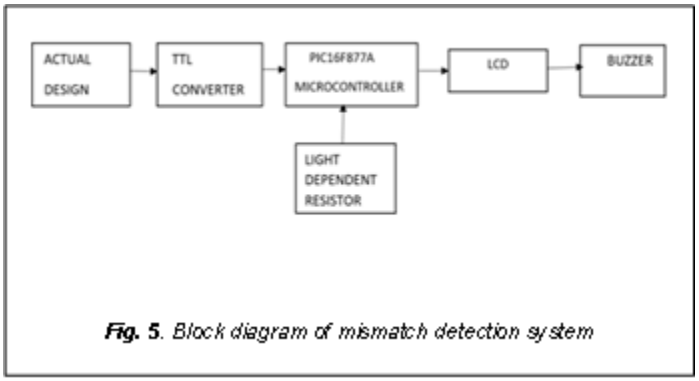

Fig. 5. Block diagram of mismatch detection system

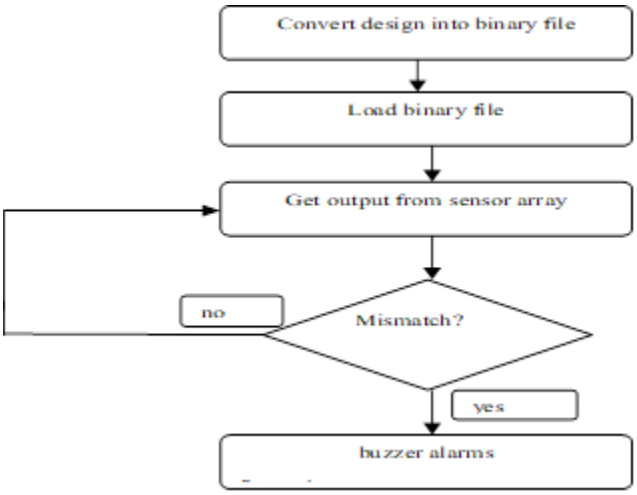

Fig. 6. Flowchart of mismatch detection system

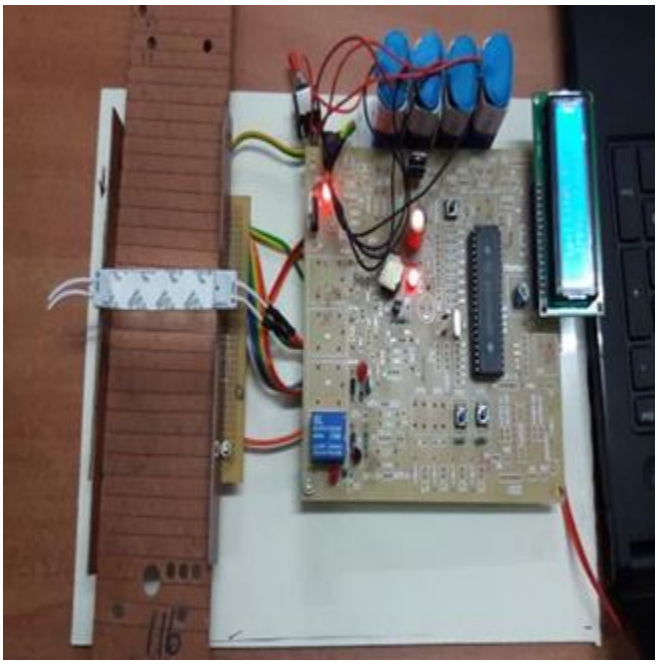

***Fig. 7**. Hardware setup*

3 EXPERIMENTAL SETUP

The experiment is conducted using hardware setup as shown in Fig 5. The card is passed between the two walls of the mount. Sensor array is mounted on the top unit. The hardware and software used in the system is discussed below.

3.1 Hardware

The microcontroller used for the experiment is an 8-bit microcontroller, PIC16F877A. It consists of 14 KB memory for program and 256 bytes for data storage. Since memory is FLASH type that can be programmed more than once, it makes microcontroller suitable for this application. The microcontroller also supports serial communication. The TTL converter cables provide two way RS232 serial communication signal conversion between the TTL output such as a microcontroller board to and from a personal computer RS232 Serial COM port. The USB TTL Serial converter cable connects PC's USB and serial UART interface of microcontroller. A sequence of design data is fed to the microcontroller through that cable. It is simply connected with computer using USB cable. Here 8 LEDs and 8 LDRs are fixed in the detection unit. The LDRs are used to sense the printed punches. LDR detects a hole as 0 and absence of a hole as 1.

3.2 Software

The actual design is an image file. An image file cannot be directly fed as input to the microcontroller. So the image file is converted into the binary file using MATLAB and fed to the microcontroller as input for comparison. MPLAB IDE software is used to program microcontrollers. For every new design the program needs to be same and only the design data gets changed.

4 RESULTS

A sample card is taken for the experiment. The design is loaded into the controller with modification (binary '1' is entered as '0' or binary '0' is entered as '1') in the design in one or two places. When the card passed through the path the sensor accurately detects the mismatched pattern. LCD displays the error detected and buzzer alarms.

5 CONCLUSION AND FUTURE SCOPE

The error in the punched card causes wastage of cards as well as makes the verification process tedious. Sensor based solution saves time and manual intervention in the verification process. Similar experiments to be conducted for finding the thread overloading or missing while weaving cloths in the power looms.

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