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DESIGNING AN AUTOMATED SAMPLE COLLECTER

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ABSTRACT

There are factories that use conveyer belts in their good manufacturing process. They have a requirement of checking the quality of samples while moving on the conveyer belts. Manual sample collection is a time wasting work and is a hard work for the worker. Therefore, a low cost automated sampling system has been developed to avoid the above mentioned problems. In this research work, the objective is to collect random samples. A proto type has been developed to implement this system properly. This system consists of three parts i.e. counting system, sampling and conveyer system. Using these systems, processes such as moving object counting, random samples generating and sample collecting has been automated.

Keywords: Samples collecting, Object counting, Conveyer, Random samples

1 INTRODUCTION

1.1 Industrial Background

In the speed running world everyone are considering the time factor as an important issue. Most of the modern manufacturing industries that use conveys, consist of highly automated workstations. These manufacturers produce a large quantity of objects like soaps, snack bottles...etc.[1]The counting of objects takes a lot of time when a large order is received. Therefore they are used some automated systems for counting those items. There are lot of automated counting systems based on image processing, Programmable Logic Devices

(PLDs)...etc. [2] But they are highly costed systems and they are not suitable to small and medium industries.

Manufactures also check quality of the products by getting samples. These process also mostly can be found in conveys. Generally, the process of sampling objects is performed manually in small and medium industries. However, there are some automated systems related to this process. One of those systems is used an autonomous robot that can identify objects when placed on the conveyor belt based on color sensing and then sort by relocating them to a specific location. It synchronizes the movement of robotic arm to pick the objects moving on a conveyor belt. [3] But this system also highly costed and complexed.

According to current manufacturing industrial background, there is a requirement of the automated system for counting and sampling objects on conveys. It should be cost effective and simple one.

1.2 Project Description

Considering current industrial background, an automated system is developed. The main intention of this project is to count the objects moving on a conveyer belt in industries and to get samples of objects randomly for checking quality of the objects. Main features of this system can be stated as follows,

- Custom Selecting Function: Give ability to select number of products, that user need to deliver at one time (selecting total number). As well as give ability to select number of samples, that user need to check the quality of product (selecting sampling frequency). In this case, sampling frequency should less than or equal to total number.
- Random Sample Generating function: A list of random numbers can be generated automatically, that equal to the selected sampling frequency.
- Automatic sample gather function: According to the selected random list, suitable samples are gather automatically from conveys helping pusher arm.

2 EXPERIMENTAL

The system consists of three parts i.e. counting system, sampling and conveyer system.

2.1 Counting System

Counting of objects take place through in LDR (receiver) and Laser LED (transmitter) which is main part of counting circuit. Sensor senses the objects when conveyor is rotating and material is flowing on belt. Sensor and send signal to IC(ATmega328), after converting this analog signal to digital signal, LCD display shows output which is value of counted by sensor.

2.2 Sampling System

According to the given total number of objects and sample frequency, random digits are generated by system automatically. This number of random digits is equal to the sampling frequency (number of object to be check).For this random number generation, an algorithm is used with Arduino programming language. While the counting is on progress, the previously generated random values are compared with the counting values. If the values are equal, it is indicated by LED and captured object number is displayed on LCD display.

2.3 Conveyer System

Conveyors are used for material handling between two working stations. Conveyor may be horizontal or vertical. Products of irregular shape can be easily carried on a horizontal conveyor. Therefore, used horizontal flat belt conveyor An AC motor of 5/6 r/min is used for rotating the conveyer belt. A solenoid is mounted near the conveyer belt. It is used as pusher arm. When a previously captured objects move towards, pusher arm gives a push to remove the object from the belt automatically. These removing objects can be collected using tray. For implementing the system, following block diagram is used.

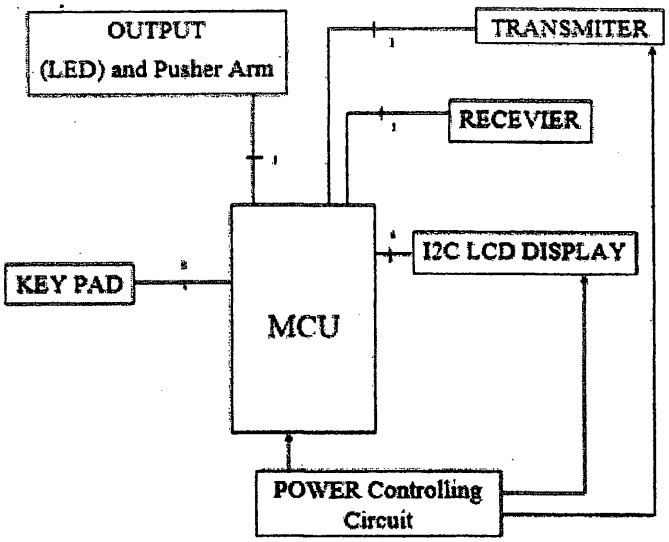

Figure 1: Block diagram of the system

3 RESULTS & DISCUSSION

Main target of this project is to automate the sample collecting process when objects moving on conveyer belts. According to the experimental results, when entered the total number of objects that need to move on conveys and number of samples that to be check, random number list was generated. While the counting was on progress, previously generated random values was compared with the counting values. When a random number and a counted value were equal, it was indicated by a Blue LED. When the captured object came to in front of the solenoid, object was removed from conveyer belt by pushing of solenoid. This process can be done by changing total number of objects and sample frequency. In those process also achieved the expected output as properly. Proto type of the system was created to visualize outcomes of the project.

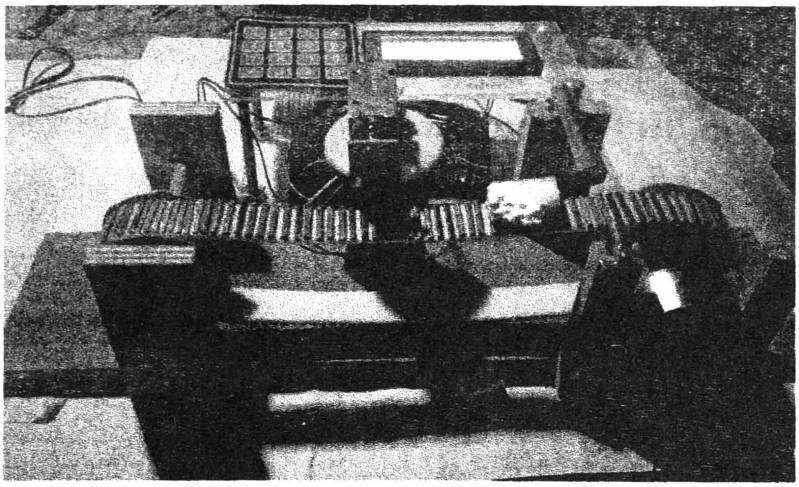

Figure 2: The proto type of the system

There are some limitations of this system. Those are can be given as follows,

- This system have to re-configure according conveyer belt rotating speeds. [4]
- This system cannot used to collect heavy items.
- This system cannot be used to collect items like glass bottles which can be brittle when apply force.

4 CONCLUSION

According to obtained results, expected output of the system is achieved. This automated sample collecting system is very useful to manufacturing industries because this system is cost effective system. As well as time wastage is also reduced because manual object counting and sample collecting consumes much time. Therefore, manufacturing productivity also can be increased using this automated system. This system can be developed further. A robot arm can be used to pick the selected objects instead of using a solenoid. Further, a memory card module can be used to store the sampling history.

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REFERENCES

[1]. Aniket Thor,Satish Kakade,Shahrukh Shaikh, "Counting Conveyor For Engineering Applications," *IPASJ International Journal of Mechanical Engineering (IIJME),* vol. 3, no. 5, p. 4, 2015.

[2]. Amruta Pandit,Jyoti Rangole, "Literature Review on Object Counting using Image Processing Techniques," *International Journal of Advanced Research in Electrical,Electronics and Instrumentation Engineering,* vol. 3, no. 4, p. 4, 2014.

[3]. Pankaj Agarwal, Ratnesh Kumar tiwari, Samardeep Banyal,, "COLOR/METAL SENSING SORTING SYSTEM," *International Journal Of Engineering Research & Management Technology,* vol. 1, no. 2, p. 11, 2014.

[4]. L. K. Nordell, "," *Conveyor Belt Speed and Pulley Diameter,* p. 1, 17 September 2003.