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Design and Fabrication of Faulty Product Detection and Separation System

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Abstract: *With recent advances in industrial technologies, automation has become an indispensable part in the manufacturing world. Industrial environments are adopting more and more aspects of automation to increase product quality, accuracy, and reduce product costs. Conveyor systems are used wildly in manufacturing industries. This automated conveyor system works by detecting the size of the material in the conveyor using ultrasonic sensors. The microcontroller analyses this data from the ultrasonic sensor and then directs the pneumatic cylinder material to different directions, height- wise, depending on the height of the material. The position of the conveyor is indicated by a 16X2 liquid crystal display and LED. This project thus automates the material separation process in the conveyor to improve efficiency and increase productivity.In this report we have discussed about how the faulty product detection works , what are its procedure and steps, the components used for making this project and etc,. Also in this project we have done the modification in such a way that the color sensor detects the color faulty products and also the ultrasonic sensor detects the height difference and DC gear motor with detachable arm helps in sorting of faulty products.*

Keywords: Conveyor, faulty product detection, Automation, Embedded system

I. INTRODUCTION

All product manufacturing units need to have a faulty product detection and separation system in order to maintain product quality and maintain a good reputation. So here we demonstrate such a system using a mini conveyer belt system. We propose to design and fabricate a faulty product detection and separation mechanism. Each product is different and thus has different mechanisms to detect faulty products. Here we detect faulty products based on product size. We use a sensor to detect each product height as products move over a conveyer belt. A defected product with height lower than minimum limit will be automatically detected as it moves on a conveyer belt and separated by a conveyer arm. Here we use rollers and rubber belt to develop a mini conveyer belt mechanism. This mechanism is operated by a motor. We use an ultrasonic sensor to detect product height and products with less than minimum height are detected as faulty products.

Conveyor belt scales are most important for the production of a great variety of pre-packaged product the main aspect of this project is to increase the accuracy and speed of the checking dimensions of the material in the industry and accept or reject the material as per predetermined standard set by industry based on scalar and pneumatic system. There are various methods of measuring the dimension of the material. These conventional methods are not suitable for the industrial application, because every industry requires an automatic dimension measuring and control machine in order to accept or reject the job as per standard height. This problem is sort out by proposed design of production lines. Introduction to the increasing level of automation, automatic control technology application in the production of quantitative packaging and more in food, fertilizer, oil bottle packaging are widely used in industry. Automation system nowadays is chosen to overcome these problems. Our design produces efficient and productive results.

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Need of Project:

Detection of faulty products mechanism plays a vital role in every manufacturing industry to maintain the quality of the products. Even a slight change in color of product or dimension of product can lead to imperfection of production. In automation manufacturing, the process is handled by the robots, computer system's or by a controller. The entire production is done and packed and stored in the warehouse of the company. In olden days, the manufacturing and checking for faulty products is difficult as they use to do the checking manually one by one, which use to consume a lot of time and a lot of effort. But in today's manufacturing, we can check the products in automation process. Due to this, when the product reaches to customer and it fails to work, leads to the replacement of product or change of item. Due to this there will be a lot of time consuming for the process and because of that we must check all the products again in the production line of the faulty product, to go on smooth process for other customers. So this leads to interchanging of the product in between two relative products but that can lead to testing of all products of the production line again for the old manually process.

II. LITERATURE SURVEY

[1] G. Lo Re proposed a model-based method for the fault detection in sensor networks where the measurements are collected from its neighbouring nodes and implementation convergence cast-broadcast method. Ease of use, portability and scalability features of this method makes its implementation with better performance compared to others but the size of the field is limited.

[2] Arash proposed a model-based method stating the detection process using the clusters assuming at least a single cluster with homogeneous nodes where the energy spent by the node is calculated in a cluster and if drops uses recovery algorithm. Energy efficient and faster response and a well performing cluster heed algorithm for clusters are the features driven but the number of nodes are limited in a cluster.

[3] Jeng-Yang Wu proposed a model-based method for fault detection using the fusion center for monitoring assuming each sensor node has a binary decision rule based observations and equation decreasing the error rate at a time step for the limited number of nodes in the network.

[4] A distributed heuristic method is proposed usesthe tendency value and share the nodes test value which is compared with the other node values and validates them later. The simulation is done using C++. This method minimizes the likelihood of incorrect faulty node diagnosis. But if the status of the node is not acquired then this algorithm does not work.

[5] A time-series analysis method is used for the faulty node identification and arrangement of redundant nodes and replaces the redundant node using threshold model and simulation process which reduced the power consumption and power loss except for the fixed threshold policy condition.

[6] The fault detection in the real-world datasets described defines four fault models: Rule-based, Estimation, Time series analysis and Learning-based models respectively. It also states the detection techniques used in each model. The combination of these classes of methods results in reduced faulty nodes only if the estimated and the tendency value used is determined correctly.

[7] A heuristic approach proposed by S. Gayathri, and Ms.R.Divya, for the detection uses the round trip delay and round trip path computations and compares with the threshold for the identification of faulty nodes improving the network efficiency except for the complex paths.

[8] A new method is proposed for existing fault detection by calculating the difference of test value between the nodes which improves the accuracy in validating the results and in the process of simulation.

[9] For data centre monitoring sited uses hardware and software design architectures. The validation of the output is done; it shows a significant increase in the performance, dynamic implementation with low power but it is a time consuming process in testing and implementing the same.

III. METHOD OF DISEASE DETECTION

The system consists of conveyor belt mechanism on which the products will be kept for sorting purpose. Aultrasonic sensor is used to detect the fault in the product. Ultrasonic sensor is adjusted little above the height of the product that

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are to be tested and hence a faulty product which has more height than the actual product will be detected by the ultrasonicsensor and the sensor will give signal to the circuit and the circuit will start push motor to collect faulty product in separated box. The dc motor operate flap will push the faulty product out of the conveyor and the faulty product will be collected in a box beside the conveyor. This way fault detection and sorting of faulty product will be achieved.

The conveyor belt consists of two cylindrical roller operated by DC motor which serves the function of pulleys. The conveyor belt rotates over cylindrical rollers, one of the roller is powered by a DC motor, moving the belt and the components on the belt forward. Here, the conveyor DC motor receives power and signal from the electronic circuit.

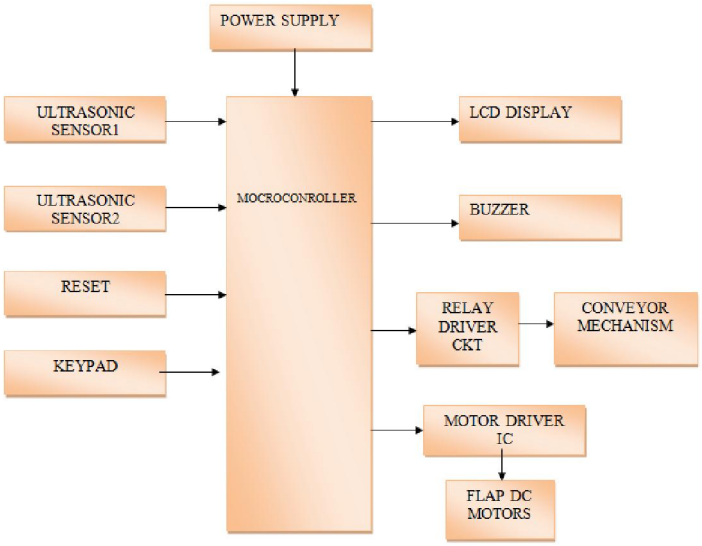

Fig. 1. Block Diagram

PIC18f4520Microcontroller

PIC18f4520 is a 40 PIN Micro-controller from Microchip with 13 channel 10 bit Analog to Digital Converter.

Special PIC18f4520 Micro controller Features

- Up to 10 MIPS Performance at 3V
- C compiler optimized RISC architecture
- 10-bit ADC, 13 channels, 100K samples per second
- Programmable Low Voltage Detection Module
- Master Synchronous Serial Port supports SPI™ and I2C™ master and slave mode
- EUSART module including LIN bus support
- Four Timer modules
- Up to 5 PWM outputs

Fig. 2. PIC 18f4520

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Conveyor Belt

The conveyor belt consists of two cylindrical roller operated by DC motor which serves the function of pulleys, with a continuous loop of oil bottles which is to be measured is maintained. The conveyor belt rotates over cylindrical rollers, one of the roller is powered by a DC motor, moving the belt and the components on the belt forward. Here, the conveyor DC motor receives power and signal from the electronic circuit.

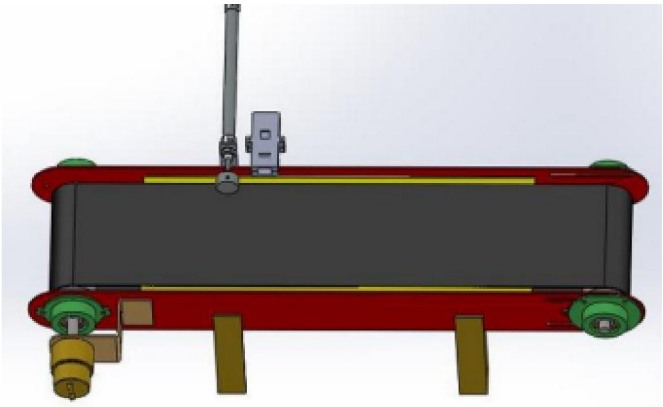

Fig. 3.Em18 RFID Tag Reader

Ultrasonic Sensor

Board Ultrasonic sensors use sound waves above human hearing (20 kHz) to detect objects by measuring the time it takes for a sound pulse to travel to an object and back, enabling distance measurement

How it works:

- The sensor emits a high-frequency sound wave (ultrasound).
- The sound wave travels to an object and reflects back as an echo.
- The sensor measures the time it takes for the echo to return.
- The distance to the object is calculated using the speed of sound and the time it took for the echo to return

Fig. 4.Ultrasonic Sensor

Motor Driver L293D

L293D motor Driver IC is an integrated circuit that can drive two motors simultaneously and is usually used to control the motors in an autonomous system. This motor driver IC enables us to drive a DC motor in either direction and also control the speed of the motor.

L293D is a dual H-bridge motor driver IC. H-bridge is the simplest circuit for controlling a low current-rated motor. One H-bridge is capable to drive a DC motor bidirectional. L293D is a current enhancing IC. It can also act as a switching device.

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The L293D is a 16-pin Integrated circuit, with eight pins, on each side, dedicated to the controlling of a motor. There are 2 input pins, 2 output pins and 1 enable pin for each motor. The L293D IC is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. It is designed to drive inductive loads such as relays, solenoids, DC & bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.

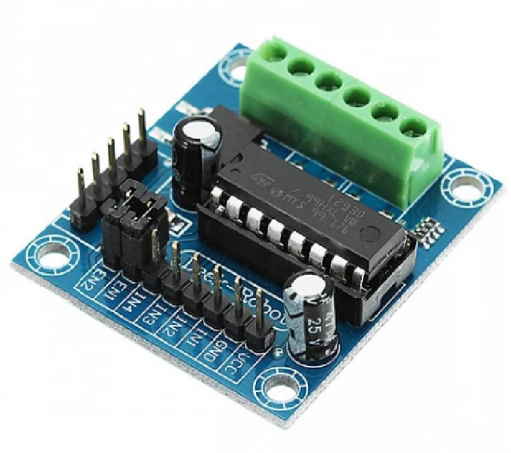

Fig -5:L293D Motor Driver

LCD Display

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD.

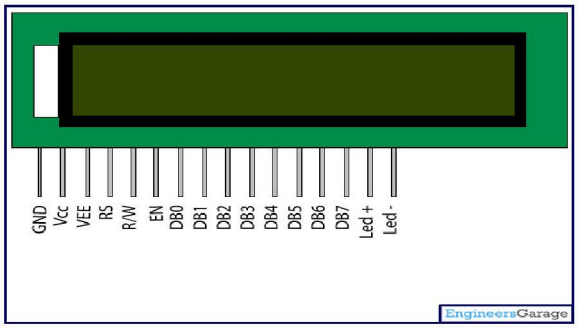

Fig. 7.LCD Display

IV. CONCLUSION

The automatic material separating conveyor system has been constructed and tested. The automatic material separating system is highly useful in quality control system to reject and accept materials/products. The automatic material separating conveyor system will help to separate material accurately. The automatic material separating conveyor system will be cost, time and space saving thus aiding to be beneficial in both the economic and technical aspects. Overall inspection time and enterprise overhead expenses is greatly reduced. It aids in speeding up the process as well as improving efficiency of production line. In proposed system to check the every bottle weight and decide the bottle is passed or fail. The decision to pass or fail a manufactured part based on automatically inspection is extremely important

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to a production operation. Inspection improvement is necessary to increase the accuracy of product and improve the performance of inspection processes.

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