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Monitoring Line Efficiency in Garment Industry using IoT

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Abstract: ***The conventional method of monitoring efficiency in garment industry is to collect the number of pieces produced per hour by each line manually and entered in the website . This method is time consuming, wastage of man power, and involves non valued activities. The IOT based line efficiency monitoring system that checks the efficiency of end line production in garment industry in real time through weight sensor (one for each parameter: pass pieces, defect pieces) . Weight of the garment and the target per hour are given as the input. As a variation in the value of weight sensor signifies that garment is dropped into the bin, therefore the number of pieces produced is increased and vice versa. The Wi-Fi module in the system transfers data processed by the microcontroller, and transfers the data to the website as well as smart phone. This system can help the factory officials to monitor efficiency at real time basis.***

Keywords: IoT, Weight sensor, Node MCU, real time efficiency monitoring.

I. INTRODUCTION

Garment industry across the world rely on the efficiency of manufacturing processes to create quality products. Manufacturing efficiency is level of performance within the company and there are many advantage for monitoring the line efficiency such as reducing human intervention ,increasing visibility ,real time data tracking etc. Efficiency in the sewing floor gives how efficiently the resources are being used in the sewing floor. In this IOT based system it quickly identify any changes in the weight of garment and calculate the efficiency of the line and report the same to the officials immediately . The system is designed for continuous on floor sensing and real time reporting of production, efficiency, number of defect pieces information's where the officials can access the data on the smart phone/PC through Internet. The proposed system employs use of weight sensors to measure the parameters, and is economical, accurate, and required less manpower. Cost of the system is very less because it depends on the number of parameters to be measured is only two(i.e. pass piece and defect piece).This study has been carried out at a reputed industry situated at Chennai, Tamil Nadu in India and the system has been implemented on end line which can be also used in finishing for finding out the efficiency in finishing floor and it will be automatically updated in the website through IoT.

II. SYSTEM ARCHITECTURE

This system monitor number of pass and defect pieces and informs about the end line efficiency via a web page.This system makes use of weight sensors, Wi-Fi enabled microcontroller, and ADC . The sensors which is placed under the bin captures the data in the form of analog signals which is converted into digital signals by ADC. These digital signals are sent to the microcontroller. The microcontroller will process the digital information, analyze it, and further communication is done by the Wi-Fi module, which sends an Information's onto the webpage/Smart phone, which also displayed on the LCD . Microcontroller accepts and processes the data collected from the sensors to the Web page via Wi-Fi module in the microcontroller. This is done with the help of coding. The code is written in Embedded-C and using the Arduino IDE software to simulate the code.

A. Thing Speak

Thing speak is a open IoT platform where we can directly connect the microcontroller with cloud and can be displayed in the thing speak platform.

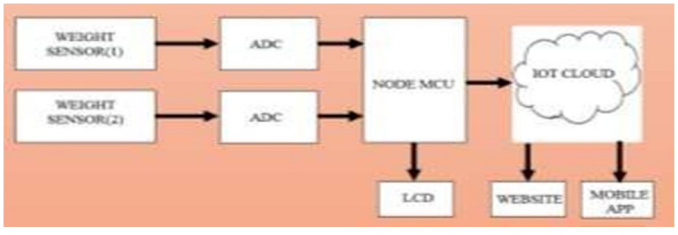


Figure1. Architecture diagram

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B. Weight Sensor

A weight sensor is used to detect the weight of the garment and conveys number of garments produced by the production line. The same principle can be used in finishing floor. It also have application in packing for automatically getting the weight of carton box.

C. Node MCU

Node MCU is developed by ESP8266 open source community and has a operating system of XTOS. It is enabled with 128kb memory and storage of 4MB space. It has 10 general purpose I/O pin.

II. METHODOLOGY

A. ADC Technique

Reads the value from the specified analog pin[1]. The Arduino board contains a 6 channel (8 channels on the Mini and Nano, 16 on the Mega), 10-bit analog to digital converter[1]. This means that it will map input voltages between 0 and 5 volts into integer values between 0 and 1023[1]. This yields a resolution between readings of 5 volts / 1024 units or, .0049 volts (4.9 MV) per unit. The input range and resolution can be changed using analogReference [1]. It takes about 100 microseconds (0.0001 s) to read an analog input, so the maximum reading rate is about 10,000 times a second[1].

B. Data Transfer

The data stored in the memory of microcontroller is transferred to the thing speak cloud through Wi-Fi. The data is connected by the unique API key which will directly connected to the particular field assigned by the user. Accordingly the value will be automatically updated and shown in graphical form as shown in figure.

III. FORMULA'S USED

Efficiency is the comparison of what is actually produced or performed with what can be achieved[2]. In general ,efficiency is the percentage of output by input[2]. In sewing floor, the equation for efficiency is calculated as given below:

Efficiency = (Number of pieces produced/Target for given time)*100 [2]

IV. RESULT

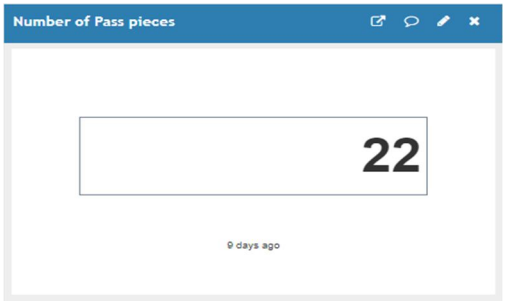


Figure2. Dashboard view for pass pieces



Figure3. Dashboard view for efficiency of line



Figure4. Dashboard view for defect pieces

The figure 2 shows the number of garments produced per line at the time interval of 15 min. From the graph in Fig. 3 shown above, efficiency of the line is 73% for the same time interval .Figure 4 shows the number of defective garments per hour.

V. CONCLUSION

The low cost, efficient, real-time efficiency monitoring system has been implemented and tested .This system can be also modified to identify the garment number so that it can be useful for tracking. This system has a wide range of scope in garment industry like it can be used in finishing section for counting the number of garment produced. It can be also used for finding the weight of carton box and automatically entering the weight in the website.

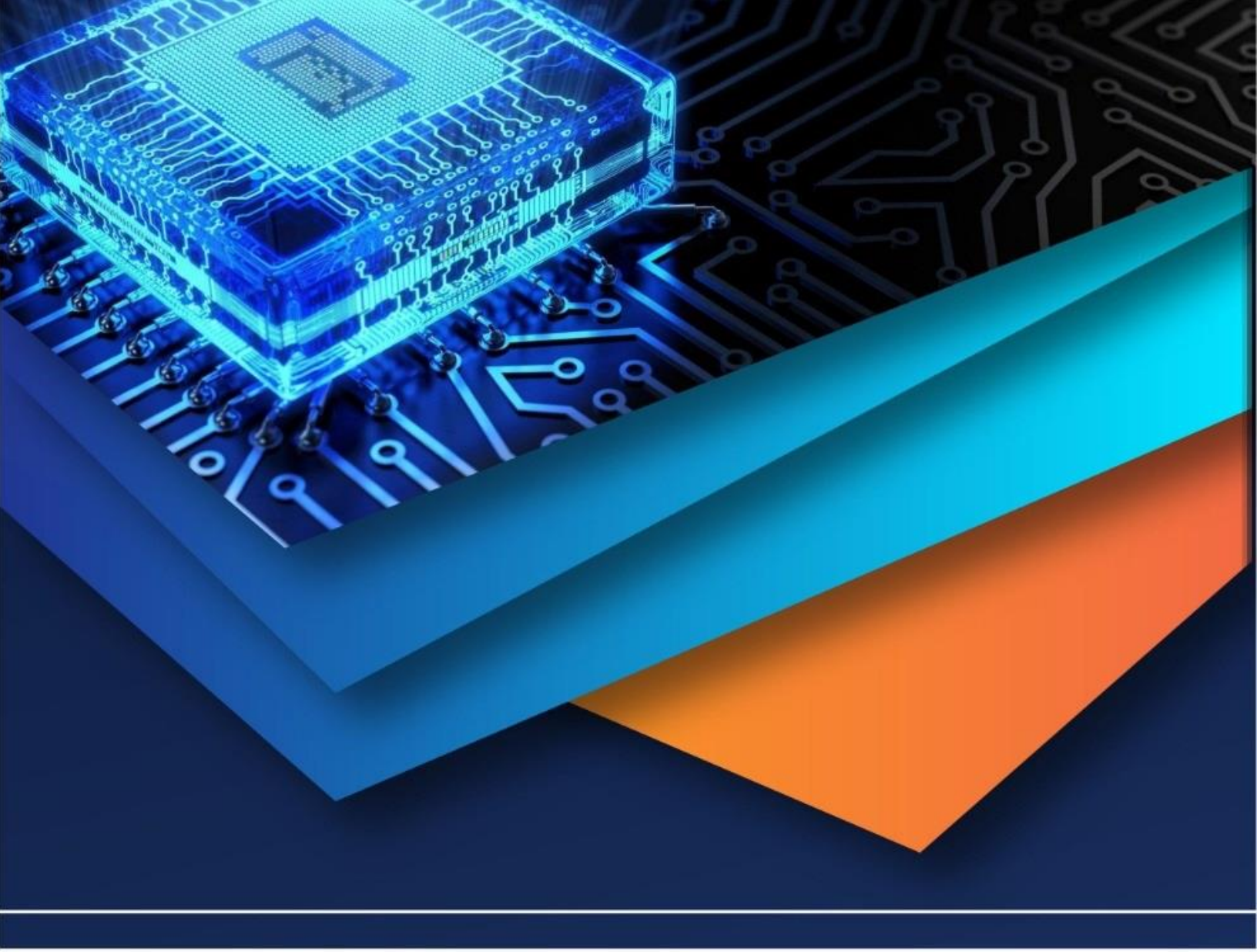
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