IoT Based Power Loom Monitoring System

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Abstract. This paper's IoT-based Power Loom Monitoring system mainly focuses on monitoring the power consumption of the power loom through the Internet of Things. Internet of things plays a vital role in all remote monitoring applications and with the help of the IoT platform, we can monitor any data, from anywhere in the world. Due to an increase in power loom production in India which is about 2.43 million recognized power looms, power looms contribute to around 62% of textile production in India which is yielding about 54,000 sq meters of fabrics and providing jobs opportunities for 57.45 lakh people directly and indirectly. And hence to make the power loom industry profitable and to make scalability of the production process by continuous monitoring of the power parameters of the power loom with the help of current sensors and voltage sensors is carried out in this paper. Additionally, the status of the thread involved in the power loom operation is continually monitored with the help of proximity sensors. Finally thus obtained data from the sensors deployed in the power loom is pumped to the universal webserver hosted in the registered URL and the data is made available anywhere in the world.

Keywords: IoT, Power Loom, sensors, industry 4.0.

1 Introduction

Internet of things plays a vital role in our project. The basic idea behind the Internet of things is assigning the unique IP address to the things that will be communicating with the host with its IP address[1]. And hence thus acquired data through the Internet of things are made available globally and can be accessed from different locations without any range restrictions. With the help of the above technology, an online power loom monitoring system has been constructed by deploying the data acquisition sensors in the power looms[2], and its essential power parameters like voltage, current consumption by each and every power loom have been monitored. Additionally, by taking the essential steps at the right time regarding production and maintenance through the available data we can increase productivity and maximize the

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profitability of each and every power looms of each and every power looms. Automation is the process of minimizing the need for human intervention in a process. The textile business has grown to overtake the united states as the world's second-largest employer.The loom data interpretation system is a computer-assisted information system[4,10] that enables better production monitoring and quick corrective action. It enables better quality and control over production. The continuous operation of each and every loom increases a mill's output[8].With its increasing expansion and demand, the textile sector is confronted with a slew of issues that must be addressed[9]. The use of automation in the textile industry is one technique for addressing these issues. Automation is the process of minimizing the need for human intervention in a process. Automation is one of the fundamental keys to quality improvement and cost competitiveness in most textile manufacturing sectors. Automated processes demand less human interaction and require less human tier to create.

2 Problem statement

In the current manner, several different technologies are used in the power loom sector. However, their abilities aren't often used. These power looms with voltage sensor, current sensor, and proximity sensor lack even the most basic features and do not provide service protection. Workers receive old-age benefits or social security. The employees complained that they were paid a pittance for their 12 hours of hard work, with no perks. The steam loom was used to create the power loom. The loom automates the weaving process, decreasing the need for humans to supervise it.

3 Proposed System

In the proposed system the power loom is fully automated and the overall performance of the power loom is monitored in the cloud platform[5,6]. Due to the accessibility of data globally, the performance of the power loom can be monitored any time and from anywhere without any range restrictions with valid credentials. Additionally, with the continual monitoring of the power parameters, the decision regarding the production or maintenance can be taken immediately whenever it is required and hence the productivity and profitability of the power looms can be increased[7].

The Fig.1.represents the overall data flow iot based power loom monitoring system. The primary source of power supply is obtained from the AC mains through AC main chords and which is further step-down through a step-down transformer to obtain low voltage AC line for the project operation. Thus, obtained low voltage AC signal is converted into DC voltage with the help of a bridge rectifier which is further processed with capacitive filters to retrieve the purest form of DC voltage for microcontroller operation. Thus produced DC voltage contains voltage fluctuation when there is a change in the input voltage level and hence linear voltage regulators are used to get constant DC voltage. We have used the Arduino Mega microcontroller unit as the brain of this project. ARDUINO Mega development board consists of an Atmega2560 chip which has 54 digital GPIO pins ranging from D0 to D53 and 16 analog pins ranging from A0 to A15. It works on the 10 bit ADC resolution which in turn yields us 1023 stages of ADC output starting for zero to five Voltage. Additionally, it has 4

hardware USART ports that can be capable of communicating to 4 different serial communication devices individually.

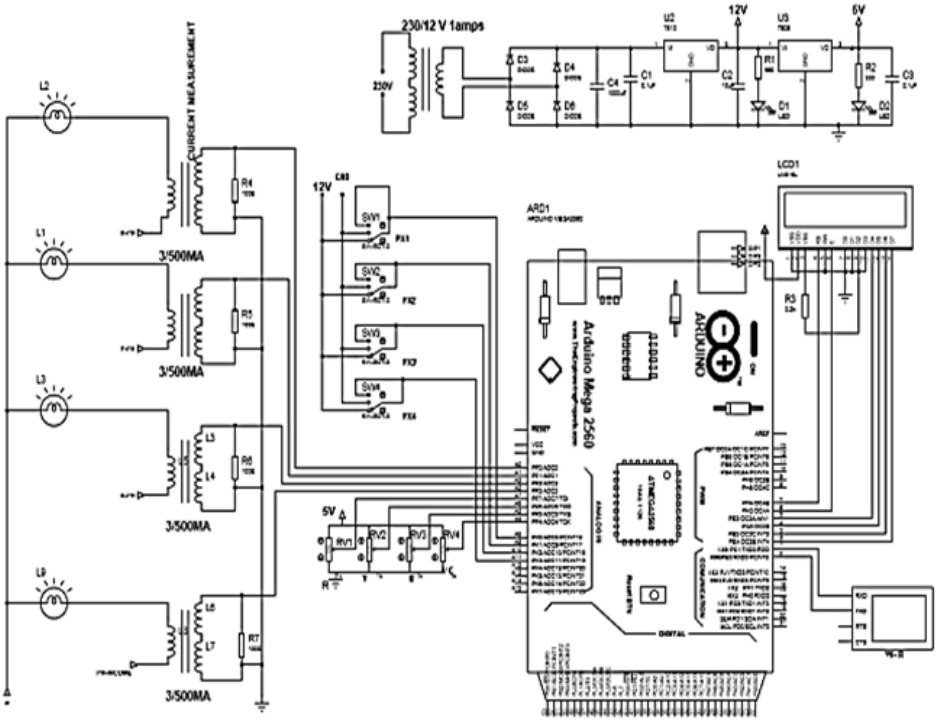

Fig. 1. Circuit diagram

The sensors used are current sensors, voltage sensors, and proximity sensors. The current sensors are nothing but the CT coils which will be round made up of ferrite core wounded by the copper coil. Based on the current sensing ability of the current transformer, the number of turns in the CT coil will be varied. Finally, the net output from the CT coil will be a current and it will be converted to its equivalent voltage with the help of burden resistor and by the scaling up formula constructed in the embedded c program identifies the current that passes through the CT coil and displayed in the 16X2 LCD locally.

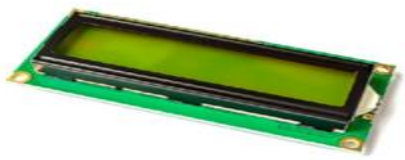

Fig. 2. LCD display

Another sensor used in our project is to measure the voltage of the power loom. Here for this purpose, we have used a voltage transformer that will step down the existing voltage input of

the power loom and scale down the voltage to the microcontroller readable voltage. Again with the help of the inbuilt ADC channel present in the microcontroller unit, the voltage is scaled up and the desired voltage level is monitored in the 16X2 LCD. Additionally, the acquired voltage and current ratings are transmitted to the cloud platform and the android application to monitor globally.

Fig. 3. Proximity sensor

The proximity sensor is used in our project to identify the thread status of the power loom and with the help of the proximity sensor, we can determine the presence of thread where ever it is required. The 16X2 LCD Display is used in our project to display the status of the sensors locally. This display is capable of displaying 32 characters at the same time and hence it is named a 16x2 LCD which means 16 characters will be displayed in the first row and another set of 16 characters will be displayed in the second row.

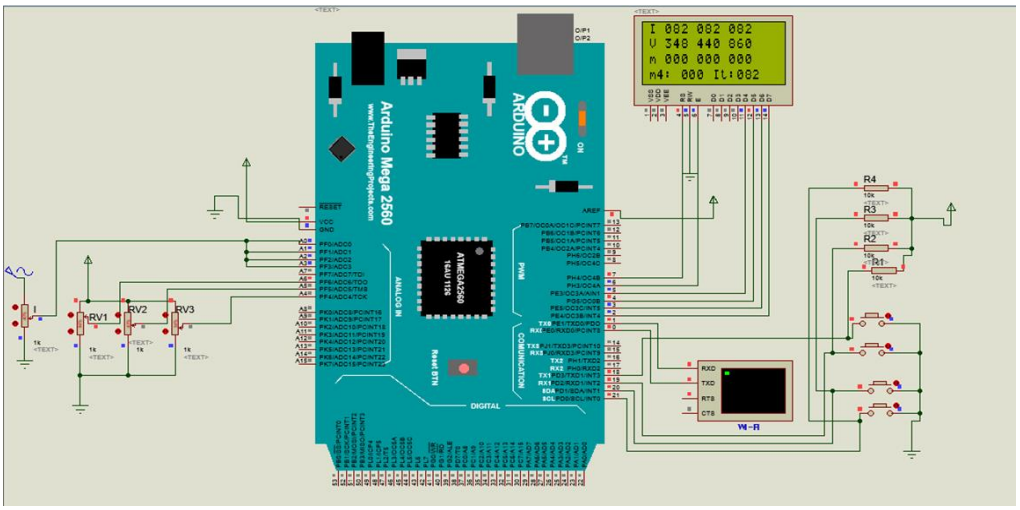

Fig. 4. Simulation diagram

In our project, we have used NODE MCU which is the evolved IoT development board from the raw ESP8266 WIFI core chip. In this module, the programming of ESP8266 is made possible without any additional external components. It has a built USB to Serially controller CH340G which supports retrieving data from ESP8266 serially and hence it forms easy to view the data thus obtained from sensors. The power supply to the NODEMCU can be powered externally through VIN and GND pin or the UNIVERSAL USB pin. This simulation modeling is for IoT based power loom monitoring system. This simulation analysis was

carried out by the Proteus Software which is used to add and modify the components after compiling the program source code.

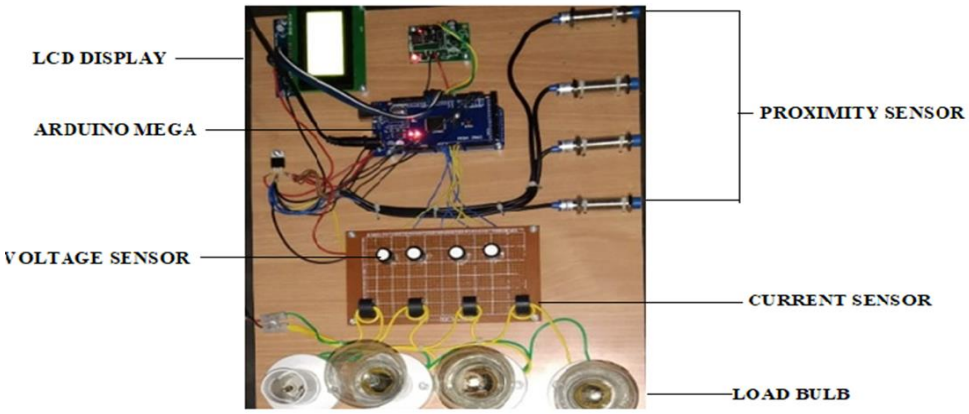

Fig. 5. Prototype

The Arduino is connected with the voltage sensor and current sensor and proximity sensor. These sensor data are through the arduino of some specified pins. As voltage regulator is used for any electronic device that maintains the voltage of power source within acceptable limits. The voltage regulator is needed to keep voltages within the prescribed range. The Arduino is linked to a display that displays the energy consumption readings. The cost of the readings can be checked and managed using the Wi-Fi module. The cloud server serves as a storage medium for the energy consumption data, which may be obtained at any time.

4 Results and Conclusion

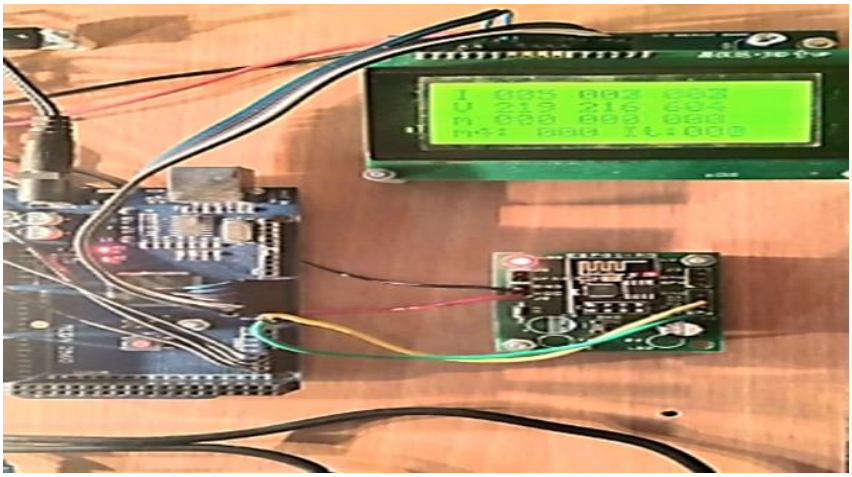

Fig. 6. Energy measurement in power loom

The LCD shows the output of energy consumed and production, In addition Current and Voltage Sensors and proximity sensors deployed and same connected to Arduino microcontroller. Also the Arduino unit connected using Wi-Fi Module to Cloud for communication of current drawn from each machines for computing total power consumed.

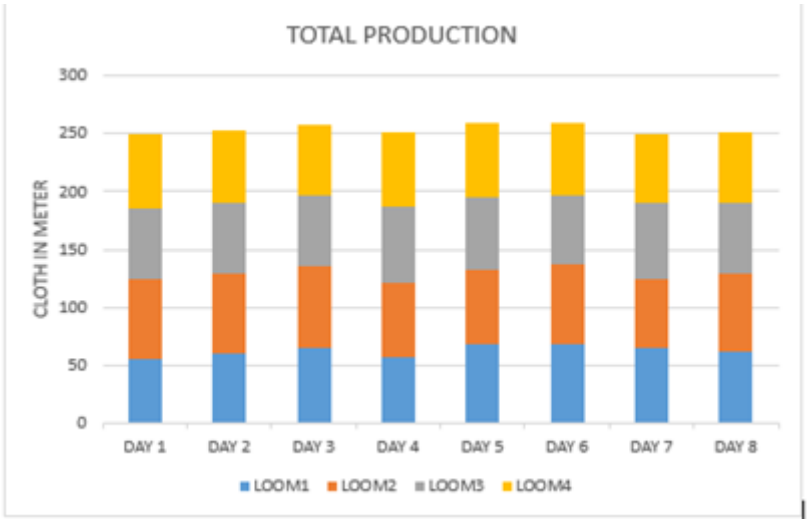

Fig. 7. Total production

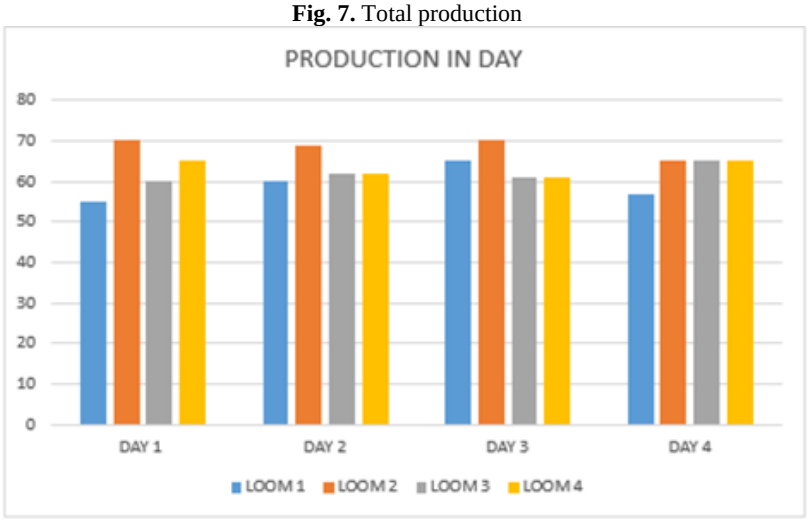

Fig. 8. Day production chart

The bar graph report generated by our system's simulation generates a production rate for each loom by day. The overall production of each power loom for the month is calculated using all data obtained from the system.The report contains various data information, such as the number of looms that have manufactured garments, the current and voltage for each power loom, and the overall power for the loom, as well as other information, such as production statistics in a bar graph.

6 Conclusion

The power loom machine monitoring system works for the development of power using IoT. This project gives the way of introducing automation in various industries on making the process. By innovating the automation system in power loom for the development of technology can be moved. This project is mainly for the small-scale industries of the power loom sector. This was majorly reducing the amount of manpower used in the power loom industry for knowing about the output of productions in each loom. Then it provides the report for each loom and various data through the web application. It has been programmed with the system; it proves the overall data of each loom for a total of a month, which reduces the manpower and consumption of time. So for make the move of automation in small scale industries of power loom sector.

References

[1] Gurusamy Pandian P.G., Sarvanasankar S., Ramasamy S.N.: Prevention of Fire Hazards and Control in South Indian Power Loom Industries using SHAPA Sensors. International Research Journal of Engineering and Technology. (2015)

[2] C.J. Vignesh, S. Nevash, V.N. Soorya, V. Sakthi Anandakumar.: Autonomous Monitoring Unit for Power Loom. European journal of molecular and clinical medicine ISSN 2515-8260, Volume: 07, Issue 02, (2020)

[3] Prasanna Kumar E., Karuppusamy P., Santhosh Kumar D., Sowndharsekar C., Venugopal S.: Intelligent monitoring system for production management in power loom. IJAREEIE 6(3). (2017)

[4] M. Saravanan, M. Jagadesh, V. Deepan, R. Divya, S. GowriManohari.: Smart Data Monitoring System for Power Loom Using IoT Security Architecture of the Internet of Things International Journal of Pure and Applied Mathematics.pp. 937-947 (2018)

[5] Shao J.F., Qin L.S.: Design of loom monitoring and management system based on C/S model,Journal of Textile Research.(2006)

[6] Shaik, Summaiya.R, and R.Dulange Satish.: A study of factors affecting productivity of Power Loom Industries , International Journal of Engineering Research & Technology.pp. 12 (2013)

[7] S. D. Gokhale, V. B. Kumbhar, P. P. Zirmite, S. P. Salgar.: Automation of Plain Weaving Machine using PLC. International Research Journal of Engineering and Technology. (2017)

[8] Deepan.V, Divya.R, GowriManohari, Gowrishankar.S.: Weaving Loom Monitoring and Control System Using Iot,International Journal of Advanced Research in Science and Engineering (2017)

[9] Chummar, Aby, and George Mathew SoniKuriakose.: Study on improving the production rateby rapier looms in textile industry, International Research Journal of Engineering and Technology.(2013)

[10] R. Sundarraj, Mr. A. Arunraja.: Power Loom Control using PIC18F4620,SSRG International journal of Electronics and communication Engineering.ISSN 2348-8549, Volume: 03, (2018)