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IoT Based Smart Factory Over the Cloud

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Abstract: ***Industry 4.0 is a huge step forward in the industrialization process. Modern environment industries are seeing fast growth in terms of performance capabilities and expectations for corporate clients and the industrial sector in recent years. The Internet of Things (IoT) is a cutting-edge and quickly expanding sector for network automation, data sensing, data mining, and control. These systems have a strong inclination to monitor and regulate various industrial processes. Because of its cost-effectiveness and adaptability, IoT systems have been adopted and have applications in a variety of sectors. In this project, we're creating a prototype that features real-time AC motor control through a wireless network. Data may be saved, monitored, and then transported to cloud storage with the aid of this technology.***
Keywords: Industry 4.0, DC motor, automation, control

I. INTRODUCTION

A. Industry 4.0

The Internet revolution was the catalyst for an irreversible shift in communication. Despite the fact that the computers are separated by geological obstacles, it allows information to be exchanged. As time has gone, we've created new technologies that have allowed us to advance from the first to the fourth generation of the Internet. This generation has been influenced by the Internet of Things idea (IoT). The Internet now has the capability of collecting data on every individual who uses it. The internet of things, often known as IOT, is a technology that allows physical devices to be managed over the internet. We provide a powerful industry automation technology that allows customers to remotely operate industrial appliances and machinery.

II. LITERATURE REVIEW

According to Tavner et al, (2008) , the CM was designed primarily to evaluate the physical features that identify current machine conditions and to use these measurements to predict and/or diagnose possible defects. However, while CM may seek to add protection, its primary job is to detect any changes in machine behaviour and predict failures before they occur. Dual tone multi frequency with GSM can only be utilised for a small number of devices. The user interface is poor.[4]. cloud-based data servermonitor the home conditions and power consumption of appliance[5].

III. METHODOLOGY

Industry 4.0 concept uses internet as the main communication technology and controllers should have either built-in WIFI modules or external module should be attached to it. The hardware circuitry is connected at the device end and controlling part is the software connection.AC motors cannot be directly controlled for polarity changes hence a motor driver is essential for this purpose

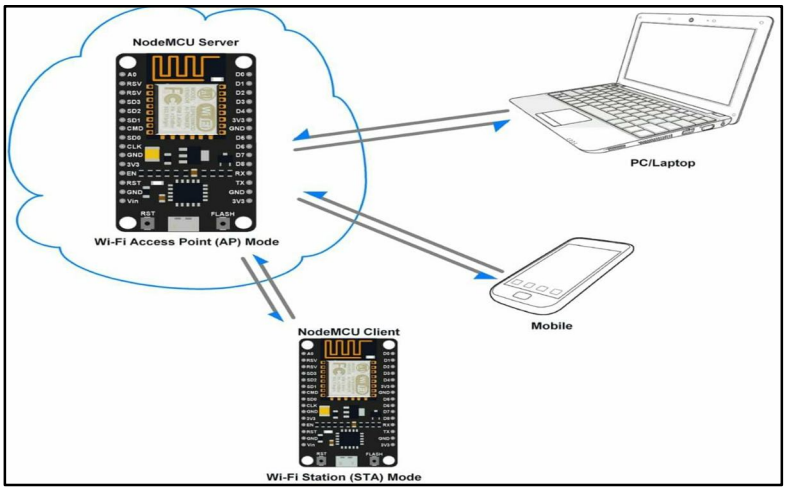

Fig 1: Block Diagram of Node Interconnections

1) Motor speed is monitored and data is available on the website/app.
2) Motor can be turned on/off from any part of the world.
3) Temperature of the industry Environment is monitored and available to the user on website/ app.
4) Humidity of the industry Environment is monitored and available to the user on website/ app
5) As the data is available to the user in a website / app form, it is an efficient user interface from where the user can control industry as well as monitor the industry from anywhere.

Industry 4.0 is a step ahead towards industrialization where there is a need to explore all possible options for efficient designs required in different industrial units

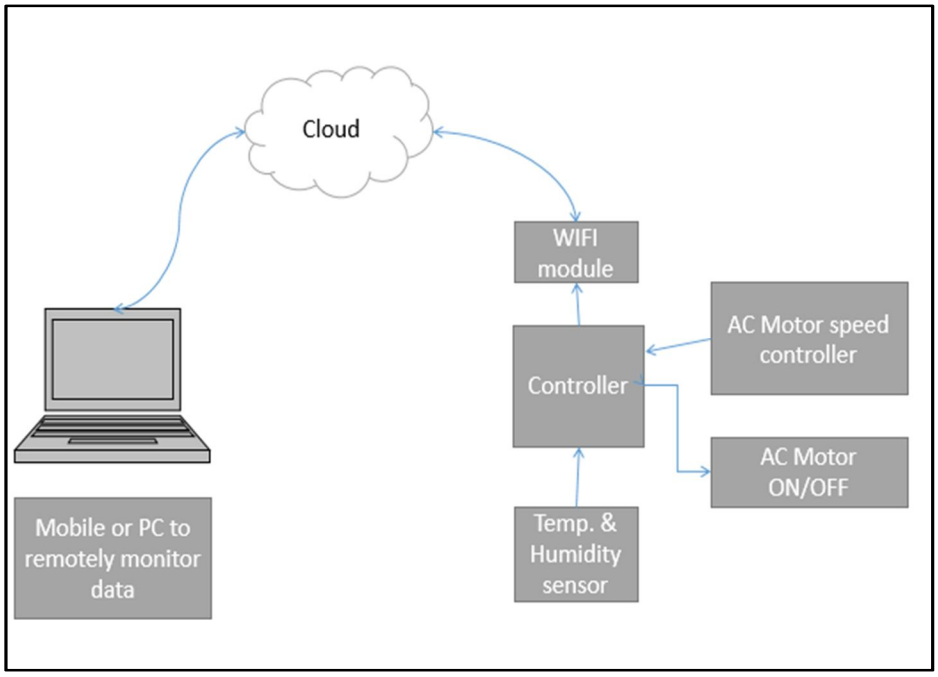

Fig 2: Block diagram of Industry 4.0 Load monitoring system

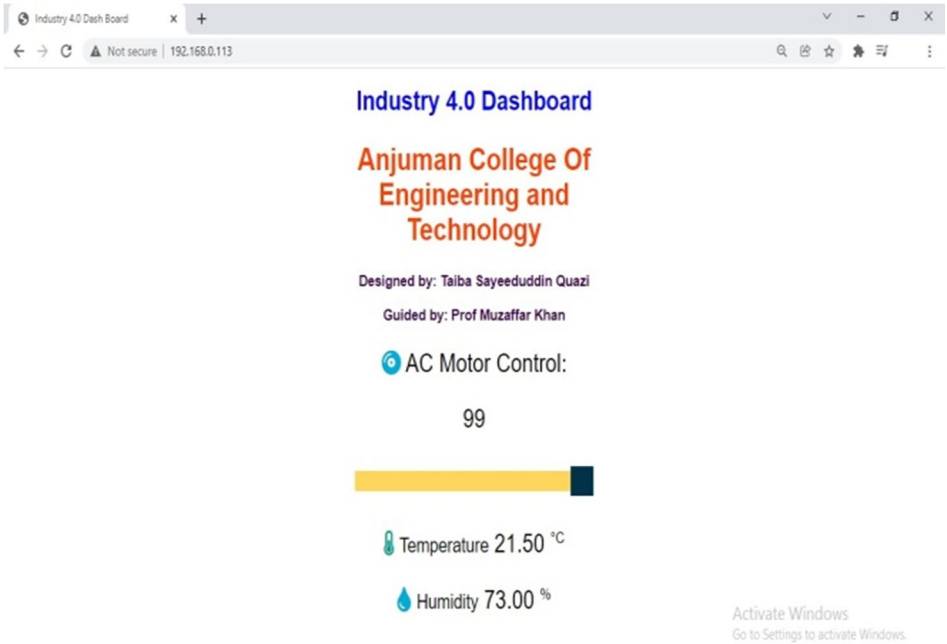

Fig 3: Designed Webpage

The above page will be displayed in the client web browser. You can now start, stop and toggle the direction of dc motor using web page you can also change the rotation speed of motor. You can select any three speeds.

1) At end of the web page status of the motor is displayed.
2) Button Start Motor
3) Will start rotating the motor 1 and 2 in clock wise direction.
4) Button Toggle Direction
5) Will toggle direction and starts rotating motors in anti clock wise direction. In order to bring back to clock wise press
6) Start Motor again: In loop function nodemcu is waiting for any request from client.
7) If request is made nodemcu performs the desired function in client request and before closing the request nodemcu replies with the updated status of the dc motor.
8) Temperature and humidity values are displayed on the screen.
9) The circuit has 4 speed control carefully chosen. Pins 13, A0, A1, A2, A3 shows status of speed.
10) Pin 13 blinks whenever push button is pressed or Wemos pulse is received.
11) Pin2 is input from zero cross detector
12) Pin3 is drive to triac opt coupler
13) Atmega8 standalone version runs on 16mhz external crystal.
14) Push buttons with parallel headers for Wemos, trigger a pulse to pin7 and pin8 for increasing or decreasing of fan speed. These pins are pulled up.
15) Schematic has own Zero cross detector for each channel. Each channel i.e each fan has separate Atmega8 standalone.
16) Standard configuration of MOC3021 driving Triac. Snubber circuit added for this inductive load.
17) Pin A0 is showing lowest speed for the fan is driven through a transistor to MOC3021 to ensure very low speed to AC fan is avoided.
18) I2C EEPROM saves the speed whenever corresponding speed level is changed

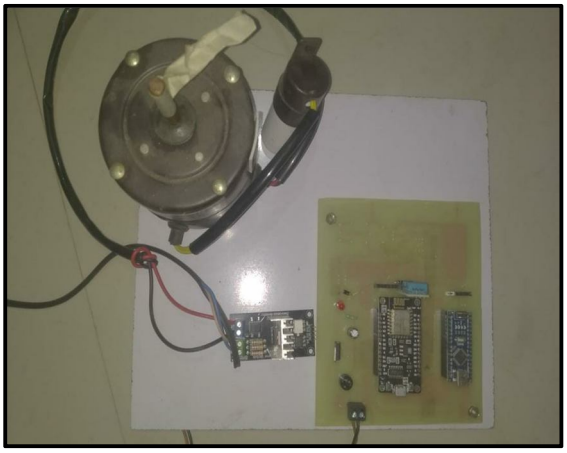

Fig 4: Implemented Hardware

Two controllers are used in this system; one controller dedicatedly monitors the temperature and humidity around the motor and the other controller dedicatedly controls the speed of motor using dimmer module. Temperature and humidity in industries has to be always maintained and another important factor is the effect of humidity on the parts of motor which reduces the life of motor due to rusting. Excess temperature starts to develop when heat is dissipated through the motor and if not monitored then leads to burning of motor coils, these situations can be avoided by using this proposed system which updates the temperature and humidity around the motor in real time, the person sitting at the control room of factories can then change the speed of motor and also control the turning on/off of the motor through this system. LAN connection or router based connection is required for this system where the controller should be connected in the same network as that of controlling system. The IP address of the controller in the network is taken to design the webpage. The design elements of the webpage are made using HTML language. The webpage is designed with simple elements like slider, output label, headings, title. The webpage designs can be changed according to the factory needs and this system is just a prototype which consists of a single device control and when systems are implemented in factories, industries then designing of webpage will require some more elements in the webpages.

IV. CONCLUSION

The designed project is very convenient to use and as it is based on internet as a technology, it can be controlled from any part of the world or the devices can be controlled from any room of the factory using the LAN network. The nodemcu comes with built-in wifi module which ensures that there is constant connectivity without the need of externally connecting the WIFI module. The controller was programmed using arduino ide and the webpage was designed using small elements like slider or buttons which makes the work easy. AC motors can be controlled for its direction as well as its movement can be stopped.

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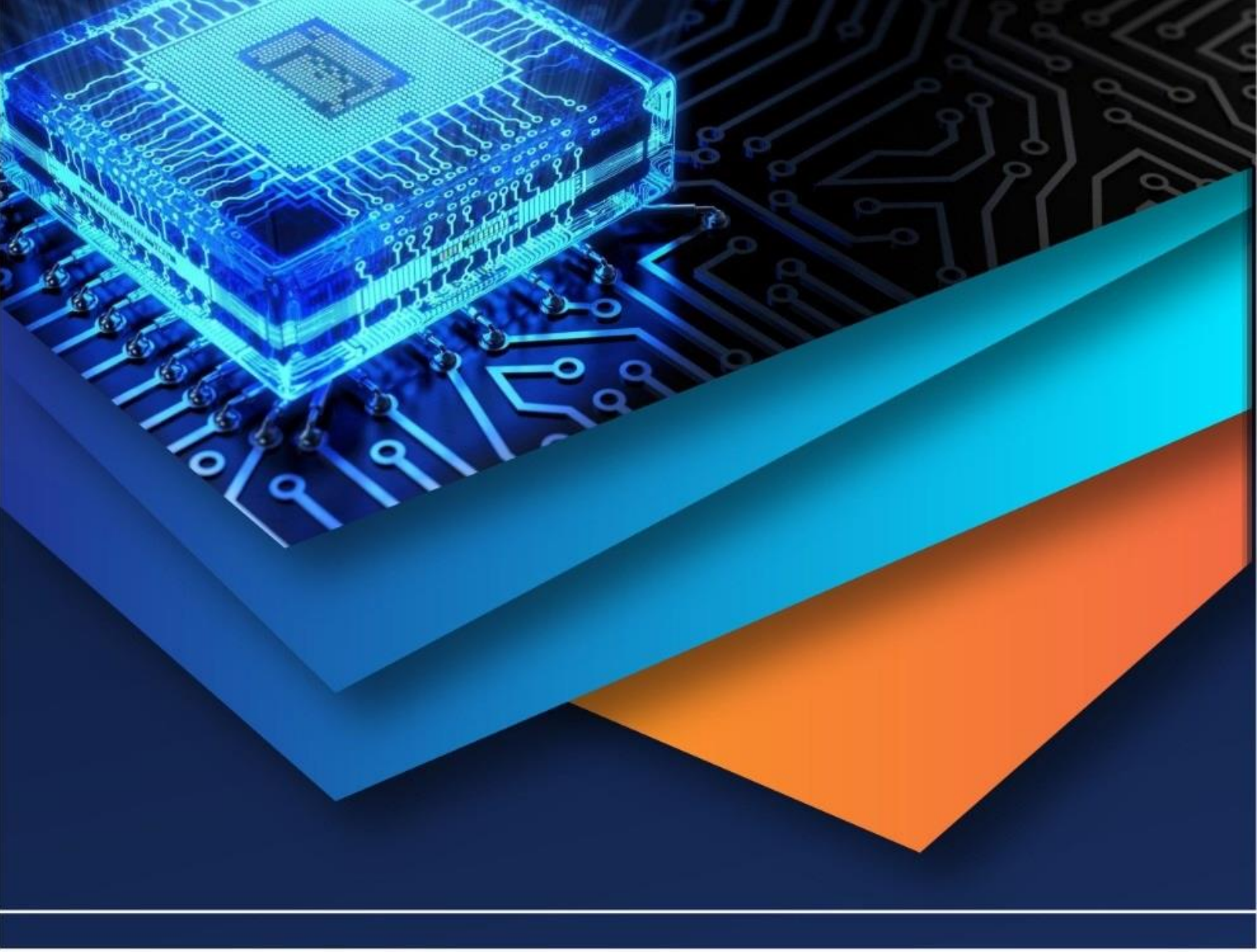

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