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DESIGN AND IMPLEMENTATION OF INDUSTRIAL AUTOMATION BASED ON INTERNET OF THINGS (IOT) USING NODEMCU ESP8266

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ABSTRACT

Industrial IoT Development Kits provide an entire, high quality design environment for engineers and solution architects to drastically accelerate the development and delivery of IoT applications. Using these kits, any development/industrial environment can be quickly turned into a production ready unit. Machine automation technology can be set to work as fixed applications, programmable applications, or flexible/adaptable applications. Each of these types of machine automation has certain advantages and disadvantages. Recent advancements in machine automation are due to a better understanding of machine automation and the adoption of new machine capabilities such as feedback controllers, robotics, networking, digital computers, and interconnectivity.

KEYWORDS: IIoT, IoT, ESP8266.

1. INTRODUCTION

Internet of things (IoT) in automation industry is proving to be a game changer for automation companies. Industrial automation companies that use IoT solutions can reap new benefits. The Internet of Things (IoT) helps to create new technologies to solve problems, enhance operations, and increase productivity. The IoT can be explained as the connection of inimitably identifiable electronic devices using Internet 'data plumbing' including Internet

Protocol (IP), cloud computing and web services. Internet of Things (IoT) Impact on Industrial Automation is very high and it makes us to use tablet computers, smart phones, virtualized systems, and cloud storage of data and so on.

2. INTERNET OF THINGS (IOT)

The Internet of Things (IoT) plays a vital role in the industrial automation as it is starting to explore and implement IoT concepts and technology. IoT helps to streamline, collapse, and create system architectures that are effective, affordable and responsive. The major aim is to create frictionless communications and interaction from manufacturing field input/output including analyzers, actuators, robotics etc to enhance flexibility and increased manufacturing. Using IoT, the industrial automation has leveraged commercial technologies in major applications and these examples include PLCs displacing banks of relays.

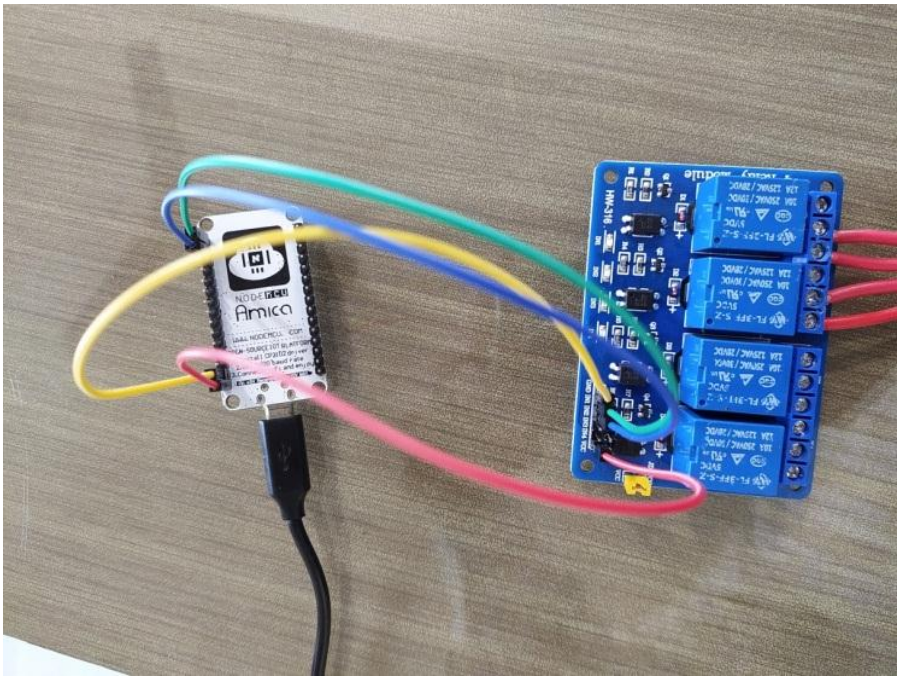

Fig. 1: Shows the Circuit of ESP8266 and 4 Channel Relay.

3. INDUSTRIAL AUTOMATION?

The Internet of Things (IoT) describes a phenomenon where more and more IoT devices are connected to the Internet, such as smart homes, smart fridges, and industrial manufacturing machines. These interconnected smart devices are significant in enabling automation across industries.

Fig. 2: Shows the implementation of Relay and ESP8266 on Machines.

4. OBJECTIVES

1. To convert data from ADC relay to the Node MCU ESP8266 microcontroller.
2. To control the relay by Node MCU ESP8266 microcontroller which is connected to the machines depending on the sensor value received.
3. To automate the functioning and increase the efficiency of machines with ESP8266 sensor installed at different parts of the machines.

5. ESP8266

ESP8266EX (simply referred to as ESP8266) is a system-on-chip (SoC) which integrates a 32-bit Tensilica microcontroller, standard digital peripheral interfaces, antenna switches, RF balun, power amplifier, low noise receive amplifier, filters and power management modules into a small package. It provides capabilities for 2.4 GHz Wi-Fi (802.11 b/g/n, supporting WPA/WPA2), general-purpose input/output (16 GPIO), Inter-Integrated Circuit (I^2C), analog-to-digital conversion (10-bit ADC), Serial Peripheral Interface (SPI), I^2S interfaces with DMA (sharing pins with GPIO), UART (on dedicated pins, plus a transmit-only UART can be enabled on GPIO2), and pulse-width modulation (PWM). The processor core, called "L106" by Espressif, is based on Tensilica's Diamond Standard 106Micro 32-bit processor controller core and runs at 80 MHz (or overclocked to 160 MHz). It has a 64 KiB boot ROM, 32 KiB instruction RAM, and 80 KiB user data RAM. (Also, 32 KiB instruction cache RAM and 16 KiB ETS system data RAM.) External flash memory can be accessed through SPI. The silicon chip itself is housed within a 5 mm × 5 mm Quad Flat No-Leads package with 33 connection pads — 8 pads along each side and one large thermal/ground pad in the center.

6. Relay

A Relay is a simple electromechanical switch. While we use normal switches to close or open a circuit manually, a Relay is also a switch that connects or disconnects two circuits. But instead of a manual operation, a relay uses an electrical signal to control an electromagnet, which in turn connects or disconnects another circuit.

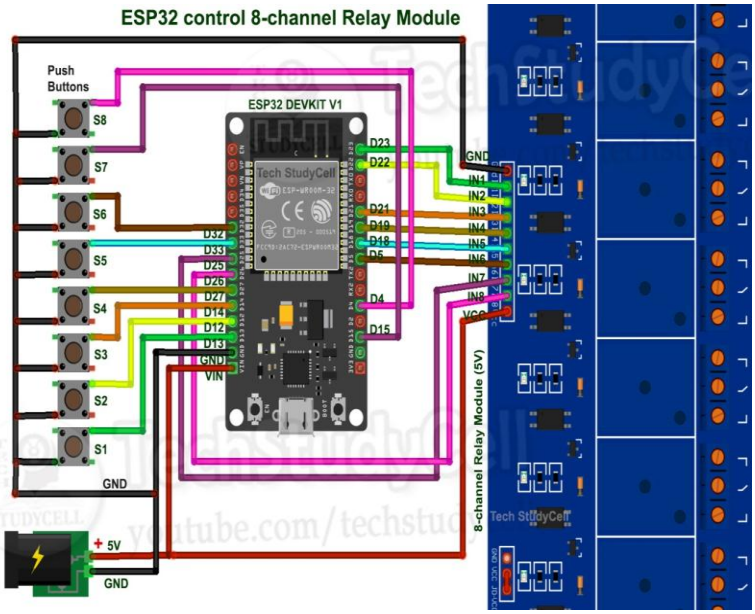

Fig. 3: Industrial Automation using Blynk & ESP8266.

7. FLOW CHART OF PROPOSED TECHNIQUE

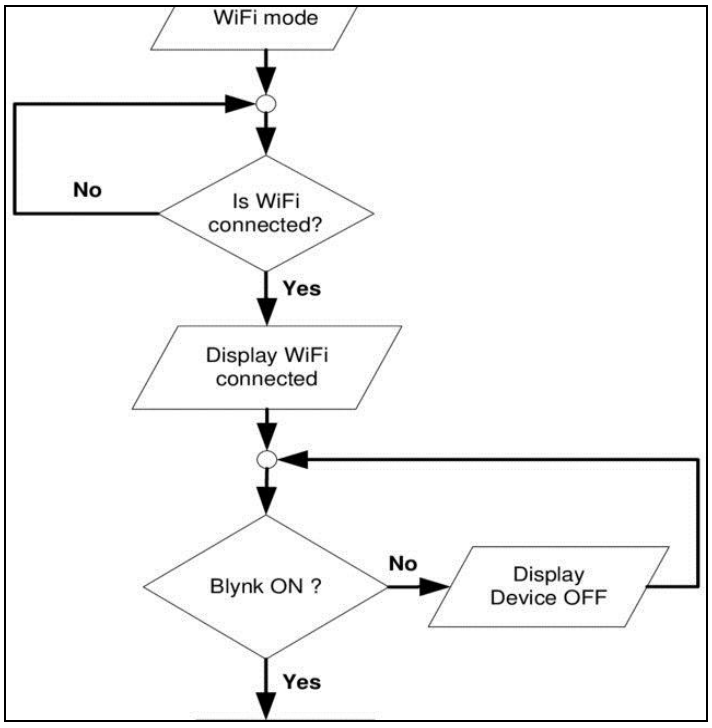

Fig. 4: Flow Chart of Proposed System.

6. IMPLEMENTATION OF INDUSTRIAL IOT

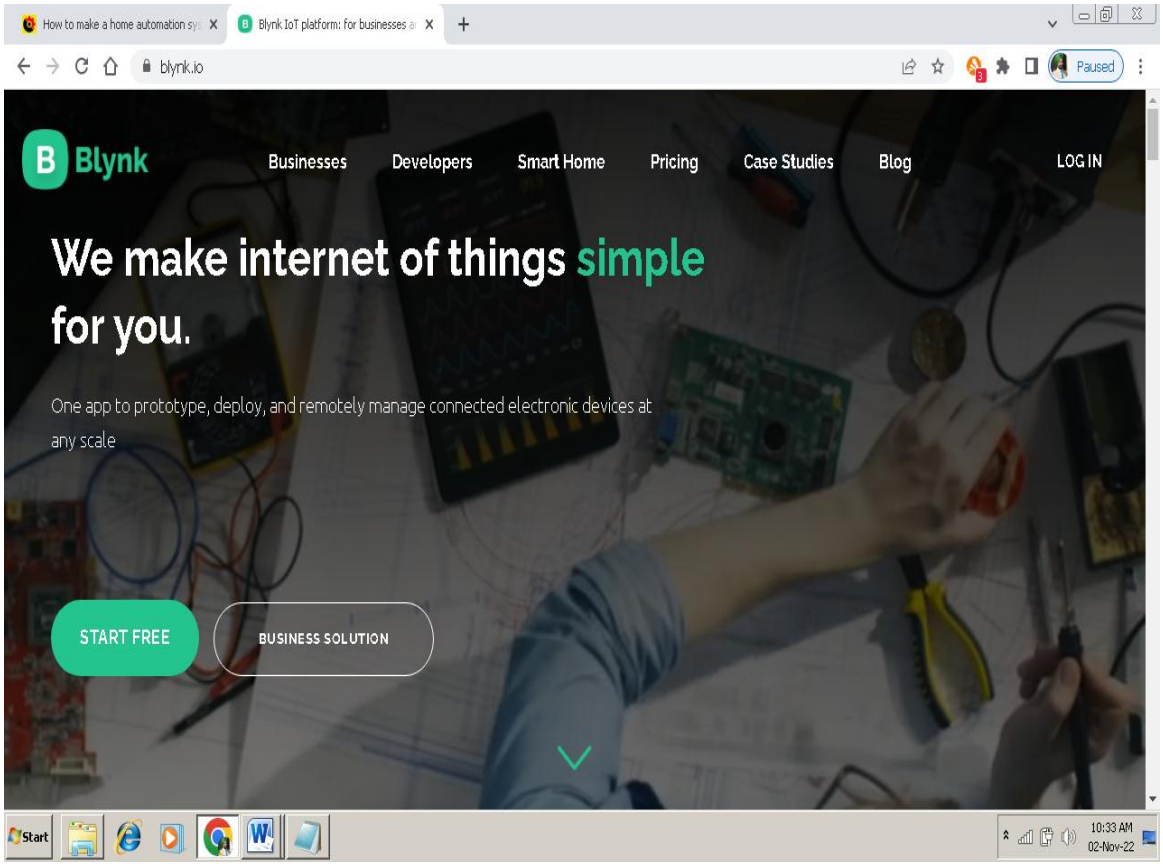

Fig. 5: Go to the Blynk official website using your browser. Then login to this site using your email and password.

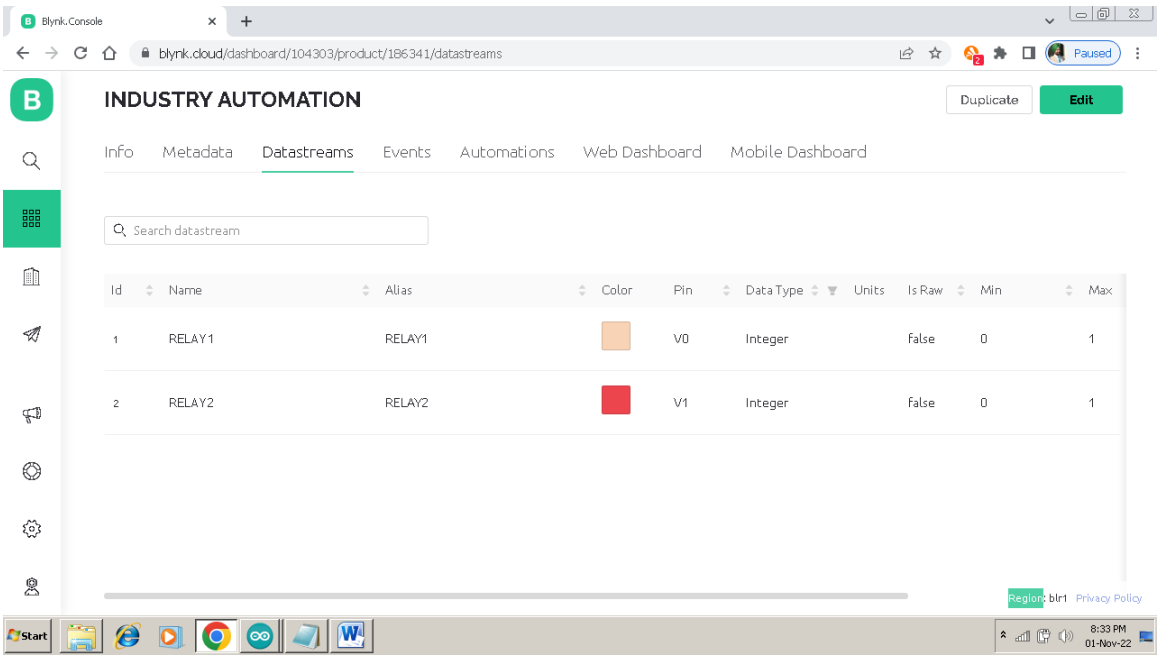

Fig. 6: Click the "Datastreams" tab and create two Datastreams as VitualPin. Also, set the first pin and the second pin to V0 and V1. Then, select the data type as an integer.

Fig. 7: Relay 3 control the Machine 3 with ESP8266 Microcontroller.

Table 1: Shows the machine name with values of Power ON (1) and Power OFF (0)

MACHINE NAME	POWER ON/OFF
MACHINE1	1
MACHINE4	0
MACHINE2	1
MACHINE3	1
MACHINE4	1
MACHINE2	1
MACHINE2	1
MACHINE3	0
MACHINE4	0
MACHINE1	0

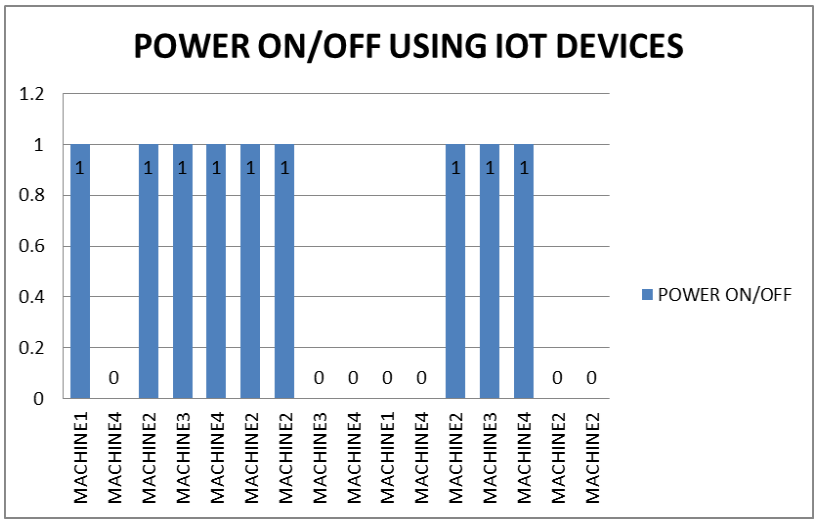

Fig. 8: Graph shows the machine name and values of Power ON or Power OFF.

7. CONCLUSIONS

The hardware demonstrates the industry controller through Blynk web server using IOT. This is an economic, robust and secure method of controlling the devices remotely. IOT providing the necessary communication infrastructure promising the implementation of this controller in large scale. The challenge that we faced is in terms of the speed of controlling. Each request takes 4 to 6 seconds to either turn ON/OFF. This is because of using open source web server. If one has dedicated web server, the speed of the response could be faster and additional security features may be further implemented.

Node-MCU based automated industry system was implemented using Arduino IDE. This can be used to control the electrical appliances such as machines, light, fan, gas, temp, door lock etc. The measurements of sensors and actuators are read from webpage. The system is a cost effective one, portable, reliable and user friendly. This is more useful for smart buildings and smart villages. The proposed system saves the resources and also reduces the heat generation. It also ensures the security and safety of industry.

REFERENCES

1. Sidharth Sharma, Supankar Das, Jitendra Virmani, "IoT Based Dipstick Type Engine Oil Level and Impurities Monitoring System: A Portable Online Spectrophotometer", IEEE, 2019.
2. Long Zhao, Igor Matsuo, Yuhao Zhou, Wei-Jen Lee, "Design of an Industrial IoT-Based Monitoring System for Power Substations", IEEE, 2019.
3. Christos Alexakos, Andreas Komninosy, Christos Anagnostopoulos, "Building an Industrial IoT Infrastructure with open Source Software for Smart Energy", IEEE, 2019.
4. Foivos Christoulakis, Kleanthis Thramboulidis, "IoT-based Integration of IEC 61131 Industrial Automation Systems: The case of UML4IoT", IEEE, 2016.
5. Sherif El-Gendy, "IoT Based AI and its Implementations in Industries", IEEE, 2020.
6. Paolo Ferrari, Paolo Bellagente, Alessandro Depari, Alessandra Flammini, Marco Pasetti, Stefano Rinaldi, Emiliano Sisinni, "Evaluation of the impact on industrial applications of NTP used by IoT devices", IEEE, 2020.
7. Apurva S Zope, Mayuri S Jambhale, Nimisha M Korde, Hajra A Khan, Prof.Akansha Bhargav, "Iot Based Industrial Automation", International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Published by, www.ijert.org ICIATE - 2017 Conference Proceedings.

8. Ravi Kishore Kodali, SreeRamya Soratkal and Lakshmi Boppana, IOT based control of Appliances", International Conference on Computing, Communication and Automation (ICCCA2016).
9. H.S. Raju, Sanath Shenoy, "Real-Time remote monitoring and operation of Industrial Devices using IoT and Cloud", IEEE, 2016.
10. Shaikh Rehan, Risha Singh, "Industrial and Home Automation, Control, Safety and Security System using Bolt IoT Platform", Proceedings of the International Conference on Smart Electronics and Communication (ICOSEC 2020).