IOT based industry automation (Industry 4.0)

First Author: Monika Kailas Jadhav (Student)

Second Author: Priyanka Bhima Nawale (Student)

Third Author: Sayli Ravindra Bhat (Student)

Fouth Author: Prof. Ankit S. Jain (Project Guide)

Department of Electrical Engineering

MET's Institute of Engineering, Adgaon, Nashik

Abstract:

A simple approach for speed and Direction control Of DC motor using IOT is presented. This approach is based on providing a variable dc voltage to dc motor via NODEMCU. In this project DC motor speed and direction is control via internet of things. We could achieve effective speed and it is easy, fast and effective by this method of control to vary motor speed from 0 to 100% of rated speed. The proposed system is suitable for different industrial applications such as trolley buses, subway cars, or battery-operated vehicles.

Keywords: IOT, Automation, Nodemcu, Blynk

1. Introduction

1.1 overview

Industries now a days are using Programmable logic controllers (PLCs) and PWM techniques in their existing system to control the motor and machines. Henceforth, continuous monitoring is required resulting into human intervention. Existent system are immobile and controlling over distance is not possible. As PLCs does not have display, for sake of visualization of data industries need HMI system thus increasing the cost of overall system. Forthcoming start ups and micro industries under Make in India may not be able to afford this technology.

1.2 Problem Description

Customization in control parameters, is one of the challenges faced by industries. In heavy industries without automation, humans have to handle hazardous chemical, heavy equipments present in production or packaging line. Any accident or flaw in the system may cause damage to humans, which sometimes can be fatal. The existing system does not assure occupational safety. Present systems need high and continuous maintenance. To eliminate these flaws from the system, new system has to be developed.

1.3 objective

In various industries more than two DC motors are used for various applications so maintenance of those motors were a difficult task for the operators in the industry. But by the use of IoT based system any operator can check any motor's present status from the control room. He can record real time readings of various parameters like voltage, current and temperature by using IoT based system on a single computer screen. Also if he find any abnormal condition in any motor of the plant he can stop the motor from the control room by the use of IoT based system.

1.4 system requirement

1.4.1 Hardware requirement

| Sr.no	Parameter	Description	Quantity
1.	Node MCU	is an open source, prototyping platform based with in-built ESP-8266 technology	
2.	LCD 16x2	To display parameters like current, voltage and Power and direction of Motor e.g. Forward, Reverse	
3.	DC Gear Motor	We used 1000RPM motor as a model of industry machine	
4.	Motor Driving Circuit	Here we used L298 driving circuit.It is a high current motor driver perfect for driving DC Motors and Stepper Motors.	
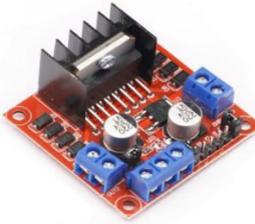
1.4.2 Software Requirement

Sr. No	Parameter	Description
1.	Arduino IDE	For programming in Arduino controller
2.	OrCAD	For Block diagram designing
3.	Altium	For PCB designing
4.	Proteus	For Power supply simulation
5.	Blynk APP	For controlling and monitoring hardware project

1.5 Technology used

Blynk is a platform that allows to build interfaces for controlling and monitoring the hardware project from iOS and Android devices. After downloading the Blynk app, by creating a project dashboard and arranging the buttons, sliders, graphs etc.Blynk is a hardware-agnostic IoT platform with white-label mobile apps, private clouds, device management, data analytics, and machine learning.

Blynk has been designed for the Internet of Things (IOT). It controls hardware remotely, display sensor data, store data, visualize it, and do many other operations. Every time by pressing a Button in the Blynk app, the signal travels to the Blynk Cloud, where it finds its way to the hardware. It works the same in the opposite flow.

2. System architecture
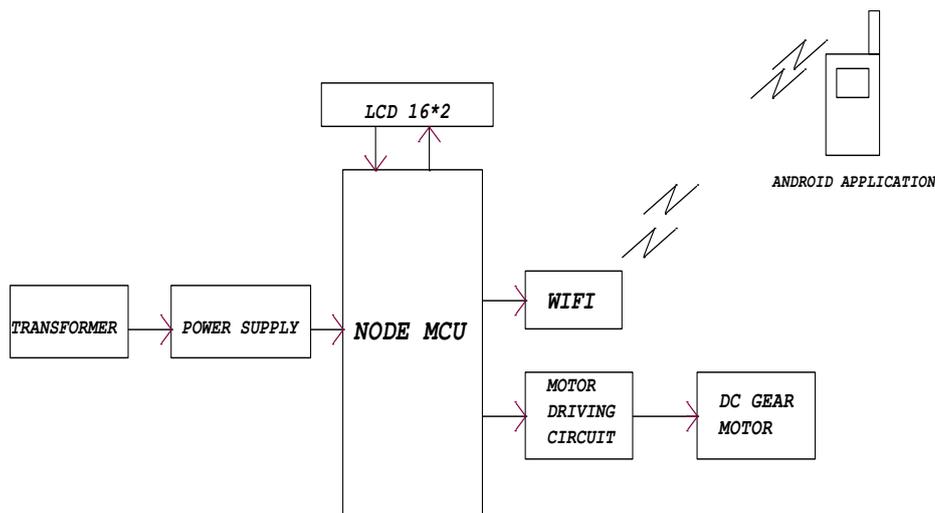
2.1 Methodology:

Here we propose a solution for an effcient industry automation system that will allow user to control industry machines over the internet, thus automation of modern industries is achieved. PLCs being costly and inconvenient will be replaced by different type of micro controller. In industries to reduce manual overhead we will implement Internet of Things (IoT) in industry to monitor as well as to control machines. Here we will be using a NodeMCU controller with inbuilt Wi-Fi module ESP8266. By sending and receiving the data or commands, through this Wi-Fi module, we can remotely access and control the device connected to NodeMCU. For sending and receiving the commands we will be using BLYNK android application. It is an open source platform. For driving the motor we will use motor driving module L298. By programming the NodeMCU user can connect the system over the internet and can control the speed, direction of rotation, on and off time for machine through the android application. Once the controller is programmed we can always vary the controlling parameters just by using th application; without re-programming the controller. By using this methodology, we will be developing a system which will be cost effective, user friendly, convenient and portable. By adding a virtual timer for the machines, we can ensure no energy is wasted during any process in the industry.

The main advantage of this technology is, there will be no range limitation for accessing and controlling the system. We will use the latest microcontroller NodeMCU. So through Wi-Fi, user can easily connect internet to NodeMCU with router hotspot, WLAN or any other devices like mobile. Once nodemcu is connected to the internet using the SSID (user name) and password, user will connect Android application to the internet rom the router or hotspot. In the Android application we will require a Gmail ID and password, through which a concerned person can easily login into Android application. Since, industrial data is very confidential we will be maintaining the data security and control, by giving control only to responsible persons. Multiple persons can control the system by logging into BLYNK android application using Gmail ID and Password.

2.2   Results

As a result of this project, we have automated the conventional system with the help of IOT and we can control the system remotely from Blynk Application.
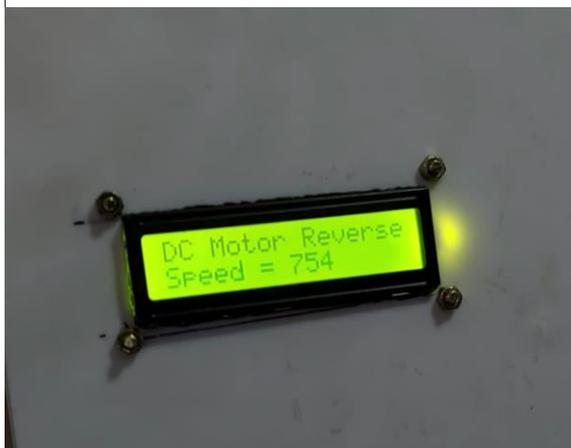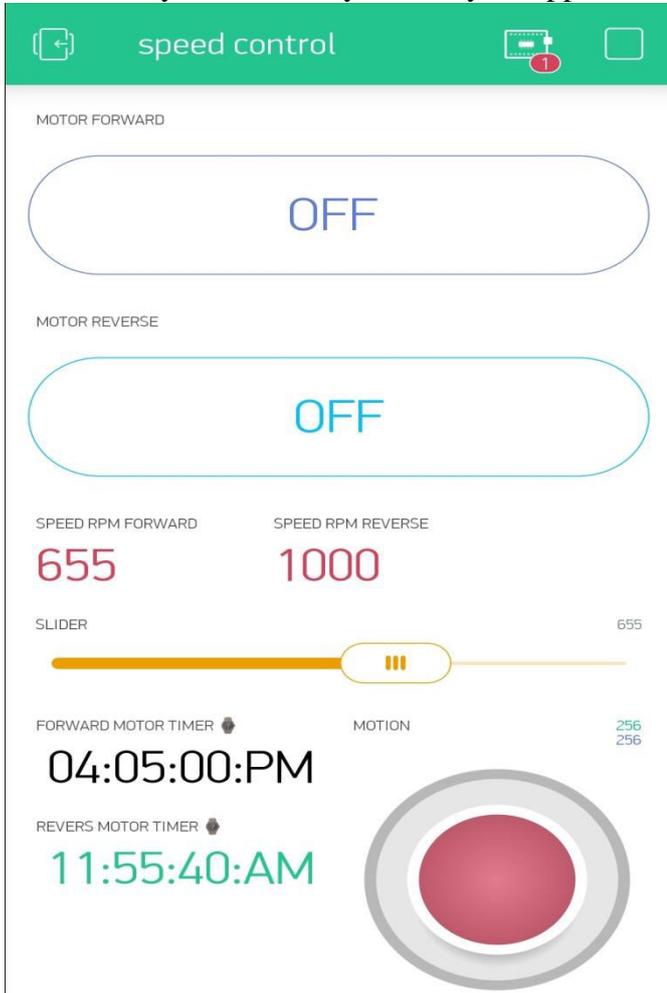
3. Conclusion

The key feature of this project is to provide flexible and long distance connectivity between industry and user. Thereby controlling different industrial parameters remotely.

From this project we can conclude that our project can be used in industries where speed control and continuous data monitoring is needed.

Using this work flow is optimized, data collection becomes easier , productivity increases. Also this solution is simple to operate, energy efficient and reliable.

4. Future scope

This project can be used as a prototype for further development and growth and can provide impetus to the cutting edge technology. This device can be integrated with robotics, drones, cameras, house doors, lockers, smart systems and buildings. It lays emphasis on eliminating the need and use of multiple remotes for each individual object for its maneuver.

5. References

[1] Mohamed Harunur-Rashid, "Power Electronics Circuits, Devices, and Applications", Prentice Hall International, 1990 3rd edition Chapters V & VI.

[2] Ashraf Salah El Din Zein El Din "PLC-Based Speed Control of DC Motor" 2006 IEEE.

[3] PARESH C. SEN, "Electric Motor Drives and Control-Past, Present, and Future," IEEE transactions on industrial electronics, vol. 37, no. 6, December 1990.

[4] T. Sysala and P. Dosthl "Implementation of Adaptive Controller (6-modeI) into PLC library" 2004 5th Asian Control Conference.

[5] ParvizAmiri, MahsaBagheri "Speed Control of DC Motor by Programmable Logic Control with High Accuracy" IEEE Trans. Universal Journal of Control and Automation 1(4): 91-97, 2013.

[6] Kelvin T. Erickson "Programmable Logic controllers" 1996 IEEE IEEE POTENTIALS

[7] RaosahebPawar, YogeshShirke, PrashantTitare, "Speed Control of DC motor using Programmable Logic Controller" International Journal of Advanced Research in Engineering & Management, ISSN: 2456-2033 || PP. 14-16

[8] Maria G. Ioannides, "Design and Implementation of PLC-Based Monitoring Control System for Induction Motor" IEEE TRANSACTIONS ON ENERGY CONVERSION, VOL. 19, NO. 3, SEPTEMBER 2004

[9] *I. Colak, R. Bayindir, A. Bekta, and G. Bal*, "Protection of Induction Motor Using PLC," 2007 IEEE, POWERENG 2007, April 12-14, 2007, Setubal, Portugal.

[10] RamazanBayindir, SeyfettinVadi, FulyaGoksucukur, "Implementation of a PLC and OPC-Based DC Motor Control Laboratory" 4th International Conference on Power Engineering, Energy and Electrical Drives Istanbul, Turkey, 13-17 May 2013.