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IoT BASED PLC CONTROLLING AND MONITORING IN SCADA

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Abstract - *Programming Logic Controllers (PLCs) places an important role in the field of automation. Many industries use PLC's to reduce manual work and to increase the efficiency of product output. PLC's use a programming language called Ladder Logic. Our main idea of our project is to combine IOT with the industrial automation to control PLC from anywhere in an wireless manner. We will connect microcontroller with PLC and communicate to PLC in an wireless manner via microcontroller. The microcontroller gives commands to the S7 1200 PLC, according to the commands received PLC perform the operations. We are working on mechatronics Testing station. Testing station detects the various properties of the workpieces inserted into it, faulty workpieces are rejected. And the whole process is monitored in SCADA viewer. In SCADA we can monitor the whole process of Testing station. We can also control the PLC from SCADA viewer also.*

Key Words: **Arduino, blynk app, ENC28J60, Nodemcu, PLC, TIA portal.**

1. INTRODUCTION

In this modern era, industries are growing rapidly. These large scale industries are run by heavy machines and are tough to operate them. Many experts undertook challenging experiments to automate the heavy PLC machines and they are running successfully in the present trending world. In industries PLC are used to replace electromechanical relay systems and provide a simpler solution to modify the operation of control systems. Instead of having to rewire a large bank of relay systems . They are used to handle and control the actual process done in industries. But controlling and operating the automated PLC machines is done manually which sometimes lead to delay in the work. So, this paper gives a brief explanation on controlling of automated PLC machines using wireless connections (WIFI).In this theory IoT technology is linked with PLC programming. These automated PLC machines can be controlled from anywhere across the world using a mobile app in a wireless manner through Wi-Fi.

The proposed project is successfully implemented on mechatronics testing station which works on pneumatics. It has 3 sections in which the first section measures the height of the work piece, if the work piece is not having required height it is rejected. The second section is used to detect the material of the work piece, if the work piece is made of non-plastic material it will be rejected. The last section is pick and place arm which is used to place work pieces from the testing station to the successive station.

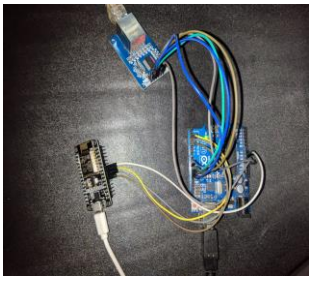


Fig: Hardware connection

Fig: Testing station

The block diagram of proposed method is shown in the below fig.

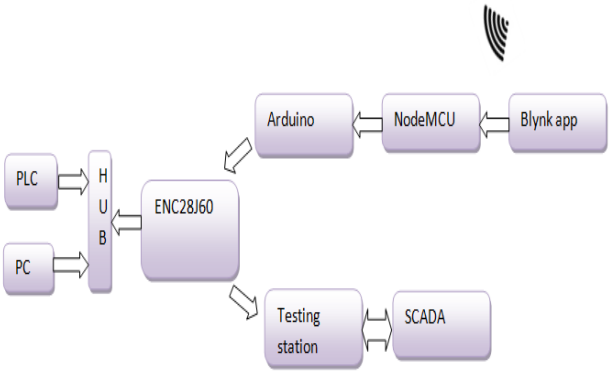


Fig. block diagram

HARDWARE AND SOFTWARES

HARDWARE

To execute wireless communication with PLC machines hardware components are used. It can be done using various types of components. There are many type of connections in implementation. In this paper the the components used are arduino, nodemcu, TTL convertet, PLC testing machine.

ENC28J60: ENC28J60 ethernet controller are used to connect between USB and UART communication. Here ENC28J60 is used to transmit data from arduino to PLC.

Fig. ENC28J60 ethernet controller

Arduino: Arduino is an open source platform for electronics to relate hardware components using software programming. We are using this board to communicate between nodemcu and TTL converter.

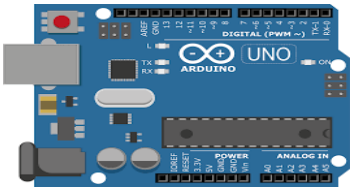


Fig. Arduino board

NodeMCU: NodeMCU is an IOT platform which works on ESP8266 WI-FI SOC and includes hardware based on ESP-12 module. To communicate in a wireless manner we send data to nodeMCU using blynk app.

Fig. NodeMCU board

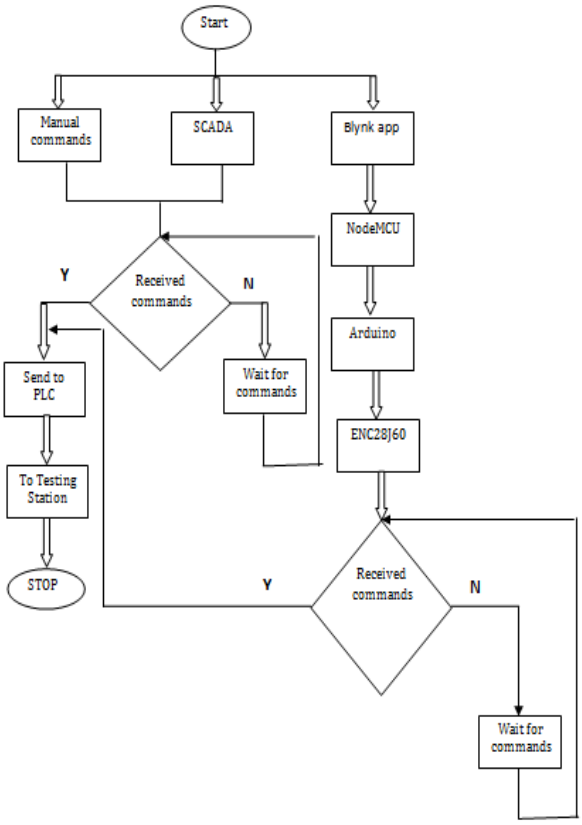
PLC: PLC is an electronic device that takes input from the plant via sensors and transmitters, executes the programmed logic and generates the useful outputs on actuators to control the plant. We worked on S7 1214C PLC.

Fig:PLC S7 1214C

SOFTWARES

In executing the connection between hardware components for the processing of the system various softwares are used. They are Arduino programming, TIA portal, Blynk app, SCADA.

FLOW CHART



2.PROPOSED METHODOLOGY:

In this methodology TIA portal is used for PLC programming. Working of testing station in mechatronics kit and Arduino to PLC communication via ENC28J60 programs are written in the TIA portal. Blynk app is used for wireless communication. Transmission of data is from Blynk app to NodeMCU.

This paper gives different ways of operating industrial machines like using manual commands, SCADA and also by using wireless communication. In both manual operation and through SCADA whenever the data received by the PLC it sends the corresponding actions to the testing station and the station operates according to the commands. But, this process of controlling cannot be done from anywhere in the globe. In a critical situation or to immediate controlling of PLC machines there is a need for wireless communication for industrial automated PLC's.

In the wireless controlling of PLC machines we can control PLC across the globe through Wi-Fi. Initially, Using Wi-Fi data is transferred from NodeMCU to Arduino using Blynk app. Then programming for the Testing Station and arduino to ENC28J60 is done in TIA portal software. Whenever the commands received from Blynk app then ENC28J60 sends data to PLC and testing station operates. We can also control our station from SCADA viewer too.

RESULT

Using the proposed methodology the code is written in TIA portal software. The working of Testing station with different methods of operating the outputs are as shown in below figs.

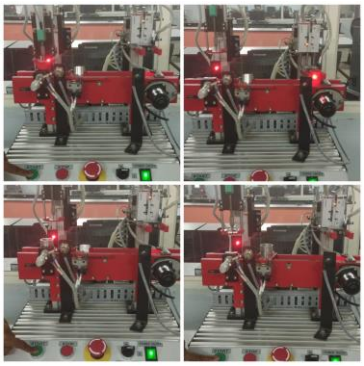


Fig : Output using manual operation

Fig : Ouput using Blynk App

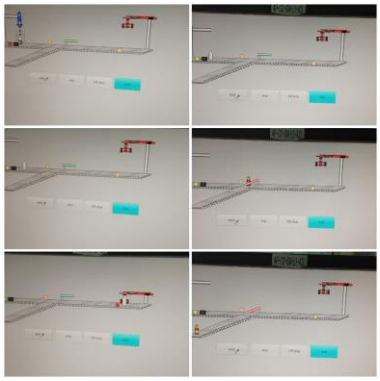


Fig : Output using SCADA

3. CONCLUSION

Using wireless communication with PLC's in industrial automation we can easily control our large scale machines from anywhere across the globe and can have a reduced manual work. It is very useful in case of emergency situations. Introducing IoT into Industrial automation gives a new era in the fields of communication. In future, this kind of proposal is very useful and we can also implement this in a 2 way communication by sending PLC data to cloud and also controlling PLC from cloud.

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