



Automatic Drilling and Tapping Machine Monitoring using NodeMcu

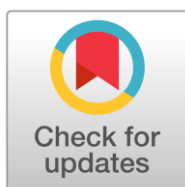
S. Kamalakkannan ^{a,*}, J. Lavanya ^a

^a Department of EEE, S.A Engineering College, Chennai-600077, Tamil Nadu, India.

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Abstract: Industrial automation is most emerging technology, and now a day's industries almost are operated by automation. Most of the industrial plants, are automated without any operator machine interaction. Using arduino IDE and matlab simulink software, program is developed to indicate the machine status and number of job counts to the server. In this work, consideration was given to nodeMCU controller for drilling and tapping machine monitoring which can be operated both manually and automatically. This system gives a real-time view of the industrial plant, reduction in troubleshooting time for faults and also it assures safety of operator.

Keywords: NodeMCU Controller, ESP8266 Wi-Fi module, Arduino IDE.

1. Introduction

In recent years, most of the manufacturing industries are switching from the traditional manual system to automation system. The aim of this work is to design and fabricate automatic drilling and tapping machine [1] monitoring using nodeMCU. This monitors the machine status and also counts number of jobs to the server through anyone of internet protocol [2] with the help of ESP8266 controller.

Machine status monitoring is a process of periodically checking the status of the machine to enhance the overall productivity. The data sent by the machine status monitoring system is very important for the production managers and their supervisors to analyse the production factors and also to solve issues such as production delay, production calamity, and improper maintenance as the breakdown takes a long time to get reported and fixed. This system also provides a clear visibility of the production directly to supervisors instead of relying on the production manager bug report.

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi (SoC) System on Chip from oppression systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It uses many open source projects, such as Andalusian and SPIFFS.

2. System Components

The following section will give an overview of the major part of the system that will make up the proposed system.

2.1 ESP8266 Wi-Fi Module

The ESP8266 shown in fig 1. is a very user friendly and low-cost device to provide internet connectivity to projects. The module can work both as an access point (can create hot

spot) and as a station (can connect to Wi-Fi), hence it can easily fetch data and upload it to the internet making internet of things as easy as possible. It can also fetch data from internet using apish hence project could access any information that is available in the internet, thus making it smarter. Another exciting feature of this module is that it can be programmed using the arduino IDE which makes it a lot more user friendly.



Fig 1. ESP8266 Wi-Fi module

2.2 Arduino Integrated Development Environment (Ide)

Arduino is a prototype platform based on an easy to use hardware and software. It consists of a circuit board, which can be programmed and a ready-made software called Arduino. Integrated Development Environment is used to write and upload the computer code to the physical board. The key features are,

- Arduino boards are able to read analogy or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions.
- Unlike most previous programmable circuit boards, arduino does not need an extra piece of hardware in order to load a new code onto the board. It can simply use by a USB cable.
- Additionally, the arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, arduino provides a standard form factor that

breaks the functions of the micro-controller into a more accessible package.

C. Matlab Software

Matlab is a fourth-generation programming language and numerical analysis environment. Uses for matlab include matrix calculations, developing and running algorithms, creating user interfaces (UI) and data visualization. The multi-paradigm numerical computing environment allows developers to interface with programs developed in different languages, which makes it possible to harness the unique strengths of each language for various purposes. Matlab is used by engineers and scientists in many fields such as image and signal processing, communications, control systems for industry, smart grid design, robotics as well as computational finance. Simulink is a simulation and model-based design environment for dynamic and embedded systems, integrated with matlab.

3. System Configuration

This section deals with block diagram of proposed working method shown in fig 2. The proposed working method is the machine work status monitoring [3-5] which displays the machine status using arduino program and count number of jobs through mobile phone.

The prototype has three inputs and outputs are indicated by indication lamps. The machine starts functioning when Push button is pressed for ON/OFF drill chuck motor. Here, drill chuck motor should be in ON condition for further operation of drilling and tapping process. Power control switches are used to select the modes of operation. The machine will work in two modes of operation. First is single cycle mode operation. Here, an operator has to press the start button to drill or tap the job at once. Second mode of operation is the repeat cycle mode operation. In this mode an operator

has to press the start button to drill or tap the job and after completion of first job it takes some interval and continues with the next job process.

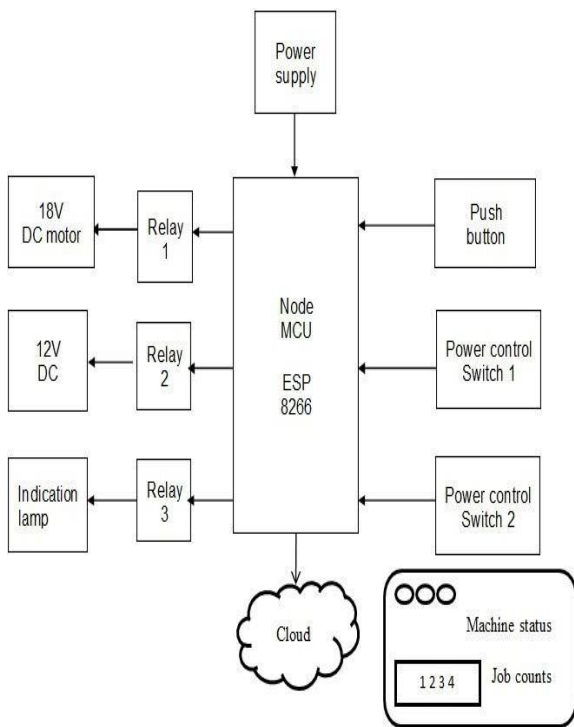


Fig 2. Block diagram of proposed system

This operation will continue until the operator changes the mode of operation [6]. ESP8266 is programmed to monitor the status of drilling and tapping machine and also to count the number of jobs counts. Both these operations output is viewed by an internet server called industrial ubidots. [7-9] Ubidots is an analytic tool which runs serverless function or creates own API to decode and encode data frames using ubi-functions. They compute math and statistical expressions directly from ubidots UI with synthetic variables. Finally, indication lamps indicate the output of motor condition.

4. Simulation of Matlab Software

This chapter consist of simulation part of our project where it consists of auto mode, manual mode, input and output. Manual mode should be operated by human, were auto mode operates the system automatically.

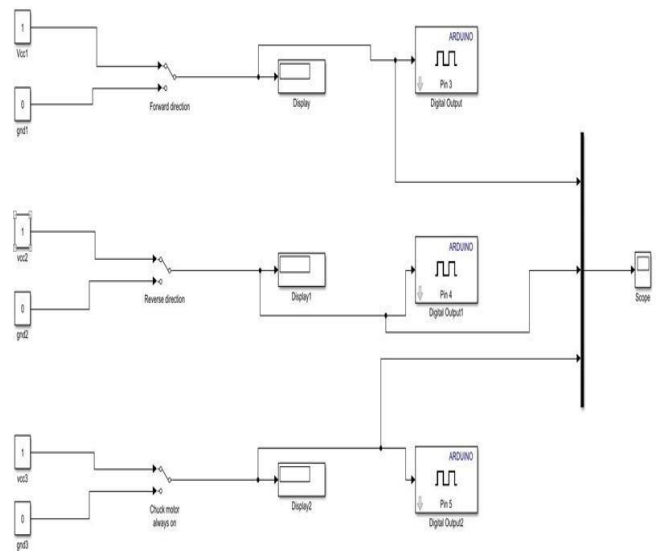


Fig 3. Block of Simulation-motor processing ON/OFF

The simulink diagram of motor processing controller consists of the following:

Constant: Generates the constant value. Value 1 represents the source or supply, Value 0 represent ground.

Manual switch: Switch between two input's that is from constant value 0 and 1. Manual switch is used for ON/OFF the motor manually.

Display: Displays the signal value (i.e, whether the motor is ON/OFF) during simulation. This displays as 0 and 1 (see fig 3).

Mux: Combines the input signals of same data type and numeric type into virtual vector.

4.1 F Low Chart

Ubidots is an internet server, connected through mobile hotspot. [10-15] Here, D0, D1, D2 pins used for forward, reverse, chuck motor and D5 pin used to indicates the number of jobs counts. When 3v supply is given to D0 pin, the forward motor is turned ON which indicates by the indicator. Simultaneously, D1 and D2 pin indicates the reverse and chuck motor condition (see fig 4).

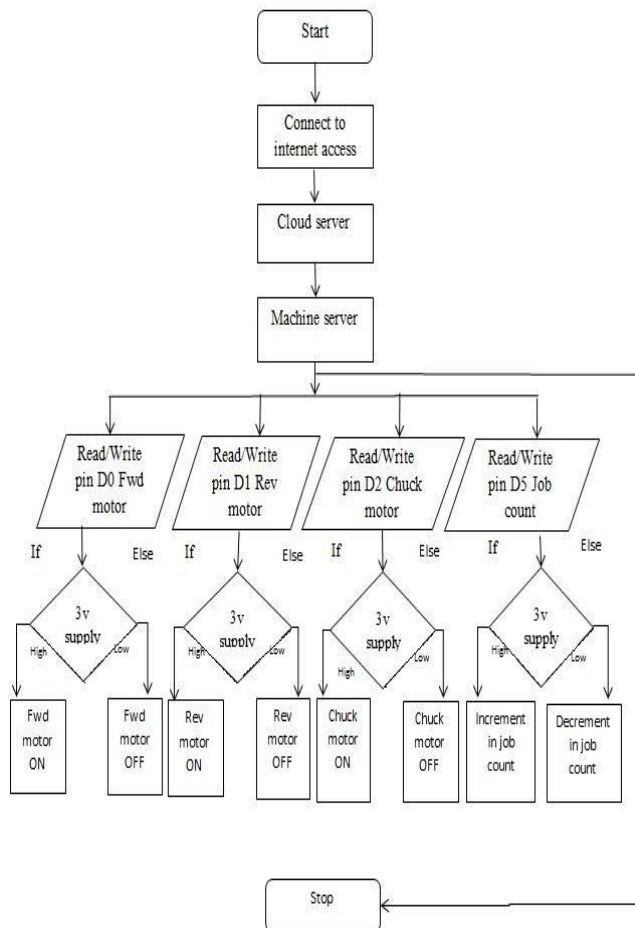


Fig 4. Flow chart of machine monitoring using arduino

5. Simulation Results

In this section, we described about the simulation results of this work. Here, the output of motor condition (Forward/Reverse-ON/OFF) are indicated in three colours, they are as follows:

- Orange colour PWM signal indicates the condition of chuck motor ON/OFF.
- Meganta colour PWM signal indicates the condition of forward motor ON.
- Blue colour PWM signal indicates the condition of reverse motor ON.

The above figure 5 shows the simulation output of chuck motor condition ON. The forward, reverse and chuck motor is turned ON by manual switch.

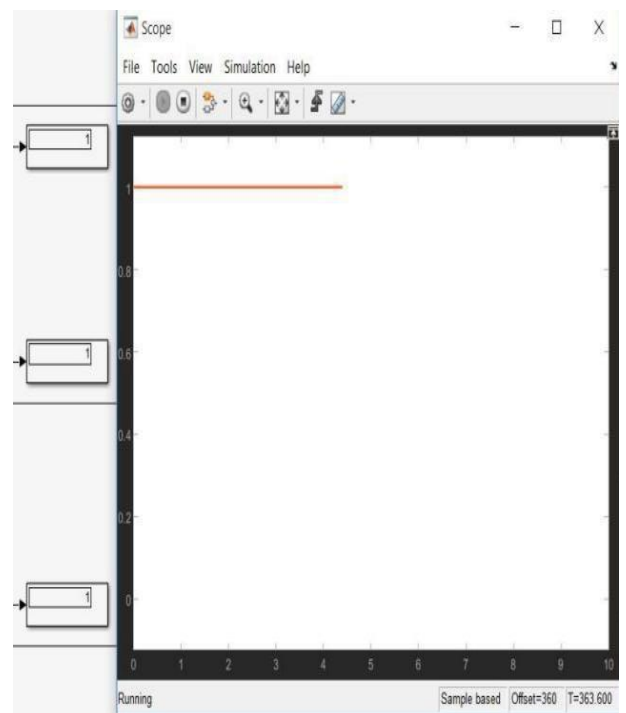


Fig 5. Simulation of matlab when three motors are ON

The above fig 5. shows the simulation output of chuck motor condition ON. The forward, reverse and chuck motor is turned ON by manual switch.

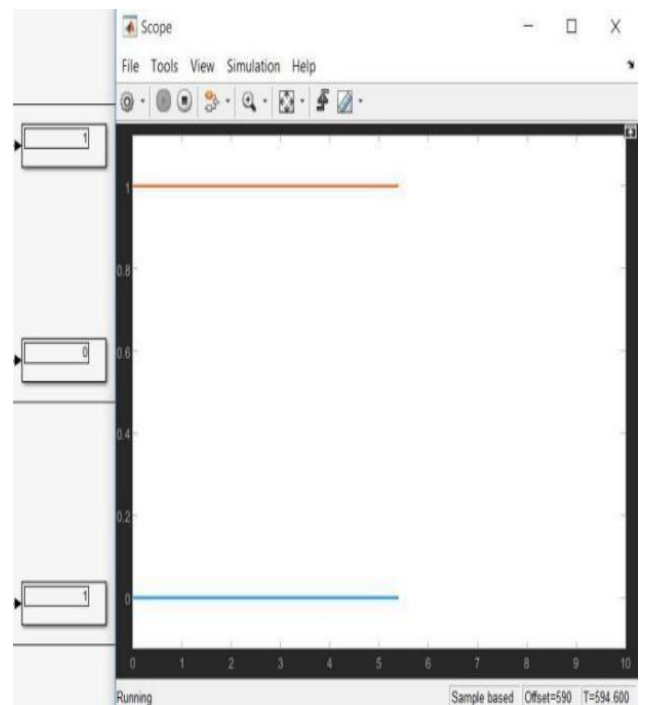


Fig 6. Simulation of forward and chuck motor ON

The above fig 6. shows the simulation output of reverse motor OFF and chuck motor ON condition.

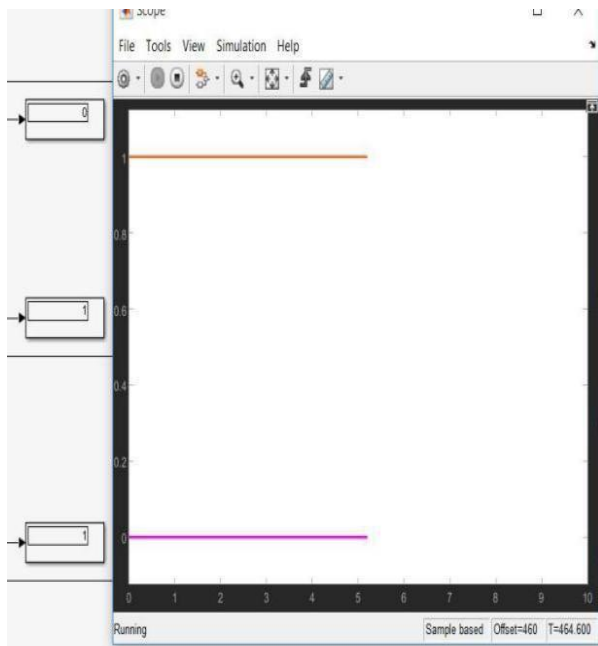


Fig 7. Simulation of reverse and chuck motor ON

The above figure 7 shows the simulation output of forward motor OFF and chuck motor in ON condition.

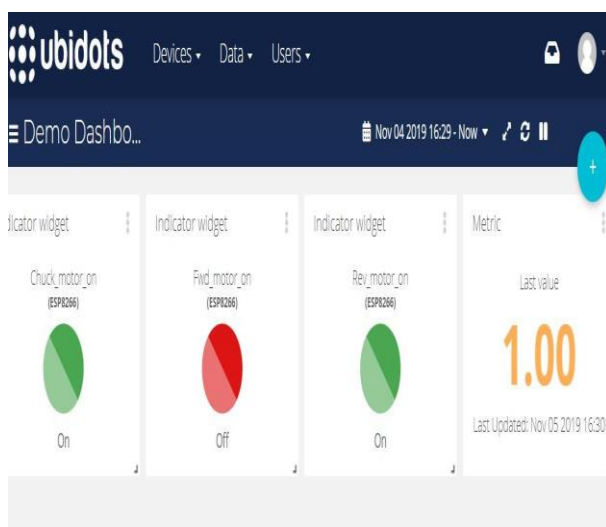


Fig 8. Output of machine status with job counts

The above fig 8 shows the output of machine status using ubidots internet server and monitored using arduino program to count number of jobs counts through mobile phones.

6. Conclusion

The execution of this work is as followed, the development of drilling and

tapping machine monitoring system using IoT application. There is a higher requirement for expandability and faciliation of the system. Machine status monitoring using nodeMCU controller gives many advantages, such as less hardware, software, accuracy, enhance the overall productivity and simplicity of expansion. The trend of business is towards using digital and android mobile communication technologies to increase competitiveness. This work gives basic idea of how to drill and tap machine monitoring status in the industries.

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