

Analyze Internet of Things-Based Control AC/DC Drive Monitoring System

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Abstract

The IOT-based control of a DC footing engine has been considered in this article. The web is the most widely used, quick, and easily accessible correspondence medium in the modern world. The suggested architecture allows anybody from anywhere in the world to control large mechanical equipment. The suggested framework is simple and extremely beneficial in terms of cost and effectiveness. The exchanging and speed of the DC engine may be limited in this framework by applying a self-created Android application. The PROTEUS replication confirmed the hypothetical assessments of the suggested framework's exposition.

Keywords: IOT, android application, Internet, Traction motors.

INTRODUCTION

Previously, the internet was only used for basic correspondence and data transmission. Nonetheless, the Internet of Things concept has caused a worldwide explosion in web development [1]. Today, the power of the internet is used for a variety of tasks, such as remotely operating a server computer from anywhere on the planet. The web aided the

development of the concept of cell phones, which have greatly aided the equivalent. Application-specific Android applications have been developed that accomplish tasks while significantly reducing human effort. Many low-effort and adaptive monitoring frameworks have been developed by combining the notion of IOT with remote means of communication. IoT is defined as a realm in which things (gadgets) may be

assigned unique IDs and transport data across a network without requiring human-to-human or human-to-PC connection [2]. Many more ideas have been investigated and developed. The Internet of Things is expected to play an important role in a variety of fields, ranging from manufacturing line computerization to human services [3]. However, one significant limitation of these ideas is that their reach is limited. The applications must be regulated inside a specific setting, which necessitates some physical proximity to the individual concerned [4]. Android phones, on the other hand, have overcome this barrier due to their helpful nature and excellent network. Because Android is an open source system, it is popular among customers and mobile phone manufacturers [5]. The suggested framework allows the control individual to control the framework with the click of a button on his PDA. PCs, on the other hand, may be used for the same purpose. The framework is made up of extremely basic and easy-to-use sorts of equipment that can handle tasks as vast as managing the footing of any device using the Internet of Things concept (IOT). As it is, the structure will boost venture productivity. Furthermore, because human capital is valued, it will reduce the amount of labour used significantly, resulting in a significant

savings in the organization's income. Working together may be made easier by adopting this invention. In atomic reactors, for example, once the chain reaction begins, it is impossible to enter the framework. Constant monitoring of the structure is critical since even little flaws or spillages can have a large impact on people and span a large area. To monitor everything that happens within an atomic reactor, necessary electrical devices can be installed first and then tested using IOT. These gadgets may be linked to several PCs, forming a whole control room, and even to modern mobile phones, allowing crisis scenarios to be handled as well. In order to improve traffic management, a small electronic device with speed sensors is installed in automobiles. When a vehicle crosses as far as possible, the vehicle information is automatically sent to the police control centre, and a challan is generated, which they must pay or their permission will be revoked. A little electronic lock is installed inside the motor to safeguard any vehicle. If a person discovers that his or her car has been stolen, they may lock the motor with the aid of their modern mobile phones, and the hoodlum will never again be able to drive the vehicle since the lock is entrenched into the motor and difficult to unlock in such circumstances.

PROPOSED TECHNIQUE

The goal is to control large mechanical machinery from anywhere on the earth using an Android phone. A virtual product such as Android studio may be used to construct an Android application. With its client programmable front end, the built Android application may control and screen the heap. It will provide a list of the several locations where the machines may be located. The specific option will take you to a page where a gadget with numerous speed control features will be available. When the speed incentive is set, the information is delivered from the programme to an online web server. The expert in command can finish this task. The Android application and Wi-Fi module are linked to an online cloud server, which stores the administrator-specified speed. The Wi-Fi module will obtain the relevant control information from the online web server. In cases of contemporary drive control, the Wi-Fi module connects to the ARDUINO UNO microcontroller or a programmable logic controller (PLC). The Wi-Fi module sends control data to the ARDUINO microcontroller. The information is then obtained by the microcontroller from the module. The microcontroller PWM pins are used to generate balanced heartbeats with varying pulse widths. These

heartbeats provide support to the engine driver. Because it operates in the 5V to 36V range, the engine driver IC may be successfully controlled by the microcontroller. Thus, the engine driver runs the engine in accordance with the beats sustained to it. The android application will also assist in monitoring the machine's status. The framework allows the administrator to inspect the machines' control and speed settings. Figures 1 and 2 depict the basic square form of the suggested framework, in which a guy may operate various industrial facility hardware by just tapping his mobile phone application.

Makers of processors Furthermore, the energy measurements for each phase were performed using Freescale Semiconductor Inc.'s "FFT-Based Algorithm for Metering Applications" library. The IoT-IMM-H reference voltage input was obtained on a transformer, with a single reference for the R, S, and T phases. The programme equalised the 120-degree differential between the R, S, and T phases. To save money, a single voltage reference was employed. However, the currents from each phase were measured independently. Because the difference between the phases was so small, the sensitivity required for predictive maintenance was unnecessary.

True power (P), measured power (W), apparent power (S), measured voltage (VA), and reactive power (Q) are all computed in AC energy measurement. Equations 1 and 2 illustrate complex and real components trigonometrically, while Figure 10a shows an energy estimate. The "FFT-Based Algorithm for Metering Applications" is discussed in full in the AN4255 application note and will not be covered in this study further. For each phase, the integrated programme calculated Vrms and Irms energy individually. This operation required 3750 samplings from the embedded programme, with an average of 25 samplings each

alternation (Fig. 10b). The effective value of the AC signals was calculated using the root mean square (RMS). As a consequence, the LPC1769 was readily able to conduct the energy calculations for the three phases due to its high processing power.

$$I_{RMS} = \sqrt{\sum_{k=0}^{\frac{N}{2}-1} (I_{RE}^2(k) + I_{IM}^2(k))}$$

$$U_{RMS} = \sqrt{\sum_{k=1}^{\frac{N}{2}-1} (U_{RE}^2(k) + U_{IM}^2(k))}$$

Where IRE(k), URE(k) are real parts and IIM(k), UIM(k)

imaginary parts of k. (1)(2)

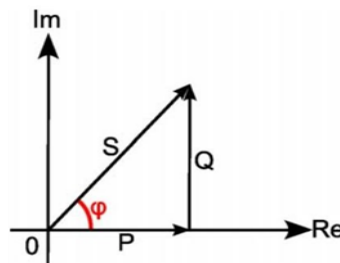


Fig. 10 a. Energy calculation triangle: apparent power (S), true power (P), reactive power (Q) and CosFi

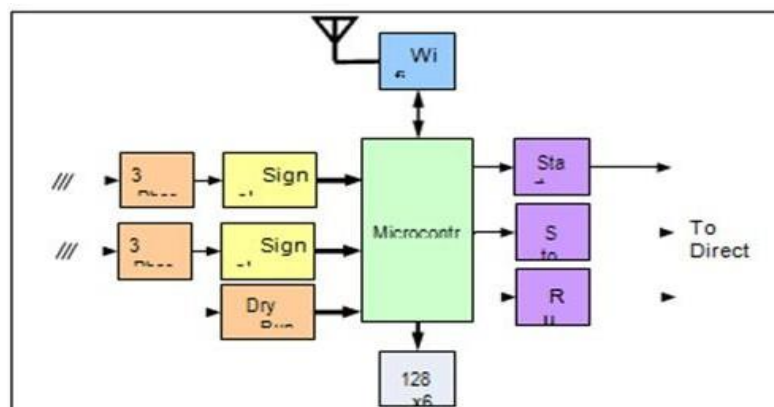


Fig.1.Block diagram representation



Fig.2. Diagrammatic representation

ANDROIDAPPLICATION

The Android application is built on an open source platform such as Android Studio. The application established in this manner will provide options for both the administrator and the control individual. The app would provide two-way control. The controller can select the machine whose parameter is to be controlled as the primary mode of control.

When this is done, the current movement will be linked to the next action, which will have varied features for speed control. When the decision is made, the client will be approved using a specified secret word in the programme. The web on the phone transmits control information to the cloud web server when the secret phrase matches the predetermined secret word. However, in contrast to the standard cloud-driven design, virtual assets for the Internet of Things, a product engineering to evaluate

the strain between powerful development and competent activity of IoT applications has also increased [6].

Currently, in the primary way of control, an administrator can be physically present at the machine area and periodically download the needed machine running parameters from the web server, after which he can work the machine as usual. The operating parameters of the machine will be obtained by the microcontroller in the second proposed approach, and the code transferred in the microcontroller will transmit expected guidelines to the engine driver by exchanging exhibit, and the machine will continue to operate at the supplied parameters. The CMS software reads the IoT-IMM-H modules as well as the other sensory data derived by the IoT-IMM-H via the UDP protocol. Because handshaking is not required, the UDP protocol is perfect for such sensor

readings. The TCP/IP stack software does not waste extra processing resources if there are new packet losses or if parts of the IoT-IMMH modules are closed. The CMS software examines the motor data for around three seconds before broadcasting a UDP broadcast packet to all IoT-IMMH modules. They receive this packet and respond with a data packet. Even though all IoT-IMMH modules have the identical data, there is no packet loss since the CMS software is constructed as "event driving." The IoT-IMMH modules' data packets are automatically added to the pool of data packets. A CMS thread updates the database with other predictive maintenance and energy statistics based on the data in the pool.

SMARTPHONE

There are approximately 3 billion smartphone users, with Android accounting for nearly 82%. 2.4 billion of the total accessible gadgets are IoT compatible [7]. The Android application that was created will be installed on the smartphone. The smartphone will use its internet connection to transfer control data to online cloud servers such as firebase or one of the several database systems accessible. The Android application will be simple to use and available to all Android smartphone users.

MICROCONTROLLER

The implanted ATmega328P microprocessor is accompanied by the arduino UNO microcontroller. The ARDUINO UNO is designed to allow many offices to communicate with PCs, another ARDUINO, and other on-board controllers [8]. The board's standard operating voltage is 5V. In any case, the recommended information voltage varies from 7V to 12V. It has 14 computerised input/output pins, 6 of which are bidirectional. On the board, there are six basic I/O pins. It has 32 KB of flash memory, of which 0.5 KB is used by the boot loader.

The clock frequency is 16MHz. SRAM and EEPROM are 2 KB and 1 KB, respectively. Furthermore, the microcontroller has extremely useful measurement capabilities, with length and breadth of 68.6 mm and 53.4 mm, respectively [9]. The arduino microcontroller will be loaded with an arduino C application. The application will direct the microcontroller to download control data from the internet cloud web server. The data will be gathered via the Wi-Fi module at regular intervals. This data will be in the form of basic characteristics ranging from 0-255. Similarly, the microcontroller may be used

to balance the pins of the engine driver IC, causing the engine to operate in several modes such as forward motoring, forward braking, switch motoring, and turn about braking. Furthermore, the specific basic

attributes have speak to speeds where 0 talks to 0 speed and 255 speaks to complete speed. The arduino UNO microcontroller is seen in Figure 3.

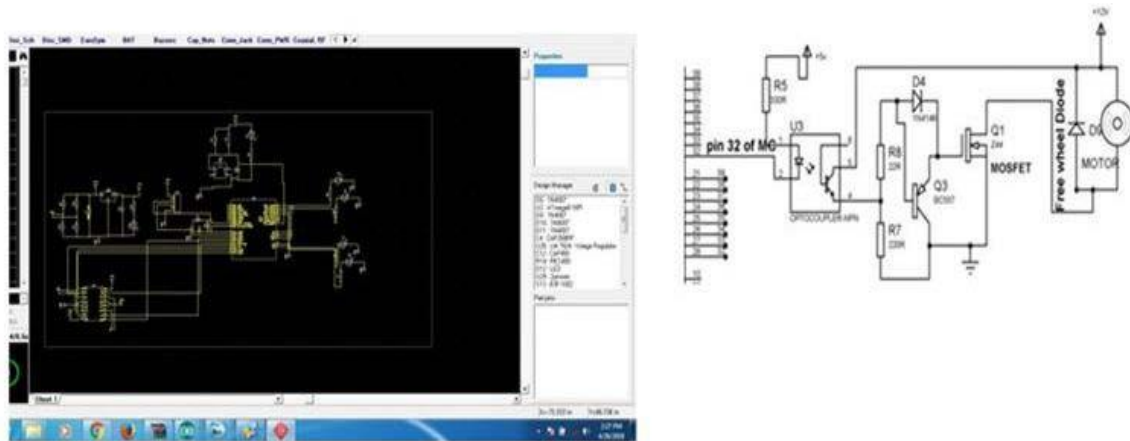


Fig.3. Diagrammatic representation

WI-FIMODULE



Fig.4. ESP8266 Wi-Fi module



Fig.5. Arduino UNO Wi-Fi board

The Arduino microcontroller may be connected to the internet in a variety of ways. One method is to use the Arduino UNO Wi-Fi board [10]. It is seen in Figure 5. It is a microcontroller board with an inbuilt Wi-Fi module. A second ESP8266 Wi-Fi module can also be used. It has an integrated TCP/IP protocol stack.

It comes with AT command set firmware pre-installed. It comes with 1MB of Flash memory. IEEE 802.11 b/g/n Wi-Fi is used. It contains sixteen GPOI pins. It supports both the SPI and I2C communication protocols [11]. There is also a predefined library accessible for coding. Figure 4 depicts an ESP8266 Wi-Fi module.

MOTORDRIVER

The motor driver integrated circuit L293D was employed in the prototype simulations. The L293D is a dual H-bridge motor driver integrated circuit. The IC is depicted in Fig. 6. This integrated circuit is controlled by the arduino microcontroller and acts as the final stage in the proposed system. The motor may be made to function in all four quadrants by using the motor driver IC. It has a 600 mA output current and a max output current of 1.2 A per channel. The IC also has output diodes to defend against any back EMF created

by the motor. The output voltage ranges from 4.5 V to 36 V [12].



Fig.6. L293D motor driver

Field-Effect Transistor using Metal Oxide Semiconductor (MOSFET) The metal-oxide semiconductor field-effect transistor (MOSFET) has four terminals. A substrate, or body, contact is present in addition to the drain, gate, and source. In most cases, the substrate is linked to the source terminal for practical applications. If this is the case (which is frequently the case), the MOSFET may be thought of as a conventional three-terminal device, with the drain, gate, and source being the terminals of interest.

The MOSFET, like all FET structures, operates by using the field effect - the attraction or repulsion of charge carriers via an applied voltage - but it has a twist that has allowed it to become the dominant technology for silicon based FETs. Because of the availability of a high grade oxide (SiO₂, or silicon dioxide) for the silicon system, the MOSFET structure has prevailed. As we'll see, this oxide

functions as an insulator, giving electrical isolation between the gate and an active (conduction) channel between the source and drain, so providing the necessary input/output separation.

SIMULATION RESULTS

The framework's reenactment is basic. Above all, because these libraries are not preset in proteus, the Bluetooth and Atmega-328 libraries need be obtained. These libraries are easily available over the internet. The next stage involves extracting records from the downloaded zip organiser and merging them into the proteus envelope's library section (present in the introduced drive). Everything else is available in the product. The rundown appears in the component list after constructing the catch or the codes.

To transmit a Bluetooth signal, select a virtual terminal from the instruments area

in the upper left corner of the screen in the state of waveforms directly beneath the tests. When you perform the replication, a virtual terminal appears. The engine behaves similarly when the relevant codes are entered into the terminal. The circuit is then tried, and the corresponding helped PWM sign is discovered on the simulated oscilloscope.

The waveform seen underneath on the virtual oscilloscope is the driver circuit's yield PWM beat. The recreation circuit map as attracted proteus is discussed in Fig.7. The waveforms obtained during the forward driving technique of activity are depicted in Fig. 8. The virtual terminal diagram of the equivalent is shown in Fig. 9. Figure 10 shows the reenactment results when a slower speed is linked as advised.

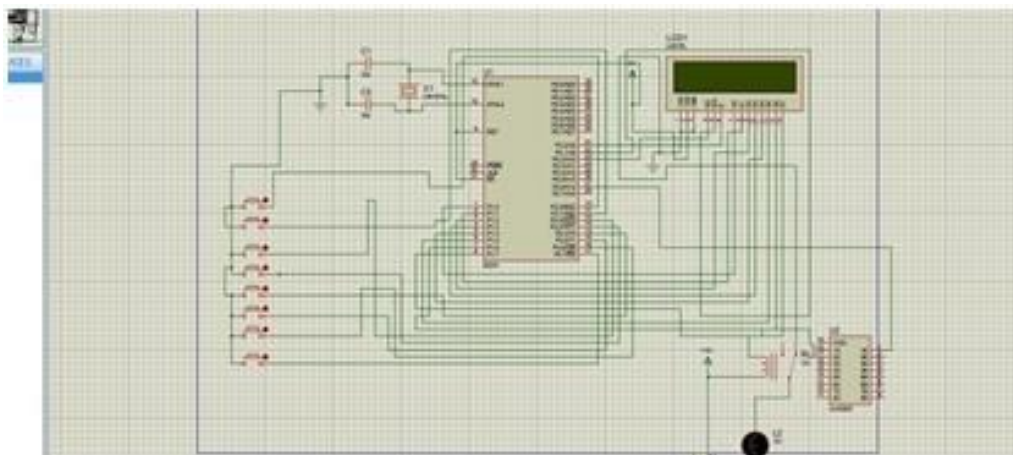


Fig.7.1. Proteus Schematic of the Circuit Diagram

EXPERIMENTAL STUDY

The technique is being tested in a facility in Bursa, Turkey's textile capital. The plant has 18 looms ranging in power from 2.7 kW to 4.5 kW. The motors' maintenance plan has been established, and the energy

spent per product has been calculated. The statistics show that when the stator winding temperature of the motor is incorporated in the model, the linear results improve.



Fig. 7.2 *Experimental Result testing*

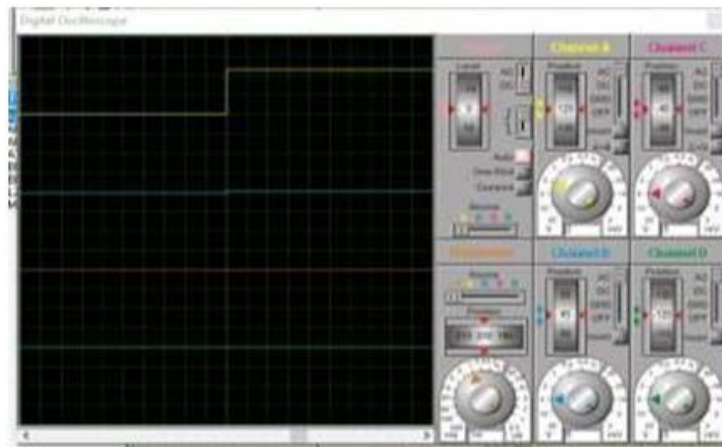


Fig.9. *Virtual terminal at different modes of operation*

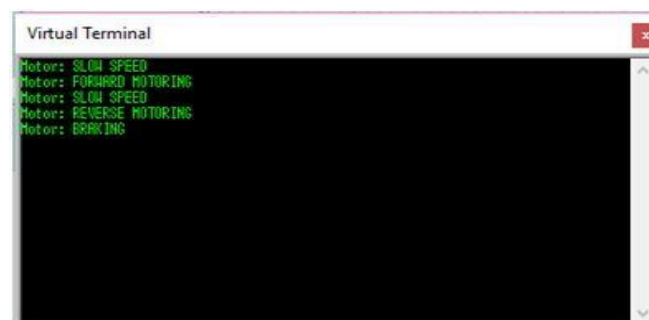
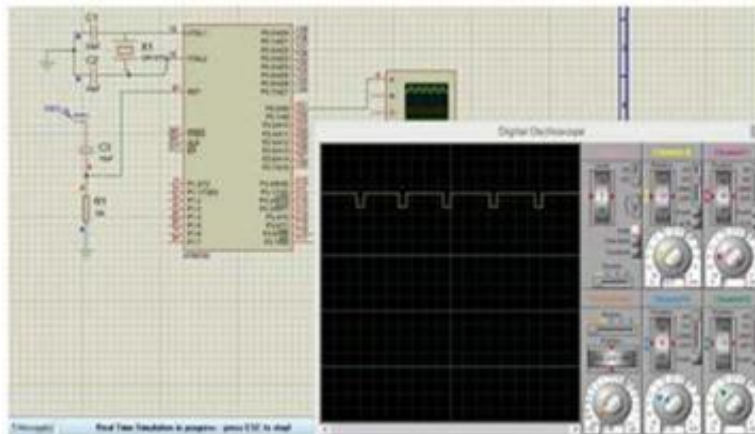


Fig.10. *Simulation results for a slower controlspeed*



Practical Implemented Result



CONCLUSION

The technology developed in this study has shown good results in production conditions with low change in motor load. This method of learning may be used to motor power ratings, particularly for 7/24 machines. This study supplied statistics not only for the development of mathematical models, but also for the CMS operator to develop a motor maintenance schedule.

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