Journal of Science, Computing and Engineering Research (JSCER)
Volume-7, Issue-11, November 2024.
DOI: *https://doi.org/10.46379/jscer.2023.071102*
ISSN: 2708-1079

Comparative Design and Analysis of Motor Control System using IOT Application

Suresh Shyamkumar, Sivanandan P, Vebin Selvam

Assistant Professor,St.Loyala Institute of Technology, Chennai

Article Information

Received : 02 Nov 2024
Revised : 06 Nov 2024
Accepted : 10 Nov 2024
Published : 14 Nov 2024

Corresponding Author:
Suresh Shyamkumar

Abstract— Nowadays, Dc motor is being used in many applications such as robotics, lifts, conveyors, and industrial application. Usually, Dc motor drives are being controlled and operated manually by the workers due to which lots of accidents occur, and it also generates more faults in the system and requires regular maintenance. Due to this, there is a vast increase in the mass of the workers, which means higher worker charge and requires a skillful worker who has knowledge of dc drives the system. So, this project focuses on minimizing the risk of accidents and mass numbers of the workers by using the Internet of Things (I.O.T), which can be monitored and operate the drives with apps. This project controls the speed of the motor and temperature by using the Speed sensor and temperature sensor. This provides flexibility in operation and gives higher efficiency.

Keywords: ***Internet of Things, Android Apps, Remote Access, Dc Motor***

Citation: Suresh Shyamkumar, Sivanandan P, Vebin Selvam, "Identifying Design and Analysis of Motor Control System using IOT Application", Journal of Science, Computing and Engineering Research, 7(11), November 2024.

I. INTRODUCTION

Today the world is connected to a digital platform in every real-time application. Where each industries and factories tend to compete themselves with other to be on the top and to achieve higher profit and globalization. By using IoT data form, smart devices generate a large amount of data, and because of digitalization, it ensures lower cost, improvement in production quality, flexibility, and efficiency. This project can be implemented in industries (such as conveyors, hoists, lifts), hospitals, military, agriculture, and home automation.

By using some sensors for actuators and drives, which sense the motion of the drives and collect the data from it, which is provided to the Arduino and then to the wi-fi module that makes the device working as an IoT. Due to this, there will be ease of collecting the data of the drives. The users can operate electrical drives from any remote place through apps that are available on the smartphone, which should be linked with the internet. If the user wants to control and operate the drives at a particular speed, then the user should provide the data from an app, then the user data will allow the drives to work or operate at a given data and promises the users to have complete control over the device.

II. RELATED WORKS

Existing System In earlier days, factories and industries use Pic microcontroller, rheostat, keypad, relays, GSM to control the speed of the dc motor due to which there is an increase in worker requirement to operate and control the dc motor. The Arduino and wi-fi shields are not used to control and monitor the motor; instead of this component, they use Rheostat and CRO (Crystal oscilloscope).

Due to manual operation and control of the motor tends to be hazardous for the workers when the motor exceeds its maximum speed or when motor is in fault calculation. The actual calculation of speed (RPM) of the motor is not accurate as compared to the proposed system. To Switch On/Off, the motor GSM and manual switches are used in the existing system due to which this system takes lots of time to control the dc motor and require skilful worker. GSM requires a network that cannot be available in some remote areas due to which control operation cannot start and reduces the efficiency of the system.

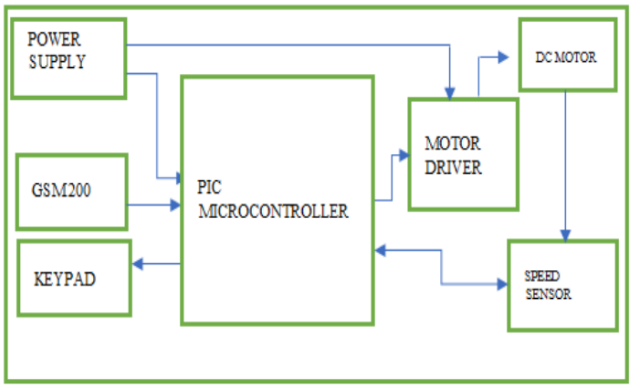

Fig. 2.1: Block diagram of the existing system

Proposed System In the proposed system, we have implemented IoT to control dc motor, which effectively reduces the human efforts for laboriously monitoring the parameters of drives for a regular interval of time. Through IoT, we were controlling parameters such as direction, speed, and temperature and displayed it on the liquid crystal display (LCD).

To achieve those parameters automatically, we are using some sensors like speed sensors for measuring the rpm of the motor and temperature sensor (LM35) for measuring the amount of heat generated by the motor during its running condition. For making IoT, we have used the Wi-Fi module, which has its TCP/IP protocol stack integrated with the module, which helps the microcontroller to connect any Wi-Fi networks.

Through this IoT, the motor speed can be varied to its minimum and maximum speed with the help of smart devices that contain app to operate the dc drives. The projects also contain matrix keypad, which is also used for providing the data of speed through which motor runs at the given numerical value with the help of Arduino mega.

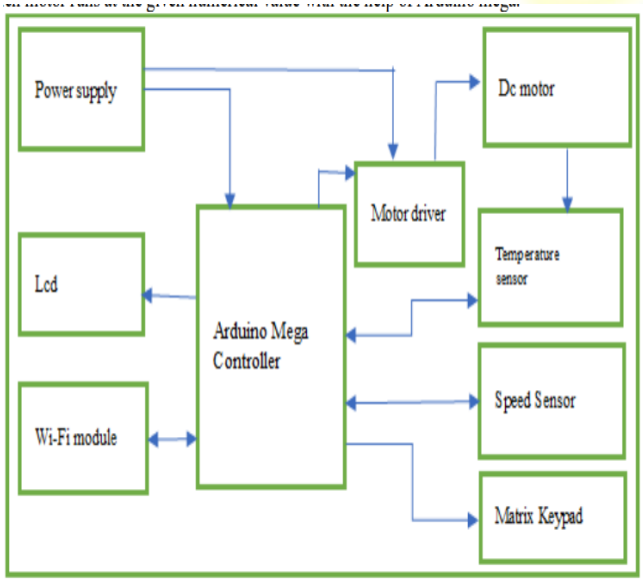

Fig. 2.2: Block diagram of the proposed system

III. BACKGROUND OF STUDY

Software Used In software used is a process to check whether circuit is working or not working and also to find the errors in the circuit by using computer software, so here we have used proteus 8 professional which is a simulation software where we run and test our circuit.

For the programming part, we used Arduino software, where each sensor and actuator start as per the program, written by the users and for editing we have used Microsoft Office and Photoshop CS6.

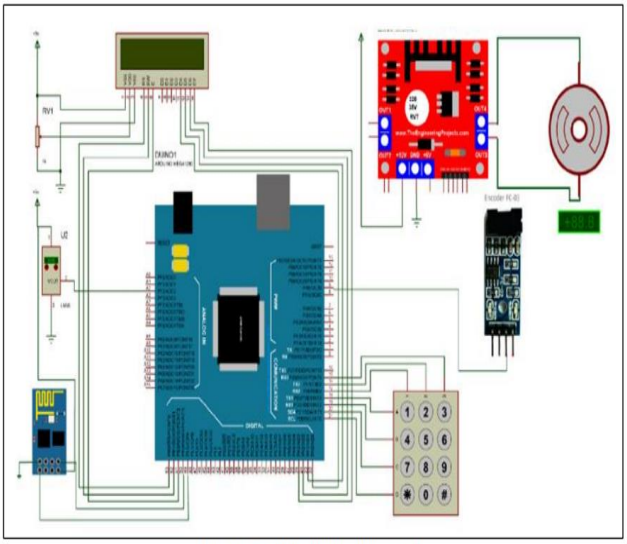

Fig. 3.1: Circuit diagram of software used.

Hardware Used Arduino Mega 2560: Arduino is an open-source platform which has its hardware and software or IDE (integrated development environment) inbuild in it which runs on a computer where user can write and upload the code with the physical world.

The microcontroller used in Arduino mega is ATMEGA 2560, and its products are licensed under GNU Lesser General Public License (LGPL) or General Public License (GPL). Arduino mega board contains 54 digital and 16 analog input/output pins and 4 UARTs ports that are interfaced with other circuits and boards.

The boards consist of serial communication interfaces, including Universal Serial Boards (USB), on some models, where the programs from the computer are loaded to the boards. The programming language used in the microcontroller of Arduino mega is C and C++.

IV. METHODOLOGY

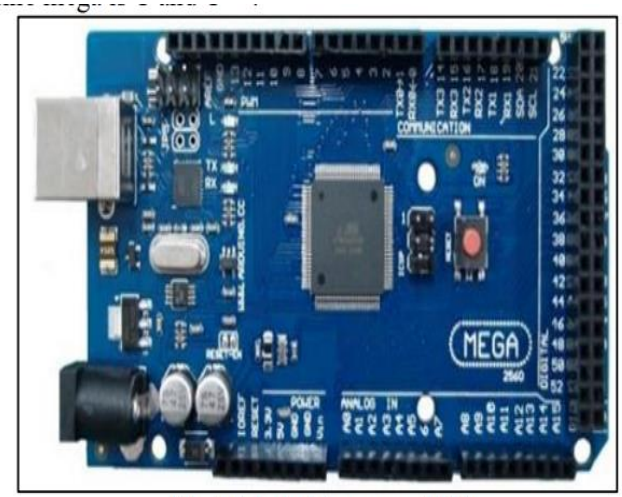

Fig. 3.2.1: Arduino mega 2560

ESP8266 WIFI is an Integrated low power 32-bit CPU works with TCP/IP protocol stack that is Incorporated with SOC, which gives any microcontroller access to your Wi-Fi network. This device transmits the data wirelessly with an operating range of 2.4GHz, and its working range around 50 meters and can be extended further using directional antennas.

The ESP8266 module needs a 3.3V power supply for the module, where it also needs to communicate via serial port at 3.3V. ESP8266 module has powerful on-board processing and provides storage capability that allows sensors and other specific devices to integrated with the module through its GPIOs with minimal development up-front and minimal loading during runtime.

This module provides a high degree of on-chip integration that lets for minimal external circuit board, including the front-end module, and is designed to occupy minimal PCB area.

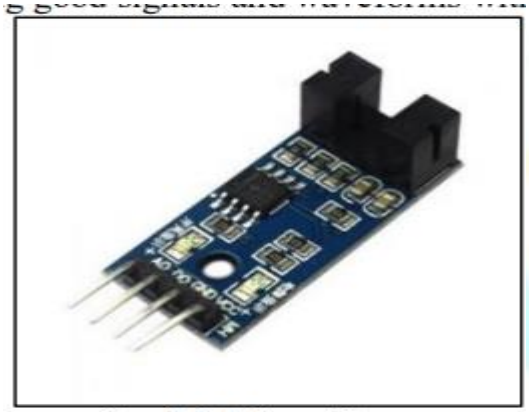

Fig. 3.2.4: Speed Sensor

Temperature Sensor LM35 is a device that is used for measuring temperature and consists of analog output voltage proportional to the temperature. It provides output voltage in Centigrade (Celsius). The sensitivity of this device is 10 mV/degree Celsius.

As output voltage is linearly proportional to a temperature that is increasing in temperature, increase the output voltage. This device does not need external standardization to provide accuracy to measure the temperature at room temperature. LM35C is rated for a -40o C to +110o C range. LM35 has the advantages of low cost, portable size, and higher accuracy; it is widely used for the project's works.

Speed Sensor The speed sensor is a tool that measures the RPM of the electric motor. This device provides pulses to the microcontroller by counting the rate at which events occur for a given period and by dividing the total number of occasions by the time to get the price. The optical speed sensor consists of a phototransistor and photodiode which emits infrared light and phototransistor senses the presence and absence of light.

It generates an output pulse as a digital logic high level and logic low level. If the output pulse is high, then the views are off, and if the output level is low, then the lights are on. The speed sensor uses LM393 full voltage comparator and has the advantage of performing good signals and waveforms with a strong driving ability for more than 15mA.

Dc Motor Dc motor is an energy conversion device that converts electrical energy into mechanical energy. When a current pass through a conductor or a coil, it generates an electromagnetic field that is aligned with the center of the coil. The direction and magnitude of the magnetic field can be changed by changing the current magnitude and direction flowing through the coil.

The dc motor consists of fixed sets of magnets in the stator, armature with one or more windings of insulated wire, and commutator, which is connected at the end of windings, which periodically reverses the current direction between the rotor and the external circuit

Fig. 3.2.5: Dc motor

This structure has the power consumption 20.49 nW and circuit delay is 38.83 ps. Circuit diagram of the conventional double tail comparator shown in Fig 4. This structure has low static power consumption and operates at lower supply voltages compare to the single tail comparator. The working of this comparator is given below.

V. RESULTS AND DISCUSSIONS

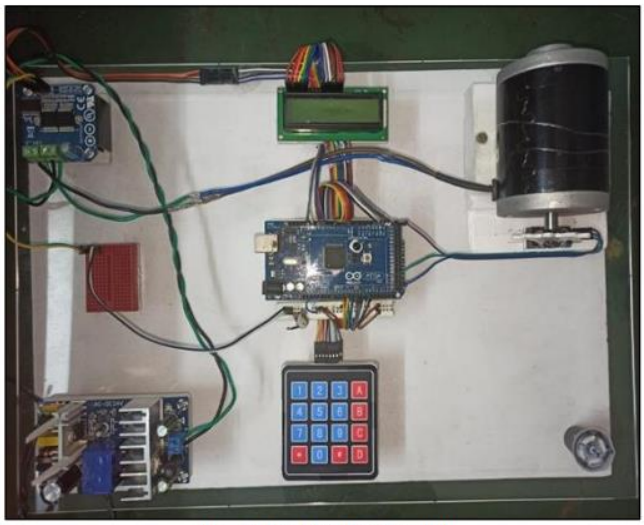

Fig. 4: Final hardware model

Arduino is an open-source platform which has its hardware and software or IDE (integrated development environment) inbuild in it which runs on a computer where user can write and upload the code with the physical world. The microcontroller used in Arduino mega is ATMEGA 2560, and its products are licensed under GNU Lesser General Public License (LGPL) or General Public License (GPL). Arduino mega board contains 54 digital and 16 analog input/output pins and 4 UARTs ports that are interfaced with other circuits and boards. The boards consist of serial communication interfaces, including Universal Serial Boards (USB), on some models, where the programs from the computer are loaded to the boards. The programming language used in the microcontroller of Arduino mega is C and C++.

VI. CONCLUSION

We would like to express our sincere gratitude to our Head of the department Dr. Vs. Arulmurgan/Department of EEE/ECE for providing his guidance, suggestion throughout the course of the project. Also, we would like to thank our project coordinator Mr. Mohanraj Assistant Professor/Department of EEE for their helping hand and letting us to do project work on this topic and constantly motivating us to work hard. Specially we would like to thank to Mr. Pramod Thapa, UG student, Department of Computer Science Engineering/Excel Engineering college for giving his idea and making our project successful.

REFERENCES

[1]. P. Nirmala, T. Manimegalai, J. R. Arunkumar, S. Vimala, G. Vinoth Rajkumar, Raja Raju, "A Mechanism for Detecting the Intruder in the Network through a Stacking Dilated CNN Model", Wireless Communications and Mobile Computing, vol. 2022, Article ID 1955009, 13 pages, 2022. https://doi.org/10.1155/2022/1955009.

[2]. D. Sathyanarayanan, T. S. Reddy, A. Sathish, P. Geetha, J. R. Arunkumar and S. P. K. Deepak, "American Sign Language Recognition System for Numerical and Alphabets," 2023 International Conference on Research Methodologies in Knowledge Management, Artificial Intelligence and Telecommunication Engineering (RMKMATE), Chennai, India, 2023, pp. 1-6, doi: 10.1109/RMKMATE59243.2023.10369455.

[3]. J. R. Arunkumar, Tagele berihun Mengist, 2020" Developing Ethiopian Yirgacheffe Coffee Grading Model using a Deep Learning Classifier" International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-9 Issue-4, February 2020. DOI: 10.35940/ijitee.D1823.029420.

[4]. Ashwini, S., Arunkumar, J.R., Prabu, R.T. et al. Diagnosis and multi-classification of lung diseases in CXR images using optimized deep convolutional neural network. Soft Comput (2023). https://doi.org/10.1007/s00500-023-09480-3

[5]. J.R.Arunkumar, Dr.E.Muthukumar," A Novel Method to Improve AODV Protocol for WSN" in Journal of Engineering Sciences" ISSN NO: 0377-9254Volume 3, Issue 1, Jul 2012.

[6]. R. K, A. Shameem, P. Biswas, B. T. Geetha, J. R. Arunkumar and P. K. Lakineni, "Supply Chain Management Using Blockchain: Opportunities, Challenges, and Future Directions," 2023 Second International Conference on Informatics (ICI), Noida, India, 2023, pp. 1-6, doi: 10.1109/ICI60088.2023.10421633.

[7]. Arunkumar, J. R. "Study Analysis of Cloud Security Chanllenges and Issues in Cloud Computing Technologies." Journal of Science, Computing and Engineering Research 6.8 (2023): 06-10.

[8]. J. R. Arunkumar, R. Raman, S. Sivakumar and R. Pavithra, "Wearable Devices for Patient Monitoring System using IoT," 2023 8th International Conference on Communication and Electronics Systems (ICCES), Coimbatore, India, 2023, pp. 381-385, doi: 10.1109/ICCES57224.2023.10192741.

[9]. S. Sugumaran, C. Geetha, S. S, P. C. Bharath Kumar, T. D. Subha and J. R. Arunkumar, "Energy Efficient Routing Algorithm with Mobile Sink Assistance in Wireless Sensor Networks," 2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ACCAI58221.2023.10201142.

[10]. R. S. Vignesh, V. Chinnammal, Gururaj.D, A. K. Kumar, K. V. Karthikeyan and J. R. Arunkumar, "Secured Data Access and Control Abilities Management over Cloud Environment using Novel Cryptographic Principles," 2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI), Chennai, India, 2023, pp. 1-8, doi: 10.1109/ACCAI58221.2023.10199616.

[11]. Syamala, M., Anusuya, R., Sonkar, S.K. et al. Big data analytics for dynamic network slicing in 5G and beyond with dynamic user preferences. Opt Quant Electron 56, 61 (2024). https://doi.org/10.1007/s11082-023-05663-2

[12]. Krishna Veni, S. R., and R. Anusuya. "Design and Study Analysis Automated Recognition system of Fake Currency Notes." Journal of Science, Computing and Engineering Research 6.6 (2023): 16-20.

[13]. V. RamKumar, S. Shanthi, K. S. Kumar, S. Kanageswari, S. Mahalakshmi and R. Anusuya, "Internet of Things Assisted Remote Health and Safety Monitoring Scheme Using Intelligent Sensors," 2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI), Chennai, India, 2023, pp. 1-8, doi: 10.1109/ACCAI58221.2023.10199766.

[14]. R. S. Vignesh, R. Sankar, A. Balaji, K. S. Kumar, V. Sharmila Bhargavi and R. Anusuya, "IoT Assisted Drunk and Drive People Identification to Avoid Accidents and Ensure Road Safety Measures," 2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ACCAI58221.2023.10200809.

[15]. I. Chandra, G. Sowmiya, G. Charulatha, S. D, S. Gomathi and R. Anusuya, "An efficient Intelligent Systems for Low-Power Consumption Zigbee-Based Wearable Device for Voice Data Transmission," 2023 International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering (ICECONF), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ICECONF57129.2023.10083856.

[16]. G. Karthikeyan, D. T. G, R. Anusuya, K. K. G, J. T and R. T. Prabu, "Real-Time Sidewalk Crack Identification and Classification based on Convolutional Neural Network using Thermal Images," 2022 International Conference on Automation, Computing and Renewable Systems (ICACRS), Pudukkottai, India, 2022, pp. 1266-1274, doi: 10.1109/ICACRS55517.2022.10029202.

[17]. R. Meena, T. Kavitha, A. K. S, D. M. Mathew, R. Anusuya and G. Karthik, "Extracting Behavioral Characteristics of College Students Using Data Mining on Big Data," 2023 International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering (ICECONF), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ICECONF57129.2023.10084276.

[18]. S. Bharathi, A. Balaji, D. Irene. J, C. Kalaivanan and R. Anusuya, "An Efficient Liver Disease Prediction based on Deep Convolutional Neural Network using Biopsy Images," 2022 3rd International Conference on Smart Electronics and Communication (ICOSEC), Trichy, India, 2022, pp. 1141-1147, doi: 10.1109/ICOSEC54921.2022.9951870.

[19]. I. Chandra, G. Sowmiya, G. Charulatha, S. D, S. Gomathi and R. Anusuya, "An efficient Intelligent Systems for Low-Power Consumption Zigbee-Based Wearable Device for Voice Data Transmission," 2023 International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering (ICECONF), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ICECONF57129.2023.10083856.

[20]. Revathi, S., et al. "Developing an Infant Monitoring System using IoT (INMOS)." International Scientific Journal of Contemporary Research in Engineering Science and Management 6.1 (2021): 111-115.