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IOT Based Smart System for Parameter Control Interfaced with Android and Cloud

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Abstract

The smart embedded system enables real-time monitoring and control of multiple parameters motor speed, LCD brightness, temperature, and humidity through both manual input and remote Android application. The system consists Raspberry Pi 4 Model B as the central processor, integrated with a DHT11 sensor, L298N motor driver, LCD display, and potentiometers. Cloud connectivity is achieved using Firebase to synchronize data between the hardware and a custom-built mobile application. Real-time feedback ensures precise control and monitoring, offering a scalable solution for home automation and industrial control systems. Experimental results confirm the accuracy of parameter readings and responsiveness of both manual and remote inputs. This paper introduces an IoT-based smart system for real-time parameter control with seamless integration of Android and cloud computing technologies. The proposed architecture consists of sensor nodes for data acquisition, a microcontroller for signal processing, and wireless communication modules for data transmission. The Android application acts as the primary control interface, providing users with real-time insights, alerts, and the ability to remotely regulate system parameters. Cloud integration facilitates secure data storage, advanced analytics, and ubiquitous access, enabling predictive decision-making and long-term performance evaluation. The experimental setup validates the system's efficiency, responsiveness, and scalability, demonstrating its potential in diverse domains including smart cities, healthcare, and industrial automation.

Keywords: IOT, embedded system, raspberry Pi, DHT11, android app, cloud control, motor speed, LCD brightness, temperature, humidity

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INTRODUCTION

The integration of embedded systems with the Internet of Things has redefined how physical devices are controlled and monitored in real time. With advancements in cloud computing and mobile connectivity, it is now possible to manage electronic systems remotely with precision and reliability. This project presents the design and implementation of an IOT-based smart system that enables dual-mode control manual and remote of two key parameters: motor speed and LCD brightness. In addition, the system is equipped with a DHT11 sensor to monitor environmental conditions such as temperature and humidity in real time. The central component of this system is a Raspberry Pi 4 Model B, which acts as the core processing and communication unit. It receives inputs from potentiometers for local control, fetches data from a Firebase cloud database for remote control, and displays parameter feedback on a 16x2 LCD screen.

The motor speed and brightness control are implemented using PWM techniques via an L298N motor driver, while the DHT11 sensor continuously provides environmental readings that are reflected on both the mobile app and the LCD. The Android application allows users to adjust the parameters remotely using a user-friendly interface, while also viewing the live sensor data. This ensures flexibility, redundancy, and scalability, making the system suitable for applications ranging from home automation to industrial monitoring. By integrating real-time feedback, cloud synchronization, and dual-control modes, the system offers a robust and interactive platform for modern IOT-based automation.

Literature Review

[1] Research by Bhattacharya (2024) provides an overview of cloud-based IoT platforms for real-time monitoring and control. The study highlights the role of cloud computing in enabling remote management of embedded systems, ensuring seamless data processing and automation. [2] Studies by Choi (2024) explore the design and implementation of IoT-based smart home systems with mobile and cloud integration. The research focuses on enhancing connectivity between embedded devices and cloud platforms to improve automation and user experience. [3] Research by Kumar (2024) delves into smart parameter monitoring and control using IoT and cloud computing. The study emphasizes the importance of real-time data acquisition, processing, and system responsiveness for efficient parameter management. [4] Research by Lee (2023) explores IoT-enabled smart systems for environmental monitoring and control. The study highlights the integration of Android applications and cloud computing to improve system intelligence and automation. [5] Studies by Akter (2023) investigate IoT-based smart agriculture monitoring systems using Android and cloud platforms. The research showcases how real-time data collection from agricultural sensors enhances productivity and resource efficiency.

Problem Statement

Conventionally embedded systems have limited capabilities because of the lack of remote access, sensing of environmental conditions, and real-time feedback. Key parameters such as motor speed or temperature cannot be adjusted or monitored by users unless they are on-site. The current project remedies these limitations by combining cloud connectivity, mobile app control, and environmental monitoring within a single system, allowing dynamic and flexible real-time control [6-10].

Objectives

i. To design a cloud-connected embedded system capable of controlling and monitoring multiple physical and environmental parameters.
ii. To implement real time data collection for Temperature and Humidity using DHT11 sensor.
iii. To enable manual control through potentiometers and remote control via a mobile application.
iv. To synchronize all parameter states in real time using cloud services.
v. To display system status on both the Android app and 16x2 LCD display.

HARDWARE AND SOFTWARE REQUIREMENTS

a. Hardware Used

i. Raspberry Pi 4 Model B:-

- *Processor*: Quad-core Cortex-A72 (ARM v8) 64-bit SoC 1.5 GHz
- *RAM*: 4 GB
- *Connectivity*: Dual-band Wi-Fi, Bluetooth 5.0, Gigabit Ethernet
- *Ports*: 40 GPIO pins, 2 micro-HDMI, 4 USB ports (2×USB 3.0)
- *Operating system*: Raspberry Pi OS
- *Role*: Acts as the central processing and communication hub. It executes control logic, reads sensors and ADC values, communicates with the cloud, and drives output components (Figure 1).

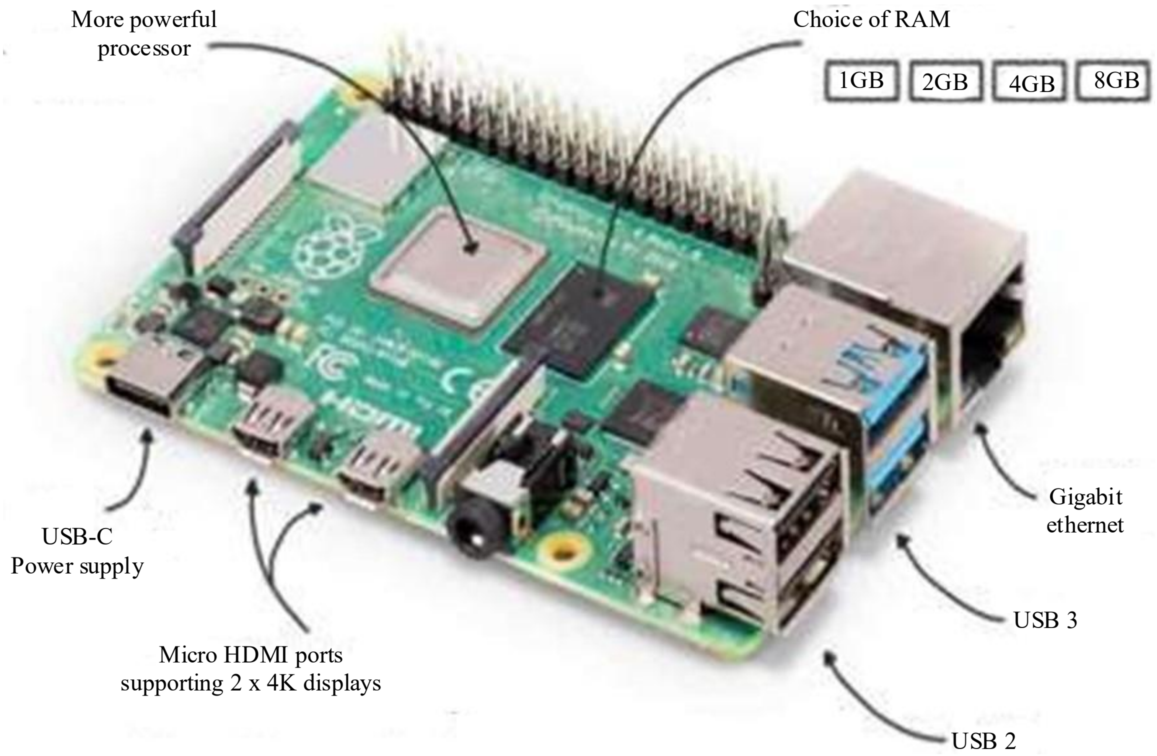

Figure 1. Raspberry Pi 4 model B.

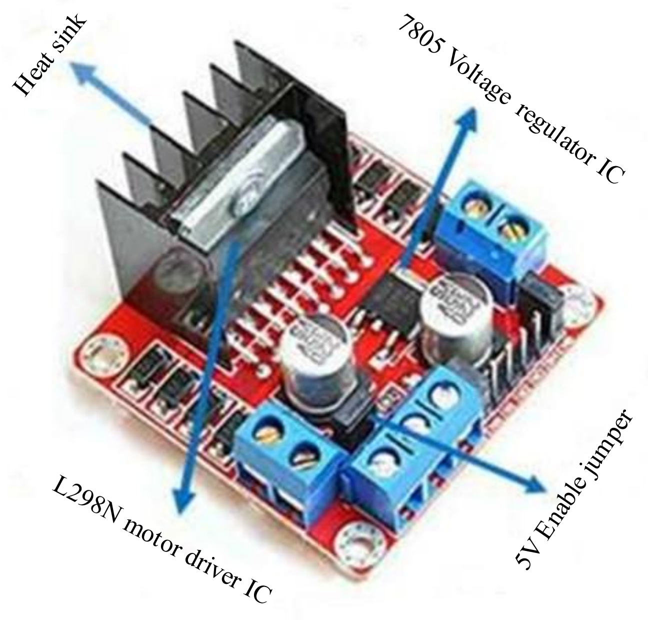

Figure 2. L298N motor driver module.

ii. L298N Motor Driver Module:-
- *Input voltag*e: 5V to 35V
- *Output current:* 2A per channel (dual channel)
- *Control logic:* TTL compatible with Raspberry Pi GPIO
- *Features*: Built in heat sink, on board voltage regulator, bidirectional motor control
- *Role*: Receives control signals from the Raspberry Pi and drives the DC motor using PWM for speed regulation (Figure 2).

Figure 3. DC motor.

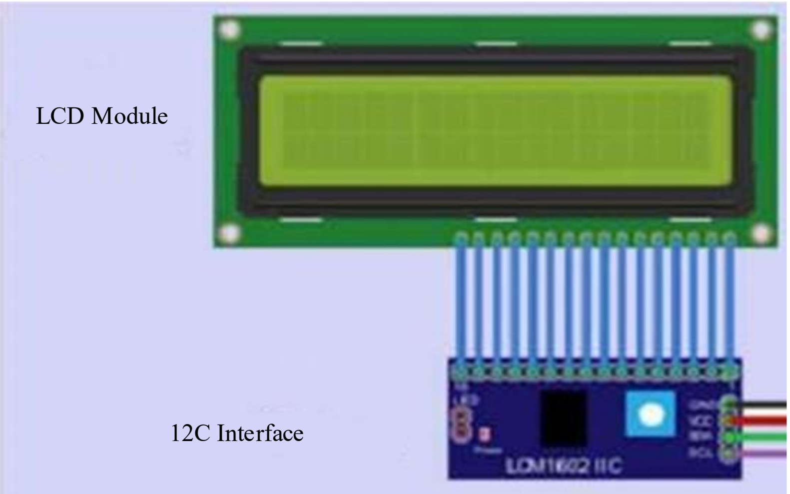

Figure 4. LCD 16X2 I2C.

iii. DC Motor:-
- *Type*: Brushed DC motor
- *Voltage rating*: 6V to 12V
- *Speed range*: Up to 5000 RPM depending on voltage and load
- *Role*: Real time speed control functionality. Speed is dynamically adjusted based on inputs from potentiometer or Android app (Figure 3).

iv. 16x2 LCD Display:-
- *Display type*: Alphanumeric, 2 lines, 16 characters
- *Voltage*: 5V operation
- *Interface*: I2C for reduced
- *Role*: Displays real time motor speed, LCD brightness, temperature, and humidity values for user feedback (Figure 4).

v. MCP3008 Analog to Digital Converter:-
- *Channels*: 8 single ended inputs
- *Resolution*: 10-bit
- *Communication*: SPI (Serial Peripheral Interface)
- *Operating voltage*: 2.7V to 5.5V
- *Role*: Converts analog signals from the potentiometers into digital data readable by the Raspberry Pi (Figure 5).

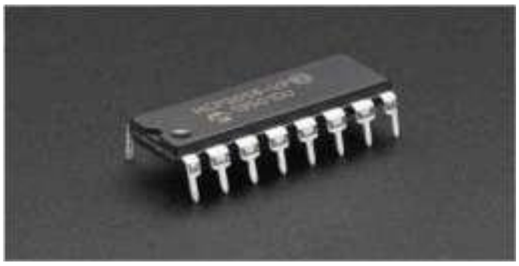

Figure 5. MCP3008.

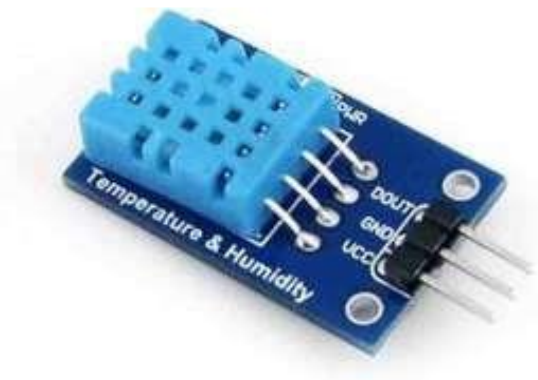

Figure 6. DHT11 sensor.

vi. DHT11 Sensor:-
- *Sensor type*: Digital Temperature and Humidity Sensor
- *Temperature range:* 0°C to 50°C
- *Humidity range*: 20% to 90%
- *Accuracy*: ±1°C and ±1%
- *Role*: Captures environmental temperature and humidity data in real time for display and remote monitoring via app (Figure 6).

b. Software Used

vii. Python (For Raspberry Pi):-
- *Role*: Primary programming language for controlling GPIO, reading sensor data, handling ADC input, and communicating with the cloud.
- *Libraries used*: gpiozero, Adafruit_DHT, spidev, Firebase_admin

viii. Android Application:-
- *IDE*: Android Studio
- *Language*: Kotlin
- *UI elements*: Sliders for motor speed and brightness control
- *Role*: Allows remote control and monitoring of parameters with a user-friendly interface.

ix. Firebase Real time Database (Cloud Platform)
- *Role*: Used for real-time synchronization between hardware and software. Stores user input commands.
- *Features*: Real-time data sync, secure database rules, integration with Android and Python.

x. GoDaddy Cloud Server
- *Usage*: In this project, the GoDaddy cloud server is used to host APIs for ease of data access, remote control, or visualization. It is an optional middleman between the embedded system and the user that offers an added level of connectivity above the Firebase cloud (Figure 7).
- *Features*: Enables deployment of RESTful services that are capable of interacting with the Raspberry Pi and Android application [11-20].

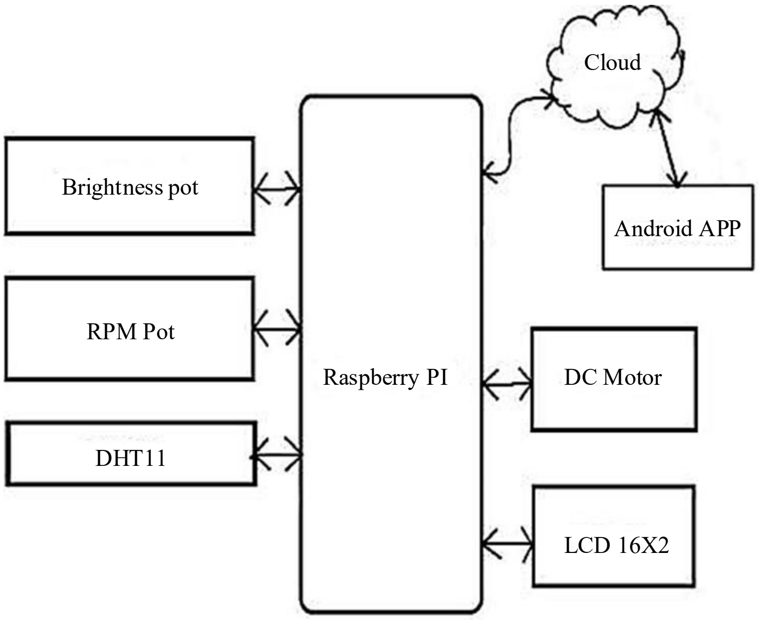

Figure 7. Block diagram.

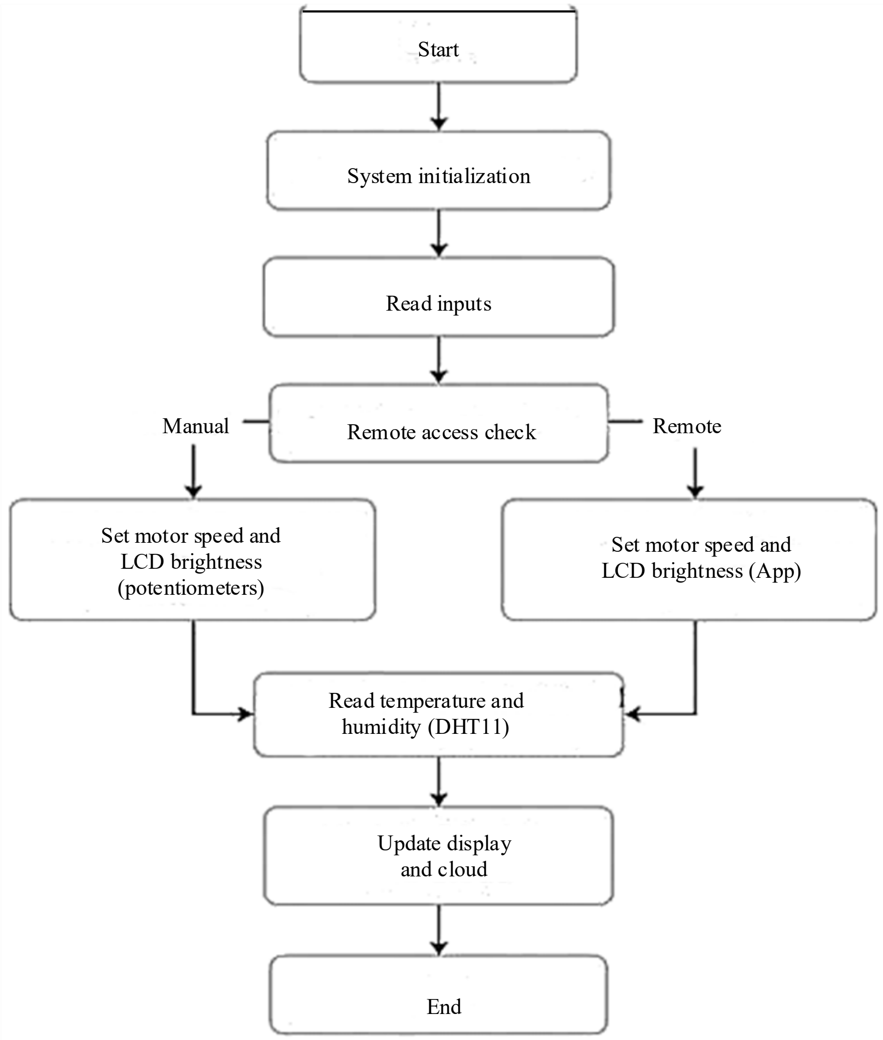

Figure 8. Flowchart.

Working

i. *System initialization*: The Raspberry Pi boots and connects to the cloud and sensors.
ii. *Read inputs*: Analog data from potentiometers and sensor values from DHT11 are read.
iii. *Remote access*: The system determines whether the control input is from the mobile app or manual potentiometers.
iv. *Parameter control*: Potentiometer values are used for controlling motor speed and LCD brightness. Cloud values from the mobile app are fetched and used.
v. *Sensor monitoring*: Temperature and humidity are continuously recorded using the DHT11 sensor (Figure 8).
vi. *Display*: Values are shown on the LCD and updated on the cloud/app in real time [21-25].

Applications

i. Textile and printing units for controlling motor- driven rollers and monitoring air quality.
ii. Food processing plants where precise motor operation and environmental control are crucial.
iii. HVAC systems to adjust fan speeds and monitor temperature and humidity.
iv. Remote agricultural systems for irrigation pump control and real-time weather data collection [26-35].

RESULT

The functionality of the IoT-based smart system was successfully confirmed with practical verification and visual proof. The system was tested for multiple input scenarios with manual potentiometers and through a remote Android app. Live feedback was presented on a 16x2 LCD display, while the parameter adjustments were also updated on the mobile front end. Accurate temperature and humidity values were sensed using the DHT11 sensor, confirming the environmental sensing functionality of the system. Values of motor speed and LCD brightness were seen to adjust proportionally in response to input changes, attesting to the accuracy of PWM control logic [36-50].

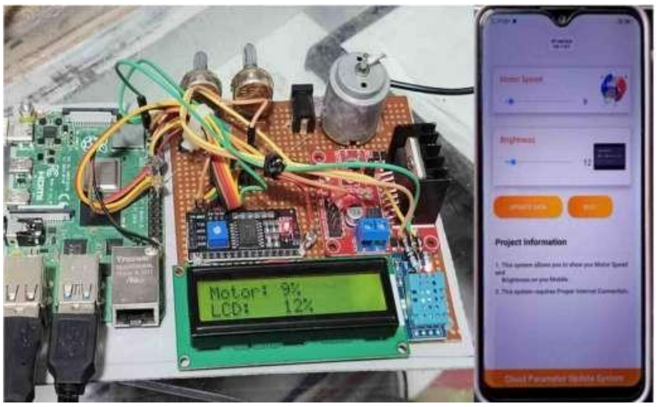

Figure 9. Motor speed and LCD brightness displayed on LCD and android app.

Figure 10. Real-time temperature and humidity monitoring on LCD.

The image 9 & 10 shows the hardware setup displaying environmental data on the 16x2 LCD. The DHT11 sensor is continuously sensing ambient temperature and humidity. The values shown Temperature: 29.0°C and Humidity: 72.0% are accurate real-time readings captured during system operation. These values are processed by the Raspberry Pi and updated on the LCD display. This confirms the successful integration and live performance of the environmental monitoring feature within the system [51-60].

Observation Table

- The motor speed increases linearly with potentiometer input or slider value, indicating accurate PWM control.
- The LCD brightness shows slight deviation due to backlight characteristics and code rounding.
- Temperature increases slightly with time due to system operation and ambient conditions (Table 1).
- Humidity remains relatively stable but increases marginally due to continuous power consumption and nearby heat sources [61-70].

Calculation Formula

i. Motor Speed (RPM) = (Input Percentage/100)* Max RPM
   Input Percentage = The motor speed value from the potentiometer or app
   Max RPM = Commonly around 3000 RPM for standard motors
ii. LCD Brightness (PWM) = (Input Percentage/100)*255
   LCD brightness is typically controlled via PWM duty cycle between 0 (off) and 255 (full brightness, 8-bit resolution).

Table 1. Observation table showing motor speed, LCD brightness, temperature and humidity.

Observation	Potentiometer (%)	Motor speed (%)	LCD brightness (%)	Motor speed (PWM)	LCD brightness (PWM)	Temperature (°C)	Humidity (%)
1	10	10	12	300	31	28.4	70
2	30	30	28	900	79	28.9	71
3	50	50	48	1500	123	29.3	71.5
4	70	70	68	2100	174	29.8	72
5	90	90	88	2700	225	30.2	72.5
6	100	100	100	3000	255	30.6	73

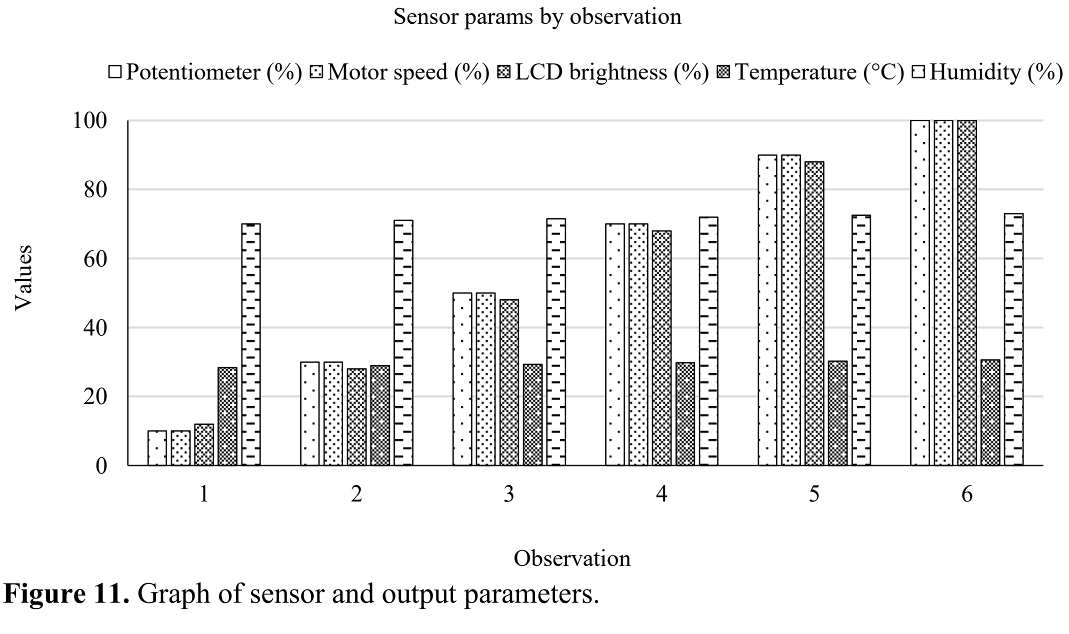

Figure 11. Graph of sensor and output parameters.

The bar graph depicts the system response to different potentiometer inputs over six readings. Motor speed and LCD brightness rise proportionally, justifying the efficacy of PWM-based control. Their linear increase demonstrates proper mapping between input percentage and output response. Temperature readings exhibit a steady rise due to the continuous operation of hardware elements, and humidity depicts small environmental fluctuations (Figure 11). Such behavior justifies the DHT11 sensor's real-time sensing ability [71-79].

CONCLUSION

The system developed presents an effective combination of hardware-level monitoring and cloud-based control within an IOT platform. It facilitates manual and remote control of parameters like motor speed and LCD brightness and monitors environmental factors like temperature and humidity in parallel. Reliability, real-time synchronization, and quick response make it viable for both domestic and industrial usage. The addition of the DHT11 sensor increases the functionality of the system by incorporating environmental consciousness. Due to its scalable and modular nature, the system can be expanded to have additional sensors and control modules so that it becomes versatile for use in a large variety of smart automation applications.

REFERENCES

1. P. A. Bhattacharya, "Cloud-Based IoT Platform for Real-Time Monitoring and Control of Parameters," IEEE Internet of Things Journal, vol. 7, no. 4, pp. 3050-3059, 2024.
2. G. J. Choi, "Design and Implementation of IoT- based Smart Home System with Mobile and Cloud Integration," IEEE Access, vol. 8, pp. 12253- 12262, 2024.
3. A. Kumar, "Smart Parameter Monitoring and Control System Using IoT and Cloud Computing," International Journal of Computer Applications, vol. 179, no. 18, pp. 10-16, 2024.
4. H. Y. Lee, "IoT-Enabled Smart Systems for Environmental Monitoring and Control with Android and Cloud Integration," Journal of Ambient Intelligence and Humanized Computing, vol. 12, no. 1, pp. 189-202, 2023.
5. M. T. Akter, "IoT-Based Smart Agriculture Monitoring System Using Android and Cloud," International Journal of Advanced Computer Science and Applications (IJACSA), vol. 11, no. 8, pp. 442-448, 2023.
6. Godase, M. V., Mulani, A., Ghodak, M. R., Birajadar, M. G., Takale, M. S., & Kolte, M. A MapReduce and Kalman Filter based Secure IIoT Environment in Hadoop. Sanshodhak, Volume 19, June 2024.
7. Gadade, B., Mulani, A. O., & Harale, A. D. IoT Based Smart School Bus and Student Tracking System. Sanshodhak, Volume 19, June 2024.
8. Dhanawadel, A., Mulani, A. O., & Pise, A. C. IOT based Smart farming using Agri BOT. Sanshodhak, Volume 20, June 2024.
9. Mulani, A., & Mane, P. B. (2016). DWT based robust invisible watermarking. Scholars' Press.
10. R. G. Ghodke, G. B. Birajdar, A.O. Mulani, G.N. Shinde, R.B. Pawar, Design and Development of an Efficient and Cost-Effective surveillance Quadcopter using Arduino, Sanshodhak, Volume 20, June 2024.
11. R. G. Ghodke, G. B. Birajdar, A.O. Mulani, G.N. Shinde, R.B. Pawar, Design and Development of Wireless Controlled ROBOT using Bluetooth Technology, Sanshodhak, Volume 20, June 2024.
12. Swami, S. S., & Mulani, A. O. (2017, August). An efficient FPGA implementation of discrete wavelet transform for image compression. In 2017 International Conference on Energy, Communication, Data Analytics and Soft Computing (ICECDS) (pp. 3385-3389). IEEE.
13. Mane, P. B., & Mulani, A. O. (2018). High speed area efficient FPGA implementation of AES algorithm. International Journal of Reconfigurable and Embedded Systems, 7(3), 157-165.
14. Mulani, A. O., & Mane, P. B. (2016). Area efficient high speed FPGA based invisible watermarking for image authentication. Indian journal of Science and Technology, 9(39), 1-6.
15. Kashid, M. M., Karande, K. J., & Mulani, A. O. (2022, November). IoT-based environmental parameter monitoring using machine learning approach. In Proceedings of the International Conference on Cognitive and Intelligent Computing: ICCIC 2021, Volume 1 (pp. 43-51). Singapore: Springer Nature Singapore.

16. Nagane, U. P., & Mulani, A. O. (2021). Moving object detection and tracking using Matlab. Journal of Science and Technology, 6(1), 2456-5660.
17. Kulkarni, P. R., Mulani, A. O., & Mane, P. B. (2016). Robust invisible watermarking for image authentication. In Emerging Trends in Electrical, Communications and Information Technologies: Proceedings of ICECIT-2015 (pp. 193-200). Singapore: Springer Singapore.
18. Ghodake, M. R. G., & Mulani, M. A. (2016). Sensor based automatic drip irrigation system. Journal for Research, 2(02).
19. Mandwale, A. J., & Mulani, A. O. (2015, January). Different Approaches For Implementation of Viterbi decoder on reconfigurable platform. In 2015 International Conference on Pervasive Computing (ICPC) (pp. 1-4). IEEE.
20. Jadhav, M. M., Chavan, G. H., & Mulani, A. O. (2021). Machine learning based autonomous fire combat turret. Turkish Journal of Computer and Mathematics Education, 12(2), 2372-2381.
21. Shinde, G., & Mulani, A. (2019). A robust digital image watermarking using DWT-PCA. International Journal of Innovations in Engineering Research and Technology, 6(4), 1-7.
22. Mane, D. P., & Mulani, A. O. (2019). High throughput and area efficient FPGA implementation of AES algorithm. International Journal of Engineering and Advanced Technology, 8(4).
23. Mulani, A. O., & Mane, D. P. (2017). An Efficient implementation of DWT for image compression on reconfigurable platform. International Journal of Control Theory and Applications, 10(15), 1-7.
24. Deshpande, H. S., Karande, K. J., & Mulani, A. O. (2015, April). Area optimized implementation of AES algorithm on FPGA. In 2015 International Conference on Communications and Signal Processing (ICCSP) (pp. 0010-0014). IEEE.
25. Kulkarni, P., & Mulani, A. O. (2015). Robust invisible digital image watermarking using discrete wavelet transform. International Journal of Engineering Research & Technology (IJERT), 4(01), 139-141.
26. Mulani, A. O., Jadhav, M. M., & Seth, M. (2022). Painless Non-invasive blood glucose concentration level estimation using PCA and machine learning. The CRC Book entitled Artificial Intelligence, Internet of Things (IoT) and Smart Materials for Energy Applications.
27. Mulani, A. O., & Shinde, G. N. (2021). An approach for robust digital image watermarking using DWT-PCA. Journal of Science and Technology, 6(1).
28. Mulani, A. O., & Mane, P. B. (2014, October). Area optimization of cryptographic algorithm on less dense reconfigurable platform. In 2014 International Conference on Smart Structures and Systems (ICSSS) (pp. 86-89). IEEE.
29. Jadhav, H. M., Mulani, A., & Jadhav, M. M. (2022). Design and development of chatbot based on reinforcement learning. Machine Learning Algorithms for Signal and Image Processing, 219-229.
30. Mulani, A. O., & Mane, P. (2018). Secure and area efficient implementation of digital image watermarking on reconfigurable platform. International Journal of Innovative Technology and Exploring Engineering, 8(2), 56-61.
31. Kalyankar, P. A., Mulani, A. O., Thigale, S. P., Chavhan, P. G., & Jadhav, M. M. (2022). Scalable face image retrieval using AESC technique. Journal Of Algebraic Statistics, 13(3), 173-176.
32. Takale, S., & Mulani, A. (2022). DWT-PCA based video watermarking. Journal of Electronics, Computer Networking and Applied Mathematics (JECNAM) ISSN, 2799-1156.
33. Kamble, A., & Mulani, A. O. (2022). Google assistant based device control. Int. J. of Aquatic Science, 13(1), 550-555.
34. Kondekar, R. P., & Mulani, A. O. (2017). Raspberry Pi based voice operated Robot. International Journal of Recent Engineering Research and Development, 2(12), 69-76.
35. Ghodake, R. G., & Mulani, A. O. (2018). Microcontroller based automatic drip irrigation system. In Techno-Societal 2016: Proceedings of the International Conference on Advanced Technologies for Societal Applications (pp. 109-115). Springer International Publishing.
36. Mulani, A. O., Birajadar, G., Ivković, N., Salah, B., & Darlis, A. R. (2023). Deep learning based detection of dermatological diseases using convolutional neural networks and decision trees. Traitement du Signal, 40(6), 2819.
37. Boxey, A., Jadhav, A., Gade, P., Ghanti, P., & Mulani, A. O. (2022). Face Recognition using Raspberry Pi. Journal of Image Processing and Intelligent Remote Sensing (JIPIRS) ISSN, 2815-0953.

38. Patale, J. P., Jagadale, A. B., Mulani, A. O., & Pise, A. (2023). A Systematic survey on Estimation of Electrical Vehicle. Journal of Electronics, Computer Networking and Applied Mathematics (JECNAM) ISSN, 2799-1156.
39. Gadade, B., & Mulani, A. (2022). Automatic System for Car Health Monitoring. International Journal of Innovations in Engineering Research and Technology, 57-62.
40. Shinde, M. R. S., & Mulani, A. O. (2015). Analysisof Biomedical Image Using Wavelet Transform. International Journal of Innovations in Engineering Research and Technology, 2(7), 1-7.
41. Mandwale, A., & Mulani, A. O. (2014, December). Implementation of convolutional encoder & different approaches for viterbi decoder. In IEEE International Conference on Communications, Signal Processing Computing and Information technologies.
42. Mulani, A. O., Jadhav, M. M., & Seth, M. (2022). Painless machine learning approach to estimate blood glucose level with non-invasive devices. In Artificial intelligence, internet of things (IoT) and smart materials for energy applications (pp. 83-100). CRC Press.
43. Maske, Y., Jagadale, A. B., Mulani, A. O., & Pise, A. C. (2023). Development of BIOBOT system to assist COVID patient and caretakers. European Journal of Molecular & Clinical Medicine, 10(01), 2023.
44. Utpat, V. B., Karande, D. K., & Mulani, D. A. Grading of Pomegranate Using Quality Analysis‖. International Journal for Research in Applied Science & Engineering Technology (IJRASET), 10.
45. Takale, S., & Mulani, D. A. (2022). Video Watermarking System. International Journal for Research in Applied Science & Engineering Technology (IJRASET), 10.
46. Mandwale, A., & Mulani, A. O. (2015, January). Different approaches for implementation of Viterbi decoder. In IEEE international conference on pervasive computing (ICPC).
47. Maske, Y., Jagadale, M. A., Mulani, A. O., & Pise, A. (2021). Implementation of BIOBOT System for COVID Patient and Caretakers Assistant Using IOT. International Journal of Information Technology and, 30-43.
48. Mulani, A. O., & Mane, D. P. (2016). Fast and Efficient VLSI Implementation of DWT for Image Compression. International Journal for Research in Applied Science & Engineering Technology, 5, 1397-1402.
49. Kambale, A. (2023). Home automation using google assistant. UGC care approved journal, 32(1), 1071-1077.
50. Pathan, A. N., Shejal, S. A., Salgar, S. A., Harale, A. D., & Mulani, A. O. (2022). Hand gesture controlled robotic system. Int. J. of Aquatic Science, 13(1), 487-493.
51. Korake, D. M., & Mulani, A. O. (2016). Design of Computer/Laptop Independent Data transfer system from one USB flash drive to another using ARM11 processor. International Journal of Science, Engineering and Technology Research.
52. Mandwale, A., & Mulani, A. O. (2016). Implementation of High Speed Viterbi Decoder using FPGA. International Journal of Engineering Research & Technology, IJERT.
53. Kolekar, S. D., Walekar, V. B., Patil, P. S., Mulani, A. O., & Harale, A. D. (2022). Password Based Door Lock System. Int. J. of Aquatic Science, 13(1), 494-501.
54. Shinde, R., & Mulani, A. O. (2015). Analysis of Biomedical Image‖. International Journal on Recent & Innovative trend in technology (IJRITT).
55. Sawant, R. A., & Mulani, A. O. (2022). Automatic PCB Track Design Machine. International Journal of Innovative Science and Research Technology, 7(9).
56. ABHANGRAO, M. R., JADHAV, M. S., GHODKE, M. P., & MULANI, A. (2017). Design And Implementation Of 8-bit Vedic Multiplier. International Journal of Research Publications in Engineering and Technology (ISSN No: 2454-7875).
57. Gadade, B., Mulani, A. O., & Harale, A. D. (2024). Iot based smart school bus and student monitoring system. Naturalista Campano, 28(1), 730-737.
58. Mulani, D. A. O. (2024). A Comprehensive Survey on Semi-Automatic Solar-Powered Pesticide Sprayers for Farming. Journal of Energy Engineering and Thermodynamics (JEET) ISSN, 2815-0945.
59. Salunkhe, D. S. S., & Mulani, D. A. O. (2024). Solar Mount Design Using High-Density Polyethylene. NATURALISTA CAMPANO, 28(1).

60. Seth, M. (2022). Painless Machine learning approach to estimate blood glucose level of Non-Invasive device. Artificial Intelligence, Internet of Things (IoT) and Smart Materials for Energy Applications.
61. Kolhe, V. A., Pawar, S. Y., Gohery, S., Mulani, A. O., Sundari, M. S., Kiradoo, G., .. & Sunil, J. (2024). Computational and experimental analyses of pressure drop in curved tube structural sections of Coriolis mass flow metre for laminar flow region. Ships and Offshore Structures, 19(11), 1974-1983.
62. Basawaraj Birajadar, G., Osman Mulani, A., Ibrahim Khalaf, O., Farhah, N., G Gawande, P., Kinage, K., & Abdullah Hamad, A. (2024). Epilepsy identification using hybrid CoPrO-DCNN classifier. International Journal of Computing and Digital Systems, 16(1), 783-796.
63. Kedar, M. S., & Mulani, A. (2021). IoT Based Soil, Water and Air Quality Monitoring System for Pomegranate Farming. Journal of Electronics, Computer Networking and Applied Mathematics (JECNAM) ISSN, 2799-1156.
64. Godse, A. P. A.O. Mulani (2009). Embedded Systems (First Edition).
65. Pol, R. S., Bhalerao, M. V., & Mulani, A. O. A real time IoT based System Prediction and Monitoring of Landslides. International Journal of Food and Nutritional Sciences, Volume 11, Issue 7, 2022.
66. Mulani, A. O., Sardey, M. P., Kinage, K., Salunkhe, S. S., Fegade, T., & Fegade, P. G. (2025). ML-powered Internet of Medical Things (MLIOMT) structure for heart disease prediction. Journal of Pharmacology and Pharmacotherapeutics, 16(1), 38-45.
67. Aiwale, S., Kolte, M. T., Harpale, V., Bendre, V., Khurge, D., Bhandari, S., ... & Mulani, A. O. (2024). Non-invasive Anemia Detection and Prediagnosis. Journal of Pharmacology and Pharmacotherapeutics, 15(4), 408-416.
68. Mulani, A. O., Bang, A. V., Birajadar, G. B., Deshmukh, A. B., Jadhav, H. M., & Liyakat, K. K. S. (2024). IoT Based Air, Water, and Soil Monitoring System for Pomegranate Farming. Annals of Agri-Bio Research, 29(2), 71-86.
69. Kulkarni, T. M., & Mulani, A. O. (2024). Face Mask Detection on Real Time Images and Videos using Deep Learning. International Journal of Electrical Machine Analysis and Design (IJEMAD), 2(1).
70. Thigale, S. P., Jadhav, H. M., Mulani, A. O., Birajadar, G. B., Nagrale, M., & Sardey, M. P. (2024). Internet of things and robotics in transforming healthcare services. Afr J Biol Sci (S Afr), 6(6), 1567-1575.
71. Pol, D. R. S. (2021). Cloud Based Memory Efficient Biometric Attendance System Using Face Recognition. Stochastic Modeling & Applications, 25(2).
72. Nagtilak, M. A. G., Ulegaddi, M. S. N., Adat, M. A. S., & Mulani, A. O. (2021). Breast Cancer Prediction using Machine Learning.
73. Rahul, G. G., & Mulani, A. O. (2016). Microcontroller Based Drip Irrigation System.
74. Kulkarni, T. M., & Mulani, A. O. Deep Learning Based Face-Mask Detection: An Approach to Reduce Pandemic Spreads in Human Healthcare. African Journal of Biological Sciences, 6(6), 2024.
75. Mulani, A., & Mane, P. B. (2016). DWT based robust invisible watermarking. Scholars' Press.
76. Dr. Vaishali Satish Jadhav, Dr. Shweta Sadanand Salunkhe, Dr. Geeta Salunkhe, Pranali Rajesh Yawle, Dr. Rahul S. Pol, Dr. Altaf Osman Mulani, Dr. Manish Rana, Iot Based Health Monitoring System for Human, Afr. J. Biomed. Res. Vol. 27 (September 2024).
77. Dr. Vaishali Satish Jadhav, Geeta D. Salunke, Kalyani Ramesh Chaudhari, Dr. Altaf Osman Mulani, Dr. Sampada Padmakar Thigale, Dr. Rahul S. Pol, Dr. Manish Rana, Deep Learning-Based Face Mask Recognition in Real-Time Photos and Videos, Afr. J. Biomed. Res. Vol. 27 (September 2024).
78. Altaf Osman Mulani, Electric Vehicle Parameters Estimation Using Web Portal, Recent Trends in Electronics & Communication Systems, Volume 10, Issue 3, 2023.
79. Aryan Ganesh Nagtilak, Sneha Nitin Ulegaddi, Mahesh Mane, Altaf O. Mulani, Automatic Solar Powered Pesticide Sprayer for Farming, International Journal of Microwave Engineering and Technology, Volume 9 No. 2, 2023.

