Journal of
Computer Science and Software Development

JScholar
Fostering Scholarly Communication

Review Article Open Access

IoT Weather Station

Bavesh Reddy R[1], Prabhu Kumar K[1], Naga Sai Anil K[1], Bavesh Reddy[1], Ganeshaperumal D[2] and Vamsi G[1]

[1]Computer science and engineering kalasalingam academy of research and education krishnan koil, India
[2]Electronics and communication engineering. kalasalingam academy of research and education krishnan koil, India

Received Date: May 06, 2023 **Accepted Date:** **June 06**, 2023 **Published Date:** June 09, 2023

***Corresponding author:** Naga Sai Anil K, Computer science and engineering kalasalingam academy of research and education krishnan koil, India, Tel: 9502301646, Email: 9918004043@klu.ac.in

Citation: Bavesh Reddy R, Prabhu Kumar K, Naga Sai Anil K, Bavesh Reddy, Ganeshaperumal D, et al. (2023) Iot Weather Station. J Comput Sci Software Dev 2: 1-8

Abstract

Today, intelligent technologies such as IoT and Machine Learning are being introduced in a big way. For IoT implementation, there are many IoT hardware platforms available. An example is the ESP8266 chip. This work develops an actual Weather forecasting system that can be utilized for a range of purposes, such as homes, companies, farms, venues, and so on. A temperature sensor (DHT11), a BMP180 sensor, and a rain sensor module are used in the system. Using Node MCU the detected data from the sensors is updated in the thing speak server. A model named logistic regression is used in ML (machine learning). For monitoring actual values, data is also shown on a custom webpage. This model is built using real time application that has been pre-recorded. The data is extracted from openweathermap.org.

Keywords: Weather Station, Humidity

Introduction

A DHT11 humidity and temperature sensor, as well as a BMP180 sensor and a rain sensor module, are used in the system. Using Node MCU as well as the ESP8266-01 module, the detected data from the sensors is posted to ting speak server. As of late, new approaches to forecasting atmospheric conditions have emerged with the aim of improving accuracy. Data mining and machine learning applications are providing significant contributions of their own. There are many machine learning implementations, the most prominent of which are categorization and predictions. Predicting sequences from various types of unsupervised or supervised learning problems or instances is not the same as predicting sequences from other types of learning issues or situations. Despite the fact that there are different sorts of challenges depending on input and output sequences, most prediction problems involving sequence data are classed as sequence prediction problems. We'll need to build a time series analytical framework 2 to do sequence prediction. It is employed in the implementation of real-time prediction. Time series prediction, as the name implies, is based on a given number of data points accumulated at specific intervals. These are examined in order to identify the long-term trend in order to make a forecast or perform another calculation. System monitors the weather and updates the information on the web page. The data is sent to the web page in order to keep the meteorological conditions of the area up to date. Anywhere around the world, a specific location can be identified. Temperature and Humidity sensors are included in the system

Existing and Proposed System

Existing Systems

Weather stations are often used to detect weather and climatic changes using various sensors such as thermometers, barometers, wind vanes, rain gauges, and other devices. In existing weather monitoring systems. The majority of these devices use simple analogue technologies, which would then be directly recorded and stored in a database. The weather forecast is then broadcast on news programs and radio broadcasting using this information.

Existing weather monitoring systems typically consist of large machinery in several mechanical parts that require ongoing maintenance and must be physically inspected and updated on a regular basis. Power needs are one of the major constraints these devices are often positioned far from the primary power supply. The information received from the devices should be transferred to the computer or PC via a link from the logger.

Proposed System

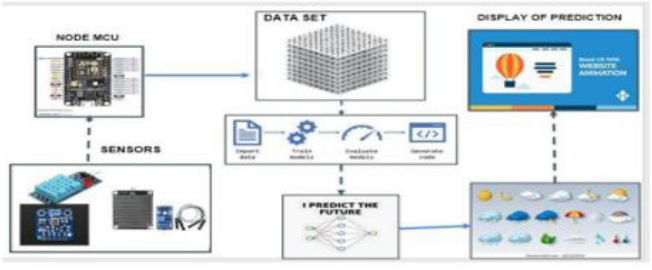
The suggested system is a Weather monitoring technology that makes real-time information easily accessible all over a broad variety of devices by leveraging IoT. Temperature, humidity, pressure, and rain are among the weather and climate variations monitored by the system. Unlike traditional weather monitoring instruments, our recommended IoT weather is small and compact, making it easy to install on terraces. We can easily take it to a faraway location for installation because it is highly portable. Our systems (sensors and boards). Our system requires less power than the other systems which are already available in the market and also affordable which gives us more value to the design in terms of cost and quality.

System Design

DHT11, BMP180, Rain sensor module, these sensors are connected to the Node MCU. Program these sensors and connect to the thingspeak server. Hence, we can monitor the weather condition in thingspeak server from time to time.

Node MCU helps to collect information sent by the sensors. Then, pass it to the database. This information updates date to date. Collected information helps to predict the future weather conditions using pandas using linear regression algorithm. Later sends this information to the webpage to monitor.

Figure 1: system design



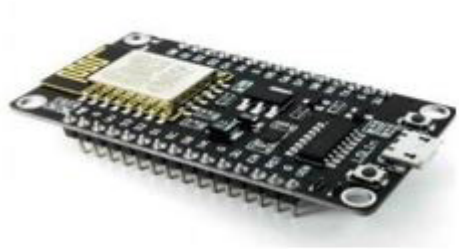
Sensor Organization

Node MCU

As shown in Fig. 2, Node MCU is an upgraded form of Arduino with an embedded Wi-Fi chip. It is affordable than other modules that can work continuously.

Node MCU comes under the low cost microcontroller board with a Wi-Fi module. ESP 8266 powers the module. The Lua scripting language is used on the board. We can modify and develop the code in Arduino IDE.

Figure 2: NODE MCU

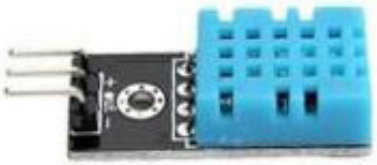


DHT11

As illustrated in Fig. 3, it is a module for sensing humidity and temperature It senses the humidity and climate of the region air using a piezoelectric humidity sensor and a thermistor.

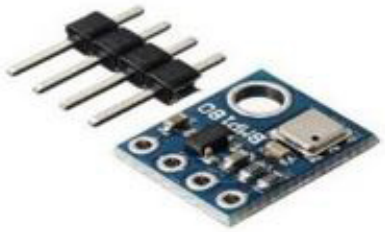
The DHT11 is a simple humidity and temperature sensor. It just uses a capacitive humidity sensor and thermistor to examine the ambient air, and it outputs a digital signal pin that can also read relative humidity between 20 and 80 percent with 5 percent accuracy.

Figure 3: DHT 11 C.BMP180



A BMP180 is a pressure sensor that measures the pressure in the environment. The atmospheric and biometric are estimated using the BMP180 sensor. The operating mechanism of an air pressure sensor is relatively basic; it is based on the weight of air. Because the air we breathe has a specific weight and a specific pressure

Figure 4: BMP 180



D. Rain Sensor Module

The rain sensor module is an excellent tool for detecting rain. A raindrop sensor can be used as a switch or to track rainfall intensity when it falls through the wet board. Then it will turn on when it is attached to the induction board does not have a raindrop, and DO output is high. The information gathered will be sent to the Thingspeak server.

Figure 5: Rain Sensor Module

Software Used

The Arduino IDE is virtualization technology for writing, compiling, and transferring code to Arduino. Thingspeak is a virtualized Internet of Things platform that allows users to collect and store sensor data. An unencrypted document with file extensions.html is an HTML web page. It usually includes multimedia elements as well.

Weather Prediction

In openweathermap.org it is mandatory to create an account and produce a key for the account. This key helps in real

time extraction of data. We collect temperature, humidity, rain, and pressure using (openweathermap.org) for real time analysis. Train a model using machine learning techniques and grab information from the application using a key that is generated in the openweathermap.org. Predict the feature weather forecasting. We use the Python programming language for extraction of data from time to time and the predicted output that will be sent back to the website into structured data. In the Web page we are going to take prediction data and make a different framework that will be correlated to precisely the efficiency of the weather that will be monitored.

Figure 6: THING SPEAK

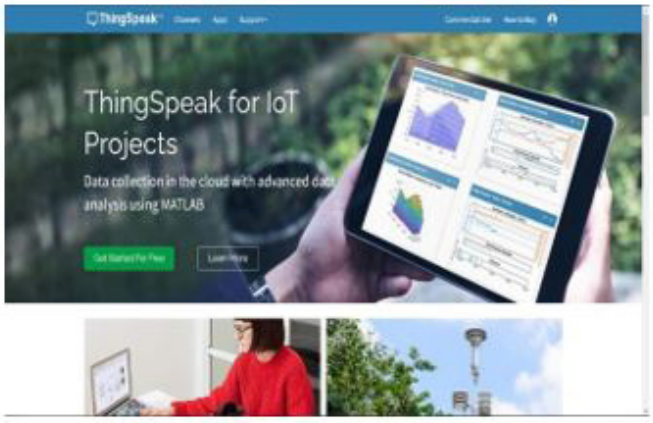
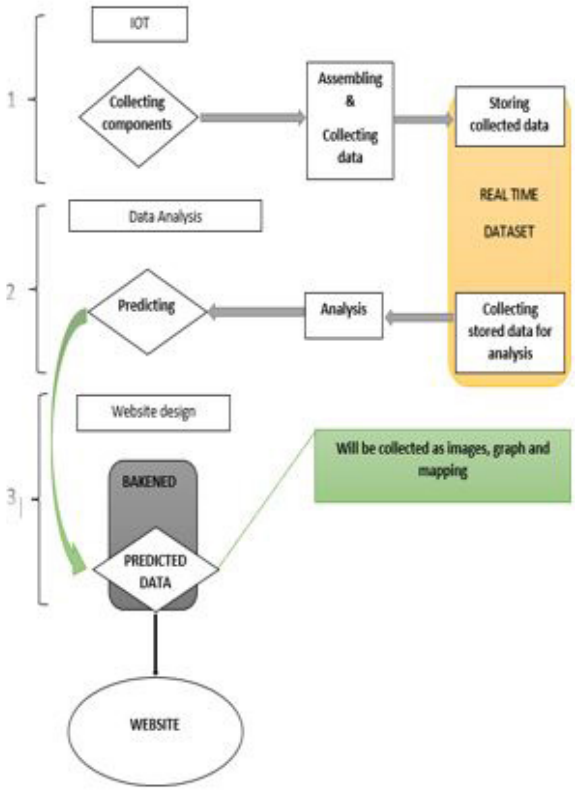


Figure 7: Flow Chart



The Thingspeak server is used as a communication server for our sensors. First, we need to create an account

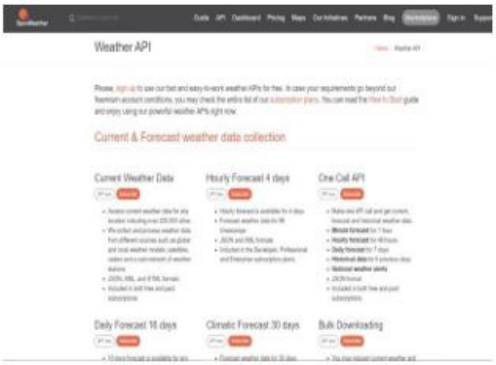
Figure 8: Flow chart

In Thingspeak server API Keys are generated for separate accounts the key is written in Arduino ide It is used to write the data in server. And channel ID is also separate for each channel.

Figure 9: Thingspeak Server Login Page

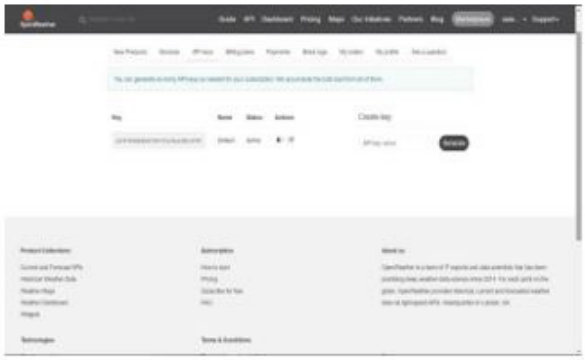
Open weather web site is used to get data for real time to train data for our forecast. We need to create an account on the website.

Figure 10: Open Weather website



separate API keys are created for users which are used to get data

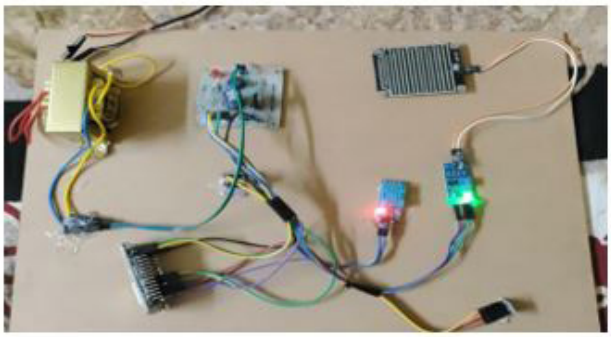
Figure 11: Open Weather API keys



Conclusion

The sensors are connected to Node MCU and programmed using Arduino ide successfully and information was sent to thingspeak server. And We collected temperature, humidity, rain, and pressure using (openweathermap.org) for real time analysis. Train a model using machine learning techniques and grab information from the application using a key that is generated in the (openweathermap.org). predict the future weather forecasting and displayed in website

Figure 12: Sensor Connections

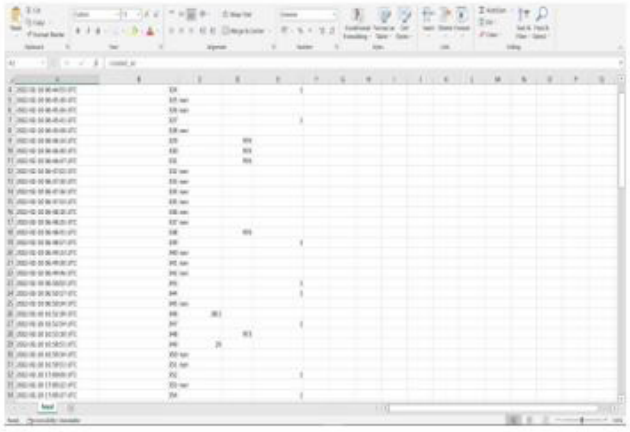


The sensors are connected to Node MCU and programmed using Arduino ide successfully. Generates the graphical information.

Figure 13: Thingspeak Sensor

Information was sent to the thingspeak server.

Figure 14: Feed



Data can be collected from Thingspeak server

Figure 15: Website

predicted the future weather and displayed in website successfully

Table 1: Comparison with existing systems

	Proposed	S.S.Bhatkandel et al [23]	Y. Radhika et al. [24]
Accuracy	84%	82.6%	80%
Parameters used	Max and Min Temperature, Humidity	Max and Min Temperature, Humidity and wind speed	Max and Min Temperature, Rain fall
Algorithm used	Logistic regression	Decision Tree	Artificial Neural Network

Acknowledgment

First and foremost, I wish to thank the Almighty God for his grace and benediction to complete this Project work successfully. I would like to convey my special thanks from the bottom of my heart to my dear Parents and affectionate Family members for their honest support for the completion of this Project work. I express deep sense of gratitude to “Kalvivallal” Thiru. T. Kalasalingam B.com., Founder Chairman, “Ilayavallal” Dr.K.Sridharan Ph.D., Chancellor, Dr.S.Shasi Anand, Ph.D., Vice President (Academic), Mr.S.Arjun Kalasalingam M.S., Vice President (Administration) , Dr.R.Nagaraj, ViceChancellor, Dr.V.Vasudevan Ph.D., Registrar , Dr.P.Deepalakshmi M.E., Ph.D., Dean (School of Computing) . And also, a special thanks to Dr. A. Francis Saviour Devaraj. Head, Department of CSE, Kalasalingam Academy of Research and Education for granting the permission and providing necessary facilities to carry out Project work. I would like to express my special appreciation and profound thanks to my enthusiastic Project Supervisor Dr. D. Ganeshaperumal, Associate Professor/CSE of Kalasalingam Academy of Research and Education [KARE] for his inspiring guidance, constant encouragement with my work during all stages. I am extremely glad that I had a chance to do my Project under my Guide, who truly practices and appreciates deep thinking. I will be forever indebted to my Guide for all the time he has spent with me in discussions. And during the He gave me the emotional support and flexibility I needed to keep going through the most difficult periods of writing my report. Apart from my Project guide, I’d like to thank the rest of the Class committee members, as well as all academics and non-teaching staff, for their encouraging comments. Last but not least, I would want to convey my thanks. to all of my professors, well-wishers, and friends from high school and college for their unwavering support.

References

1. Asghar MH, Negi A and Mohammadzadeh N (2015) Principle application and vision in internet of things (IoT). International Conference on Computing Communication Automation 427-431.

2. Lage and Correa JC (2015) Weather station with cellular communication network", 2015 XVI Workshop on Information Processing and Control (RPIC) 1-5.

3. Gheith R, Rajamony P, Bohrer K, Agarwal M, Kistler BLW, Eagle et al. (2016) Ibm bluemix mobile cloud services", IBM Journal of Research and Development 60: 2-3,

4. Gangopadhyay S and Mondal MK (2016) A wireless framework for environmental monitoring and instant response alert. International Conference on Microelectronics Computing and Communications (Micro Com) 1-6.

5. Saini H, Thakur A, Ahuja S, Sabharwal N and Kumar N (2016) Arduino based automatic wireless weather station with remote graphical application and alerts", 2016 3rd International Conference on Signal Processing and Integrated Networks (SPIN) 605-609.

6. G.A. Munandar et al., Design of real-time weather monitoring system based on mobile application using automatic weather station, in 2nd International Conference on Automation, Cognitive Science, Optics, Micro Electro-Mechanical System, and Information Technology (ICACOMIT) (2017)

7. Snyder D, Garcia-Romero D, Sell G, Povey D, Khudanpur S (2018) X- vectors: robust dnn embeddings for speaker recognition, in: IEEE International Conference on Acoustics, Speech and Signal Processing, ICASSP, IEEE.

8. Dueben PD, Bauer P (2018) Challenges and design choices for global weather and climate models based on machine learning, Geosci. Model Dev 11.

9. Aamer Hammad, et al. (2018) A Very Low Cost Open Wireless Internet of Things (IoT) Air Quality Monitoring Platform", 2018 15th International Conference on Smart Cities: Improving Quality of Life Using ICT & IoT (HONET-ICT).

10. Jayasuriya Yasas Pansilu, et al. (2018) Low Cost and IoT Based Greenhouse with Climate Monitoring and Controlling System for Tropical Countries", 2018 International Conference on System Science and Engineering (ICSSE).

11. Ayzel G, Heistermann M, Winterrath T (2019) Optical flow models as an open benchmark for radar-based precipitation nowcasting (rainymotion v0.1), Geosci Mod Dev 12.

12. Fernandez-Ahumada L, Ramirez-Faz J, Torres-Romero M and Lopez-Luque R (2019) Proposal for the Design of Monitoring and Operating Irrigation Networks Based on IoT Cloud Computing and Free Hardware Technologies. Sensors 19: 2318.

13. Chen R, Wang X, Zhang W, Zhu X, Li A, Yang C (2019) A hybrid cnn- lstm model for typhoon formation forecasting, Geoinformatica 23: 3.

14. Novotny O, Plchot O, Glembek O, Burget L, et al. (2019) Analysis of dnn speech signal enhancement for robust speaker recognition, Comput. Speech Lang 58.

15. Bin Sadli and Muhamad Dan Darrawi (2019) An IoT-based Smart Garden with Weather Station System", IEEE 9th Symposium on Computer Applications & Industrial Electronics (ISCAIE).

16. Cloud-Based Weather Monitoring System Sai Yeshwanth Chaganti NandaKoteswara Rao Pandi (2020).

17. Gaurav Verma, Pranjul Mittal, Shaista Farheen (2020) Real Time Weather Prediction System Using IOT and Machine Learning.

18. Mrinmoy Sadhukhan, Sudakshina Dasgupta, Indrajit Bhattacharya (2021) An Intelligent Weather Prediction System Based on IOT.

19. Vaishnavi Lakhara, Priya Kurade, Tejaswini Pawar (2021) Real Time Weather Monitoring System Implementation Based on Internet of Things.

20. Shivang J, Sridhar SS (2018) Weather prediction for indian location using Machine learning," International Journal of Pure and Applied Mathematics 118: 1945-1949.

21. Khan ZU and Hayat M (2014) Hourly based climate prediction using data mining techniques by comprising entity demean algorithm" Middle-East Journal of Scientific Research 21: 1295-1300.

22. Bhatkande SS, Hubballi RG (2016) Weather Prediction Based on Decision Tree Algorithm Using Data Mining Techniques." Belgaum India: International Journal of Advanced Research in Computer and Communication Engineering, 5: 483-48.

23. Radhika Y, and Shashi M (2009) Atmospheric temperature prediction using support vector machines." International Journal of Computer Theory and Engineering 1.1, vol. 1: 1793-8201.

24. Chauhan D, Thakur J (2018) Data mining techniques for Weather Prediction:" International Journal of Computer Science Trends and Technology (IJCST) 6: 249-254.

25. Badhiye SS, Wakode BV, Chatur PN (2012) Analysis of Temperature and Humidity Data for Future Value Prediction" International Journal of Computer Science and Information Technologies 3: 3012-3014.

26. Olaiya F, Adesesan Barnabas Adeyemo (2017) Application of Data Mining Techniques in Weather Prediction and Climate Change Studies. IJCSNS International Journal of Computer Science and Network Security 17: 22-25.

27. Sawale GJ, Gupta SR (2013) Use of Artificial Neural Network in Data Mining for Weather Forecasting", International Journal of Computer Science and Applications 6: 383-387.

28. Gautam A, Verma G, Qamar S, Shekhar S (2019) Vehicle Pollution Monitoring, Control and Challan SystemUsing MQ2 Sensor Based on Internet of Things", Wireless Personal Communications (An International Journal of Springer with impact factor of 1.2).