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Implementation of an Adaptive Real-Time Weather Forecasting System Using Real-Time Operating System

K. P. GOWSHICKRAJA[1], P. PRAVEENKUMAR [2]
Assistant Professor[1], PG Student[2]
Annai Mathammal Sheela Engineering College,Namakkal

ABSTRACT: *Recently several real-time weather forecasting systems based on Internet of Things (IoT) have been developed to provide short-term real time forecasts also referred to as Nowcasts. The main challenge in these systems is to use appropriate prediction algorithms that can predict different weather parameters with the highest possible accuracy. In this work, an IoT based weather forecasting system has been implemented to provide short-term weather forecasts at intervals ranging from twenty min to one hour . Several adaptive forecasting algorithms based on variants of the Multiple Linear Regression technique as well as K-Nearest Neighbors (K-NN) have been experimented. Generally adaptive forecasting algorithms analysis more real time parameters and The parameters analysed are: temperature, humidity, atmospheric pressure, rainfall, luminosity, wind-speed, and wind direction.For real time analysis Real time Operating System (RTOS) is implemented to enhance the spped of the embedded comtrollers. The best adaptive schemes are able to predict these parameters with an overall less percentage of error.*

Keywords: K-nn,IOT*.*

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I. INTRODUCTION:

A clever technique that is utilized to obtain real-time reporting of weather conditions is the real-time weather forecasting system. With the use of recent weather data, the status of the atmosphere might be forecast in the future. This study describes a Raspberry Pi-based solution of wireless temperature and humidity monitoring. The goal of this project is to create a temperature and humidity monitoring kit that can be used with a Raspberry Pi. The study's main concern is the embedded project for measuring the room's temperature and humidity[1]. This research present about Automatic temperature and humidity control system by using Fuzzy Logic algorithm for mushroom nursery. Fuzzy logic is used for analysis event in micro-controller for control device in mushroom nursery [2]. When assessing the quality of the air in urban agglomerations or precision agriculture, atmospheric temperature and humidity are important elements to consider. With the emerging Internet of Things technology, it is possible to collect data from the field using low-power gadgets fitted with sensors and communication circuits [3]. This study suggested a method for controlling the temperature and humidity of server rooms using fuzzy logic, based on the Wemos D1 microcontroller, as an infrared transmitter remote control to regulate temperature and mode setting in Air Conditioners [4]. The performance of the sensor system and the application is then tested. The test indicates that the system can connect to the host and communicate with the smartphone. Additionally, the system uses less than 0.53958 watts to function, meeting the low-cost goal, according to 24-hour battery tests [5].

II. POWER SUPPLY CIRCUIT

An electrical appliance known as a power supply provides electricity to an electrical load, such as a server or laptop computer, among other electronic devices. Converting electric current from a source to the proper voltage, current, and frequency to power the load is the primary purpose of a power supply.

- **Voltage regulator:**

A voltage regulator is a component of the power supply unit that ensures a steady constant voltage supply through all operational conditions. It regulates voltage during power fluctuations and variations in loads. It can regulate AC as well as DC voltages.

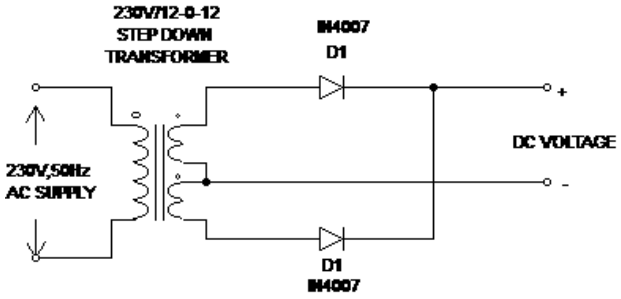
- **Transformer :**

Transformer: A device that steps up or steps down the voltage as it transmits electrical energy from one alternating-current circuit to one or more other circuits.

- **Rectifying circuit:**

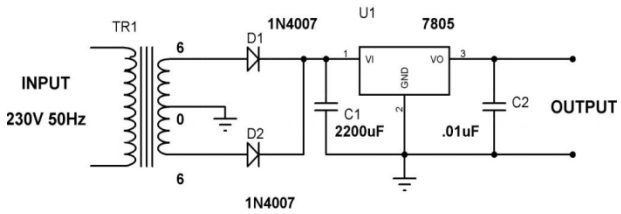
Rectification is the conversion of alternating current (AC) to direct current (DC). A half-wave rectifier is a circuit that allows only one half-cycle of the AC voltage waveform to be applied to the load, resulting in one

non-alternating polarity across it.



- **Capacitors :**

A two-terminal electrical device known as a capacitor is capable of storing energy in the form of an electric charge. It is made up of two electrical wires that are spaced apart by a certain amount. Vacuum may be used to fill the space between the conductors, or a dielectric, an insulating substance, may be used instead.



- **ENC28J60 module:**

A small standalone Ethernet controller called the ENC28J60 has an integrated MAC and PHY, 8 Kbytes of buffer RAM, and a Serial Peripheral Interface.

- **NRF24L01 Wireless Transceiver:**

The SPI protocol is used by the NRF24L01 module and Arduino to interact. Only devices having dedicated SPI communication lines can use the module because it functions as an SPI slave.

- **Dweet:**

IoT device messaging is available through Dweet. It uses a straightforward API to "Dweet" data from your smartphone to the cloud in a manner akin to Twitter. You can show the data on a dashboard once it has been collected.

- **HC-05 Bluetooth module:**

Unlike the HC-06, which is solely a Slave, the HC-05 may be configured to function as both a Master and a Slave, allowing it to communicate between two Arduino boards or any other devices. The HC-05 typically includes a breakout board for quick connections, and it speaks serially with the Arduino.

- **Cayenne Devices:**

MyDevices' Cayenne is an IoT platform that enables customers to easily prototype and publish their linked IoT solutions.

- **Blynk Devices:**

The IoT platform Blynk allows users of iOS or Android smartphones to remotely operate devices like the Arduino, Raspberry Pi, and NodeMCU. By compiling and providing the required address on the accessible widgets, this application is used to construct a graphical interface or human machine interface (HMI).

III. CONCLUSION

The wireless module for monitoring temperature and humidity data in real-time was demonstrated in this project. The module is dependable, effective, and appropriate for long-term monitoring of climate data. The data gathered were sufficient to be evaluated in order to find a new technique to balance the load caused by the

number of occupants and energy needed to power up electrical appliances like air conditioners and lights while also reducing the amount of money spent on electricity. Although there is a minor delay in the data transmission process, this does not interfere with the system's ability to deliver the whole set of data needed for a research project. In terms of battery life, the module can run for a longer period of time if the atmega328 and NodeMCU are set up to enter sleep mode between packet sending operations. Less current is drawn from the battery when the board is in sleep mode. Future work on this module or an extension of it will involve adding more sensors to measure other types of comfort-related data. Data is being remotely monitored through the Ad Fruit MQTT Platform due to the wireless and mobile nature of this module. Here, the processing speed is increased by using a real-time operating system.

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BIOGRAPH

Mr. K.P.GOWSHICKRAJA
Received the B.Engineering Degree from Kongunadu college of Enginnering and technology, Trichy in 2016. The M.E Degree from Kongunadu college of Enginnering and technology, Trichy in 2018. He has been working as an Assistant professor in Annai Mathammal Sheela Engineering College, Erumapatty, Tamilnadu, India. His research interest includes Image Processing.
Email:gowshick1994@gmail.com

Mr. P.PRAVEENKUMAR
He is doing his ME degree of EST at Annai mathammal sheela Engg college, Erumapatty in 2023 . He obtained his B.E degree from Annai mathammal sheela Engg college, Namakkal in 2021. His research interest include "Embedded system".
Email:ppraveenkumar693 @gmail.com