

Design of Weather Monitoring System Using Arduino and Analysis on Cloud

PREPARED BY

KEVALKUMAR MANDANKA
INFORMATION TECHNOLOGY
CHANDUBHAI S PATEL
INSTITUTE OF TECHNOLOGY
GUJARAT,INDIA
19it063@charusat.edu.in

AKSHAY MALAVIYA
INFORMATION TECHNOLOGY
CHANDUBHAI S PATEL
INSTITUTE OF TECHNOLOGY
GUJARAT,INDIA
19it061@charusat.edu.in

Under Guidance of :-
Prof. Ravi Patel

Chandubhai S Patel Institute Of Technology
Department Of Information And Technology
At. Changa, Dist Anand-388421,Gujarat,India

Abstract

This article mainly combines the control system and data acquisition technology based on two research fields, and creates a database system to generate the provided data according to the adopted attributes. The main attributes have been selected based on the sensors used to build the system to create an effective weather station project. The recommended sensor is used to measure and store temperature and humidity data. Since the data is periodically read and stored as a real database system, the acquired data can be displayed directly and indirectly in two ways. The analysis of store data is considered to be the main challenge of this work, which provides opportunities for mining past recorded data. In addition, the entire system monitors and controls the location locally according to the periodic changes that occur under climatic conditions in order to maintain the recommended location in the required weather conditions.

KEYWORDS—DATABASE, DATA ACQUISITION, TEMPERATURE AND HUMIDITY SENSOR, ARDUINO SYSTEMAUTOMATION.

I. INTRODUCTION

This article identifies the ability to associate control modules with database programming languages to achieve honest results. The weather station is considered to be a technical method that allows the use of specific equipment to measure weather parameters based on atmospheric conditions on land or at sea for a proposed location to achieve predicted weather conditions and study climate characteristics. The problem of weather forecasting began in the 19th century and officially started thereafter, and then under certain atmospheric conditions, the basis of measurement and recording based on real data at specific locations was changed [1]. The collected data can determine and confirm the recommended warranty for the selected location. The weather is mainly affected by two parameters, temperature and humidity. These parameters fluctuate especially in places affected by the solar radiation temperature and the vertical position of the sun radiating at a specific location based on the latitude of the tropical line. In fact, due to the high-level effects that may be degraded in the entire scheme under certain minor changes, the atmosphere is considered a chaotic and vital scheme. Therefore, this matter will cause trouble for climate predictions in the long future, and predictions may be made only in the following days. Therefore, weather station experts will constantly predict weather conditions based on theoretical research on climatic conditions. It must be mentioned that human struggles in the past followed some undesirable parameters and terminology, such as measuring pressure, humidity intensity research and its impact on temperature, climate conditions, and finally the conditions that affect the sky. There are almost no recommended parameters. A generation of microcomputers and microcontrollers based on prosperity and smart devices greatly simplified the terminology proposed, reducing it to

a dynamic factor, and wisely responded to changes in atmospheric conditions. However, user input adaptation is considered to be the most important point that affects the preparation of a database model based on predictive output. This research paper introduces two weather parameters based on data packaging and collection used to generate suggested weather stations. These two weather parameters are identified by temperature (T) and humidity (H). In the end, the idea is considered perfect, especially for devices that control a specific house based on sensor readings.

II. RELATED WORKS

Most research papers and studies in this field have not prioritized data storage and data collection based on the output of the microcontroller sensor. In this article, the result data obtained by the system can be stored and drawn at the same time as the monitoring weather station system. In other words, you can demonstrate and view information through both direct and indirect techniques. The term directly means that the weather conditions can be displayed directly on the (16×2) LCD display without creating a database on the ground area. However, indirect technology means that as long as the sensor is measuring weather conditions, the weather conditions can be recorded and stored in the PC. The main challenge of this work is to show and confirm that a microcontroller with a high-energy sensor can be linked with the data acquisition system to create a database based on the weather station attributes. The proposed idea allows predicting opportunities based on the data realized by the microcontroller sensors, rather than directly monitoring the system. In order to reduce costs, the proposed system uses a sensor that is identified as a DHT sensor to provide temperature and humidity readings to build the heretical structure of the climate database. The question of the weather forecast depends entirely on the weather conditions on the last day in order to specify how much the weather may change in the future. The paper that proposed the idea of a renewable solar system and a hybrid power station discussed some factors that greatly affect weather conditions, such as the color of solar radiation due to environmental reactions and the reflection of changing temperature conditions and therefore changing humidity conditions proportionally. This article proposes a simple way to monitor/store data locally, that is, users can install the system in a specific location and start recording and monitoring data related to (day/night) automatic systems.

III. SYSTEM MODULE

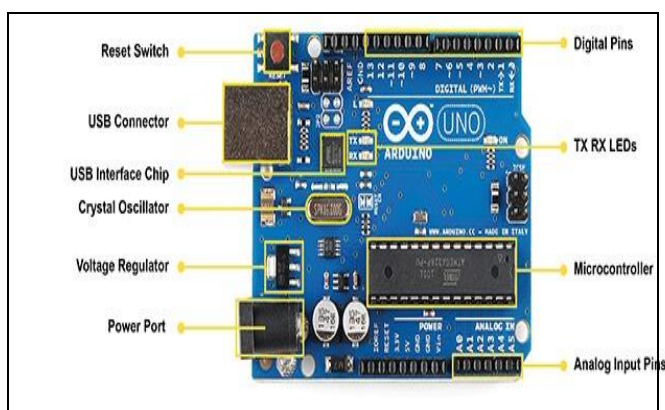
The weather station system is a large, sensitive and reliable system. Therefore, the key reason why such systems are so much needed is planning. For example, most airway companies and transportation systems need to plan timetables based on climatic conditions and possible changes. On the other hand, the design requirements for such large-scale systems are not cheap, especially for systems that regularly observe and monitor large cities. This article shows a simple way to evaluate the cost and performance of this important system. In addition, this work also created a data accumulation/recording center to initiate weather forecast tasks. The prosperity and

superiority of Arduino microcontrollers greatly promoted this work. In this project, only one sensor was used to implement weather station attributes to create the proposed database accumulation system. DHT sensor, used to measure temperature (T) and humidity (H). The Arduino microcontroller uses these sensors to directly measure data through the 16×2 LCD display, or indirectly by storing the data from the Arduino I/O serial monitor to a specific location in the excel file. Then, analyze the recently implemented data, and draw it into a chart through the R language to display it as the database output result.

MAJOR COMPONENT AND TOOLS:-

1. Arduino UNO Board

Arduino is an open source electronic board that supports hardware and software. Arduino is considered to be the most typical microcontroller for processing input modules (such as sensors), these sensors transfer the implemented data to the Arduino to make appropriate decisions. In addition, the Arduino microcontroller handles output modules and devices, such as controlling lights, motors and other actuators. The part responsible for the control module is usually installed on a board called (ATMEGA) and can be programmed using the Arduino IDE programming language. The Arduino program is written by connecting the development board to the computer in order to create a programming user interface area to start the control task correctly.

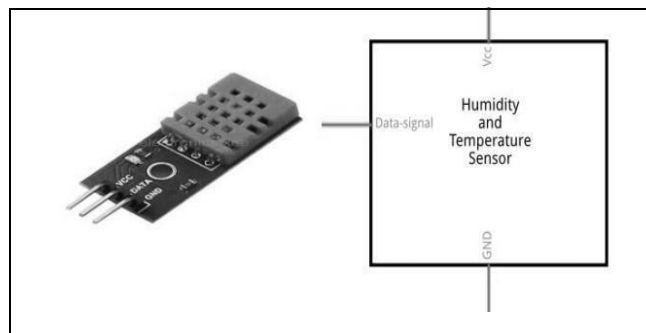


AURDINO UNO BOARD

2. Temperature and Humidity Sensor (DHT)

The temperature/humidity sensor (DHT) shown in the figure periodically measures the values of (T) and (H) according to the update cycle, and adjusts the digital signal output. Due to the temperature/humidity sensing module based on proprietary digital signals and data, the sensor is considered to be reliable and stable. The DHT sensor is composed of a resistive element that reads humidity and a negative temperature coefficient NTC element that reads

temperature. The sensor uses 8-bit microcontrollers for processing, these microcontrollers have reliability, sensitivity, stability, high responsiveness, no interference, and the final cost is low. The temperature/humidity sensor (DHT) used is provided by 3 pins (VCC connected to 5V of Arduino, GND (connected to Arduino GND) and DATA (connected to digital pins of Arduino board)).



DHT SENSOR MODULE

3. LCD 16 × 2 display module

The proposed liquid crystal LCD display is considered to be the focus of this work, and it regularly displays several data simultaneously on 16 columns and 2 rows. The main function of the proposed LCD display is to display the information reported by the sensors used as several attributes, so as to clarify the system conditions regularly. According to the connection scheme shown in Figure 3 written by the Fritzing program, it is recommended to interface with the Arduino board.



LIQUID CRYSTAL LCD DISPLAY ALLOWS 16 PINS TO BE CONNECTED ALONGSIDE WITH ARDUINO MICROCONTROLLER AS EXPOSED IN FOLLOWING TABLE.

PIN NO.	FUNCTION	NAME
1	Ground 0 V	VSS
2	Supply Voltage 5V	VDD
3	Contrast Adjustment	VO
4	Register Select	RS
5	Read/write signal	R/W

6	Data read/write enable system	E
7 8 9 10	Low order data bus used for data transfer between microcontroller and LCD display.	D0-D3
11 12 13 14	High order data bus used for data transfer between microcontroller and LCD display.	D4-D7
15	Backlight 5V	LED+
16	Backlight 0V	LED-

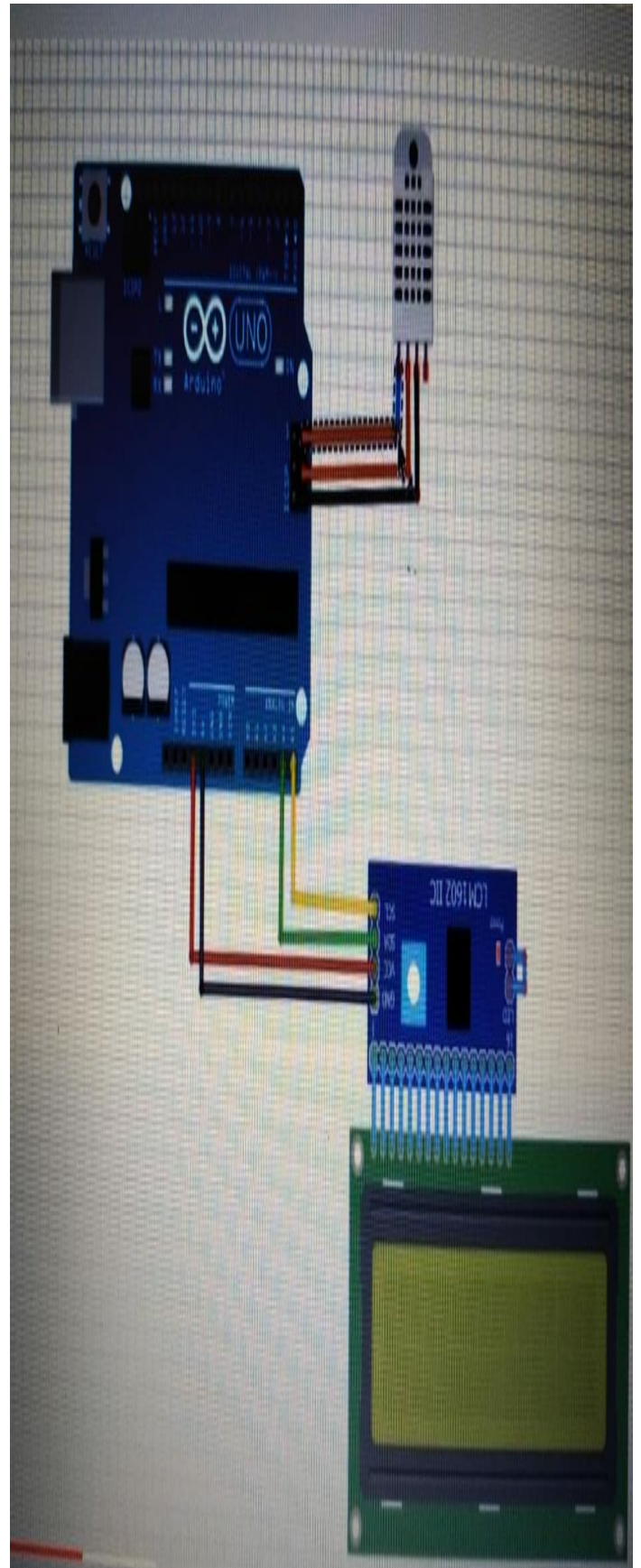
In accordance with the diagram exposed in Fig, the pins of liquid crystal 16×2 LCD display are attached to Arduino UNO as follows:

- Vss pin of the LCD is connected to the GND.
- VDD pin is connected to the 5V.
- Vo is connected to a 10K Ω potentiometer to adjust the contrast of the display.
- Rs pin is connected to digital pin 7.
- R/W pin is connected to the GND.
- E pin is connected to pin 8.
- D0 – D3 are not connected.
- D4 is connected to pin 9, D5 to pin 10, D6 to pin 11, D7 to pin 12 of Arduino respectively.

METHODOLOGY:-

The system main governor represented by Arduino UNO controls each component separately. As mentioned earlier, the system consists of an LCD display that directly displays the data provided by the sensor. The DHT11 sensor measures (T) and (H) locally based on Arduino code. The following figure shows the entire connection scheme of the system, which is similar to the entire components of the proposed system. Each element in the system needs to provide 5V and GND from the Arduino board. Therefore, the data pin of the DHT sensor is connected to pin 5 of the Arduino, and the LCD display connection is shown above. The proposed system follows a specific work plan. The plan is proposed to make statistics on the control specifications prepared by the system designer. The controller specification brings trouble to the sensor, mainly the sensor responsible for realizing the attributes of the weather station. First, the DHT sensor starts to measure the temperature (T) in degrees Celsius ($^{\circ}\text{C}$) and the humidity (H) in percentages (%), and transmit the data directly and indirectly to the display and I/O of the microcontroller, respectively. Monitor. Finally, the main challenge of this article is to store the suggested sensor output in a simple excel file by establishing a link between

the Arduino serial monitor and the Arduino code-based data acquisition program to create our own R-based language The database system to solve, for any local specific area.



Reference:-

www.jmest.org

<https://www.ieee.org/conferences/publishing/templates.html>

<https://www.arduino.cc/en/Tutorial/BuiltInExamples>

https://www.researchgate.net/publication/316597515_Design_of_Weather_Monitoring_System_Using_Arduino_Based_Database_Implementation -----

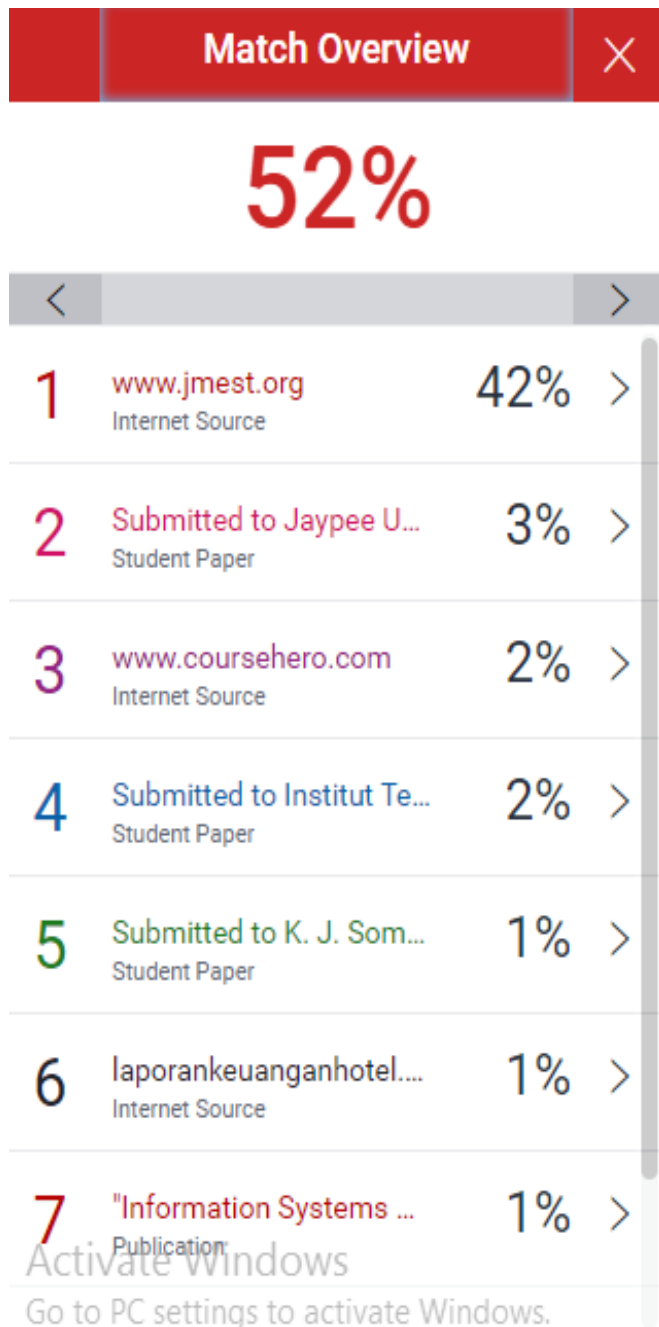
<http://www.jmest.org/wp-content/uploads/2018/05/18050101.pdf>

Conclusion:-

We develop a system based on aurdino which takes input from our surrounding atmosphere and whole data is processed and final outcome is shown in the lcd display after that we also use google firebase in which we analysis whole data of temperature and humidity.

FUTURE WORKS:-

As a future work, it is proposed that whole data is transfer and demonstrate the realized sensors data wirelessly based on Bluetooth module or Wi-Fi chip over *APK* smart phone application. Finally, sensors data can be sent to specific phone numbers via GSM module.



ABOUT AUTHORS:-



AKSHAY MALAVIYA
STUDENT
INFORMATION TECHNOLOGY
CSPIT
CHANGA, ANAND
GUJARAT, INDIA.
19it061@charusat.edu.in



KEVAL MANDANKA
STUDENT
INFORMATION TECHNOLOGY
CSPIT
CHANGA, ANAND
GUJARAT, INDIA.
19it063@charusat.edu.in

Turnitin Originality Report

Processed on: 02-Nov-2020 00:53 IST
 ID: 1432650388
 Word Count: 1980
 Submitted: 3

Similarity Index

51%

Similarity by Source

Internet Sources: 50%
 Publications: 6%
 Student Papers: 29%

Design of Weather Monitoring System Using Arduino and Analysis on Cloud By Kevalkumar Mandanka

41% match (Internet from 30-Aug-2018)

<http://www.jmest.org/wp-content/uploads/JMESTN42352157.pdf>

3% match (student papers from 11-May-2019)

[Submitted to Jaypee University of Information Technology on 2019-05-11](#)

2% match (Internet from 19-Aug-2020)

<https://www.coursehero.com/file/53366293/JMESTN42352157pdf/>

2% match (student papers from 04-Nov-2019)

[Submitted to Institut Teknologi Brunei on 2019-11-04](#)

1% match (student papers from 29-May-2020)

[Submitted to K. J. Somaiya College of Engineering Vidyavihar, Mumbai on 2020-05-29](#)

1% match (publications)

["Information Systems Design and Intelligent Applications", Springer Science and Business Media LLC, 2018](#)

Design of Weather Monitoring System Using Arduino and Analysis on Cloud
 PREPARED BY KEVALKUMAR MANDANKA INFORMATION TECHNOLOGY
[CHANDUBHAI S PATEL INSTITUTE OF TECHNOLOGY GUJARAT,INDIA](#) 19it063
[@charusat.edu.in](#) AKSHAY MALAVIYA INFORMATION TECHNOLOGY
[CHANDUBHAI S PATEL INSTITUTE OF TECHNOLOGY GUJARAT,INDIA](#) 19it061
[@charusat.edu.in](#) Under Guidance of :- Prof. Ravi Patel Chandubhai S Patel
 Institute Of Technology Department Of Information And Technology At.
 Changa, Dist Anand-388421,Gujarat,India Page 1 Abstract – This article
 mainly combines the control system and data acquisition technology based on
 two research fields, and creates a database system to generate the provided
 data according to the adopted attributes. [The main attributes have been](#)
[selected based on the sensors used to build the system to create an effective](#)
[weather station project. The](#) recommended sensor is [used to measure and](#)
[store temperature](#) and [humidity data](#). Since [the data](#) is periodically read and
 stored as a real database system, [the acquired data can be displayed](#) directly
 and indirectly [in two ways](#). The analysis of store data is considered to be the
 main challenge of this work, which provides opportunities for mining past
 recorded data. In addition, the entire system monitors and controls the
 location locally according to the periodic changes that occur under climatic
 conditions in order to maintain the recommended location in the required

weather conditions. **KEYWORDS— DATABASE, DATA ACQUISITION, TEMPERATURE AND HUMIDITY SENSOR, ARDUINO SYSTEMAUTOMATION.** I. INTRODUCTION This article identifies the ability to associate control modules with database programming languages to achieve honest results. The weather station is considered to be a technical method that allows the use of specific equipment to measure weather parameters based on atmospheric conditions on land or at sea for a proposed location to achieve predicted weather conditions and study climate characteristics. The problem of weather forecasting began in the 19th century and officially started thereafter, and then under certain atmospheric conditions, the basis of measurement and recording based on real data at specific locations was changed [1]. The collected data can determine and confirm the recommended warranty for the selected location. The weather is mainly affected by two parameters, temperature and humidity. These parameters fluctuate especially in places affected by the solar radiation temperature and the vertical position of the sun radiating at a specific location based on the latitude of the tropical line. In fact, due to the high- level effects that may be degraded in the entire scheme under certain minor changes, the atmosphere is considered a chaotic and vital scheme. Therefore, this matter will cause trouble for climate predictions in the long future, and predictions may be made only in the following days. Therefore, weather station experts will constantly predict weather conditions based on theoretical research on climatic conditions. It must be mentioned that human struggles in the past followed some undesirable parameters and terminology, such as measuring pressure, humidity intensity research and its impact on temperature, climate conditions, and finally the conditions that affect the sky. There are almost no recommended parameters. A generation of microcomputers and microcontrollers based on prosperity and smart devices greatly simplified the terminology proposed, reducing it to a dynamic factor, and wisely responded to changes in atmospheric conditions. However, user input adaptation is considered to be the most important point that affects the preparation of a database model based on predictive output. This research paper introduces two weather parameters based on data packaging and collection used to generate suggested weather stations. These two weather parameters are identified by temperature (T) and humidity (H). In the end, the idea is considered perfect, especially for devices that control a specific house based on sensor readings. II. RELATED WORKS Most research papers and studies in this field have not prioritized data storage and data collection based on the output of the microcontroller sensor. In this article, the result data obtained by the system can be stored and drawn at the same time as the monitoring weather station system. In other words, you can demonstrate and view information through both direct and indirect techniques. The term directly means that the weather conditions can be displayed directly on the (16×2) LCD display without creating a database on the ground area. However, indirect technology means that as long as the sensor is measuring weather conditions, the weather conditions can be recorded and stored in the PC. The main challenge of this work is to show and confirm that a microcontroller with a high -energy sensor can be linked with the data acquisition system to create a database based on the weather station attributes. The proposed idea allows predicting opportunities based on the data realized by the microcontroller sensors, rather than directly monitoring the system. In order to reduce costs, the proposed system uses a sensor that is identified as a DHT sensor to provide temperature and humidity readings to build the heretical structure of the climate database. The question of the weather forecast depends entirely on the weather conditions on the last day in order to specify how much the weather may change in the future. The paper that proposed the idea of a renewable solar system and a hybrid power station

discussed some factors that greatly affect weather conditions, such as the color of solar radiation due to environmental reactions and the reflection of changing temperature conditions and therefore changing humidity conditions proportionally. This article proposes a simple way to monitor/store data locally, that is, users can install the system in a specific location and start recording and monitoring data related to (day/night) automatic systems. **III. SYSTEM MODULE** The weather station system is a large, sensitive and reliable system. Therefore, the key reason why such systems are so much needed is planning. For example, most airway companies and transportation systems need to plan timetables based on climatic conditions and possible changes. On the other hand, the design requirements for such large-scale systems are not cheap, especially for systems that regularly observe and monitor large cities. This article shows a simple way to evaluate the cost and performance of this important system. In addition, this work also created a data accumulation/recording center to initiate weather forecast tasks. The prosperity and superiority of Arduino microcontrollers greatly promoted this work. In this project, only one sensor was used to implement weather station attributes to create the proposed database accumulation system. DHT sensor, used to measure temperature (T) and humidity (H). The Arduino microcontroller uses these sensors to directly measure data through the 16×2 LCD display, or indirectly by storing the data from the Arduino I/O serial monitor to a specific location in the excel file. Then, analyze the recently implemented data, and draw it into a chart through the R language to display it as the database output result. **MAJOR COMPONENT AND TOOLS:-**

1. **Arduino UNO Board** Arduino is an open source electronic board that supports hardware and software. Arduino is considered to be the most typical microcontroller for processing input modules (such as sensors), these sensors transfer the implemented data to the Arduino to make appropriate decisions. In addition, the Arduino microcontroller handles output modules and devices, such as controlling lights, motors and other actuators. The part responsible for the control module is usually installed on a board called (ATMEGA) and can be programmed using the Arduino IDE programming language. The Arduino program is written by connecting the development board to the computer in order to create a programming user interface area to start the control task correctly.
2. **Temperature and Humidity Sensor (DHT)** The temperature/humidity sensor (DHT) shown in the figure periodically measures the values of (T) and (H) according to the update cycle, and adjusts the digital signal output. Due to the temperature/humidity sensing module based on proprietary digital signals and data, the sensor is considered to be reliable and stable. The DHT sensor is composed of a resistive element that reads humidity and a negative temperature coefficient NTC element that reads temperature. The sensor uses 8-bit microcontrollers for processing, these microcontrollers have reliability, sensitivity, stability, high responsiveness, no interference, and the final cost is low. The temperature/humidity sensor (DHT) used is provided by 3 pins (VCC connected to 5V of Arduino, GND (connected to Arduino GND) and DATA (connected to digital pins of Arduino board)).
3. **LCD 16 × 2 display module** The proposed liquid crystal LCD display is considered to be the focus of this work, and it regularly displays several data simultaneously on 16 columns and 2 rows. The main function of the proposed LCD display is to display the information reported by the sensors used as several attributes, so as to clarify the system conditions regularly. According to the connection scheme shown in Figure 3 written by the Fritzing program, it is recommended to interface with the Arduino board.

LIQUID CRYSTAL LCD DISPLAY ALLOWS 16 PINS TO BE CONNECTED ALONGSIDE WITH ARDUINO MICROCONTROLLER AS EXPOSED IN FOLLOWING TABLE.

PIN NO.	FUNCTION
1	Ground
2	Supply Voltage 5V
3	Contrast Adjustment
VO	

4 Register Select RS 5 Read/write signal R/W 6 Data read/write enable system E 7 Low order data 8 bus used for data 9 transfer between D0-D3 10 microcontroller and LCD display. 11 12 13 14 High order data bus used for data transfer between microcontroller and LCD display. D4-D7 15 Backlight 5V LED+ 16 Backlight 0V LED- In accordance with the diagram exposed in Fig, the pins of liquid crystal 16 × 2 LCD display are attached to Arduino UNO as follows: ? ? ? Vss pin of the LCD is connected to the GND. VDD pin is connected to the 5V. Vo is connected to a 10KΩ potentiometer to adjust the contrast of the display. ? ? ? ? ? Rs pin is connected to digital pin 7. R/W pin is connected to the GND. E pin is connected to pin 8. D0 – D3 are not connected. D4 is connected to pin 9, D5 to pin 10, D6 to pin 11, D7 to pin 12 of Arduino respectively. METHODOLOGY The system main governor represented by Arduino UNO controls each component separately. As mentioned earlier, the system consists of an LCD display that directly displays the data provided by the sensor. The DHT11 sensor measures (T) and (H) locally based on Arduino code. The following figure shows the entire connection scheme of the system, which is similar to the entire components of the proposed system. Each element in the system needs to provide 5V and GND from the Arduino board. Therefore, the data pin of the DHT sensor is connected to pin 5 of the Arduino, and the LCD display connection is shown above. The proposed system follows a specific work plan. The plan is proposed to make statistics on the control specifications prepared by the system designer. The controller specification brings trouble to the sensor, mainly the sensor responsible for realizing the attributes of the weather station. First, the DHT sensor starts to measure the temperature (T) in degrees Celsius (oC) and the humidity (H) in percentages (%), and transmit the data directly and indirectly to the display and I/O of the microcontroller, respectively. Monitor. Finally, the main challenge of this article is to store the suggested sensor output in a simple excel file by establishing a link between the Arduino serial monitor and the Arduino code -based data acquisition program to create our own R-based language. The database system to solve, for any local specific area. Reference:- www.jmest.org
<https://www.ieee.org/conferences/publishing/templates.html>
<https://www.arduino.cc/en/Tutorial/BuiltInExamples>
https://www.researchgate.net/publication/316597515_Design_of_Weather_Monitoring_System_Using_Arduino_Based_Database_Implementation-----

----- _httpwwwjmestorgwp-contentupl
 Conclusion:- We develop a system based on aurdino which takes input from our surrounding atmosphere and whole data is processed and final outcome is shown in the lcd display after that we also use google firebase in which we analysis whole data of temperature and humidity. FUTURE WORKS As a future work, it is proposed that whole data is transfer and demonstrate the realized sensors data wirelessly based on Bluetooth module or Wi-Fi chip over APK smart phone application. Finally, sensors data can be sent to specific phone numbers via GSM module. ABOUT AUTHORS AKSHAY MALAVIYA STUDENT INFORMATION TECHNOLOGY CSPIT CHANGA,ANAND GUJARAT,INDIA. 19it061@charusat.edu.in KEVAL MANDANKA STUDENT INFORMATION TECHNOLOGY CSPIT CHANGA,ANAND GUJARAT,INDIA. 19it063@charusat.edu.in 2 3 4 5 6 7 8