Weather Information Display System

[1]Dr Jaware Tushar H, [2]Sisodiya Gaurav, [3]Saner Parag, [4]Shinde Hitesh, [5]Patil Pankaj
[1]Assistant Professor, [2, 3, 4, 5] UG Student
[1, 2,3,4,5] Department of Electronics and Telecommunication Engineering,
R C Patel Institute of Technology, Shirpur, India

Abstract: Weather is the state of the atmosphere, to the degree that it is hot or cold, wet or dry, calm or stormy, clear or cloudy. Most weather phenomena occur in the troposphere, just below the stratosphere. Weather generally refers to day-to-day temperature and precipitation activity, whereas climate is the term for the average atmospheric conditions over longer periods of time. When used without qualification, "weather", is understood to mean the weather of earth. Monitoring the weather conditions manually is difficult. The present work is to develop an automated system which monitors the weather condition. The weather condition is driven by air pressure (temperature and moisture) differences between one place and another. These pressure and temperature differences can occur due to the sun angle at any particular spot. Through this system we can automatically collect the information about humidity and temperature. The details are stored in a database and according to current and previous data we can produce the results in graphical manner in the system. The objective of this paper is to formulate the weather and be able to forecast the weather without human error.

Index Terms **– Climate control, Weather analysis, Temperature Moderation, Humidity Control and Arduino.**

I. INTRODUCTION

Weather forecasting is the application of science and technology to predict the state of the atmosphere for a given location. Human beings have attempted to predict the weather informally for millennium and formally since the nineteenth century. Weather forecasts are made by collecting quantitative data about the current state of the atmosphere on a given place and using scientific understanding of atmospheric processes to project how the atmosphere will evolve on that place. Weather is driven by air pressure (temperature and humidity) differences between one place and another. These pressure and temperature differences can occur due to the sun angle at any particular spot, which varies by latitude from the tropics. The atmosphere is a chaotic system, so small changes to one part of the system can grow to have large effects on the system as a whole. This makes it difficult to accurately predict weather more than a few days in advance, though weather forecasters are continually working to extend this limit through the scientific study of weather, meteorology. It is theoretically impossible to make useful day-today predictions more than about two weeks ahead, imposing an upper limit to potential for improved prediction skill.

Once an all-human endeavor based mainly upon changes in barometric pressure, current weather conditions, and sky condition, weather forecasting now relies on computer-based models that take many atmospheric factors into account. Human input is still required to pick the best possible forecast model to base the forecast upon, which involves pattern recognition skills, tele-connections, knowledge of model performance, and knowledge of model biases.

II. LITERATURE REVIEW

In this section first we are design the transmitter and receiver section. In that section we use IR sensors and photodiode. Transmitter of IR sensor transmit the beam and detect if obstacle present in that slot it will receive by Photodiode and Led will on. For output part we design the parking slot display, in which we use 7 segment common cathode display which indicate 0 when slot is empty and 1 when slot is full and output of controller given to display. Now to count number of vehicle enter and exit we design counterpart. We use separate counter for IN and OUT. Through weather monitoring system we can collect the information about humidity and temperature and according to current and previous data we can produce the results in graphical manner in the system. After reviewing many articles, there are presently no papers that mention monitoring the combination of temperature, lighting and humidity in one integrated system and have actuators to modify these settings.

In addition to this, there is one research paper that has discussed monitoring these three environmental conditions however; there has been no mention about having actuators to modify. So our main idea was to coin a system that can sense the main components that formulates the weather and can be able to forecast the weather without human error. Ancient weather forecasting methods usually relied on observed patterns of events, also termed pattern recognition. For example, it might be observed that if the sunset was particularly red, the following day often brought fair weather. This experience accumulated over the generations to produce weather lore. However, not all of these predictions prove reliable, and many of them have since been found not to stand up to rigorous statistical testing. The simplest method of forecasting the weather, persistence, relies upon today's conditions to forecast the conditions tomorrow. This can be a valid way of forecasting the weather when it is in a steady state, such as during the summer season in the tropics. This method of forecasting strongly depends upon the presence of a stagnant weather pattern. It can be useful in both short range forecasts and long range forecasts. Measurements of barometric pressure and the pressure tendency (the change of pressure over time) have been used in forecasting since the late 19th century.

III. PROPOSED SYSTEM

There are a lot of high end systems available these days for round the clock weather monitoring. But these systems are implemented on a very large scale, for monitoring real time weather for a whole city. Implementing such system for a small area is also feasible, since they are designed for it and the overhead for maintaining such systems for a small area is very high.

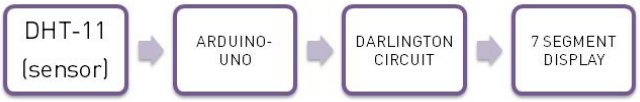

Fig 1 Flow Chart of designed system

Our proposed system makes use of one sensor to measure the weather/environment factors such as temperature and humidity. The values read from the sensors are processed by the Arduino micro-controller and stored in a text file which can be processed upon to derive analysis. The readings are also displayed on seven segment display for quick viewing. All these readings can be analysed to get the weather characteristics of a particular area and record the weather pattern. These recorded parameters are essential and vary from places to places. All these requirements are fed into the database and these values are essentials and recorded over time. Using these values as input we can plot a weather chart of a particular area over time. Based on the present weather factors and pre-set values the set actions are done.

The set action can include turning on the heating system when the Temperature is colder than the set value and turning on the cooling system when the temperature is hot or humid beyond the set values. The serial output from the Arduino micro-controller which are the values read from the sensors can also be stored in a database. The database can be used as a source for data if we want to display values through a website or a standalone application in future

IV. COMPONENT OF THE SYSTEM

4.1 Arduino

Arduino is an open source tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple micro-controller board, and a development environment for writing software for the board. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can communicate with software running on your computer (e.g. Flash, Processing, MaxMSP). The boards can be assembled by hand or purchased pre-assembled; the open-source IDE can be downloaded for free. Arduino micro-controller is shown in figure.

Fig 2 ARDUINO UNO

The Arduino programming language is an implementation of Wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the micro-controller; connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. All the modules in the circuit are connected to Arduino module.

4.2. DHT11 – Temperature and Humidity Sensor

This sensor is used to sense humidity. It facilitates us with analog and digital output. We are using digital output pin to connect it directly with the Arduino to Arduino's digital pin (pin 7).there is a step up register in the sensor to control the power. VCC and GND pins are also connected to Arduino. Fig. shows a DHT11 sensor.

DHT11 has a full range temperature compensation, low power consumption, long term stability and calibrated digital signal. The DHT sensors are made of two parts, a capacitive humidity sensor and a thermistor. There is also a very basic chip inside that does some analog to digital conversion and spits out a digital signal with the temperature and humidity. A high-performance 8-bit microcontroller is integrated in the sensor with calibration-coefficient saved in OTP memory to provide accurate temperature readings. With the new 3 pin connector that includes several soldering pads and a sturdy casing, plugging in and out the sensor is not

going to be a problem anymore. The 3 pin connector is perfect to get it going fast, and extremely easy to use. It is reliable and inexpensive.

Fig 3 DHT11 Sensor

4.3 Darlington Circuit

To provide improved performance and input/output characteristics, single transistors may be combined to form compound devices. A commonly used compound device is known as the Darlington configuration and is shown to the right (a modified version of Figure in text). In this representation, two npn BJTs are cascaded and are behaviourally equivalent to a single npn transistor.

This single compound device possesses desirable characteristics such as high input impedance, low output impedance and high current gain; but does have the disadvantages of an almost doubled VBE (overall VBE for the pair is 1.2V to 1.4V instead of the 0.6V to 0.7V for single silicon BJTs) and the fact that any leakage current from the first transistor is amplified by the second transistor. A Darlington pair may also be created using two pnp devices, particularly in discrete circuit design, or through the use of an npn and a pnp.

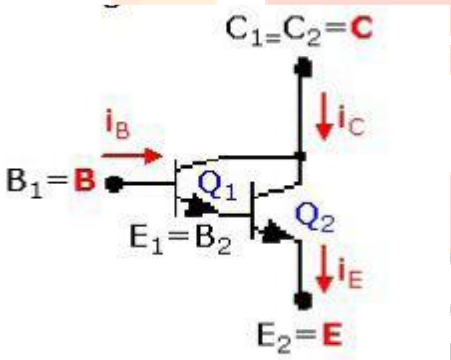

Fig 4 Darlington Circuit

The Darlington pair may be considered a single transistor when used in amplifier circuits in fact, some manufacturers package this compound transistor circuit into a single package with only three external leads (base, collector and emitter). However, although we have been concentrating on the single transistor characteristics of the compound transistor, there are some important differences. In addition to the previously mentioned increase in the total VBE drop, primary among the potential difficulties is the achievable speed of operation. Changing the voltage across any junction requires a finite amount of time, since charges must be moved and electrons and holes move at a finite speed within a material. Since the Darlington transistor pair has two base emitter junctions in series, this combination operates more slowly than a single transistor. To increase the speed of operation, a resistor may be placed between the emitter of the first transistor and the base of the second transistor.

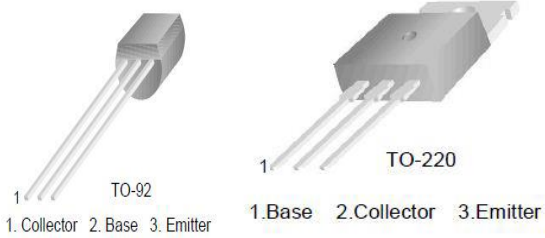

Fig 5 Transistor

4.4 Seven Segment Display

A seven-segment display (SSD), or seven-segment indicator, is a form of electronic display device for displaying decimal numerals that is an alternative to the more complex dot matrix displays. Seven-segment displays are widely used in digital clocks, electronic meters, basic calculators, and other electronic devices that display numerical information. The seven elements of the display can be lit in different combinations to represent the Arabic numerals. Often the seven segments are arranged in an oblique (slanted) arrangement, which aids readability. In most applications, the seven segments are of nearly uniform shape and size (usually elongated hexagons, though trapezoids and rectangles can also be used), though in the case of adding machines, the vertical segments are longer and more oddly shaped at the ends in an effort to further enhance readability.

The numerals 6 and 9 may be represented by two different glyphs on seven segment displays, with or without a 'tail'. The seven segments are arranged as a rectangle of two vertical segments on each side with one horizontal segment on the top, middle, and bottom. Additionally, the seventh segment bisects the rectangle horizontally. There are also fourteen-segment displays and sixteen-segment displays (for full alpha numeric); however, these have mostly been replaced by dot matrix displays. Twenty-two segment displays capable of displaying the full ASCII character set were briefly available in the early 1980s, but did not prove popular.

Fig 6 Seven Segment Display

The segments of a 7-segment display are referred to by the letters A to G, where the optional decimal point (an eighth segment, referred to as DP) is used for the display of non-integer numbers. Seven-segment displays may use a liquid crystal display (LCD), a light-emitting diode (LED) for each segment, or other light generating or controlling techniques such as cold cathode gas discharge (Panaplex), vacuum fluorescent, incandescent filaments (Numitron), and others. For gasoline price totems and other large signs, vane displays made up of electromagnetically flipped light-reflecting segments (or "vanes") are still commonly used. An alternative to the 7-segment display in the 1950s through the 1970s was the cold-cathode, neonlamp- like nixie tube. Starting in 1970, RCA sold a display device known as the Numitron that used incandescent filaments arranged into a seven-segment display.

In a simple LED package, typically all of the cathodes (negative terminals) or all of the anodes (positive terminals) of the segment LEDs are connected and brought out to a common pin; this is referred to as a "common cathode" or "common anode" device. Hence a 7 segment plus decimal point package will only require nine pins, though commercial products typically contain more pins, and/or spaces where pins would go, in order to match standard IC sockets. Integrated displays also exist, with single or multiple digits. Some of these integrated displays incorporate their own internal decoder, though most do not: each individual LED is brought out to a connecting pin as described.

4.5 ULN2803

Most of the Chips operates with low level signals such as TTL, CMOS, PMOS and NMOS which operates at the range of (0-5V) and are incapable to drive high power inductive loads. However this chip takes low level input signals (TTL) and uses that to switch/turn off the higher voltage load that is connected to the output side. The ULN2803 IC consists of eight NPN Darlington pair which provides the proper current amplification required by the loads. We all know that the transistors are used to amplify the current but here Darlington transistor pairs are used inside the IC to make the required amplification.

A Darlington pair is two transistors that act as a single transistor providing high current gain. In this pair the current amplified by the first transistor is further amplified by the next transistor providing high current to the output terminal. When no base voltage is applied that when no signal is is given to the input pins of the IC, there will be no base current and transistor remains in off state. When high logic is fed to the input both the transistors begin to conduct providing a path to ground for the external load that the output is connected. Thus when an input is applied corresponding output pin drops down to zero there by enabling the load connected to complete its path.

V. RESULT

After the weather station was designed and constructed, testing began to confirm the proper operation of the system. Testing was conducted in two stages. First the custom hardware was tested through a series of embedded test programs. Once everything was found to be functioning properly, the weather station embedded code was programmed into the modules and tested. This section will be broken down to describe the hardware tests, embedded code tests, software tests, and complete system tests. In each section, the system requirements that were verified by the conducted tests will be mentioned.

Fig 7 Temperature Results

Fig 8 Relative Humidity Results

VI. Conclusion and Future Scope

6.1 Conclusion

- This concludes that the present work was a success and it will provide a competent method for measuring real time weather readings and help farmers whose livelihood depends on the weather in a country like India to produce better quality crops.
- It can be used to gather information about the requirements for each area over the years. The gathered information is used to determine the optimal conditions for plants to grow and the farmer can modify the environment suitable for the growth of the plant.

6.2 Future scope

- In future, sensors to analyse air quality using gas detectors could be included and a web interface or service to feed the data directly to Internet could also be built.
- Adding of more sensors to monitor other environmental parameters such as Soil PH Sensor, CO2 and oxygen Sensor while allowing the replacing of current sensors if a wider range of measurements is desired. And also Integration of additional monitoring devices such as a Wi-Fi camera to monitor growth of agricultural product. And also the data can be uploaded to web server continuously.
- Develop solar operated system.
- Add different sensors to system.

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