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A Framework for Green Campus Using Arduino Uno

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ABSTRACT

Presently we are in the Growing Advanced Emerging Technologies which broadened the meaning as well as application of Internet. The ability of "Internet of Things (IoT)" promises to enhance capabilities of objects to create a smart Environment. Coming to Real World Scenario, the Resources are moderate whereas Resource Consumption is more. As the Global population grows the resources on depleted quickly. In order to have a sustainable use of resources, governments around the world paying efforts to advocate the reduction of carbon production as well as the reduction of energy. This statement motivated many campuses of educational institution to support the consumption of energy and to reduction of carbon production. Different institutions follow their own strategies to eradicate the problem. To support this aspect, we are implementing a "GREEN CAMPUS" behavior to our institution by using IoT. In this approach to construct a green campus environment will realize the idea of energy saving by properly using Less Power Consumption Attendance Devices and also helpful for Controlling the Pollution in Campus.

Keywords: *Green Campus, Auduino, IoT, RFID, Sensor*

INTRODUCTION

The Internet of things (IoT) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data. Each thing is uniquely identifiable through its embedded computing system but is able to inter-operate within the existing Internet infrastructure. The figure of online capable devices increased 31% from 2016 to 8.4 billion in 2017. Experts estimate that the IoT will consist of about 30 billion objects by 2020. It is also estimated that the global market value of IoT will reach $7.1 trillion by 2020. The IoT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, virtual power plants, smart homes, intelligent transportation and smart cities.

"Things", in the IoT sense, can refer to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, cameras streaming live feeds of wild animals in coastal waters, automobiles with built-in sensors, DNA analysis devices for environmental/food/pathogen monitoring, or field operation devices that assist fire-fighters in search and rescue operations. Legal scholars suggest regarding "things" as an "inextricable mixture of hardware, software, data and service". These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices.

Integration of sensing and actuation systems, connected to the Internet, is likely to optimize energy consumption as a whole. It is expected that IoT devices will be integrated into all forms of energy consuming devices and be able to communicate with the utility supply company in order to effectively balance power generation and energy usage. Such devices would also offer the opportunity for users to remotely control their devices, or centrally manage them via a cloud-based interface[12,13], and enable advanced functions like scheduling.

Besides home-based energy management, the IoT is especially relevant to the Smart Grid since it provides systems to gather and act on energy and power-related information in an automated fashion with the goal to improve the efficiency, reliability, economics, and sustainability of the production and distribution of electricity. Using advanced metering infrastructure (AMI) devices connected to the Internet backbone, electric utilities can not only collect data from end-user connections but also, manage other distribution automation devices like transformers and recloses. IoT frameworks might help support the interaction between "things" and allow for more complex structures like distributed computing and the development of distributed applications. Currently, some IoT frameworks seem to focus on real-time data logging solutions, offering some basis to work with many "things" and have them interact. Future developments might lead to specific software-development environments to create the software to work with the hardware used in the Internet of things. Companies are developing technology platforms to provide this type of functionality for the Internet of things. Newer platforms are being developed, which add more intelligence.

REST is a scalable architecture that allows things to communicate over Hypertext Transfer Protocol and is easily adopted for IoT applications to provide communication from a thing to a central web server.

Now a days the emerging technologies growth increases day by day. So that all the physical things connected to internet. In other words, almost every object can be part of a network with smart connectivity. So that physical objects are networked and communicated with each other. Actually the goal of "Internet of Things (IoT)" is forms a smart environment so that people can benefited from IoT. The IoT covers the building of smart cities/home/office, the provision of smart public services, and the plan of Health.

As the global population grows, the resources on earth are decreased quickly. People who live on the earth they are consumed lot of carbon resources for their daily needs. So governments around the world put lot of interest to reduce carbon usage, So they will promoted their proposition in educational institutions. Firstly educational institutions adopt this technique then automatically implemented by other organizations easily.

One of the latest IoT applications is smart campus. Now governments all over the world are planned to implement smart campus for getting revolution. This technology constructing a smart campus that implies the institution will adopt advanced Information Communication Technologies (ICTs) to automatically monitor and control every facility on campus. The profits gained with this IoT application is use of all facilities become more efficient and the energy consumed is minimized. Such a wonderful IoT application is "Green Campus".

The two major ICTs which make the realization of IoT possible are the emergence of cloud computing and the network of wireless sensors. In fact, both cloud computing and wireless-sensor network together can provide the most reliable, scalable, dynamic and compassable resources that the IoT required[14].

Majorly IoT concentrates on smart cities; there we will connect all resource consummated devices to network. So near future in which the objects of everyday life will be equipped with micro-controllers, transceivers for digital communication and use suitable network protocols to becoming an integral part of the Internet. Furthermore, by enabling easy access and interaction with a wide variety of devices such as, for instance, home appliances, surveillance cameras, monitoring sensors, actuators, displays, vehicles, and so on, the IoT will foster the development of a number of applications that make use of the potentially enormous amount and variety of data generated by such objects to provide new services to citizens, companies, and public administrations. This technology finds applications in many different domains, such as home automation, industrial automation, medical aids, mobile health care, smart grids, automotive, traffic management, etc. Our work demonstrates toward constructing a green campus. The objective is realized by constructing the Internet of Things using wireless sensor. The architecture of the green campus within IoT will be explained, and the system that we have developed is demonstrated by us.

2.1 A Survey on Facilities for Experimental Internet of Things Research:

The initial vision of the Internet of Things was of a world in which all physical objects are tagged and uniquely identified by RFID transponders[1,2]. However, the concept has grown into multiple dimensions, encompassing sensor networks able to provide real-world intelligence and goal-oriented collaboration of distributed smart objects via local networks or global interconnections such as the Internet[15]. Despite significant technological advances, difficulties associated with the evaluation of IoT solutions under realistic conditions in real-world experimental deployments still hamper their maturation and significant rollout. In this article we identify requirements for the next generation of IoT experimental facilities. While providing taxonomy, we also survey currently available research test beds, identify existing gaps, and suggest new directions based on experience from recent efforts in this field.

2.2 Smart Objects as Building Blocks for the Internet of Things:

The combination of the Internet and emerging technologies such as near field communications, real-time localization, and embedded sensors lets us transform everyday objects into smart objects that can understand and react to their environment[1,2]. Such objects are building blocks for the Internet of Things and enable novel computing applications. As a step toward design and architectural principles for smart objects, the authors introduce a hierarchy of architectures with increasing levels of real-world awareness and interactivity. In particular, they describe activity-, policy-, and process aware smart objects and demonstrate how the respective architectural abstractions support increasingly complex application.

2.3 The Development of Green Campus:

New emerging technologies have changed human life styles dramatically. As people enjoy advanced and smart lives, ironically, our earth is facing major crisis that may bring disasters to human lives as well. Fig. 1 shows the carbon emission records from January 1955 to January 2013. The concentration of atmospheric CO_2 was below 320 ppm in 1955. By January 2013, the number has increased by 25%. The data indicate how serious the earth has been polluted. In addition, more environmental crises such as global warming and climate disturbance; acid rain, and soil erosion; ecosystem damage and so forth have got the attention across the world Scholars and experts have agreed that the knowledge of protecting the earth should be cultivated by educations. Universities should provide leadership for broader society and institutions of higher learning have a special responsibility to address the continuing environmental crisis. In, the author specifically points out that one of the greatest opportunity and ability to conserve energy is through facilities management on campus. Educational institutions across the world, especially the higher education, have recognized that they are in a unique position to prevent the crisis from getting worse. Not only are the faculties realizing that they possess the intellectual capacity to address these issues, but also the institutions are putting a lot of efforts in the integration of all resources and effectively adopting new technologies to their missions to create a green environment. There are a number of well known “Green Campus” examples. For instance, the green campuses of the University of Pennsylvania, Boston University and the University of Chicago in the United States; Macquarie University in Australia; University of Copenhagen in Denmark and Queen's University in Canada, etc. In Taiwan, Y. S. Sun Green Building Research Center Located at the NCKU Li-Hsing Campus is Taiwan’s first zero-carbon, energy-saving building. The building is very famous to people in Taiwan as ‘The Magic School of Green Technology’. Embedded within The Magic School is the hope that its design principles can eventually be scaled to Taiwan’s metropolitan centres’. The building was designed to use "adequate techniques", instead of "expensive techniques", to achieve "quadruple benefit". The aims are estimated to save 50% energy, to conserve 30% water, and to reduce 30% carbon emission. It is also expected that the building will be utilized for one hundred years. The building started operation in January 2011, and in six months, the accumulated Energy Usage Intensity (EUI) was 19.3kWh/m². The figure was far less than Taiwan's medium and low intensity office buildings, which consume 125kWh/m² per year on average. The existence of ‘The Magic School of Green Technology’ will be a model for all other universities in Taiwan.

2.4 Sensor Applications for a Smarter World:

More than 50 billion devices will be connected to the Internet by 2020, but this new connectivity revolution has already started. The exponential growing number of objects connected to the Internet is changing completely our world[3]. Sensor applications for a smarter world. covering the most disruptive sensor and Internet of Things applications.

The list is grouped in 12 different verticals, showing how the Internet of Things is becoming the next technological revolution. It includes the most trendy scenarios, like Smart Cities where sensors can offer us services like Smart Parking – to find free parking spots in the streets– or managing the intensity of the luminosity in street lights to save energy. Climate change, environmental protection, water quality or CO2 emissions are also addressed by sensor networks and are just some of the examples included in the Smart Water and Smart Environment sections included in the document.

2.5 The Internet of Things:

The concept and the realization of the “Internet of Things” make the world truly ubiquitous since the IoT radically changes the view of the “Internet” by embracing every physical object into network. The term “Internet of Things” has become very popular in recent years. There are books to teach or to discuss various subjects about the IoT. International conferences open up sessions for scholars and specialists to exchange their ideas, opinions and experiences regarding the development or the applications of the IoT. And finally in 2009, even the EU Commission realized the importance of the revolution of the Internet and initiated an IoT action plan. In, it is suggested that an IoT must be internet-oriented (middleware), things oriented (sensors) and semantic oriented (knowledge)[5]. Based on the assertions, proposed that the architecture of an IoT actually contains three segments which are the hardware segment, the middleware segment and the presentation segment. The hardware segment mainly refers to the connection of sensors or any embedded communication hardware. The middleware segment usually refers to cloud environment which is responsible for data storage, computation and data analytics. The presentation segment, on the other hand, visualizes the result of data analytics or interprets the data in an easy and understandable format. Moreover, an IoT must possess the capabilities of communication and cooperation, addressability, identification, sensing, actuation, embedded information processing, localization and user interfaces. At the hardware segment, wireless sensor network is expected to be a key technology for various IoT applications such as home automation, and energy saving[8]. The sensor devices in the wireless sensor network work as the communicate node and will communicate to other devices wirelessly. The sensor device also carries out its designated duty to collect data and send data to data center. Therefore, communication and measurement are the two major functions of a wireless sensor network. ZigBee is the name of a standard that specifies the application layer of a wireless network in a small area with a low communication rate. Previous researches and projects have shown that ZigBee[20,21,22] sensor networks are suitable for applications in many different areas.

2.6 Architecture

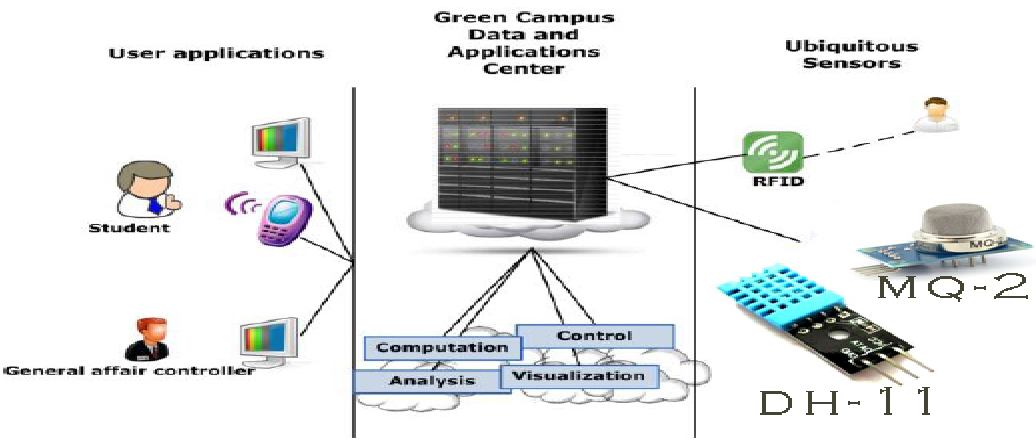

Fig 1 Components Interaction

The above figure will show the architecture[4] of the IoT the user applications like pc, mobile, general affair controller are used in this. We use sqlyog as the database in our project. The data and application center consists of computation, control, analysis and dynamical visualization of data. The sensors we use are RFID, Zigbee network are the ubiquitous sensors[6].

3. EXISTING SYSTEM

It contains three layers namely Application Layer, Network Layer and Awareness Layer[7]. Every Layer has its own task to perform the Operation but it takes more Power and More time delay to Perform.

Application layer

The application layer consists of intelligent teaching and research, intelligent resource manager and intelligent design where gather the information aggregation and sent it to the network layer.

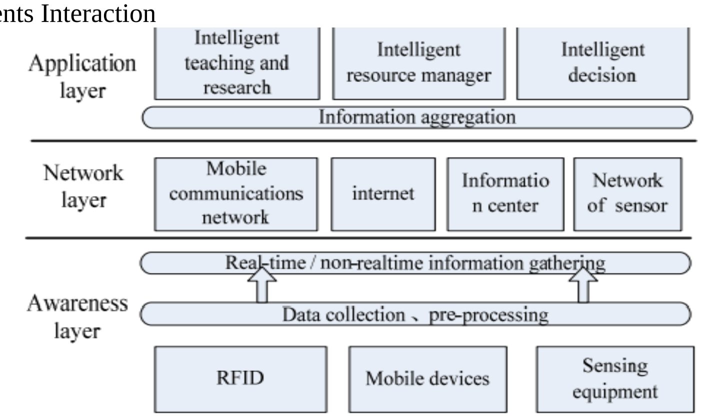

Fig.2 Existing System

Network layer

Network layer consists of mobile communications network which receives the information from the mobiles, Internet is the medium of sending and requesting the information from information center and the network sensor.

Awareness layer

It deals with the real-time, non-real time information gathering by the data collection and preprocessing of the RFID, Mobile devices and sensing equipment.

Existing system disadvantages

- Top Level Design is not perfect.
- The designer ignores to dig deeply the value of information resources, so that the resources are difficult to be share.
- More Components are required to implement.
- More Power Consumption by Components that used.
- Budget overflow.

4. PROPOSED FRAMEWORK

The architecture consists of three major segments which are the hardware segment, the middleware segment and the presentation segment. The hardware segment mainly uses RFID to induce the students who are going to enter the computer labs. The IoT[16,17] is setup to connect the computers and the air conditioners in the lab. Not only do the computers own an IP, but also each air conditioner is assigned an IP. The temperature sensor module of ZigBee[18,19] is used to monitor the temperatures in the lab[8,9,10].

Proposed system advantages

- The computer labs can be managed efficiently.
- The use of the computers will be monitored at all times.
- This mechanism decreases the number of idle power-on computers.
- The carbon, temperature and humidity present in the atmosphere will be analyzed.
- Reduces Carbon Production.

5.COMPONENTS

The proposed framework has the following components.

5.1 Hardware requirements

5.1.1 RFID

RFID is a technology which wirelessly identifies the chips or tag of interest and captures the data. It is also known as AIDC. AIDC consists of card technology, barcodes used on products technology, biometric systems optical photo recognition systems. RFID perfectly identifies the tags or the products attached with it provided they are present within the range. As a result it finds lot of applications in manufacturing or retail industries.

Any RFID system comprises of three components:

1. RFID tags
2. RFID reader
3. RFID middleware application

These are the components that integrate into the host system. The information unique to each person or each product are contained in the RFID tags. This information is transferred to reader wirelessly and further processing is done.

5.1.2 RFID Reader

The RFID readers are the devices which emits radio signals through antennae. They provide necessary amount of power to the tags, if passive tags are used. The tags will be collect data from the RFID reader which is provided by the data stream. The reader collects the information through Antennae. The data flow between the tags and the reader are handled by Middleware. Large number of tags can be detected simultaneously without any problem. RFID readers are of many types. Generally they are characterized on the basis of shape and size. They can be broadly put in three categories, one is fixed readers, second is hand-held readers and the third is mobile readers. Fixed readers are fixed to the walls or doors.

5.1.3 EM-18 READER MODULE

It is used to read unique ID from RFID tags. Whenever RFID tags comes in range, RFID reader reads its unique ID and transmits it serially to the microcontroller or PC. RFID reader has transceiver and an antenna mounted on it. It is mostly fixed in stationary position. EM18 is a RFID reader which is used to read RFID tags of frequency 125 kHz. After reading tags, it transmits unique ID serially to the PC or microcontroller using UART communication or Wiegand format on respective pins. EM18 RFID reader reads the data from RFID tags which contains stored ID which is of 12 bytes. EM18 RFID reader doesn't require line-of-sight. Also, it has identification range which is short i.e. in few centimetres.

5.1.4 RFID reader EM-18 features

1. Serial RS232/TTL output
2. Operating Frequency is 125 KHz.
3. Range is 5-8 cm.

Fig.3 EM-18 Reader Module

5.1.5 RFID TAGS

RFID tags are used for data transmission which contains wire circuit and antenna. The required amount of power from the RFID reader is received from the antenna. It also responds to the interrogation signal provided by the reader. RFID tags can be as small as a pin or can be as large as an identity card. They store information such as unique ID or mfd, in our project we use identity cards for the gathering the data. Date, expiry date etc. RFID reader has various designs based on the operating carrier frequency, amount of information it is holding, memory it will be holding. RFID tags can be read/write type or can active/passive type. Passive tags do not have power source of its own. They take power from the reader, whereas active tags have a small battery from which they draw their power, and therefore have larger communication ranges, higher data transfer speed, more amount of data storage is possible, and high price have different types of RFID tags.

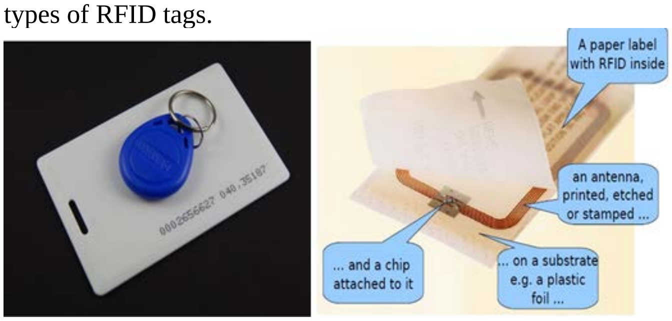

Fig.4 RFID Tags for Reader Module

5.1.6 RFID MIDDLEWARE

The RFID middleware is very important part of any RFID system. It collects all the data that tags give, does the filtering task and then send the data by Weigand or RS232 format. Then it routes the data to the dedicated information system. RFID middleware actually is used to manage and control the RFID readers' infrastructures. It acts as the brain of any RFID system as it provides the most important functionalities. Some Through there is a specific flowchart/algorithm for implementing the RFID systems, yet suitable tags, reader, antennas and middleware are selected based on the requirement.

For example passive tags are used for high volume and low cost retail items; semi-dynamic labels are used for tracking medium cost items; at long last, dynamic tags are used for the costly items such as automobiles.

There are some problems in terms of low standards and large cost of hardware necessary to deploy RFID (e.g. tags, middleware). Apart there are a lot of problems based on the privacy and security. There are also many problems specific to different industries. Lastly there are also some technical problems such as inter-organizational information system and simultaneously management of large amount of data.

5.2 SENSORS

5.2.1 Temperature & humidity sensor(DHT-11)

This DFRobot DHT11 Temperature & Humidity Sensor [3] features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a high performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness. Each DHT11 element is strictly calibrated in the laboratory that is extremely accurate on humidity calibration. The calibration coefficients are stored as programmes in the OTP memory, which are used by the sensor's internal signal detecting process. The single-wire serial interface makes system integration quick and easy. Its small size, low power consumption and up-to-20 meter signal transmission making it the best choice for various applications, including those most demanding ones. The component is 4-pin single row pin package. It is convenient to connect and special packages can be provided according to users' request.

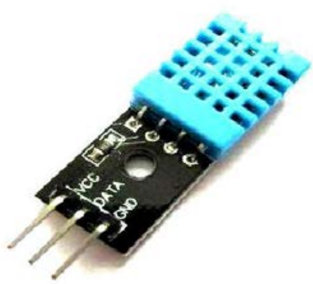

Fig.5 DHT-11 Temperature Sensor

5.2.2 Pollution sensor

Sensitive material of MQ-2 gas sensor[3] is SnO2, which with lower conductivity in clean air. When the target combustible gas exist, The sensor's conductivity is more higher along with the gas concentration rising. Please use simple electro circuit, Convert change of conductivity to correspond output signal of gas concentration. MQ-2 gas sensor has high sensitivity to LPG, Propane and Hydrogen, also could be used to Methane and other combustible steam, it is with low cost and suitable for different application.

- Good sensitivity to Combustible gas in wide range.
- High sensitivity to LPG, Propane and Hydrogen.
- Long life and low cost.
- Simple drive circuit.

Fig.6 MQ-2 Air Sensor (with Smoke, CO, LPG)

Applications:

- Domestic gas leakage detector.
- Industrial Combustible gas detector.
- Portable gas detector.

5.3 ARDUINO UNO

Fig.7 Arduino UNO Board

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 programmed as a USB-to-serial converter. Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. Revision 3 of the board has the following new features:

- 1.0 pin out: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.
- Stronger RESET circuit.
- At mega 16U2 replace the 8U2. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0.
- The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

6 RFID ANALYSIS

RFID (Radio-frequency Identification) technology is a part of Automatic Identification and Data Capture (AIDC). It is a wireless system that uses radio waves for tracking objects. Objects are attached with RFID tags that contain electronically stored information also known as 'identity'. RFID involves three main components that are scanning antenna or coil, transceiver or reader, and transponder or RFID tag. On the basis of the power source, the RFID tags can be classified in two types, active tags , and passive tags. RFID has been used in various business operations by many of the industries. Its cost-effectiveness and efficiency are few of its many benefits that has attracted numerous industries. In recent years, there have been many advancements in this technology. As a result, small businesses can also integrate RFID to enhance their business operations. Experts say that this technology is here to stay with us. It is important to know in detail about this technology.

History

The oldest known application of radio-based identification system dates back to the 1940s, i.e., during the World War II. This radio-based identification system was known as Identification Friend or Foe (IFF), and the allied fighters used it. IFF was used to distinguish between theirs plane and the enemy's plane. Works for developing an RFID system began in the early 1970s. Finally in 1979, a landmark RFID application was developed that paved the way for a more enhanced version of RFID.

Current Scenario

As a result of continuous developments in the RFID technology, it has become the most reliable, efficient and cost-effective wireless communications technology. It is a revolutionary technology that has transformed various business applications. This technology is being widely used in many industries. In recent years, market analysts have observed a significant growth in the usage of RFID-based monitoring systems in various industries. Advancements in RFID led to the development of UHF (Ultra High-frequency) RFID. With UHF RFID, companies can expect a better performance and high reliability. Studies suggest that RFID can be utilized in many other operations to make our work a lot easier. It is used anti-shoplifting systems as well as advanced burglar alarms.

Future of RFID Technology

Market analysts divide the RFID adoption into different eras that are proprietary era, compliance era, RFID-enabled enterprise era, RFID-enabled industries era, and the internet of things era. Proprietary era was the beginning of RFID adoption stage where government and businesses used to track a particular item. In the compliance era, the business used RFID-based systems for monitoring and tracking of objects. In the near future RFID-enabled enterprise era will come to existence. In this era, the companies can use RFID to improve their processes and hence improve their performance. Going by the future predictions for RFID-enabled industries era and internet of things era, the future of RFID seems bright.

MQ-2 Semiconductor Sensor for Combustible Gas

Sensitive material of MQ-2 gas sensor is SnO_2, which with lower conductivity in clean air. When the target combustible gas exists, the sensor's conductivity is more higher along with the gas concentration rising. Please use simple electronic circuit, Convert change of conductivity to correspond output signal of gas concentration. MQ-2 gas sensor has high sensitivity to LPG, Propane and Hydrogen, also could be used to Methane and other combustible steam, it is with low cost and suitable for different application.

Character

- Good sensitivity to Combustible gas in wide range.
- High sensitivity to LPG, Propane and Hydrogen.
- Long life and low cost.
- Simple drive circuit.
- Application
- Domestic gas leakage detector.
- Industrial Combustible gas detector.
- Portable gas detector.

Where to use MQ-2 Gas sensor

The MQ-2 Gas sensor can detect or measure gasses like LPG, Alcohol, Propane, Hydrogen, CO and even methane. The module version of this sensor comes with a Digital Pin which makes this sensor to operate even without a microcontroller and that comes in handy when you are only trying to detect one particular gas. When it comes to measuring the gas in ppm the analog pin has to be used, the analog pin also TTL driven and works on 5V and hence can be used with most common microcontrollers. So if you are looking for a sensor to detect or measure gasses like LPG, Alcohol, Propane, Hydrogen, CO and even methane with or without a microcontroller then this sensor might be the right choice for you.

How to use the MQ-2 sensor to measure PPM

If you are looking for some accuracy with your readings then measuring the PPM would be the best way to go with it. It can also help you to distinguish one gas from another. So to measure PPM you can directly use a module. A basic wiring for the sensor from datasheet is shown below.

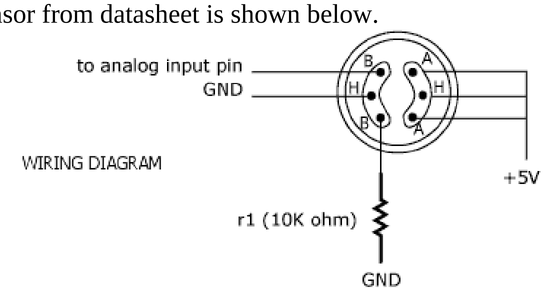

Fig.11 Internal Structure of MQ-2 Sensor

The procedure to measure PPM using MQ sensor is the same but few constant values will vary based on the type of MQ sensor used. Basically, we need to look into the (Rs/Ro) VS PPM graph given in the datasheet (also shown below).

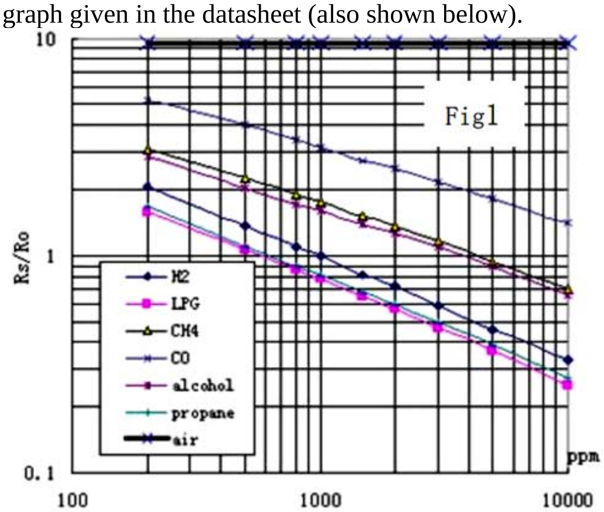

Fig.12 Output Results Analysis

The value of Ro is the value of resistance in fresh air and the value of Rs is the value of resistance in Gas concentration. First, you should calibrate the sensor by finding the values of Ro in fresh air and then use that value to find Rs using the formulae.

Resistance of sensor(Rs): $Rs=(Vc/VRL-1)\times RL$

Once we calculate Rs and Ro we can find the ratio and then use the graph shown above we can calculate the equivalent value of PPM for that particular gas.

2D model of MQ-2 Gas sensor

If you purchased sensor then you can use the following dimensions to create your own PCB for your application.

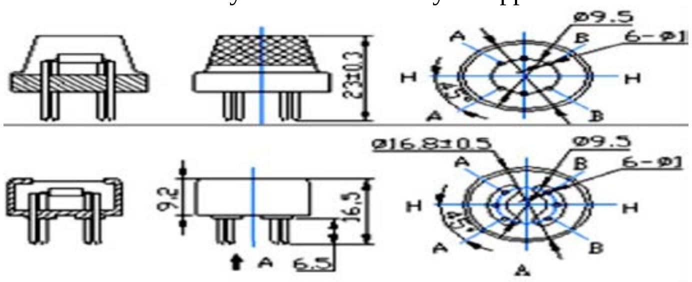

Fig.13 2D model of MQ-2 Sensor

DHT11 Temperature and Humidity Sensor

DHT11 is a part of DHTXX series of Humidity sensors. The other sensor in this series is DHT22. Both these sensors are Relative Humidity (RH) Sensor. As a result, they will measure both the humidity and temperature. Although DHT11 Humidity Sensors are cheap and slow, they are very popular among hobbyists and beginners.

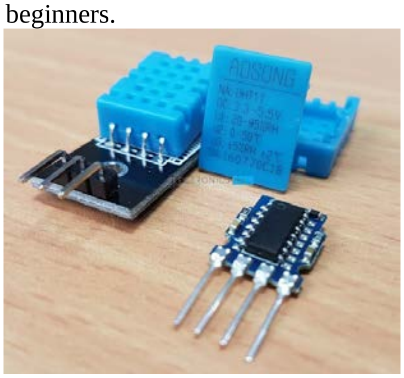

Fig.14 DHT11 Temperature and Humidity

The DHT11 Humidity and Temperature Sensor consists of 3 main components. A resistive type humidity sensor, an NTC (negative temperature coefficient) thermistor (to measure the temperature) and an 8-bit microcontroller, which converts the analog signals from both the sensors and sends out single digital signal. This digital signal can be read by any microcontroller or microprocessor for further analysis.

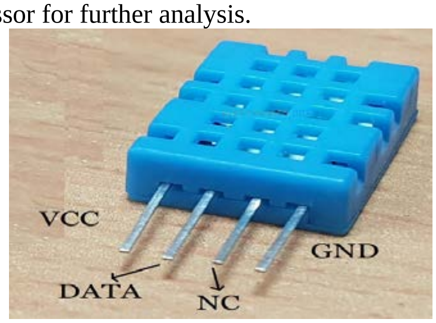

Fig.15 DHT-11 Sensor Pin Connections

DHT11 Humidity Sensor consists of 4 pins: VCC, Data Out, Not Connected (NC) and GND. The range of voltage for VCC pin is 3.5V to 5.5V. A 5V supply would do fine. The data from the Data Out pin is a serial digital data.

The following image shows a typical application circuit for DHT11 Humidity and Temperature Sensor. DHT11 Sensor can measure a humidity value in the range of 20 – 90% of Relative Humidity (RH) and a temperature in the range of 0 – 50^{0}C. The sampling period of the sensor is 1 second i.e. All the DHT11 Sensors are accurately calibrated in the laboratory and the results are stored in the memory. A single wire communication can be established between any microcontroller like Arduino and the DHT11 Sensor.

Also, the length of the cable can be as long as 20 meters. The data from the sensor consists of integral and decimal parts for both Relative Humidity (RH) and temperature.

The data from the DHT11 sensor consists of 40 – bits and the format is as follows:

8 – Bit data for integral RH value, 8 – Bit data for decimal RH value, 8 – Bit data for integral Temperature value, 8 – Bit data for integral Temperature value and 8 – Bit data for checksum.

Example

Consider the data received from the DHT11 Sensor is 00100101 00000000 00011001 00000000 00111110.

00100101	00000000	00011001	00000000	00111110
High Humidity	Low Humidity	High Temperature	Low Temperature	Checksum (Parity)

In order to check whether the received data is correct or not, we need to perform a small calculation. Add all the integral and decimals values of RH and Temperature and check whether the sum is equal to the checksum value i.e. the last 8 – bit data.

00100101 + 00000000 + 00011001 + 00000000 = 00111110

This value is same as checksum and hence the received data is valid. Now to get the RH and Temperature values, just convert the binary data to decimal data.

RH = Decimal of 00100101 = 37%

Temperature = Decimal of 00011001 = 25^{0}C

7. RFID SYSTEM ARCHITECTURE

7.1 RFID system architecture

The RFID architecture will be divided into three parts to break down its complexity, which can vary greatly depending on the implementation. Every system contains of a RF subsystem and most also of an enterprise subsystem. RFID systems aiding the supply chain often also contains an inter-enterprise subsystem.

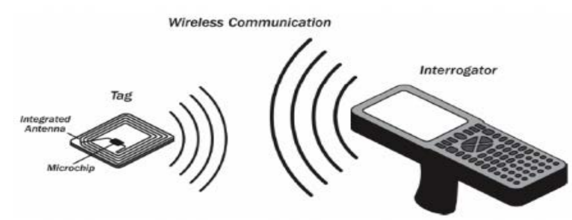

Fig.16 RFID System Architecture

7.2 RF Subsystem

The RF Subsystem enables the unique wireless identification. It consists of tags and the readers. Tags are used to mark an object or subject. Readers are then used to communicate with the tags in order to register their ID, store information on the tag or invoke more advanced operations.

7.3 Enterprise Subsystem

The enterprise subsystem contains the middleware, analytic systems and the network infrastructure. The middleware filters the raw data from the readers for the back end. An example of the enterprise subsystem Applications. It filters for example faulty and duplicate data. This reduces complexity. The analytic systems only get the data they need to know. Middleware systems are also used for monitoring and managing the readers. Analytic systems are processing the output of the middleware system. This could mean to get further information according to the IDs on that tags and to analyse and aggregate the available data to optimise the supply chain. Data could also be made available on Web servers for access to authorised users.

The network infrastructure provide the communication means to connect the RF subsystem with the enterprise subsystem and to connect the discrete parts of the enterprise subsystem. Important characteristics are for example the physical and logical topology and the protocols.

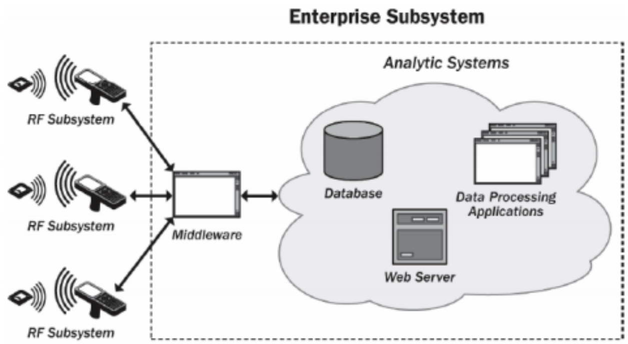

Fig.17 Enterprise Subsystem

7.4 Inter-Enterprise Subsystem

The inter-enterprise subsystem connects enterprise subsystems. This is used when data needs to be shared between different companies. RFID systems with an inter-enterprise subsystem are also called open or online systems. A scheme of the inter-enterprise subsystem offline systems. Common examples for open systems are applications in the supply chain that are supporting the EPC standard. Another part is the Object Naming Service (ONS). It is used in a supply chain application to connect the ID on the tag to further information about the product the tag is attached to. It is designed to work across company boundaries. ONS is somehow similar to DNS (Domain Name Service). The ID on the tag, is resolved to an address where further information can be accessed. Another alternative to resolve the IDs on the tag is to use the EPC Discovery Service. It is similar to search engines. Different addresses can be returned which might correspond to a specific point in the life cycle of the object.

8 CONCLUSION

The Analysis of Humidity, Temperature and Pollution Causes Gases helps to prevent or control the use of dangerous Gases and also helps to norm the pollution free campus using this Sensing and Analysing method. Coming to Rfid, it helps to minimize the use of power consumption as well as help to note down the presented and absented students with in the time and date. Not only for attendance it will also acts as a identification card for student/faculty who belongs to the same campus. Details of them can know by swapping the card through em-18 module. If we implement this Rfid to entire campus will helps for easy accessing and storing data. Thus, pollution, temperature, humidity and Rfid helps to achieve "GREEN CAMPUS"

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