FINAL REPORT

TEAM ID	**PNT2022TMID30616**
TOPIC NAME	**GAS LEAKAGE MONITORING AND ALERTING SYSTEM FOR INDUSTRIES**
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ABSTRACT

Safety plays a major role in today's world and it is necessary that good safety systems are to be implemented in places of education and work. This work modifies the existing safety model installed in industries and this system also be used in homes and offices. The main objective of the work is designing microcontroller based toxic gas detecting and alerting system. The hazardous gases like LPG and propane were sensed and displayed each and every second in the display. If these gases exceed the normal level, then an alarm is generated immediately and also an alert message (SMS) is sent to the authorized person through user. The advantage of this automated detection and alerting system over the manual method is that it offers quick response time and accurate detection of an emergency and in turn leading faster diffusion of the critical situation. Air pollution became the major problem in the world. The world is getting polluted because of emission of dangerous gases into air such as CO_2, SO_2, NO_2, and CO. These toxic gases are dissolved in air and cannot be predicted. Hence a tool is required to check the air quality. The air pollution can be monitor by using internet-based devices like IoT. Internet of thing (IoT) devices can collect the data and based on data can analysis for prediction i.e., quality of air is good or not. Thus, the air quality of a particular area can be monitored using IOT based devices and sensors using node Mcu. The purpose of this research study is to understand Information on environmental variables and also allowing easy integration into any other type of internet-based architecture (IoT) which allows the use of sensors capable of collect information on sensors related to smart city

environment measurements, with a view to providing data on which environmental pollutionrelated information.

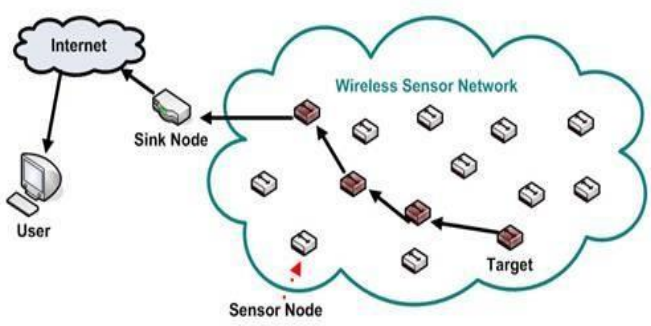
CHAPTER 1

INTRODUCTION

WIRELESS SENSOR NETWORK

A **wireless sensor network** (WSN) is a computer network consisting of spatially distributed autonomous devices using sensors to cooperatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants, at different locations. The development of wireless sensor networks was originally motivated by military applications such as battlefield surveillance. However, wireless sensor networks are now used in many civilian application areas, including environment and habitat monitoring, healthcare applications, home automation, and traffic control.

In addition to one or more sensors, each node in a sensor network is typically equipped with a radio transceiver or other wireless communications device, a small microcontroller, and an energy source, usually a battery. The size a single sensor node can vary from shoebox-sized nodes down to devices the size of grain of dust. The cost of sensor nodes is similarly variable, ranging from hundreds of dollars to a few cents, depending on the size of the sensor network and the complexity required of individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and bandwidth. In computer science, wireless sensor networks are an active research area with numerous workshops and conferences arranged each year.



Applications

The applications for WSNs are many and varied. They are used in commercial and industrial applications to monitor data that would be difficult or expensive to monitor using wired sensors. They could be deployed in wilderness areas, where they would remain for many years (monitoring some environmental variable) without the need to recharge/replace their power supplies. They could form a perimeter about a property and monitor the progression of intruders (passing information from one node to the next). There are a many uses for WSNs.

Typical applications of WSNs include monitoring, tracking, and controlling. Some of the specific applications are habitat monitoring, object tracking, nuclear reactor controlling, fire detection, traffic monitoring, etc. In a typical application, a WSN is scattered in a region where it is meant to collect data through its sensor nodes.

- Environmental monitoring
- Habitat monitoring
- Acoustic detection
- Seismic Detection
- Military surveillance
- Inventory tracking
- Medical monitoring
- Smart spaces
- Process Monitoring

Area monitoring

Area monitoring is a typical application of WSNs. In area monitoring, the WSN is deployed over a region where some phenomenon is to be monitored. As an example, a large quantity of sensor nodes could be deployed over a battlefield to detect enemy intrusion instead of using landmines. When the sensors detect the event being monitored (heat, pressure, sound, light, electro-magnetic field, vibration, etc), the event needs to be reported to one of the base stations, which can take appropriate action (e.g., send a message on the internet or to a satellite). Depending on the exact application, different objective functions will require different data-propagation strategies, depending on things such as need for real-time response, redundancy of the data (which can be tackled via data aggregation techniques), need for security, etc.

Characteristics

Unique characteristics of a WSN are:

- Small-scale sensor nodes
- Limited power they can harvest or store
- Harsh environmental conditions
- Node failures
- Mobility of nodes
- Dynamic network topology
- Communication failures
- Heterogeneity of nodes
- Large scale of deployment
- Unattended operation

Sensor nodes can be imagined as small computers, extremely basic in terms of their interfaces and their components. They usually consist of a processing unit with limited computational power and limited memory, sensors (including specific conditioning circuitry), a communication device (usually radio transceivers or alternatively optical), and a power source usually in the form of a battery. Other possible inclusions are energy harvesting modules, secondary ASICs, and possibly secondary communication devices (e.g. RS232 or USB).

The base stations are one or more distinguished components of the WSN with much more computational, energy and communication resources. They act as a gateway between sensor nodes and the end user.

The ability to accurately detect a vehicles location and its status is the main goal of automobile trajectory monitoring systems. Also the high demand of automobiles has also increased the traffic hazards and the road accidents. This is because of the lack of best emergency facilities available in our country this design is a system which can detect accidents in significantly less time and sends the basic information to first aid center within a few seconds covering geographical coordinates, the time and angle in which a vehicle accident had occurred. This alert message is sent to the rescue team in a short time, which will help in saving the valuable lives. These systems are implemented using several hybrid techniques that include wireless communication, geographical positioning and embedded applications.

Our project aims to present a technology automatically detecting the accident and a hardware tracking device based on GSM/GPS technology informing at the occurrence of accident with sufficient details like exact location and time at which accident happened. This project will establish a communication between the control station and the unit installed in vehicles. Vehicles will have GPS/GSM enabled tracking modules and will be tracked in real time using cellular networks. The software embedded in the microcontroller will control the various operations of the device by monitoring waveform from the vibration sensor. In case of accident the device will send an alert message along with location data from GPS module to control station using GSM network. It is a comprehensive and effective solution to the poor rescue response in case of accident. The accident reporting can automatically find a traffic accident, search for the spot and then send the basic information to the rescue agency covering geographical coordinates and the time and circumstances in which a traffic accident took place. At the server end, a control function will extract relevant data and store it in a database, to which accident information from prototypes will be polled in real time. Our system combines advanced hardware design and sophisticated control technology into a compact, reliable package.

CHAPTER 2

LITERATURE SURVEY

[1] METHANE LEAKAGE MONITORING TECHNOLOGY FOR NATURAL GAS STATIONS AND ITS APPLICATION

In this paper they tried to overcame the s of existing leakage monitoring techniques implemented in the natural gas stations. They are high false alarm rate, poor stability, easy to be interfered by background gas, etc. The false alarm r ate can be effectively reduced by simultaneously monitoring the leakage vibration and methane concentration. Results of laboratory tests indicate that the monitoring technology proposed in this paper enjoys such advantages as low cost, easy to-install and high reliability, and can be extensively applied for monitoring the methane leakage in natural gas stations and valve chambers of long-distance and gathering pipelines.

RECUIREMENTS: Computer, Signal demodulator, Single-parameter probe, Reflector, Compressor, Dual parameter probe, Regulating valve.

[2] LPG MONITORING AND LEAKAGE DETECTION SYSTEM

In this paper they measure the amount of gas mixed in the air to sense the leakage, the leakage is also confirmed by the reduced pressure and weight with the certain sensors. The presence of LPG in concentrations from 200–10 000 ppm. The sensor has an outer membrane coated with Tin Dioxide (SnO_2). Upon contact with the components propane and butane, in LPG, this coating reacts with them and results in an output which is converted into an electrical voltage. And then this electrical voltage is responsible for the alerting.

RECUIREMENTS: Weight sensor, Gas sensor, Buzzer, LCD Display, Arduino board, System.

[3] IMPLEMENTATION OF AMMONIA GAS LEAKAGE DETECTION & MONITORING SYSTEM USING INTERNET OF THINGS

This paper implements the ammonia gas leakage detection via a monitoring system with the help of ammonia gas sensor (MQ135), using the concept of the Internet of Things. Ammonia Gas sensor (MQ135) sense and detect a large amount of ammonia gas present in the lab, industries, factories, health care, etc, High concentration of Ammonia results in blindness, lung damage or death. Whenever ammonia gas reaches a threshold level provided in the MQ135 Sensor, the buzzer in the Ammonia Gas Sensor goes off alerting the officials. Electrochemical sensors measure the partial pressure of gases under atmospheric conditions. The system collects data about the various levels of ammonia gas at various times daily.

RECUIREMENTS: Arduino, Microcontroller, Gas Sensor – MQ 135 (Ammonia sensor), Ethernet Shield, Buzzer, ADC Process, System.

ADVANTAGES: • The system will display the ammonia gas level that exceeds its threshold level and provide a comparison on a graphical representation based on the present gas level and historical data in the final report

. [4] ADVANCED MONITORING SYSTEM FOR GAS DENSITY OF GIS This paper introduces a high-performance gas pressure sensor with high sensitivity and stability, and describes the methodology used in improving the accuracy of measured gas pressure by means of eliminating the influence of external disturbances. A yearlong test of the system, which consists of a new gas pressure sensor and calculation algorithms, was carried out on an 84kV GIS in the field. The system demonstrated its sufficient performance for the detection of the slow leakage of 0.5 % per year, which is maximum allowable value of leakage for GIS.

RECUIREMENTS: Temperature logger, High performance gas pressure senso

REFERENCES:

1) Bing Han, Qiang Fu, Hanfang Hou, 'Methane Leakage Monitoring Technology For Natural Gas Stations And Its Application', IEEE 5th International Conference on Computer and Communications,2001.

2) Shruthi Unnikrishnan,1 Mohammed Razil, Joshua Benny, Shelvin Varghese and C.V. Hari, 'LPG Monitoring And Leakage Detection System', Department of Applied Electronics and Instrumentation Engineering, Rajagiri School of Engineering and Technology, Rajagiri Valley, Kakkanad, Kochi, India.

3) J.Vijayalakshmi, Dr.G.Puthilibhai, S.R.Leoram Siddarth, 'Implementation Of Ammonia Gas Leakage Detection & Monitoring System Using Internet Of Things', West Tambaram, Chennai

4) Makiko Kawada, Tadao Minagawa, Eiichi Nagao, Mitsuhito Kamei, Chieko Nishida and Koji Ueda, 'Advanced Monitoring System For Gas Density Of GIS', Mitsubishi Electric Corporation

EXISTING PROBLEM

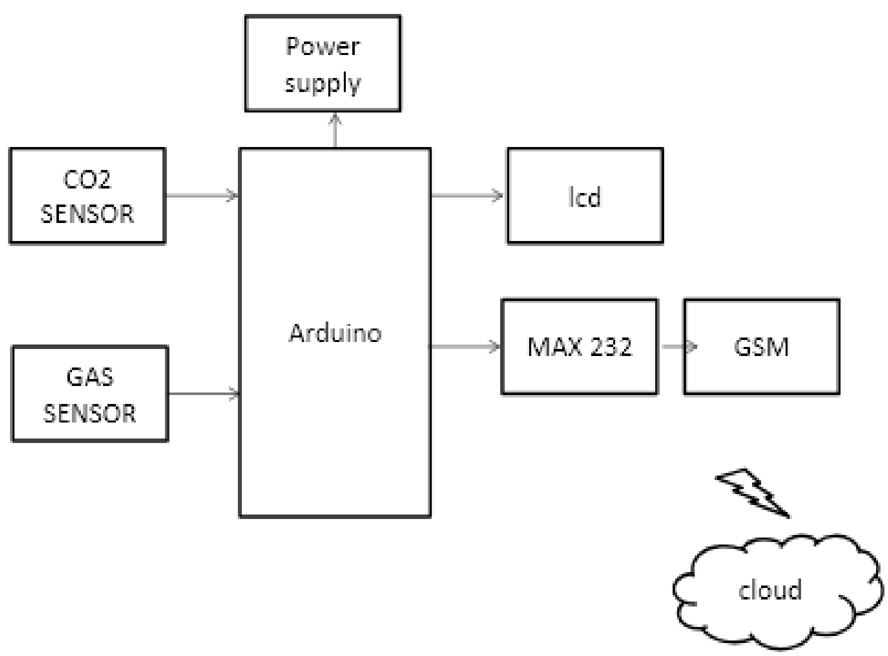
In existing system is This system uses an Arduino microcontroller connected with MQ135 and MQ6 gas sensor which senses the different types of gases present in the environment. It was then connected to the Wi-Fi module which connects to the internet and is used to display the output to the user and buzzer alerts when the ppm crosses certain limit. Their applications were industrial perimeter monitoring, indoor air quality monitoring, site selection for reference monitoring stations, making data available to users. IoT by measuring the concentration of gas using various sensors which were observed through serial monitor of Arduino. This data is collected in Thing speak channels by means of Ethernet shield which is available in live for further processing. These analyzed results were viewed through thing speak in a graphical format. Then the average pollution level was calculated using MATLAB analysis and the time controlled results were viewed through an android app. Further based on the location, the air quality index value was obtained through the android app. Along with this, the health effects were also displayed in this app, so that the users can stay aware of the pollution levels.

CHAPTER 3

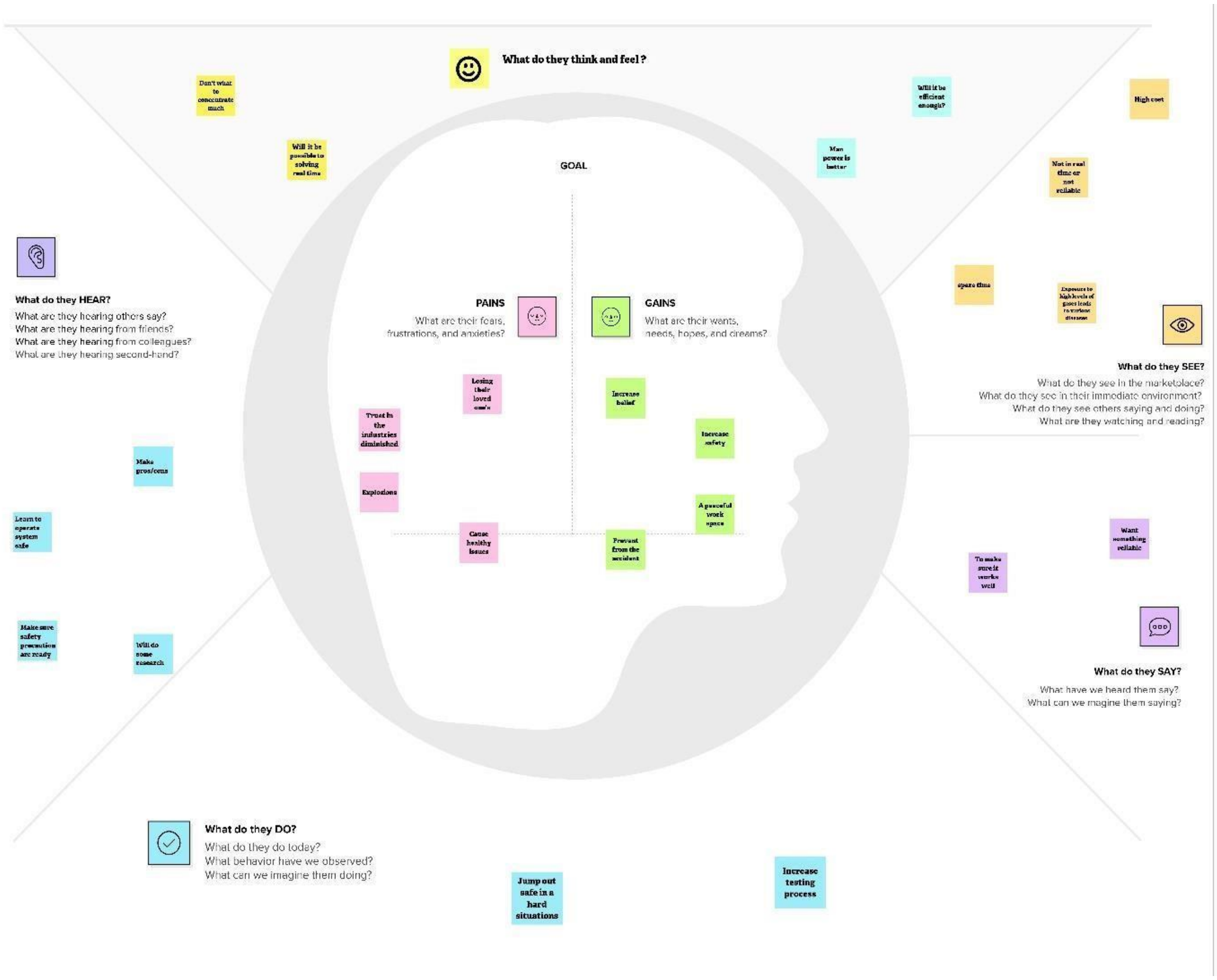
IDEATION & PROPOSED SYSTEM

In proposed system air quality microcontroller takes input in digital form so ADC was used to convert the analog output of the sensor into digital form and gives it as input to the micro controller. These values are continuously displayed on the. A switch pad was used for entering the critical value. If the value of pollutants in air exceeds the critical value entered then the buzzer beeps and also a notification will be sent to the webpage on the mobile phone by the micro controller through the GPRS module. This information is continuously being updated on the webpage which can be accessed globally. A notification was also received on the webpage when the level of pollutants rises above critical value. Mobile phone receives the signal from modem which it forward to server to the internet. Server analysis the data received from the smartphone. It concludes the output from the data received and sends the output over the internet. IOT modules have been used for the wireless communication between the base station and remote sensor node. The IOT modules communicate over cellular networks and a MCU was used to control all the processes on the sensor node. The MCU samples the sensor outputs using an internal ADC, it then calculates the gas concentrations and transmits the computed data as packets using the IOT.

BLOCK DIAGRAM



EMPATHY MAP



CHAPTER-4

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Online payment for the service

FR-2	User Access	Access the details using web browser Access the details using mobile application
FR-3	User alert	Gets alert as an SMS message Gets alert alarm in the working area.

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	**Non-Functional Requirement**	**Description**
NFR-1	**Usability**	The device must be usable by the customer anywhere
NFR-2	**Security**	Data from the sensor are stored securely and away from other data
NFR-3	**Reliability**	Data can be retrieved anytime and no data is discarded without customer knowledge
NFR-4	**Performance**	No performance delay in case of large number of data or parameters

NFR-5	**Scaliablity**	Device must be capable of measuring conditions even in large industry

REQUIREMENTS:

The Arduino Uno R3 is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, 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(Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V

Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm
Weight	25 g

Power

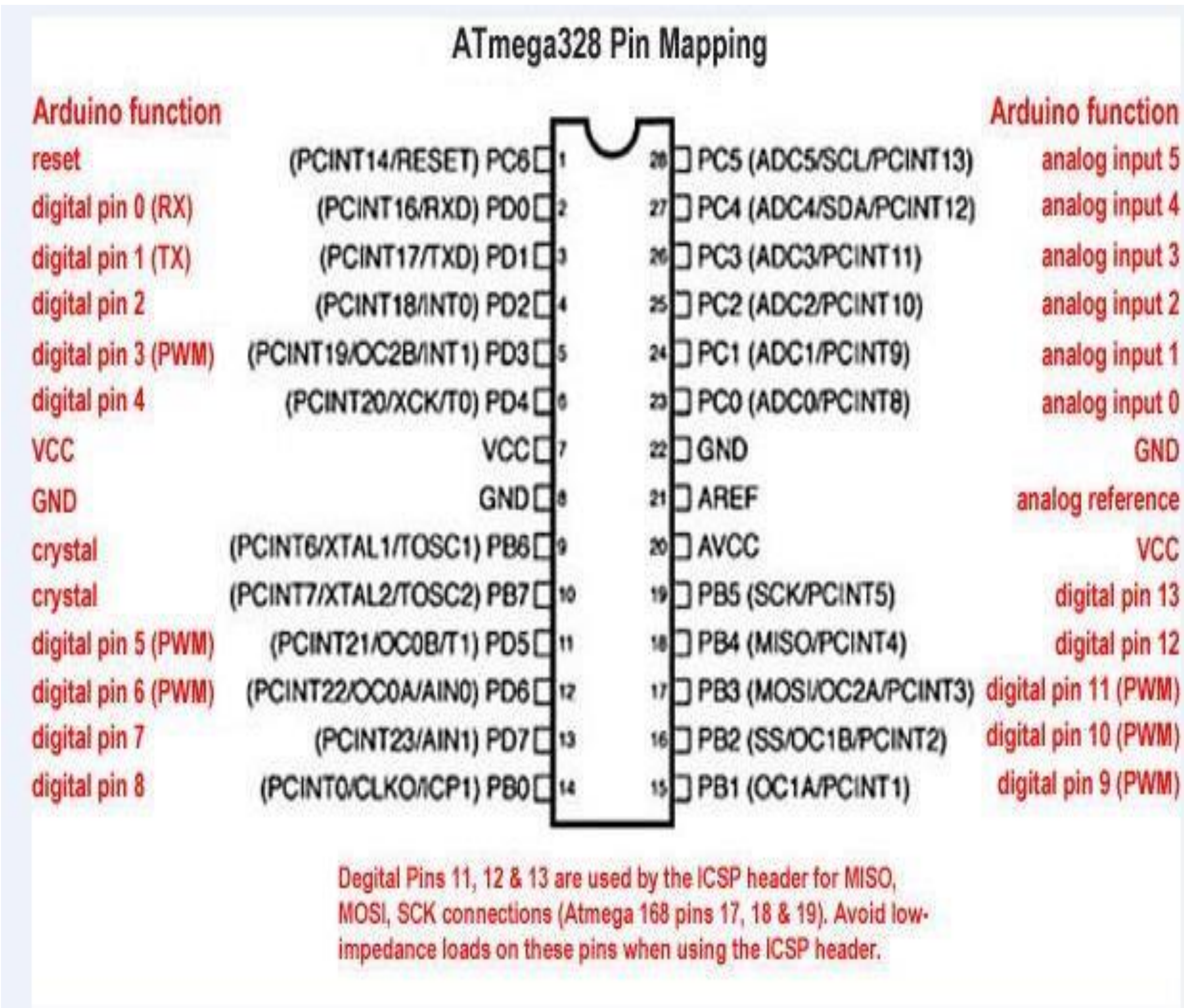
The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an ACto-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm centrepositive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts. The power pins are as follows:

VIN.- The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

5V.- The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.

3V3 - A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

GND. Ground pins.


ATmega328 Pin Mapping
Arduino function
reset
digital pin 0 (RX)
digital pin 1 (TX)
digital pin 2
digital pin 3 (PWM)
digital pin 4
VCC
GND
crystal
crystal
digital pin 5 (PWM)
digital pin 6 (PWM)
digital pin 7
digital pin 8
(PCINT14/RESET) PC6 1
(PCINT16/RXD) PD0 2
(PCINT17/TXD) PD1 3
(PCINT18/INT0) PD2 4
(PCINT19/OC2B/INT1) PD3 5
(PCINT20/XCK/T0) PD4 6
VCC 7
GND 8
(PCINT6/XTAL1/TOSC1) PB6 9
(PCINT7/XTAL2/TOSC2) PB7 10
(PCINT21/OC0B/T1) PD5 11
(PCINT22/OC0A/AIN0) PD6 12
(PCINT23/AIN1) PD7 13
(PCINT0/CLKO/ICP1) PB0 14
28 PC5 (ADC5/SCL/PCINT13)
27 PC4 (ADC4/SDA/PCINT12)
26 PC3 (ADC3/PCINT11)
25 PC2 (ADC2/PCINT10)
24 PC1 (ADC1/PCINT9)
23 PC0 (ADC0/PCINT8)
22 GND
21 AREF
20 AVCC
19 PB5 (SCK/PCINT5)
18 PB4 (MISO/PCINT4)
17 PB3 (MOSI/OC2A/PCINT3)
16 PB2 (SS/OC1B/PCINT2)
15 PB1 (OC1A/PCINT1)
Arduino function
analog input 5
analog input 4
analog input 3
analog input 2
analog input 1
analog input 0
GND
analog reference
VCC
digital pin 13
digital pin 12
digital pin 11 (PWM)
digital pin 10 (PWM)
digital pin 9 (PWM)
Degital Pins 11, 12 & 13 are used by the ICSP header for MISO, MOSI, SCK connections (Atmega 168 pins 17, 18 & 19). Avoid low-impedance loads on these pins when using the ICSP header.

Input and Output:

Each of the 14 digital pins on the Uno can be used as an input or output, using pin Mode(), digital Write(), and digital Read() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 m A and has an internal pull-up resistor (disconnected by default) of 2050 k Ohms. In addition, some pins have specialized functions:

Serial: 0 (RX) and 1 (TX).

Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.

External Interrupts: 2 and 3.

These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attach Interrupt() function for details.

PWM: 3, 5, 6, 9, 10, and 11.

Provide 8-bit PWM output with the analog Write() function.

SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK).

These pins support SPI communication using the SPI library.

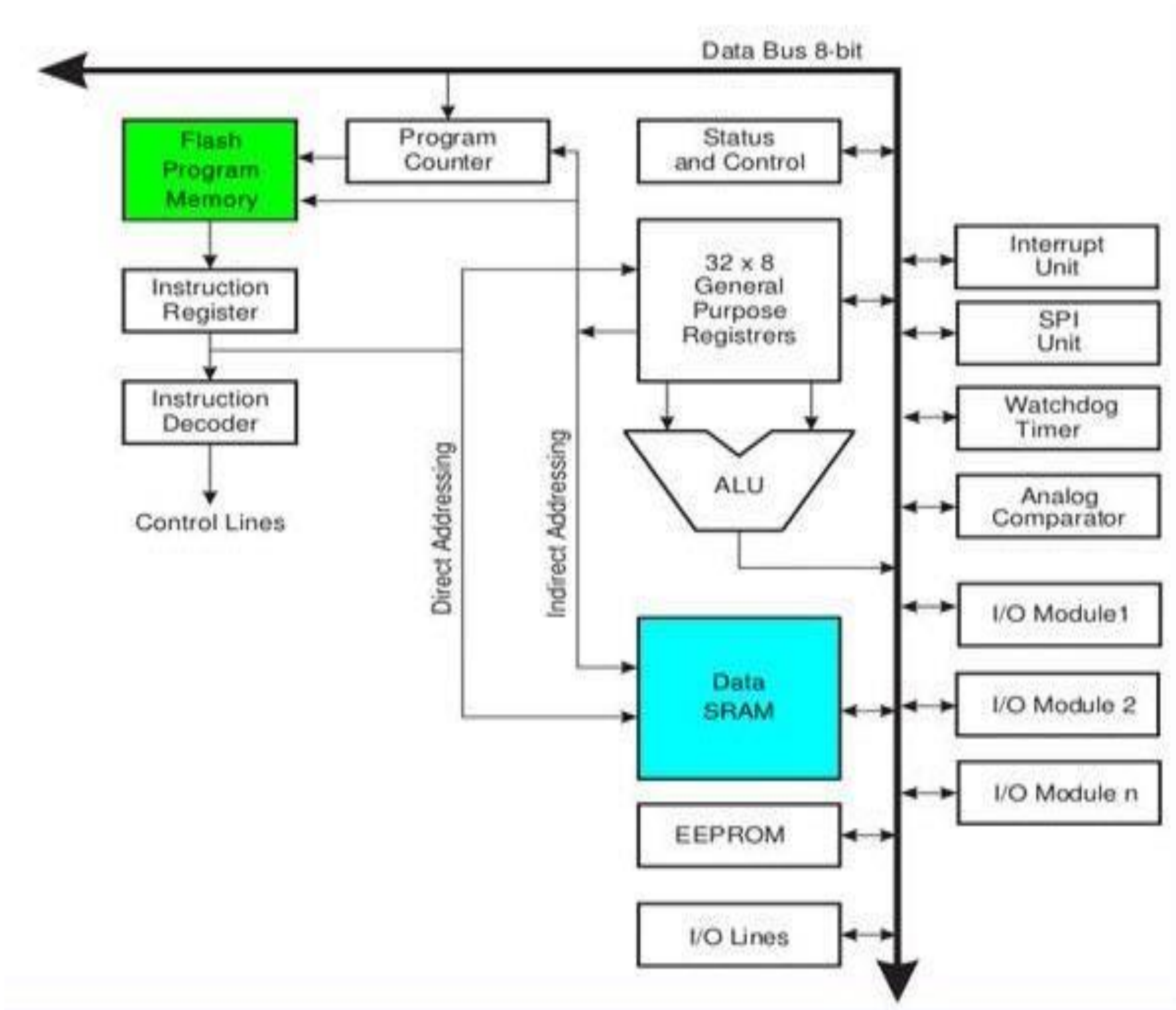
LED: 13.

There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off. 3 | P a g e 3 Arduino Uno The Uno has 6 analog inputs, labelled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference() function. Additionally, some pins have specialized functionality:

I2C: 4 (SDA) and 5 (SCL).

Support I2C (TWI) communication using the Wire library.

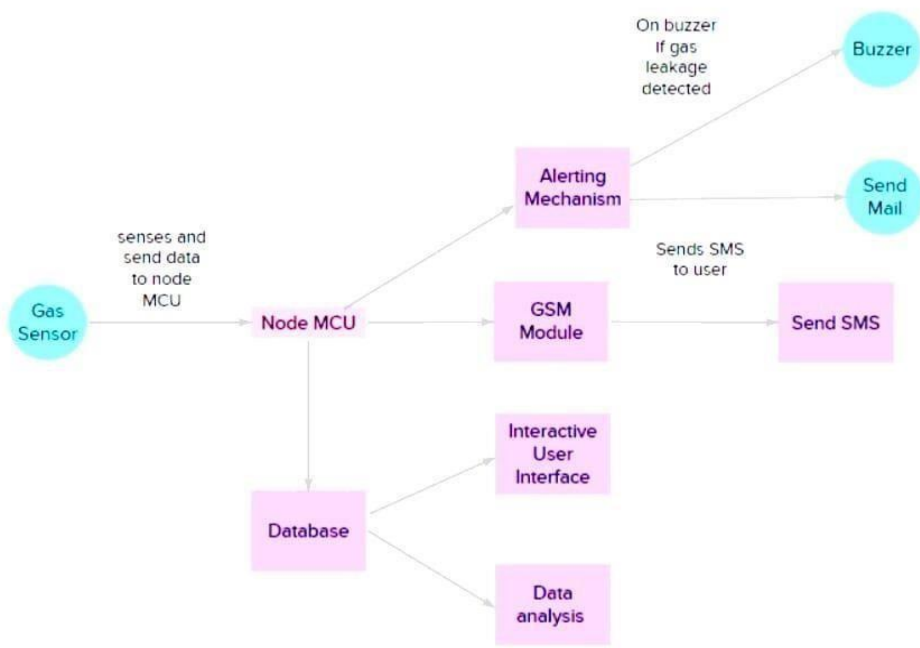
There are a couple of other pins on the board: AREF. Reference voltage for the analog inputs. Used with analog Reference(). Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.



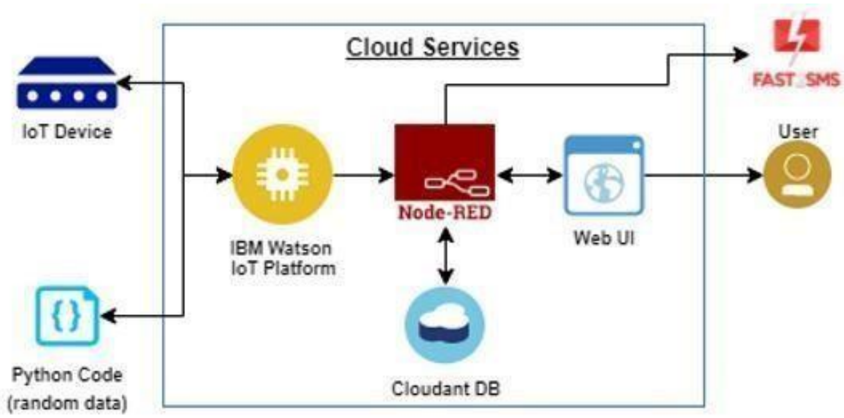
CHAPTER 5:

DATA FLOW DIAGRAM:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



TECHNICAL ARCHITECTURE:



Automatic (Software) Reset

Rather than requiring a physical press of the reset button before an upload, the Arduino Uno is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the ATmega8U2 is connected to the reset line of the ATmega328 via a 100 nanofarad capacitor. When this line is asserted (taken low), the reset line drops long enough to reset the chip. The Arduino software uses this capability to allow you to upload code by simply pressing the upload button in the Arduino environment. This means that the boot loader can have a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload. This setup has other implications. When the Uno is connected to either a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB). For the following half second or so, the boot loader is running on the Uno. While it is programmed to ignore malformed data (i.e. anything besides an upload of new code), it will intercept the first few bytes of data sent to the board after a connection is opened. If a sketch running on the board receives one-time configuration or other data when it first starts, make sure that the software with which it communicates waits a second after opening the connection and before sending this data. The Uno contains a trace that can be cut to disable the auto-reset. The pads on either side of the trace can be soldered together to re-enable it. It's labelled "RESET-EN". You may also be able to disable the auto-reset by connecting a 110 ohm resistor from 5V to the reset line; see this forum thread for details.

USB Over current Protection

The Arduino Uno has a resettable polyfuse that protects your computer's USB ports from shorts and over current. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

Physical Characteristics

The maximum length and width of the Uno PCB are 2.7 and 2.1 inches respectively, with the USB connector and power jack extending beyond the former dimension. Four screw holes allow the board to be attached to a surface or case. Note that the distance between digital pins 7 and 8 is 160 mil (0.16"), not an even multiple of the 100 mil spacing of the other pins.

RELAY:

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits, repeating the signal coming in from one circuit and re-transmitting it to another. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".

BASIC DESIGN AND OPERATION:

A simple electromagnetic relay consists of a coil of wire wrapped around a soft iron core, an iron yoke which provides a low reluctance path for magnetic flux, a movable iron armature, and one or more sets of contacts (there are two in the relay pictured). The armature is hinged to the yoke and mechanically linked to one or more sets of moving contacts. It is held in place by a spring so that when the relay is de-energized there is an air gap in the magnetic circuit. In this condition, one of the two sets of contacts in the relay pictured is closed, and the other set is open. Other relays may have more or fewer sets of contacts depending on their function. The relay in the picture also has a wire connecting the armature to the yoke. This ensures continuity of the circuit between the moving contacts on the armature, and the circuit track on the printed circuit board (PCB) via the yoke, which is soldered to the PCB.

When an electric current is passed through the coil it generates a magnetic field that activates the armature, and the consequent movement of the movable contact(s) either makes or breaks (depending upon construction) a connection with a fixed contact. If the set of contacts was closed when the relay was de-energized, then the movement opens the contacts and breaks the connection, and vice versa if the contacts were open. When the current to the coil is switched off, the armature is returned by a force, approximately half as strong as the magnetic force, to its relaxed position. Usually this force is provided by a spring, but gravity is also used commonly in industrial motor starters. Most relays are manufactured to operate quickly. In a low-voltage application this reduces noise; in a high voltage or current application it reduces arcing.

When the coil is energized with direct current, a diode is often placed across the coil to dissipate the energy from the collapsing magnetic field at deactivation, which would otherwise generate a voltage spike dangerous to semiconductor circuit components. Some automotive relays include a diode inside the relay case. Alternatively, a contact protection network consisting of a capacitor and resistor in series (snubber circuit) may absorb the surge. If the coil is designed to be energized with alternating current (AC), a small copper "shading ring" can be crimped to the end of the solenoid, creating a small out-of-phase current which increases the minimum pull on the armature during the AC cycle.

APPLICATION:

Relays are used for:

- Amplifying a digital signal, switching a large amount of power with a small operating power. Some special cases are:
  - A telegraph relay, repeating a weak signal received at the end of a long wire ○ Controlling a high-voltage circuit with a low-voltage signal, as in some types of modems or audio amplifiers,
  - Controlling a high-current circuit with a low-current signal, as in the startersolenoid of an automobile,
- Detecting and isolating faults on transmission and distribution lines by opening and closing circuit breakers (protection relays)
- Vehicle battery isolation. A 12v relay is often used to isolate any second battery in cars, 4WDs, RVs and boats.
- Switching to a standby power supply.

ARDUINO

Arduino is a computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as opensource hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL),[1] permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits.

The project's board designs use a variety of microprocessors and controllers. These systems provide sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ("shields") and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. The microcontrollers are mainly programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains, the

Arduino project provides an integrated development environment (IDE) based on the Processing language project.

The Arduino project started in 2005 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors

Daigram of Arduino Uno SMD R3

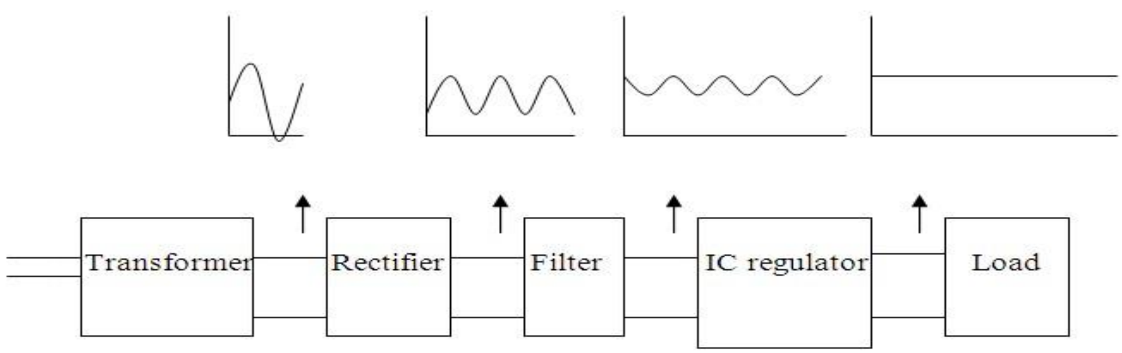
Developer	Arduino
Manufacturer	Many
Type	Single-board microcontroller
Operating system	None
CPU	Atmel AVR (8-bit), ARM Cortex-M0+ (32-bit), ARM Cortex-M3 (32-bit), Intel Quark (x86) (32-bit)
Memory	SRAM
Storage	Flash, EEPROM

POWER SUPPLIES

INTRODUCTION

The present chapter introduces the operation of power supply circuits built using filters, rectifiers, and then voltage regulators. Starting with an ac voltage, a steady dc voltage is obtained by rectifying the ac voltage, then filtering to a dc level, and finally, regulating to obtain a desired fixed dc voltage. The regulation is usually obtained from an IC voltage regulator unit, which takes a dc voltage and provides a somewhat lower dc voltage, which remains the same even if the input dc voltage varies, or the output load connected to the dc voltage changes.

A block diagram containing the parts of a typical power supply and the voltage at various points in the unit is shown in fig 19.1. The ac voltage, typically 120 V rms, is connected to a transformer, which steps that ac voltage down to the level for the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit can use this dc input to provide a dc voltage that not only has much less ripple voltage but also remains the same dc value even if the input dc voltage varies somewhat, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of a number of popular voltage regulator IC units.



IC VOLTAGE REGULATORS

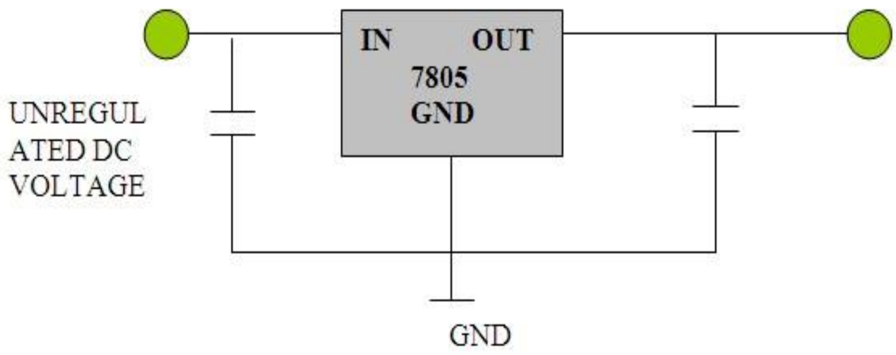
Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. Although the internal construction of the IC is somewhat different from that described for discrete voltage regulator circuits, the external operation is much the same. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set voltage.

A power supply can be built using a transformer connected to the ac supply line to step the ac voltage to desired amplitude, then rectifying that ac voltage, filtering with a capacitor and RC filter, if desired, and finally regulating the dc voltage using an IC regulator. The regulators can be selected for operation with load currents from hundreds of mille amperes to tens of amperes, corresponding to power ratings from mill watts to tens of watts.

THREE-TERMINAL VOLTAGE REGULATORS

Fig shows the basic connection of a three-terminal voltage regulator IC to a load. The fixed voltage regulator has an unregulated dc input voltage, Vi, applied to one input terminal, a regulated output dc voltage, Vo, from a second terminal, with the third terminal connected to ground. For a selected regulator, IC device specifications list a voltage range over which the input voltage can vary to maintain a regulated output voltage over a range of load current. The specifications also list the amount of output voltage change resulting from a change in load current (load regulation) or in input voltage (line regulation).

Fixed Positive Voltage Regulators:



The series 78 regulators provide fixed regulated voltages from 5 to 24 V. Figure 19.26 shows how one such IC, a 7812, is connected to provide voltage regulation with output from this unit of +12V dc. An unregulated input voltage Vi is filtered by capacitor C1 and connected to the IC's IN terminal. The IC's OUT terminal provides a regulated + 12V which is filtered by capacitor C2 (mostly for any high-frequency noise). The third IC terminal is connected to ground (GND). While the input voltage may vary over some permissible voltage range, and the output load may vary over some acceptable range, the output voltage remains constant within specified voltage variation limits. These limitations are spelled out in the manufacturer's specification sheets. A table of positive voltage regulated ICs is provided in table 19.1.

TABLE 19.1 Positive Voltage Regulators in 7800 series

IC Part	**Output Voltage (V)**	**Minimum Vi (V)**
7805	+5	7.3

7806	+6	8.3
7808	+8	10.5
7810	+10	12.5
7812	+12	14.6
7815	+15	17.7
7818	+18	21.0
7824	+24	27.1

How AES encryption works

AES comprises three block ciphers: AES-128, AES-192 and AES-256. Each cipher encrypts and decrypts data in blocks of 128 bits using cryptographic keys of 128-, 192- and 256-bits, respectively. The Rijndael cipher was designed to accept additional block sizes and key lengths, but for AES, those functions were not adopted.

Symmetric (also known as secret-key) ciphers use the same key for encrypting and decrypting, so the sender and the receiver must both know -- and use -- the same secret key. All key lengths are deemed sufficient to protect classified information up to the "Secret" level with "Top Secret" information requiring either 192- or 256-bit key lengths. There are 10 rounds for 128-bit keys, 12 rounds for 192-bit keys and 14 rounds for 256-bit keys -- a round consists of several processing steps that include substitution, transposition and mixing of the input plaintext and transform it into the final output of ciphertext.

The AES encryption algorithm defines a number of transformations that are to be performed on data stored in an array. The first step of the cipher is to put the data into an array; after which the cipher transformations are repeated over a number of encryption rounds. The number of rounds is determined by the key length, with 10 rounds for 128-bit keys, 12 rounds for 192-bit keys and 14 rounds for 256-bit keys.

The first transformation in the AES encryption cipher is substitution of data using a substitution table; the second transformation shifts data rows, the third mixes columns. The last transformation is a simple exclusive or (XOR) operation performed on each column using a different part of the encryption key -- longer keys need more rounds to complete.

Attacks on AES encryption

Research into attacks on AES encryption has continued since the standard was finalized in 2000. Various researchers have published attacks against reduced-round versions of the Advanced Encryption Standard.

Arduino

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

Why Arduino?

Thanks to its simple and accessible user experience, Arduino has been used in thousands of different projects and applications. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users. It runs on Mac, Windows, and Linux. Teachers and students use it to build low cost scientific instruments, to prove chemistry and physics principles, or to get started with programming and robotics. Designers and architects build interactive prototypes, musicians and artists use it for installations and to experiment with new musical instruments. Makers, of course, use it to build many of the projects exhibited at the Maker Faire, for example. Arduino is a key tool to learn new things. Anyone - children, hobbyists, artists, programmers - can start tinkering just following the step by step instructions of a kit, or sharing ideas online with other members of the Arduino community.

There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard, and many others offer similar functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package. Arduino also simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems:

- **Inexpensive** - Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than $50

- **Cross-platform** - The Arduino Software (IDE) runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.

- **Simple, clear programming environment** - The Arduino Software (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with how the Arduino IDE works.

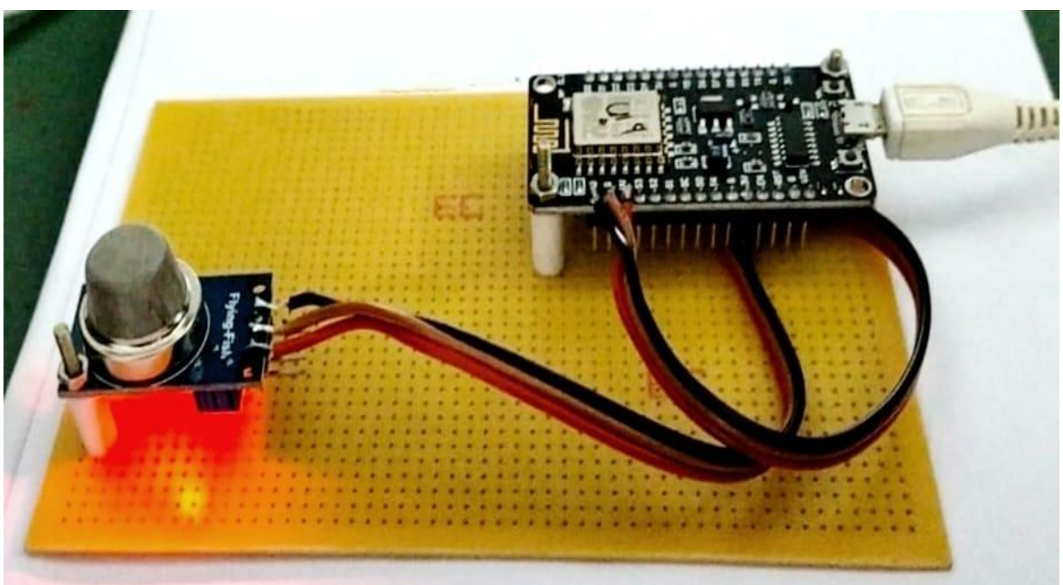
- **Open source and extensible software** - The Arduino software is published as open source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into your Arduino programs if you want to.

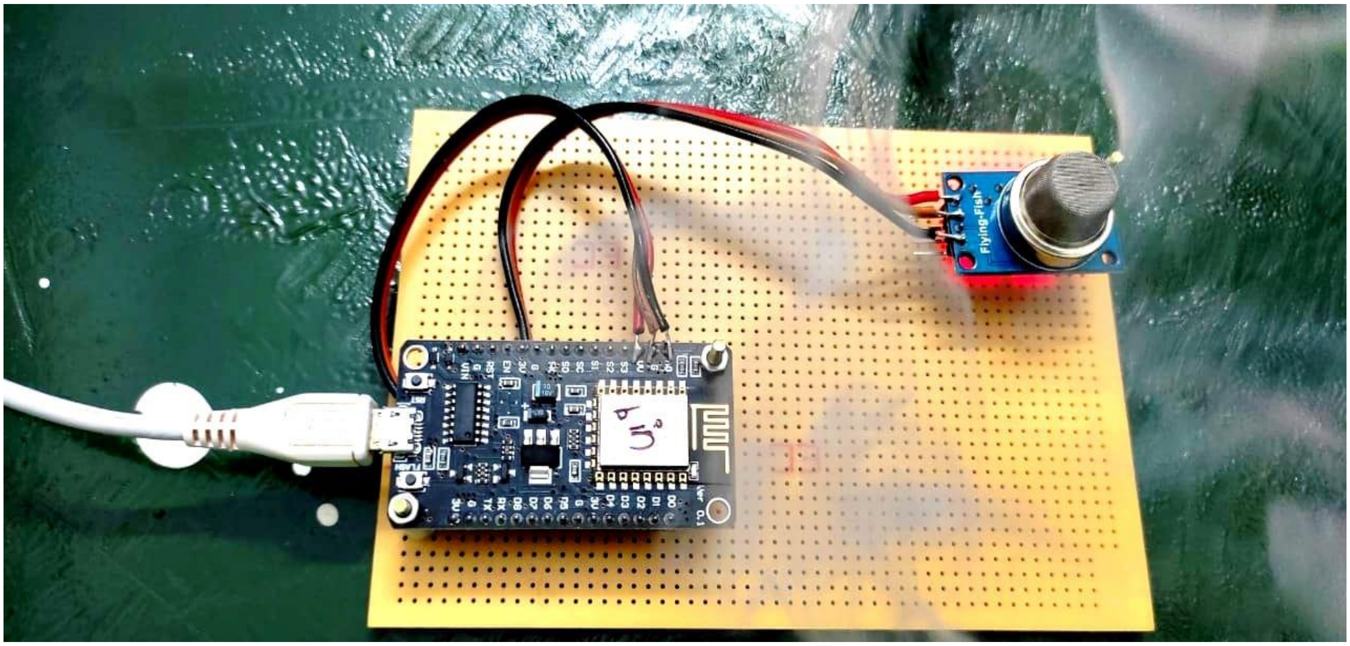
- **Open source and extensible hardware** - The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module in order to understand how it works and save money.

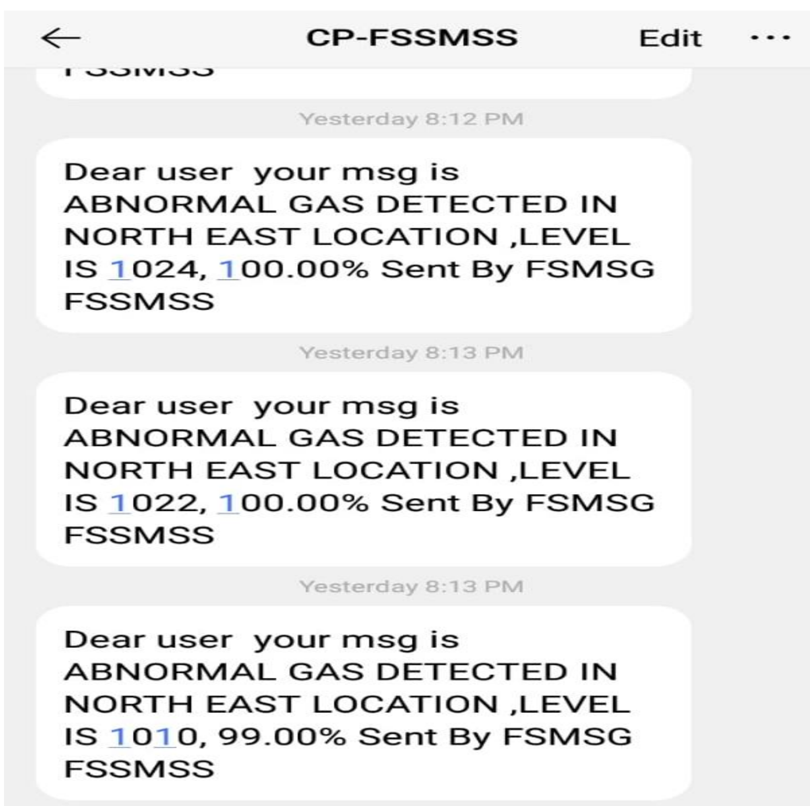
- **Arduino** is an open-source computer hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL),[1] permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form or as do-ityourself (DIY) kits.

The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program *avrdude* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

SCREEN SHOT :






CP-FSSMSS
Edit
Yesterday 8:12 PM
Dear user your msg is ABNORMAL GAS DETECTED IN NORTH EAST LOCATION ,LEVEL IS 1024, 100.00% Sent By FSMSG FSSMSS
Yesterday 8:13 PM
Dear user your msg is ABNORMAL GAS DETECTED IN NORTH EAST LOCATION ,LEVEL IS 1022, 100.00% Sent By FSMSG FSSMSS
Yesterday 8:13 PM
Dear user your msg is ABNORMAL GAS DETECTED IN NORTH EAST LOCATION ,LEVEL IS 1010, 99.00% Sent By FSMSG FSSMSS

ADVANTAGES AND DISADVANTAGES

Advantages:

- Detect the concentration of the gases
- The sensor-enabled solution helps prevent the high risk of gas explosions and affecting any casualties within and outside the premises.
- Get real-time alerts about the gaseous presence in the atmosphere
- Prevent fire hazards and explosions
- Supervise gas concentration levels
- Ensure worker's health
- Real-time updates about leakages
- Cost-effective installation
- Data analytics for improved decisions
- Measure oxygen level accuracy
- Get immediate gas leakalert

Disadvantages:

- Only one gas can be measured with each instrument.
- When heavy dust, steam or fog blocks the laser beam, the system will not be able to take measurements.

SOURCE CODE:

```
#include <ESP8266WiFi.h>

#include <WiFiClient.h>

#include <PubSubClient.h>

#include <ESP8266WebServer.h>

#include <ESP8266HTTPClient.h>



const char* ssid = "SMART-G";

const char* password = "10112019";


#define WT A0

#define CY D0



#define ID "gbezl0"

#define DEVICE_TYPE "ESP8266"

#define DEVICE_ID "GAS"

#define TOKEN "IOT-12345"


char server[] = ID ".messaging.internetofthings.ibmcloud.com";

char publish_Topic1[] = "iot-2/evt/Data1/fmt/json"; char

publish_Topic2[] = "iot-2/evt/Data2/fmt/json"; char
```

```
authMethod[] = "use-token-auth"; char token[] = TOKEN; char
clientId[] = "d:" ID ":" DEVICE_TYPE ":" DEVICE_ID;

WiFiClient wifiClient;
PubSubClient client(server, 1883, NULL, wifiClient);

void setup() {
  Serial.begin(115200);
//    dht.begin();
  Serial.println();
  WiFi.begin(ssid, password);     while
(WiFi.status() != WL_CONNECTED) {
delay(500);
    Serial.print(".");
  }
  Serial.println("");
  Serial.println(WiFi.localIP());

  if (!client.connected()) {
     Serial.print("Reconnecting client to ");
Serial.println(server);        while (!client.connect(clientId,
authMethod, token)) {
        Serial.print(".");
delay(500);
     }
```

```
        Serial.println("Connected TO IBM IoT cloud!");
    }
}

long previous_message = 0; void loop() {
client.loop();     long current = millis();
if (current - previous_message > 500) {
previous_message = current;

        float hum = map(analogRead(A0), 0, 1023, 0, 100);
float temp = map(digitalRead(D0), 0, 1, 0, 100);          if
(isnan(hum) || isnan(temp)  ){     Serial.println(F("Failed
to read sensor!"));     return;
  }

  Serial.print("GAS 1: ");
  Serial.print(hum);



  HTTPClient http;
  String postData;
  String key = Serial.readString();
Serial.print(key);   if(hum >=
80)//8870599026
  {
```

```
   postData = "username=fantasy&password=596692&to=8870599026&from=FSSMSS&message=Dear user
your msg is ABNORMAL GAS DETECTED IN NORTH EAST LOCATION ,LEVEL IS "+String(analogRead(A0))+",
"+String(hum)+"%"+" Sent By FSMSG
FSSMSS&PEID=1501563800000030506&templateid=1507162882948811640";

    Serial.print(postData);

http.begin("http://smsserver9.creativepoint.in/api.php");

http.addHeader("Content-Type", "application/x-www-form-urlencoded");   int

httpCode = http.POST(postData);

  String payload = http.getString();

  Serial.println(payload);

  http.end();

delay(1000);

  }


      String payload = "{\"d\":{\"Name\":\"" DEVICE_ID "\"";

payload += ",\"GAS 1\":";              payload += hum;

payload += "}}";


       Serial.print("Sending payload: ");

       Serial.println(payload);


       if (client.publish(publish_Topic1, (char*) payload.c_str())) {

          Serial.println("Published successfully");

       } else {

          Serial.println("Failed");

       }

//      String payload1 = "{\"d\":{\"Name\":\"" DEVICE_ID "\"";
```

```
//          payload1 += ",\"GAS 2\":";
//          payload1 += hum;
//          payload1 += "}}";
//          Serial.print("Sending payload: ");
//          Serial.println(payload1);
//          Serial.println('\n');
//
//       if (client.publish(publish_Topic2, (char*) payload1.c_str())) {
//         Serial.println("Published successfully");
//      } else {
//         Serial.println("Failed");
//      }
   }
}
```

FUTURE SCOPE

Major cities of India are pushing Smart Home application, gas monitoring system is a part of SmartHome application. Enhancing Industrial Safety using IoT. This system can be implemented in Industries, Hotels and wherever the gas cylinders are used. This system can be used in industries involving applications such as Furnace, Boilers, Gas welding, Gas cutting, Steel Plants, Metallurgical industries, Food processing Industries, Glass Industries, Plastic industries, Pharmaceuticals, Aerosol manufacturing. As hospitals require to provide maximum possible safety to patients, this system can be used to keep track of all the cylinders used in it. Some of the cylinders used are Oxygen cylinder, Carbon dioxide cylinder, Nitrous oxide cylinder. As many students are naive the risk of causing accidents is high. Hence, our system can also be used in schools, colleges. Many colleges have well established labs including chemistry lab and pharmaceutical labs where gas burners are used. Several medical equipment requires gas cylinders.

CONCLUSION

An embedded system for hazardous gas detection has been implemented; here only two gases (LPG and Propane) have been detected for demo purpose. This system provides quick response rate and the diffusion of the critical situation can be made faster than the manual methods. Checking from claiming ph from claiming Water utilization relating sensor.Those framework might screen water personal satisfaction automatically, furthermore it sends notice with commissioned individual and doesn't require kin on obligation alternately physical participation. Thereabouts those water nature trying need with be additional economical, helpful and quick. Those framework need useful adaptability toward swapping those relating sensors and evolving the pertinent projects. This framework camwood be used to screen other water caliber parameters such as turbidity, temperature, broken down oxygen levels. This project will stretch out to figure the temperature of the water and the turbidity of the water (how clean the water is) and also the ph levels of the Water. In this way this framework screens all of these parts also at last it sends those data or information Likewise a SMS with inform those sanctioned persons

REFERENCE

[1] ZulhaniRasin and Mohd Abdullah International Journal Engineering & Technology, "Water leakage Monitoring System Using Zigbee Based Wireless Sensor Network", 2005.

[2] Misiunas, D., Lambert, M., Simpson, A., Olsson, G. “Burst detection and location in water distribution networks,” Water Science and Technology: Water Supply, 5(3–4), 71–80. (2005).

[3] Bowling, Michael. "Leakage testing method for a plate heat exchanger." U.S. Patent 6,062,068, issued May 16, 2000.

[4] Daadoo, M., Tarapiah, S., &Atalla, S. (2016). Evaluating Efficiency of Multi-Layered Switch Architecture in All-Optical Networks. International Journal of Applied Engineering Research, 11(22), 11030-11036.

[5] Daraghmi, Y. A., &Daadoo, M. (2016). Intelligent Smartphone based system for detecting speed bumps and reducing car speed. In MATEC Web of Conferences (Vol. 77, p. 09006).EDP Sciences.

[6] MotazDaadoo, Shadi M.A Atallah and SaedTarapiah."Development of Low Cost Safety Home Automation System using GSM Network."European Journal of Scientific Research ISSN 14502267 Vol. 53 No 3 November, 2016, pp.338-353.

[7] MotazDaadoo, SaedTarapiah and Shadi M.A Atallah. “Analysis and Performance of a Low Cost Multiple Alarm Security System for Smart Home Based on GSM Technology and Controlling
Based on Android Smartphone." European Journal of Scientific Research ISSN 1450-216X / 1450202X Vol. 143 No 2 November, 2016, pp.136-165.

[8] Daadoo, M., &Daraghmi, Y. (2015, August). Searching of optimum characteristics of multilayer switching architecture in all-optical networks. In Heterogeneous Networking for Quality, Reliability, Security and Robustness (QSHINE), 2015 11th International Conference on (pp. 5055). IEEE.

[9] Tarapiah, S., Atalla, S., Hashim, K. F. B., &Daadoo, M. (2016). Mobile Network Planning Process Case Study-3G Network.Computer and Information Science, 9(3), 115.