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GSM Based Hospital Management

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Abstract: *Nowadays, Internet of Things (IoT) is invading almost all sectors of life since it is based on connecting living or non-living things together through computer technology. It is responsible for connecting physical objects together through the internet. Healthcare and hospitals are one of the most important sectors that require a lot of attention to transfer their old form of documentation into SMART management systems. It is essential to analyze health data in order to increase the quality of patient's care. Egypt being a development country is starting to substitute its old governmental systems into electronic SMART technology. IoT devices produce different types of data and transfer them to the cloud computing for storage and analysis. The benefits of using IoT in collecting, transferring, and analyzing patients' data for the hospitals are attracting a lot of researchers. Therefore, the arrangement of smarter and more money saving healthcare services are becoming highly required. Security and privacy, device communication, and data collection and management are some of the challenges that face the IoT technology especially when used with hospital's data. Accordingly, a proposed reference model for making SMART hospital management system is under construction in order to achieve the best performance. The model is taking into consideration both the functional and non-functional requirements of the different participants involved in the hospital management system*

Keywords: Internet of Things

I. INTRODUCTION

The research is based on the use of Internet of Things (IoT) technology to can solve the various problems related to hospitals. In hospitals, electrical and medical equipment's use excessive amount of electricity. The primary ecological effect of energy overuse is an increase in amount of carbon footprint. For example, if the devices are kept running when not necessary, the result is an increase in electrical use. This segment helps to control consumption of electricity. One more important problem related to hospital is to constantly monitored patients. So, it may sometimes occur that due to the carelessness of the hospital staff, some medication may not be properly monitored which can lead to the serious health issues of the patient. In this system using IoT, one can regulate electrical appliances and continuously supervised patients from distant position. The internet of things technology is a revolutionary change maker for the health care industry. It is changing healthcare domain by reducing operational costs and helping caretakers focus on treating patients in a better manner. Nowadays, health care industry is investing its resources in IoT to promote innovation and improvement in their procedures. With intelligent and advanced systems, they can accomplish an unmatched, real-time, life-critical data to consume it in the best possible manner. Various hospitals use various ER services, and are already using smart healthcare solutions to achieve precision in results, for better prediction and for preemptive management plans. IoT can be deeply integrated in healthcare system in various ways. Monitoring and keeping check on maintenance of hygiene providing a central monitoring system for handling core functionalities of the healthcare system and integrating each functional role such as front desk and billing staff and providing facility to numerous patients and doctors. Providing support in optimizing quality and processes by regulating a standard method to operate various functionality such as analytics and connect machines, data, and people. Internet of Things is impacting the healthcare field in a positive way by completely building platform for applications, devices and people to interact and connect with each other in delivering and availing benefits of healthcare solutions. IoT is providing various tools and resources to develop an integrated healthcare system to provide patients with better treatment, cost effective health care and positive treatment outcomes. Thus, it is a combination of multiple resources aggregated that will help healthcare

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solutions provider serve patients in a better way and assist systems to optimize their resources through automated workflows. For example, many hospitals use IoT system for resource utility management and controlling temperature and surrounding atmosphere within operating rooms. Different ways to implement Internet of Things (IoT) in health care industry:

1. Outpatient Monitoring. It permits doctors to capture various health constraints and provide guidance to patients even remotely. Therefore, need of patient's hospital visit is limited and needs to visit only on long interval basis. It helps hospitals manage resources efficiently and subsequently increase revenues at the same time providing excellent treatment to patients. A monitoring device helps the doctor to continue evaluation of the patient and recommend curative measures at regular intervals.
2. Clinical Care Hospitalized patients who requires close attention can be continuously observed using IoT driven, non intruding systems. Sensors are used to collect such data and using cloud technology to examine data. It also helps to improve the value of care through persistent evaluation.

II. METHODOLOGY

Nowadays, the customary process in the medical healthcare systems is to track the patient's vital readings such as: blood pressure, temperature, heart rate, and respiratory rate. These readings are considered as an indicator for the criticalness of the patient. Accordingly, the IoT technology helped so much in recording these readings without interfering in the patient's daily activities. These IoT devices could be small in size and thus could be implemented in smart wearable watches, clothes, jewelries, glasses, or in the smart phones. Therefore, they can help in remote monitoring and easily accessing the patient, thus improving the healthcare, time, and treatment managements. Moreover, the information collected by the IoT devices are easily transferred to the cloud computing mainly for storage. Analysis and interpretation of these information could also be done at the cloud or at the edge computing or at the fog computing technologies based on the required rapidity of the analyzed data. It is believed that the fog and the edge computing technologies have higher processing capabilities than the cloud computing. The most focused drawback of IoT along with other technologies as cloud computing is the security and privacy of data while reading and transferring. However, since the obstacle is clear then many solutions can be proposed for resolving it. Accordingly, to have a reference model for building up a complete SMART healthcare system, there should be a minimum of requirements. In other words, each healthcare system should contain a group of fixed functional and non-functional requirements to act as the basic structure for this system. Additional requirements could be added along the way based on additional extensions, innovations, or necessities

2.1 Objective

Objective of Hospital Management System with IoT Integration and Emergency Alert System:

1. Real-time Monitoring of Hospital Environment:

- Capture and transmit data related to temperature, humidity, and other environmental parameters within the hospital premises using IoT sensors.
- Ensure continuous monitoring to maintain optimal environmental conditions for patient care, staff comfort, and equipment operation.

2. Early Detection of Fire and Emergencies:

- Integrate fire detection sensors into the system to promptly identify any potential fire incidents within the hospital.
- Implement mechanisms to detect other emergency conditions such as smoke, gas leaks, or power outages.
- Enable immediate response and mitigation measures to ensure the safety and well-being of patients, staff, and visitors.

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3. Automatic Alerting System:

- Develop an automated alerting system capable of sending SMS notifications to authorized personnel in case of detected emergencies.
- Ensure timely dissemination of critical information to designated responders, including hospital administrators, security personnel, and fire authorities.

4. Enhanced Safety and Security Measures:

- Strengthen safety and security measures by proactively monitoring environmental conditions and emergency situations.
- Enable rapid decision-making and coordinated responses to mitigate risks and minimize potential harm to individuals and hospital infrastructure.

5. Efficient Resource Allocation:

- Facilitate efficient resource allocation by providing real-time insights into hospital environment data and emergency alerts.
- Enable administrators to allocate staff, equipment, and resources effectively in response to identified needs and emergencies.

6. Compliance with Regulatory Standards:

- Ensure compliance with regulatory standards and guidelines related to hospital safety, environmental monitoring, and emergency preparedness.
- Implement measures to document and track adherence to regulatory requirements, facilitating audits and inspections.

7. Continuous Improvement and Optimization:

- Foster a culture of continuous improvement by leveraging data insights and feedback to optimize hospital management processes.
- Identify opportunities for enhancing operational efficiency, resource utilization, and emergency response protocols based on system performance and user feedback.

By achieving these objectives, the Hospital Management System with IoT integration and emergency alert capabilities aims to enhance patient safety, improve operational efficiency, and mitigate risks associated with environmental hazards and emergencies within the hospital environment.

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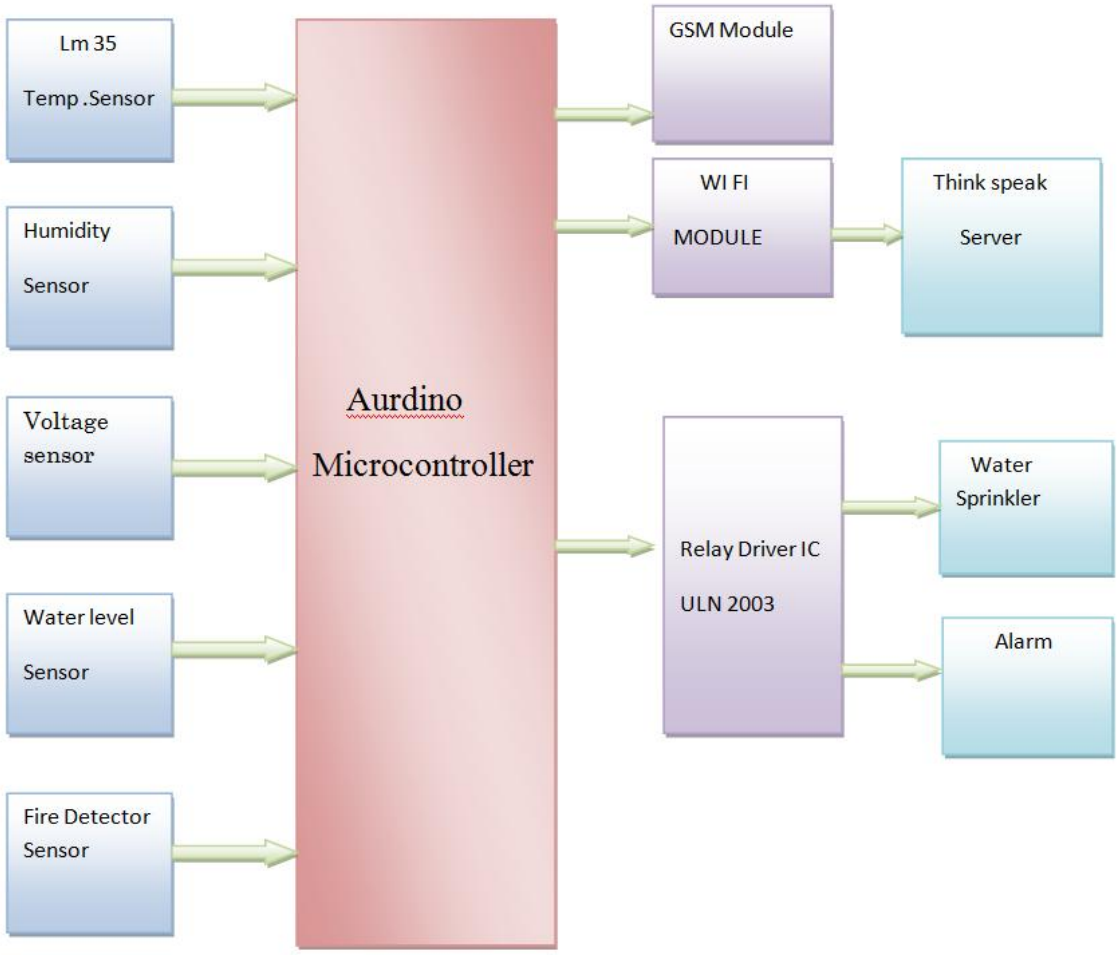
2.2 Block Diagram



Working :

In this project, a temperature sensor is employed for continuous monitoring of the hospital's ambient temperature, while a humidity sensor is deployed to measure the environmental humidity levels. All sensor data is transmitted wirelessly to the ThingSpeak server utilizing a Wi-Fi module. This dataset serves as valuable input for comprehensive analysis of the hospital's environmental conditions.

Furthermore, real-time monitoring of oxygen levels is facilitated to ensure adherence to hospital requirements. Should oxygen levels deviate from acceptable parameters, immediate notifications are dispatched via SMS to the designated medical personnel.

Additionally, a fire detection sensor is integrated into the system to promptly identify any potential fire incidents within the hospital premises. Upon detection of a fire event, the system triggers the activation of the water sprinkler system as a safety measure. Simultaneously, notifications are promptly relayed via SMS to the appropriate fire authorities for swift intervention and response.

Technical Specifications

- Microcontroller: Aurdino
- WiFi Module : ESP8266 , GSM Sim 900A
- Power Supply : 230 AC @50 Hz

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- Sensors: LM35, Humidity Sensor, Voltage and current sensor, Fire detector sensor.
- Relay Driver IC : ULN 2003
- Relay : 12 V sugar cube relay
- Output : Buzzer ,Water sprinkler

Component Description

Ardinuo UNO:

Ardinuo is an open source tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple micro-controller board, and a development environment for writing software for the board. Ardinuo can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Ardinuo projects can be stand-alone, or they can communicate with software running on your computer (e.g. Flash, Processing, MaxMSP). The boards can be assembled by hand or purchased pre-assembled; the open-source IDE can be downloaded for free. The Ardinuo programming language is an implementation of Wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the micro-controller; connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. All the modules in the circuit are connected to Ardinuo module. Sensors are connected to Ardinuo UNO board for monitoring, ADC will convert the corresponding sensor reading to its digital value and from that value the corresponding environmental parameter will be evaluated.

Thing Speak:

According to its developers, “Thing Speak” is an open source Internet of Things (IOT) application and API to store and retrieve data from things using the HTTP protocol over the Internet or via a Local Area Network. Thing Speak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates". Thing Speak has integrated support from the numerical computing software MATLAB from MathWorks allowing Thing Speak users to analyze and visualize uploaded data using Matlab without requiring the purchase of a Matlab license from Mathworks.

Wi-Fi Module

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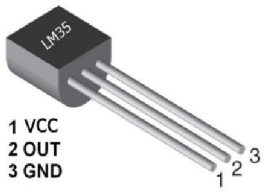
Here we used ESP8266 Wi-Fi module which is having TCP/IP protocol stack integrated on chip. So that it can provide any microcontroller to get connected with Wi-Fi network. ESP8266 is a preprogrammed SOC and any microcontroller has to communicate with it through UART interface. It works with a supply voltage of 3.3v. The module is configured with AT commands and the microcontroller should be programmed to send the AT commands in a required sequence to configure the module in client mode. The module can be used in both client and server modes.

Temperature Sensor



The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in oC). If the temperature is high then the fan will on and vice versa.., The Temperature Sensor is shown in Fig3. The scale factor is .01V/oC. The LM35 does not require any external calibration or trimming and maintains an accuracy of +/- 0.4oC at room temperature and +/- 0.8oC over a range of 0 oC to +100oC.

Humidity sensor: HIH4000

DESCRIPTION

The HIH-4000 Series Humidity Sensors are designed specifically for high volume OEM (Original Equipment Manufacturer) users. Direct input to a controller or other device is made possible by this sensor's near linear voltage output. With a typical current draw of only 200 µA, the HIH-4000 Series is often ideally suited for low drain, battery operated systems. Tight sensor interchangeability reduces or eliminates OEM production calibration costs. Individual sensor calibration data is available. The HIH-4000 Series delivers instrumentation-quality RH (Relative Humidity) sensing performance in a competitively priced, solderable SIP (Single In-line Package). Available in two lead spacing configurations, the RH sensor is a laser trimmed, thermoset polymer capacitive sensing element with on-chip integrated signal conditioning. The sensing element's multilayer construction provides excellent resistance to most application hazards such as wetting, dust, dirt, oils and common environmental chemicals.

Feature:

- Molded thermoset plastic housing
- Near linear voltage output vs %
- RH Laser trimmed interchangeability
- Low power design
- Enhanced accuracy
- Fast response time Stable,
- low drift performance
- Chemically resistant

Application:

- Refrigeration equipment
- HVAC (Heating, Ventilation and Air Conditioning) equipment
- Medical equipment
- Drying
- Metrology
- Battery-powered systems
- OEM assembly

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Fire Alarm

The bimetallic strip in a fire alarm is made of two metals with different expansion rates bonded together to form one piece of metal. Typically, the low-expansion side is made of a nickel-iron alloy called Invar, while the high-expansion side is an alloy of copper or nickel. The strip is electrically energized with a low-voltage current. When the strip is heated by fire, the high-expansion side bends the strip toward an electrical contact. When the strip touches that contact, it completes a circuit that triggers the alarm to sound. The width of the gap between the contacts determines the temperature that will set off the alarm.

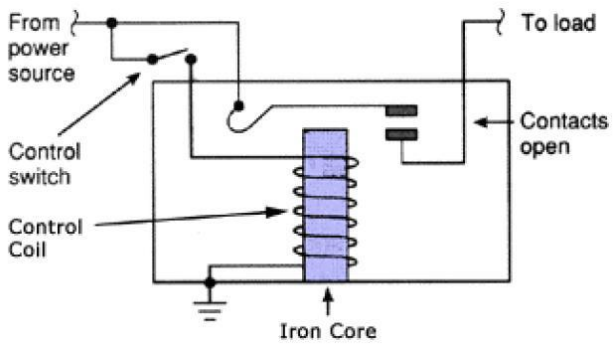
Heat detectors, whether bimetallic or other types, may be battery-operated or hard-wired into the electrical system of the building. They can also be connected to a wireless network of smoke detectors in a security system. In addition, bimetallic technology is used in a variety of other applications. For example, heat-only thermostats regulate the temperature in the home, and bimetal thermostats prevent refrigerator evaporators from overheating when defrosting the freezer compartment.

Relay

We know that most of the high end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. Relays consist of a n electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays.

The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. The application of relays started during the invention of telephones. They played an important role in switching calls in telephone exchanges. They were also used in long distance telegraphy. They were used to switch the signal coming from one source to another destination. After the invention of computers they were also used to perform Boolean and other logical operations. The high end applications of relays require high power to be driven by electric motors and so on. Such relays are called contactors.

it is an electro-magnetic relay with a wire coil, surrounded by an iron core. A path of very low reluctance for the magnetic flux is provided for the movable armature and also the switch point contacts. The movable armature is connected to the yoke which is mechanically connected to the switch point contacts. These parts are safely held with the help of a spring. The spring is used so as to produce an air gap in the circuit when the relay becomes de-energized.



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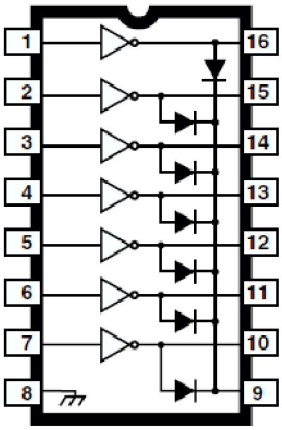
Relays have the exact working of a switch. So, the same concept is also applied. A relay is said to switch one or more poles. Each pole has contacts that can be thrown in mainly three ways. They are

- **Normally Open Contact (NO)** – NO contact is also called a make contact. It closes the circuit when the relay is activated. It disconnects the circuit when the relay is inactive.
- **Normally Closed Contact (NC)** – NC contact is also known as break contact. This is opposite to the NO contact. When the relay is activated, the circuit disconnects. When the relay is deactivated, the circuit connects.
- **Change-over (CO) / Double-throw (DT) Contacts** – This type of contacts are used to control two types of circuits. They are used to control a NO contact and also a NC contact with a common terminal. According to their type they are called by the names **break before make** and **make before break** contacts.

ULN 2003:-



Ideally suited for interfacing between low-level logic circuitry and multiple peripheral power loads, the Series ULN20xxA/L high-voltage, high-current Darlington arrays feature continuous load current ratings
to 500 mA for each of the seven drivers. At an appropriate duty cycle depending on ambient temperature and number of drivers turned ON simultaneously, typical power loads totaling over 230 W (350 mA x 7,
95 V) can be controlled. Typical loads include relays, solenoids, stepping motors, magnetic print hammers, multiplexed LED and incandescent displays, and heaters. All devices feature open-collector
outputs with integral clamp diodes. The ULN2003A/L and ULN2023A/L have series input resistors
selected for operation directly with 5 V TTL or CMOS. These devices will handle numerous interface needs — particularly those beyond the capabilities of standard logic buffers.
The ULN2004A/L and ULN2024A/L have series input resistors for operation directly from 6 to 15 V CMOS or PMOS logic outputs. The ULN2003A/L and ULN2004A/L are the standard Darlington
arrays. The outputs are capable of sinking 500 mA and will withstand at least 50 V in the OFF state. Outputs may be paralleled for higher load current capability. The ULN2023A/L and ULN2024A/L will
withstand 95 V in the OFF state. These Darlington arrays are furnished in 16-pin dual in-line plastic
packages (suffix “A”) and 16-lead surface-mountable SOICs (suffix “L”). All devices are pinned with outputs opposite inputs to facilitate ease of circuit board layout. All devices are rated for operation over the temperature range of -20°C

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to +85°C. Most (see matrix, next page) are also available for operation to -40°C; to order, change the prefix from "ULN" to "ULQ".

FEATURES

- TTL, DTL, PMOS, or CMOS-Compatible Inputs
- Output Current to 500 mA
- Output Voltage to 95 V
- Transient-Protected Outputs
- Dual In-Line Plastic Package or Small-Outline IC Package

GSM

The G510 GPRS Module supports GSM Quad Band 850/900/1800/1900 MHz., GPRS supports class 10. G510 can operate on any GSM/GPRS network to provide data communications. The G510 is similar to a condensed cellular phone core, which can be integrated into any system or product that needs to transfer
voice or data information over a cellular network. Thus, it significantly enhances the system's capabilities, transforming it from a standalone, isolated product to a powerful high-performance system with global communications capabilities.
The built around a cost effective 32-bit XCPU RISC core running at up to 312MHz with 4k of Instruction cache and 4k of Data cache, RDA8851BL offers plenty of processing power for multimedia applications. A high performance proprietary 16/32-bit digital signal processing engine can further improve overall performance and user experience when performing complex multimedia tasks.
The G510 is designed as a perfect GSM/GPRS communications solution with all the controls, interfaces
and features to support a broad range of applications:

- Low cost
- Mini size
- More settings and control signals
- Low power consumption

All these features and interfaces are easily controlled and configured using a versatile AT command interface that provides full control over the G510 operation. The G510 control and indication interface extends its capabilities beyond GSM communications. This includes a regulated output voltage for supplying external circuits. With these interfaces, the G510 can operate and control external applications and receive feedback from external environment and circuits.
The G510 interface design, using a single 42 pin SMT, through which all application interfaces are managed, facilitates fast and easy integration. It significantly shortens the development process, and minimizes the product's time to market.
The G510 is extremely compact in size with a slim mechanical design, which makes it space saving on the application board and easily fitted into any board design. The advanced power supply management significantly reduces power consumption to a necessary minimum and prolongs battery life.

Hardware Interface Description

The following section describes in details the hardware requirements for properly interfacing and
operating the G510 module.

Digital Baseband Block

- Integrated Flash on chip
- Integrated PSRAM on chip
- Serial communications interfaces
- SIM card port
- Real Time Clock (RTC) subsystem
- G510 Hardware User Manual Page 10 of 41

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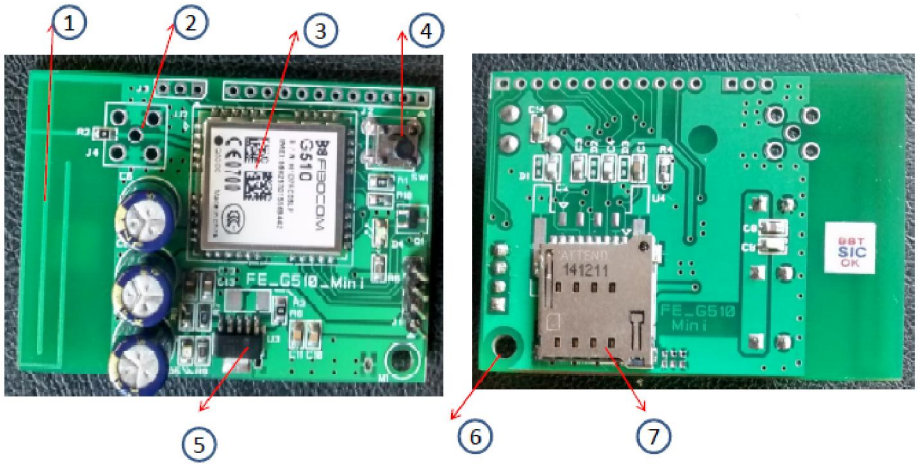
Analog Block

- Power management inside
- PLL generates 624MHz from 26MHz
- Analog audio interface management

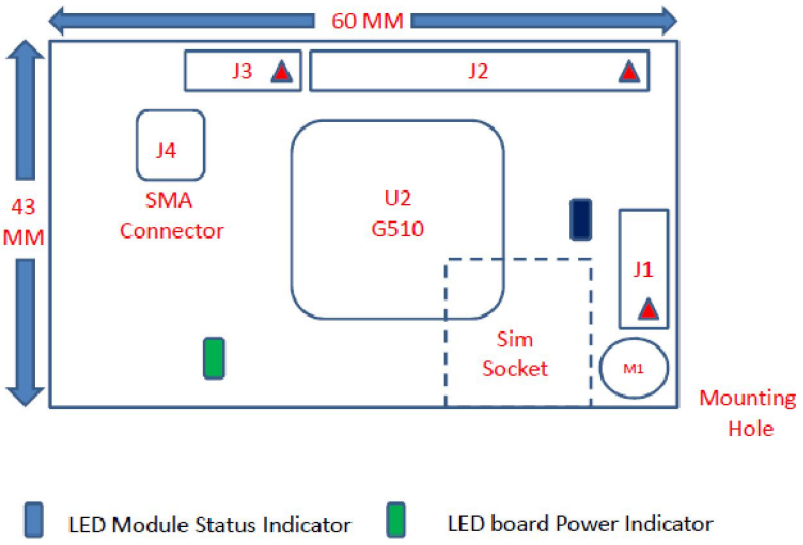
GSM Transceiver Block

- G510 Q50-00 supports GSM850/900/1800/1900 bands
- RF receiver, which includes LNAs, Mixers, PLL, I/Q outputs and buffers
- Signal processing IC for transmit and receive GSM data processing
- RF FEM control , which includes RFPA and antenna switch



1. PCB Trace Antenna
2. SMA Antenna
3. GSM Module (G510)
4. Reset button
5. Regulator IC
6. PCB Mounting hole
7. SIM Card connector

FE G510 Mini - Board Connections



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Connector Description

J1 - UART1 Interface TTL	
Pin	
1	VIN (4V 6 V DC)
2	U1-RXD
3	U1-TXD
4	GND

J3 - UART2 Interface TTL	
Pin	
1	U2-RXD
2	U2-TXD
3	GND

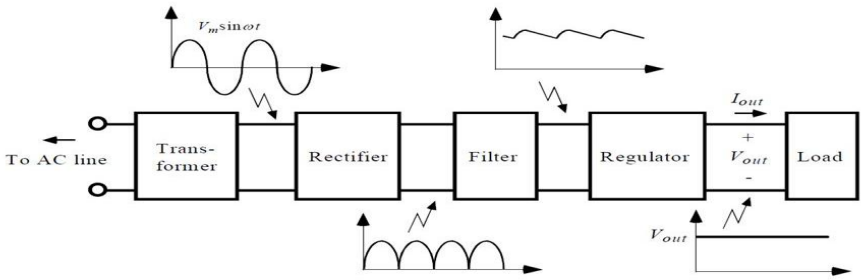
J2 - Multy Function Interface	
Pin	
1	U1_CTS
2	U1_RTS
3	U1_DCD
4	U1_DTR
5	U1_DSR
6	U1_RING
7	LPG - Status Indicator
8	WAKE_UP
9	POWER_ON
10	VDD - Output 2.8V
11	VBACKUP - RTC backup
12	RESET N

Design of power supply:-

Power supply is the first and the most important part of our project. For our project we require +5v regulated power supply with maximum current rating 500 mA.

Following basic building blocks are required to generated power supply.

Block Diagram



STEP DOWN TRANSFORMER :

Step down transformer is the first part or regulated power supply . To step down the mains 230V A.C. we require step down transformer. Following are the main characteristic of electronic transformer.

- Power transformer are usually designed to operate from source of low impedance at a single freq.
- It is required to construct with sufficient insulation of necessary dielectric strength.
- Transformer rating are expressed in volt-amp. The volt-amp of each secondary winding or windings is added for the total secondary VA. To this are added the load losses.
- Temperature rise of a transformer is decided on two well known factors i.e. losses on transformer and heat dissipating or cooling facility provided unit.

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RECTIFIER UNIT:

Rectifier unit is a ckt. Which converts A.C. into pulsating D.C. Generally semi-conducting diode is used as rectifying element due to its property of conducting current in one direction only Generally there are two types of rectifier.

- Half wave rectifier
- Full wave rectifier.

In half wave rectifier only half cycle of mains A.C. rectified so its efficiency is very poor. So we use full wave bridge type rectifier, in which four diodes are used. In each half cycle, two diodes conduct at a time and we get maximum efficiency at o/p.

Following are the main advantages and is advantages of a full-wave bridge type rectifier ckt.

ADVANTAGES :

- The need of center tapped transformer is eliminated.
- The o/p is twice that of center tap circuit for the same secondary voltage.
- The PIV rating of diode is half of the center taps circuit.

DISADVANTAGES :

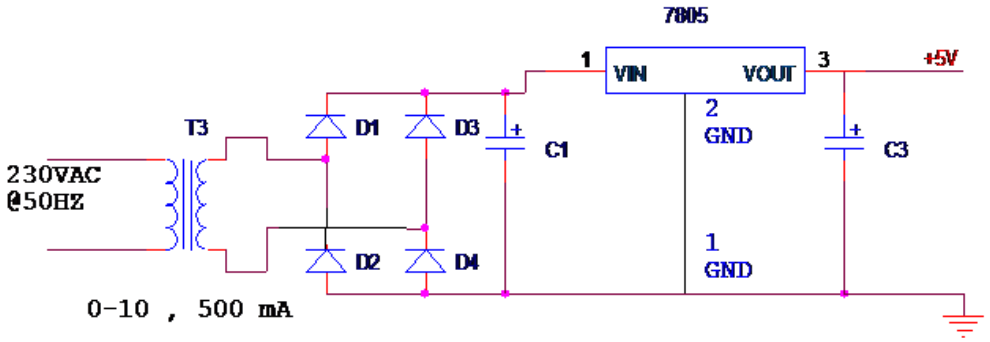
- It requires four diodes.
- As during each half cycle of A.C. input, two diodes are conducting therefore voltage drop in internal resistance of rectifying unit will be twice as compared to center tap circuit

Filter circuit :

Generally a rectifier is required to produce pure D.C. supply for using at various places in the electronic circuit, However, the o/p of rectifier has pulsating character i.e. if such a D.C. is applied to electronic circuit it will produce a hum i.e. it will contain A.C. and D.C. components. The A.C. components are undesirable and must be kept away from the load. To do so a filter circuit is used which removes (or filter out) the A.C. components reaching the load. Obviously a filter circuit is installed between rectifier and voltage regulator. In our project we use capacitor filter because of his low cost, small size and litile weight and good characteristic. Capacitors are connected in parallel to the rectifier o/p because it passes A.C. but does not pass D.C. at all.

Three terminal voltage regulators :

A voltage regulator is a ckt. That supplies constant voltage regardless of change in load current. IC voltage regulators are versatile and relatively cheaper. The 7800 series consists of three terminal positive voltage regulators. these ICs are designed as fixed voltage regulator and with adequate heat sink, can deliver o/p current in excess of 1A. These devices do not require external component. This IC also has internal thermal overload protection and internal short circuit and current limiting protection for our project we use 7805 voltage regulator IC.



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Design to step down transformer :

The following information must be available to the designer before the commences for the design of transformer.

- Power output
- operating voltage.
- Frequency Range
- Efficiency and Regulation

Size of core :

Size of core is one of the first consideration in regard of core and winding configuration used. Generally following formula is used to find area or size of core.

$Ai = \sqrt{(p1/0.87)}$

Where Ai = Area of cross section in sq. cm.

P1 = Primary voltage

In Transformer P1 = P2

For our project we required +5V regulated output. So transformer secondary rating is 12V, 500 mA.

So secondary power wattage is,

P2 = 12 X 500 X 10^{-3} w.

= 6w.

So,

Ai = (6/0.87)

= 2.62

Generally 10% of area should be added to core accommodate all turns for low Iron losses and compact size.

So,Ai = 2.88.

Turns per volt

Turns per volt of transformer are given by relation

$$\text{Turns/volt} = \frac{10{,}000}{4.44 f B Ai}$$

Here;

F is the frequency in Hz

B is flux density in Wb/m2

A is net area of cross section.

For project for 50Hz the turns per volt for 0.91 wb/m2,

Turns per volt = 50/Ai

= 50/ 2.88 = 17

Thus for primary winding = 220 X 17 = 3800.

For secondary winding = 12 X 17 = 204

Rectifier design :

R. M. S. Secondary voltage at secondary of transformer is 12V. So, maximum voltage Vm across Secondary is

= RMS voltage *1.41

= 12* 1.41

=16.97

D.C. output voltage at rectifier o/p is

Vdc = 2Vm/3.14

= 2*16.97/3.14

= 10.80 v

PIV = 2 Vm = 2 X 16.97 = 34V

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Design of filter capacitor

Formula for calculating filter capacitor is,

$$C = \frac{1}{4.3\, r\, f\, RL}$$

r = ripple present at o/p of rectifier.

(Which is maximum 0.1 for full wave rectifier ?)

f = Frequency of mains A.C.

R = I/p impedance of voltage regulator IC.

$$C = \frac{1}{4\ 3\ 0.1*50*28} = 1000F$$

IC 7805 (Voltage regulator IC):-

Specifications :-

Available o/p D.C. voltage = + 5V
Line regulation = 0.03
Load regulation = 0.5
Vin maximum = 35 V
Ripple Rejection = 66-180(db)

III. PCB DESIGNING

Introduction to PCB designing:

Now a day the printed circuit boards are having great importance; because the PCB"s are used everywhere. Even in the small circuits also PCB"s are used. PCB"s have many advantages over the circuits on track board. The PCB"s have low coast if prepare on large scale. Also by use of PCB the sizes of equipment are also reduced. Connections by wire are also reduced. The fluctuations in output due to loss connection are reduced. Here the PCB"s are design using Or CAD software. In industries also there is importance for manufacturing the PCB. In computers, televisions and in many types of equipment the PCB"s are used that is one of the reasons for reducing the sizes.

P.C.B. Designing using Diptrace

DIPTRACE is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly to create electronic prints for manufacturing of printed circuit boards, by electronic design engineers and electronic technicians to manufacture electronics schematics.

Dip Traceis an advanced PCB design software application that consists of 4 modules PCB Layout with efficient auto-router and auto-placer, schematic capture, component and pattern editors that allow you to design your own component libraries. Dip Trace has a powerful automatic router, superior to many routers included in other PCB layout packages. It can route a single layer and multilayer circuit boards, and there is an option to auto route a single layer board with jumper wires, if required. Dip Trace also provides you with external auto router support. Smart manual routing tools allow users to finalize the design and to get the results they want in a blink of an eye. There are number of verification features, that allows you to control accuracy of your project.

FUNCTIONS:

The printed circuit board usually serves there distinct functions are follows.

PCBs provides mechanical support for the components mounted on it.

It provides necessary electrical interconnections.

It act as a sink i.e. It provides a conduction path leading to removal of most of the heat generated in the circuit.

TYPES OF PCB:

1) Single sided PCB 2) Double sided PCB

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1) Single sided PCB:
This type of PCB consists of a natural coil of a copper only on one side of the base material. This type of PCB frequently used when manufacturing cost is to be kept minimum.
2) Double sided PCB:
Double sided PCB is used when there is used when there is more number of jumpers. This type of PCB has copper foil on both side of base material. Thedouble sided PCB'S are used when insulation of PCB is very complicated i.e. if jumpers are more in numbers & when it is difficult to fabricant the PCB on a single sided PCB.
To study and design the given circuit.
1. To study & design the given circuit
2. To draw the schematic of given circuit using DIP TRACE capture.
3. To draw the layout of schematic using DIP TRACE layout.
4. To study of garb magic and mask preparation using coral draw.
5. To transfer mask on copper clad by using thermal transfer technique.
6. To etching PCB using ferric chloride (Fecl3), etching pen.
7. To Clean PCB first with water and acetone for removal of black ink.
8. To mount the components and testing the circuit.
9. Taking observations, result, Graph and conclusion.

Thermal transfer:
To make paper alignment easy, cut excess paper around one corner (leave a small margin though). Leave plenty of paper on the other sides to fix the paper to the desk. As the board is larger than the final PCB, there is large margin for easy placement of paper on copper. Flip out the paper, and preheat copper surface placing the iron on top of it for 30 seconds. Remove the iron; flip back paper into its previous position over the copper. It is essential that paper does not slip from its position. You can also cover with a second sheetof blank paper to distribute pressure more evenly. Keep moving the iron, while pressing down as evenly as you can, for about one minute. Remove the iron and let the board to cool down.

Etching:
Ferric Chloride is use to etch away copper surface on the PCB board. It is a very toxin chemical and is harmful to the environment. Please handle and dispose the chemical waste with care. It is dark yellowish in color and can stain your clothing. Remember to wear protective gloves while handling FeCl3. Chemical is toxin and will cause skin irritation Wash skin with running water immediately when in contact with skin. Stronger FeCl3 solution enables etching process to be faster. When design PCB board, it may be a good idea to fill up with regions of copper. This is to minimize the area of copper surface to be etched away. With less copper to etched, it will also mean that the solution can be effectively used to etch more PCB board.

Cleaning:
Rinse PCB into a tap water then removing water contain using tissue paper. Removing ink using acetone then pcb is ready for drilling.

Drilling of PCB:
Holes through a PCB are typically drilled with small-diameter drill bits made of solid coated tungsten carbide. Coated tungsten carbide is recommended since many board materials are very abrasive and drilling must be high RPM and high feed to be cost effective. Drill bits must also remain sharp so as not to mar or tear the traces. Drilling with high-speed-steel is simply not feasible since the drill bits will dull quickly and thus tear the copper and ruin the boards.
Component mounting & testing:
Mount all the component on PCB solder it and test it with digital multimeter to check continuity and voltage flow through each component with reference of their datasheet

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ADVANTAGES OF PCB:

- PCBs have controllable and predictable electrical mechanical properties.
- Rapid production is possible.
- Time is saved since it avoids wiring connection production to another.
- Weight is reduced, cost is less.
- Soldering is done in one operation instead of individual connection between components and wires.

IV. TESTING AND TROUBLESHOOTING

Before soldering in components:

- Check that component agree with the parts list (value and power of resistors, value and voltage rating of capacitor, etc.) if in any doubt double check the polarized components (diodes, capacitor, rectifiers etc)
- If there is a significant time elapse between circuit, take the trouble to read the article; the information is often given in a very condensed from. Try to get most important point out of the description of the operation of the circuit, even if you don't understand exactly what is supposed to happen.
- If there is any doubt that some component may not be exact equivalent, check that they are compatible.
- Only use good quality IC sockets.
- Check the continuity of the tracks on the PCB (and through plated holes with double sided boards) with a resistance meter or continuity tester.
- Make sure that all drilling, filling and other 'heavy' work is done before mounting any components.
- If possible keep any heat sinks well isolated from other components.
- Make a wiring diagram if the layout involves lots of wires spread out in all directions.
- Check that the connectors used are compatible and that they are mounted the right way round.
- Do not reuse wire unless it is of good quality. Cut off the ends and strip it a new.

After mounting the component:

- Inspect all soldered joints by eye or using a magnifying glass and check them with a continuity tester. Make sure there are no dry joints and no tracks are short circuited by poor soldering.
- Ensure that the positions of all the component agree with the mounting diagram
- Check that any links needed are present and that they are in the right positions to give the desired configuration.
- Check all ICs in their sockets (see that there are no pins bent under any ICs, no near ICs are interchanged etc.)
- Check all the polarized components (diodes, capacitor etc) are fitted correctly.
- Check the wiring (watch for off cuts of components leads) at the same time ensure that there are no short-circuits between potentiometer, switches, etc. and there immediate surrounding (other components or the case). Do the same with mounting hardware such as spacers, nuts and bolts etc.
- Ensure that the supply transformer is located as closely as possible to the circuits (this could have a significant improvement in the case of critical signal level).
- Check that the connections to the earth are there and that they are of good contact.
- Make sure the circuit is working correctly before spending any time putting it into a case.

And if it breaks down:

- Recheck everything suggested so far.
- Re-read the article carefully and carefully anything about which you are doubtful.
- Check the supply voltage or voltages carefully and make sure that they reach the appropriate components especially pins of the ICs (test the pins of ICs and not the soldered joints).
- Check currents (generally they are stated on the circuit diagram or in the text). Don't be too quick to suspect the ICs of overheating.

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- If possible check the operation of the circuit in the separate stages as a general rule follow the course of the signal.
- While checking voltages, currents, frequencies or testing the circuits with an oscilloscope work systematically and take notes.
- And don't forget to switch the power on and check the fuses.

V. CONCLUSION AND FUTURE WORK

The medical community needs to be provided with the accurate information about the patient at the correct time to take the right decision. Patients can be treated during their course daywork without being interrupted through using SMART healthcare systems. The importance of the notification timing of the patient's status lies in saving this patient's life. The usage of IoT is known for its diverse proficiencies in different aspects. It helps in providing the data quickly to be either stored, recovered, or processed. In the field of healthcare systems, IoT can be of a great asset with the momentary medical readings of patients. It also can help with other healthcare activities such as image capturing and drug supervision. From our point of view, there should be minimum requirements to act as a base for any healthcare architecture. However, in this research, we showed that there were no standards for building a SMART architecture for the healthcare systems. Previous studied frameworks showed that they were established based on specific needs per each application. They were tailored for precise organization or field needs. The proposed methodology targets the basic requirements for the healthcare systems using the IoT technology. It takes into consideration the importance of handling critical cases where an alert should be sent to the care giver to evaluate the severity of the case. Time and security are not only the critical requirements for the medical community, but also, the accuracy of health data and the punctuality. Data being collected are to be saved using the cloud computing technology. Accordingly, a list of both functional and non-functional requirements has been proposed in this methodology along with their implementation to show the best practices needed for achieving the ideal performance of healthcare systems. It is intended to implement this architecture in the real medical field and examined by the different medical stakeholders.

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