LAB AUTOMATION AND SAFETY SYSTEM

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Abstract: *Modern systems generally consist of switches and sensors connected to a central hub sometimes called a "gateway" from which the system is controlled with a user interface that is interacted either with a wall-mounted terminal, mobile phone software, tablet computer or a web interface, often but not always via Internet cloud services. . The main purpose is to make the lab automate with the help of IoT concepts. This project will help to reduce the cost and electricity consumption which actually are much high. To get rid of unnecessary usage of the electricity we came to the solution which will help us to overcome this problem.*

Keywords: *ThingSpeak, ArduinoUNO*

I.INTRODUCTION

The Internet of things defines, sensors and actuators embedded in physical objects are linked through wired and wireless network. The term IoT was invented in 1999, initially to promote radio frequency identification technology. The IoT is about to transform the next decade. Literally, everything will be connected to everything. As we know that today's world is progressing very fast, things are becoming easy then before. People are considering the automatic devices instead of manual devices. They just want an easier approach to some device. The field of automation is growing very fast. Internet is the basic part of the world's communication. For the last few decades the use of internet has enormously increased. IoT is a field in which you can share all your required information from your specified file even when you are busy IoT wants to connect all potential objects to interact each other on the internet to provide secure, comfort life for human. The term Internet of Things (IoT) was first coined by Kevin Ashton in the year 1999 in the background of supply chain management. IoT represents the ability of network devices to sense and gather knowledge from the environment, this knowledge is then shared across the Internet where it can be processed and utilized for an extensive range of applications like healthcare, utilities, home automation, transportation, defense, public safety, wearable and augmented reality (AR). The appliances of the laboratory are left switched on even when not required. This leads to a rise in electricity consumption and hence exorbitant electricity bills. Our objective is to build a Smart Laboratory which takes into consideration environmental parameters such as temperature and light intensity of the laboratory. With the help of these parameters, the system will analyze and process the information collected and then produce appropriate results. This will help in automation and effective power consumption of the laboratory. The system will be able to adapt to the environment and act accordingly. This means the usage of the appliances will be done only when required. The automation of the laboratory will help in the efficient utilization of the appliances with minimal human assistance.

II.FUNCTIONAL OVERVIEW

The functional overview of lab automation and safety system involves several key steps:

A. EMBEDDED SYSTEM

Embedded System is a combination of computer software and hardware which is either fixed in capability or programmable. An embedded system can be either an independent system, or it can be a part of a large system. It is mostly designed for a specific function or functions within a larger system. For example, a fire alarm is a common example of an embedded system which can sense only smoke.

B. INTERNET OF THINGS

The digital space has witnessed major transformations in the last couple of years and as per industry experts would continue to evolve itself. The latest entrant to the digital space is the Internet of Things (IoT). IoT can also be defined as interplay for software, telecom and electronic hardware industry and promises to offer tremendous opportunities for many industries.

With the advent of the Internet of Things (IoT), fed by sensors soon to number in the trillions, working with intelligent systems in the billions, and involving millions of applications, the Internet of Things will drive new consumer and business behavior that will demand increasingly intelligent industry solutions, which, in turn, will drive trillions of dollars in opportunity for IT industry and even more for the companies that take advantage of the IoT. The number of Internet-connected devices (12.5 billion) surpassed the number of human beings (7 billion) on the planet in 2011, and by 2020, Internet-connected devices are expected to number between 26 billion and 50 billion globally. The Indian Government's plan of developing 100 smart cities in the country, for which Rs. 7,060 crores has been allocated in the current budget could lead to a massive and quick expansion of IoT in the country. Also, the launch of the Digital India Program of the Government, which aims at transforming India into digital empowered society and knowledge economy will provide the required impetus for development of the IoT industry in the country.

Analytical engines and Big data may be used for the decision making process. Several countries like US, South Korea, China among others, have taken lead in their preparedness for taking advantage for IoT. The key stakeholders in the Internet of things initiatives would be the citizens, the government and the industry. Participation and collaboration of each of the stakeholder at an appropriate stage is essential. At this juncture, we require policies for promotion of IoT and selection of e essential domains and then emphasize on building answers for what Data will Service the citizens. Internet of Things should clearly strategize with a simple goal of Value Up and Cost Down models. With industry collaboration, experiences from global forums, learnings from other countries who are leaders in IoT, active participation of global partners will help us induce more innovation driven approach. Key to success of Internet of Things would be in building open platforms for ease of use and low cost, building scalable models and using citizens as sensors. Data needs to be openly collected and shared between cross functions to bring out maximum benefits. Participation of start-ups at 4 this stage will help us devise some innovative methods/ concepts which could be cornerstones for the upcoming overall smart concept.

III.TERMINOLOGY

1.ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the

microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

2. PIR SENSOR

PIR sensor detects a human being moving around within approximately 10m from the sensor. This is an average value, as the actual detection range is between 5m and 12m.PIR are fundamentally made of a pyro electric sensor, which can detect levels of infrared radiation. For numerous essential projects or items that need to discover when an individual has left or entered the area. PIR sensors are incredible, they are flat control and minimal effort, have a wide lens range, and are simple to interface with. Most PIR sensors have a 3-pin connection at the side or bottom. One pin will be ground, another will be signal and the last pin will be power.

3.RELAY

The relay is the device that open or closes the contacts to cause the operation of the other electric control. It detects the undesirable condition with an assigned area and gives the commands to the circuit breaker to disconnect the affected area through ON or OFF.

4. MQ-135 - GAS SENSOR

The MQ-135 Gas sensors are used in air quality control equipments and are suitable for detecting or measuring of NH3, NOx, Alcohol, Benzene, Smoke, CO2. The MQ-135 sensor module comes with a Digital Pin which makes this sensor to operate even without a microcontroller and that comes in handy when you are only trying to detect one particular gas. If you need to measure the gases in PPM the analog pin need to be used. The analog pin is TTL driven and works on 5V and so can be used with most common microcontrollers.

5. DS18B20 TEMPERATURE SENSOR

Measuring temperature at hard environments, Liquid temperature measurement. Applications where temperature has to be measured at multiple points.

6. ESP8266 WIFI MODULE

ESP8266 is Wi-Fi enabled system on chip (SoC) module developed by Espressif system. It is mostly used for development of IoT (Internet of Things) embedded applications. It employs a 32-bit RISC CPU based on the Tensilica Xtensa L106 running at 80 MHz (or overclocked to 160 MHz). It has a 64 KB boot ROM, 64 KB instruction RAM and 96 KB data RAM. External flash memory can be accessed through SPI.

ESP8266 module is low cost standalone wireless transceiver that can be used for end-point IoT developments. To communicate with the ESP8266 module, microcontroller needs to use set of AT commands. Microcontroller communicates with ESP8266-01 module using UART having specified Baud rate.

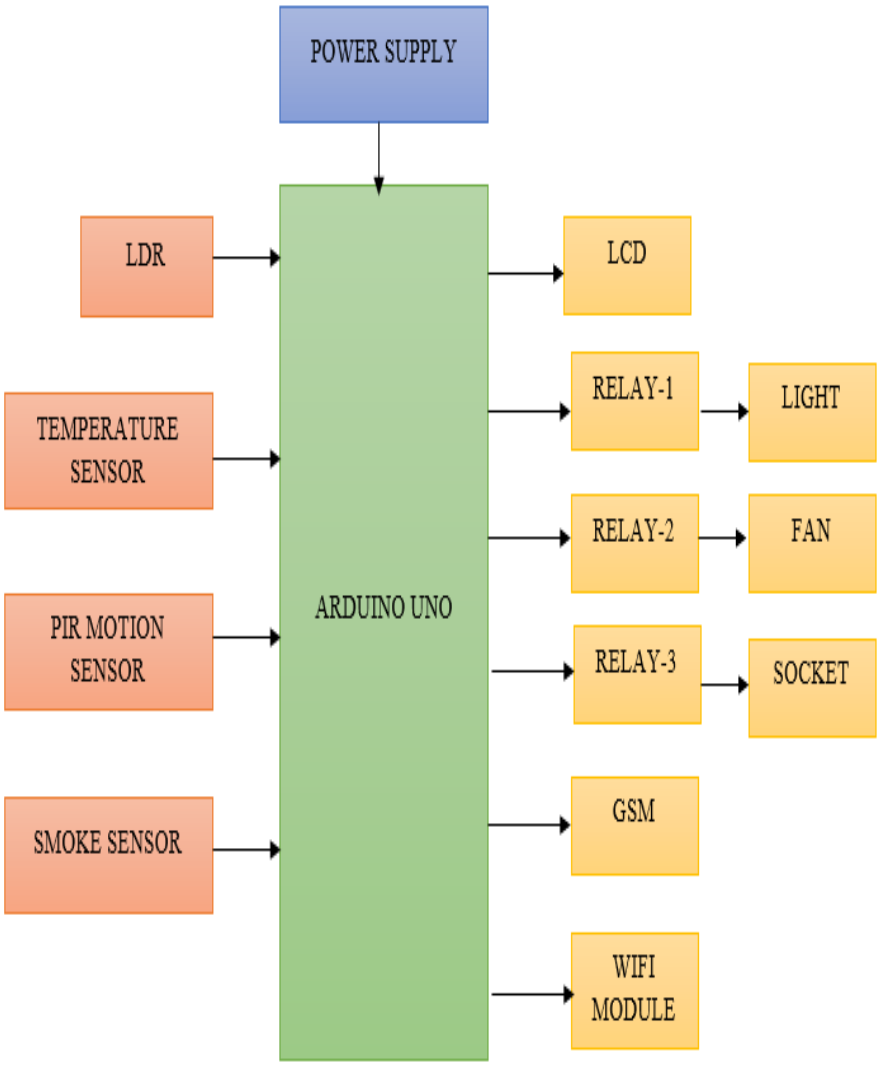
7. GSM MODULE – SIM 900

This is a GSM/GPRS-compatible Quad-band cell phone, which works on a frequency of 850/900/1800/1900MHz and which can be used not only to access the Internet, but also for oral communication (provided that it is connected to a microphone and a small loud speaker) and for SMSs. Externally, it looks like a big package (0.94 inches x 0.94 inches x 0.12 inches) with L-shaped contacts on four sides so that they can be soldered both on the side and at the bottom. Internally, the module is managed by an AMR926EJ-S processor, which controls phone communication, data communication (through an integrated TCP/IP stack), and (through an UART and a TTL serial interface) the communication with the circuit interfaced with the cell phone itself.

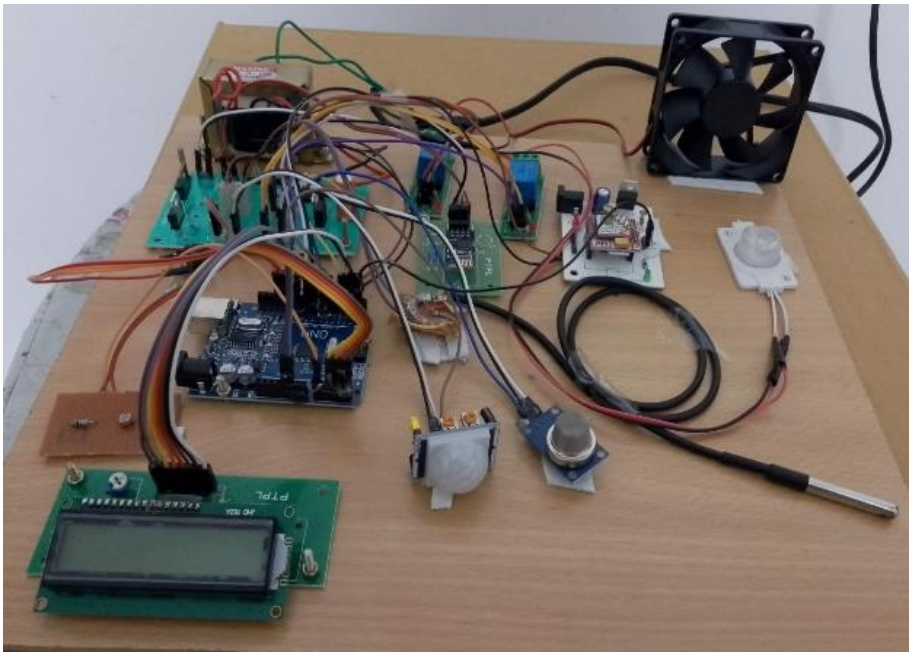
8. GSM TECHNOLOGY

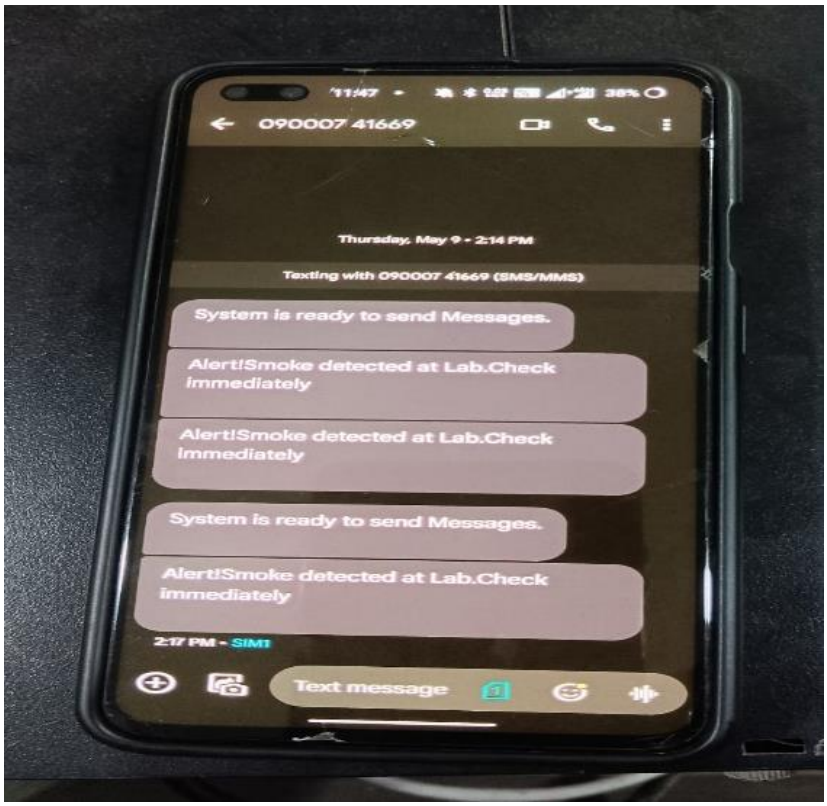
Digital cellular technology like GSM (Global System for Mobile Communication) is used to transmit mobile data as well as voice services. This concept was implemented at Bell Laboratories using a mobile radio system in 1970. As the name suggests, it is the standardization group name that was established in the year1982 to make a general European mobile telephone standard. This technology owns above 70% of the market share of the digital cellular subscriber around the world. This technology was developed by using digital technology. At present, GSM technology supports above 1 billion mobile subscribers around the world in the above 210 countries. This technology provides voice and data services from fundamental to complex. This article discusses an overview of GSM technology.

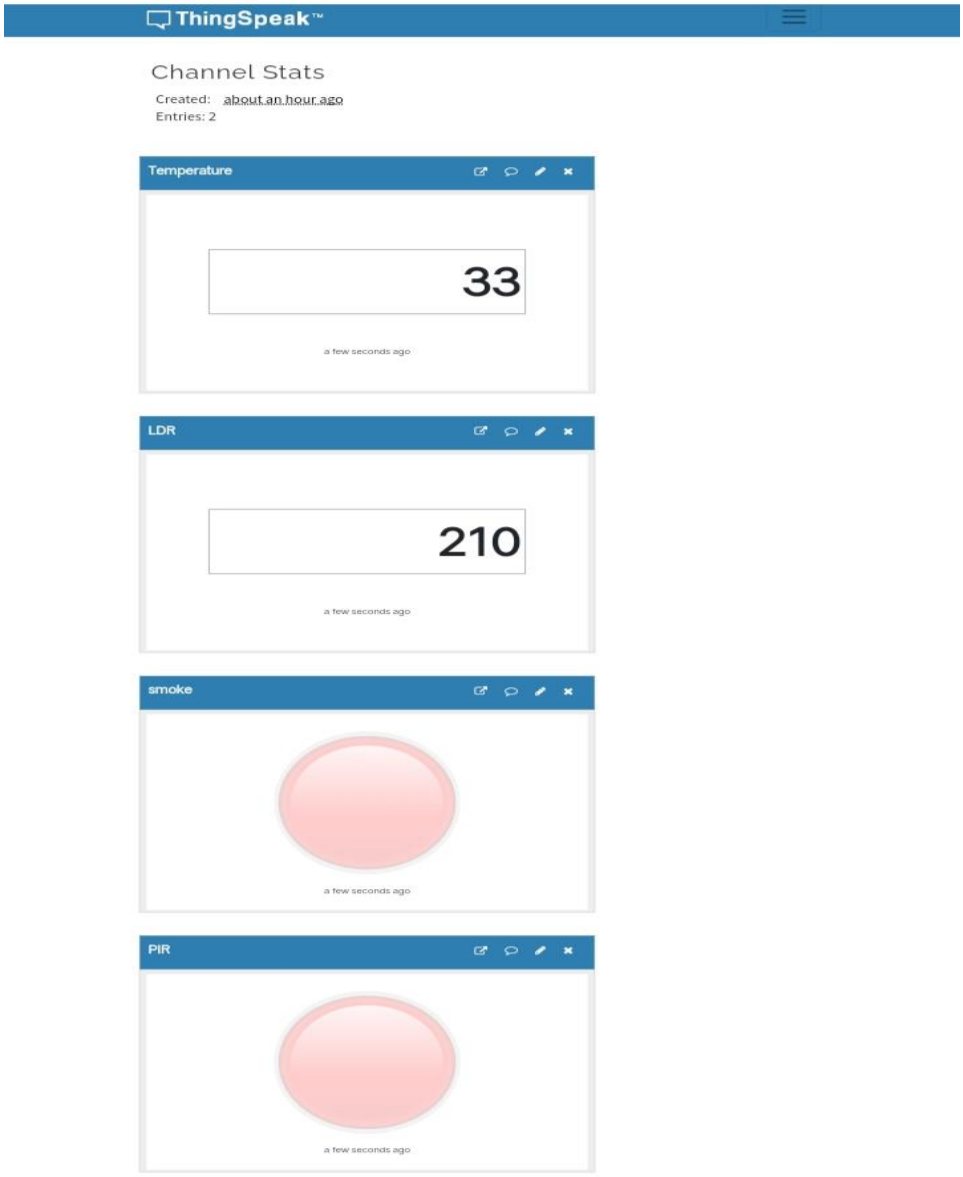
IV.DESIGN



V.RESULTS AND DISCUSSIONS







VI.CONCLUSION

Lab automation system using IoT that is capable of controlling and automating most of the appliances through an easy manageable web interface. The proposed system has a great flexibility by using Wi-Fi technology to interconnect its distributed sensors to lab automation server. It has the capability to reduce the excess usage of the power consumption and it will reduce the electricity bill up to 10% to 15% and manual switching of the computer and stuffs. So, our project is very effective and eco-friendly.

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