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IOT BASED POULTRY FARM MONITORING SYSTEM

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ABSTRACT

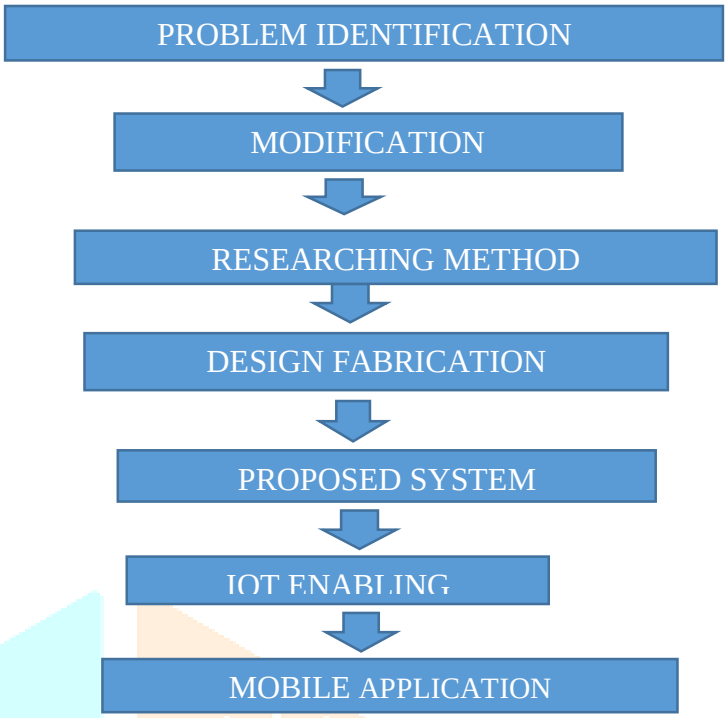
In preliminary stage, a smart poultry farm shows many distinctive features such as, automated food and water supply, egg collection, maintaining precise environmental factors etc. In this paper, Safety measures such as fire protection, anti-thief features which ensures an overall surveillance of the farm has been incorporated. Data storage through IOT is another enticing trait of this work which enables the users to Fig. out the required pre steps to adopt before any endangerments can occur. The GSM module can also provide a real time protection of the farm by notifying the farmer through an SMS at any alarming situations. All these distinguished features have been realized and observed with very perfection and it can be concluded, with the integration of GSM and IOT the proposed project work has taken the poultry farming into next level of advancement.

Keywords: Internet Of Things, GSM Module, Environmental factors,Real time protection.

1.INTRODUCTION

This project deals with the design and implementation of a prototype of an automated poultry farm system which takes responses from the microcontroller and informs the user about any necessity of the maintenance through the GSM and IOT system. Some important data obtained from sensors are stored on the website for analysis. The main target of this designed system is to build a convenient automated poultry farming system which will not only be intelligent for the users but also profitable for their poultry farming business. Moreover, various safety measures have been provided for the protection of chickens as well as whole system. An embedded system is one kind of a computer system mainly designed to perform several tasks like to access, process, and store and also control the data in various electronics-based systems. Embedded systems are a combination of hardware and software where software is usually known as firmware that is embedded into the hardware. One of its most important characteristics of these systems is, it gives the o/p within the time limits. Embedded systems support to make the work more perfect and convenient. The applications of embedded systems mainly involve in our real life for several devices like microwave, calculators, TV remote control, home security and neighborhood traffic control systems, etc.

2.METHODOLOGY



3.PROBLEM IDENTIFICATION

During the Food feeding, the food is wasted. In order to rectify this, the Wireless Sensor Networks can be used for sensing & analyzing the plants requirement. To reduce the human needs, labour cost and timing to supply the food, the IOT can be installed and the automatic control can be use Nowadays, Agricultural system requires digital technology to solve big challenges. The automation, usage of sensors, processor, new technologies and remote automation are to be required for monitoring the plants in an automatic way.

4.MODIFICATION

For maintaining cost estimation, to reduce the cost, Raspberry PI has been replaced by Node MCU, while comparing both Raspberry PI is high cost. The DC Motor is replaced by Pump Controller, because the DC Motor requires high power supply initially. Hence high power supply is to be initiated, then sensors are to be used in high ranges. This lead to high cost.

5.RESEARCH METHODS

The proposed system includes both hardware and software. The block diagram main system interfaced with all components with processor is shown below,

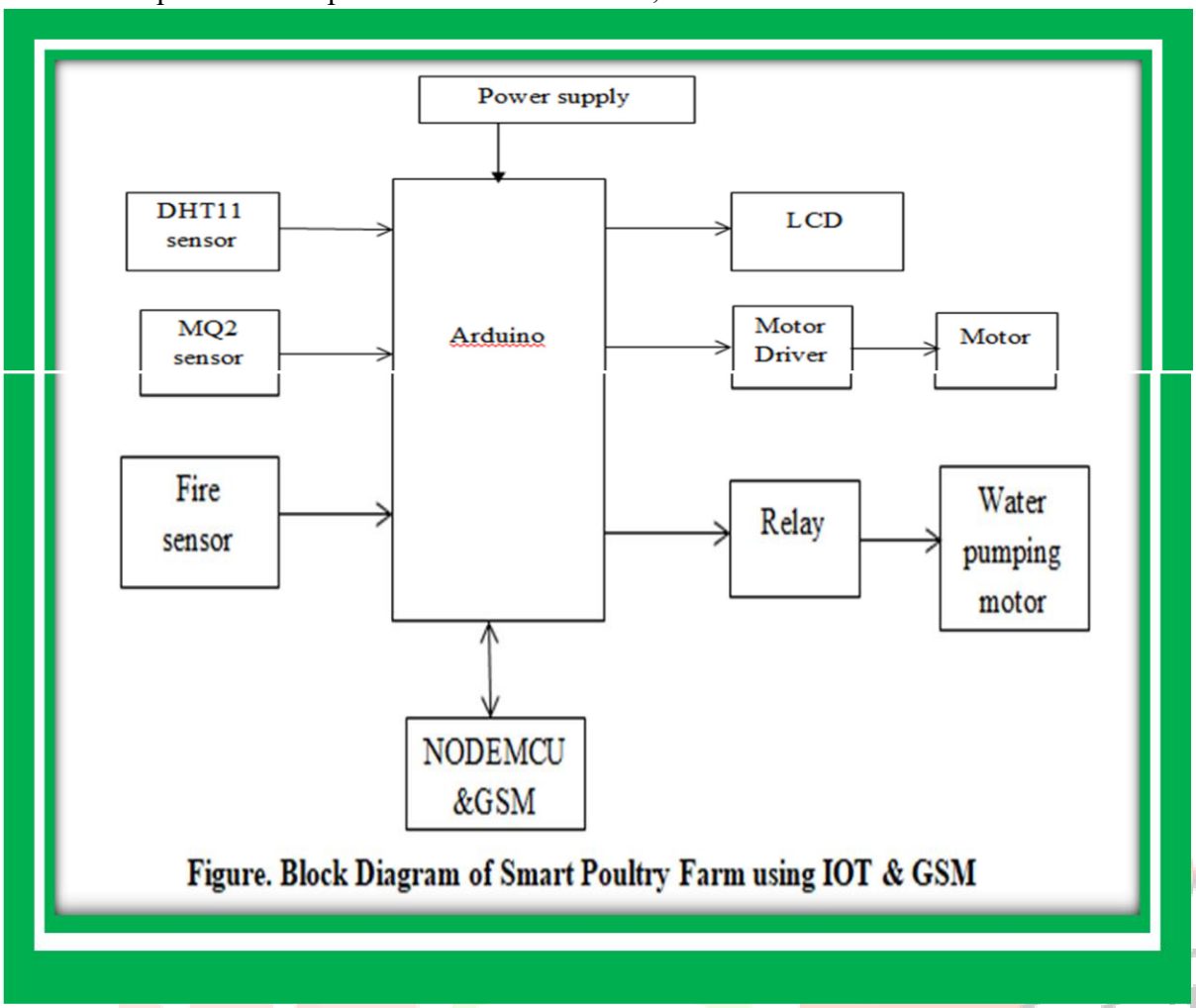


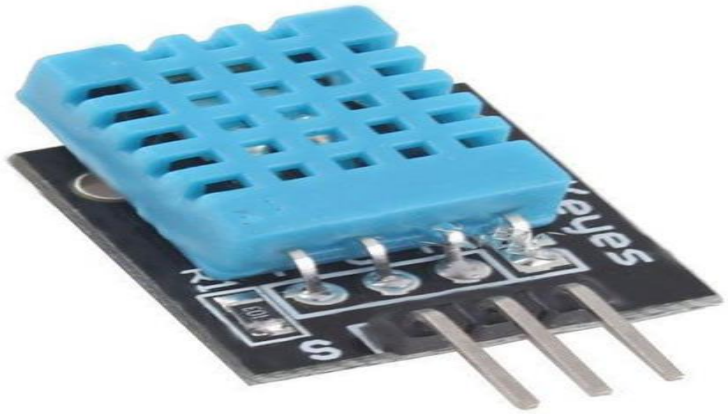
Figure. Block Diagram of Smart Poultry Farm using IOT & GSM

6.SENSORS

Sensor is a device, module, machine, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor. A sensor is always used with other electronics.Nowadays, Sensors play a major role in the IOT Technology. Since it can sensing & analyzing the information of the things which can sense.There are two types of sensors are used. They are Active & Passive Sensors. Active sensors have its own source of light or illumination. In particular, it actively sends a pulse and measures the backscatter reflected back to the sensor. But passive sensors measure reflected sunlight emitted from the sun. When the sun shines, passive sensors measure this energy.

6.1DTH11 SENSOR

The **DHT11** is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). Its fairly simple to use, but requires careful timing to grab data.



6.2MQ2 SENSOR:

MQ2 gas sensor is an electronic sensor used for sensing the concentration of gases in the air such as LPG, propane, methane, hydrogen, alcohol, smoke and carbon monoxide. MQ2 gas sensor is also known as chemiresistor. It contains a sensing material whose resistance changes when it comes in contact with the gas.

7.Features

High sensitivity to Propane, smoke, Hydrogen, LPG, CO, alcohol, Smoke. Fast response time <10s. High sensitivity,Stable and long life,Fire Sensor,Interfacing Flame Sensor with Arduino to Build a Fire Alarm System. Flame sensor module has photodiode to detect the light and op-amp to control the sensitivity. It is used to detect fire and provide High signal upon the detection.

8.PROPOSED SYSTEM

The proposed system consists of the main electrical components, which can access the automation by the usage of programming language. They are

1. Node MCU
2. Arduino
3. Pump Controller
4. Power Source

8.1NODE MCU:

Node MCU is a low-cost open source IOT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SOC from Espressif Systems, and hardware which was based on the ESP-12 module.

Power:

Input Voltage: 3.3V

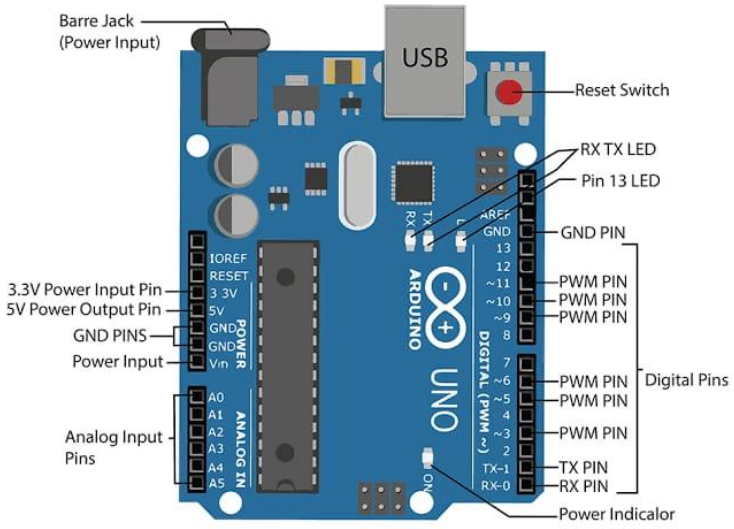
Current : 250mA

Memory RAM : 32kb

ESP8266 is a highly integrated chip designed for the needs of new connected world.ESP8266 has a powerful on-board processing and storage capabilities that allow it to be integrated with the sensors specific devices through its GPIOs with minimal development up-front and minimal loading during run time.ESP8266 is used for controlling & connecting the sensors with Mobile application software.

8.2ARDUINO

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board and a piece of software, or IDE (Integrated Development Environment) that runs on the computer, used to write and upload computer code to the physical board.It consists of different pins, in which of 6 analog pins, 14 digital pins, 3 ground pins and each input & output pins.Digital pins, which can read and write a single state, on or off.Analog pins, which can read a range of values, and are useful for more fine-grained control.



8.3PUMP CONTROLLER

Pump controllers monitor flow and level variables, and control a pump accordingly to maintain the desired levels. Pump control can include simply turning a pump on and off, or more advanced controls for pump speed, output pressure.A water pump controller senses the level of water in a tank and drives the water pump. In this, we used Water pump controller for sensing the water level in the reservoir.In this single phase motor can be used. DC Pump has long life span than AC Pump Controller.

8.4POWER SOURCE

Power to the ESP8266 NodeMCU is supplied via the on-board Micro USB connector. Alternatively, if you have a regulated 5V voltage source, the VIN pin can be used to directly supply the ESP8266 and its peripherals. The Power source in our project is an Android Mobile Phone. Because our setup is to be applied only to the four set of plants. Hence it requires less voltage power source. For supplying 5V voltage power with help of USB cable on NodeMCU is to be connected between Android phone and NodeMCU thats boost the 3.3 to 5V.

9.IOT TECHNOLOGY

The Internet of things (IOT) is a system of interrelated computing devices, mechanical and digital machines provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The definition of the Internet of things has evolved due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems.Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), and others all contribute to enabling the Internet of things. In the consumer market, IOT technology is most synonymous with products pertaining to the concept of the "smart home", including devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smartphones and smart speakers. There are a number of serious concerns about dangers in the

growth of IoT, especially in the areas of privacy and security, and consequently industry and governmental moves to address these concerns have begun.

10.INDUSTRIAL APPLICATIONS

Also known as IOT, industrial IOT devices acquire and analyze data from connected equipment, operational technology (OT), locations and people. Combined with operational technology (OT) monitoring devices, IOT helps regulate and monitor industrial systems. Also, the same implementation can be carried out for automated record updates of asset placement in industrial storage units as the size of the assets can vary from a small screw till the whole motor spare part and misplacement of such assets can cause a percentile loss of manpower time and money.

11.AGRICULTURAL AREA

There are numerous IOT applications in farming such as collecting data on temperature, rainfall, humidity, wind speed, pest infestation, and soil content. This data can be used to automate farming techniques, take informed decisions to improve quality and quantity, minimise risk and waste, and reduce effort required to manage crops. For example, farmers can now monitor soil temperature and moisture from afar, and even apply IOT-acquired data to precision fertilisation programs.

12.DATA STORAGE

A challenge for producers of IOT applications is to clean, process and interpret the vast amount of data which is gathered by the sensors. There is a solution proposed for the analytics of the information referred to as Wireless Sensor Networks. These networks share data among sensor nodes that are sent to a distributed system for the analytics of the sensory data.Another challenge is the storage of this bulk data. Depending on the application, there could be high data acquisition requirements, which in turn lead to high storage requirements. Currently the Internet is already responsible for 5% of the total energy generated, and a "daunting challenge to power" IOT devices to collect and even store data still remains.

13.SECURITY:

Security is the biggest concern in adopting Internet of things technology, with concerns that rapid development is happening without appropriate consideration of the profound security challenges involved and the regulatory changes that might be necessary. Most of the technical security concerns are similar to those of conventional servers, workstations and smartphones, and include weak authentication, forgetting to change default credentials, unencrypted messages sent between devices, SQL injections and poor handling of security updates. However, many IOT devices have severe operational limitations on the computational power available to them. These constraints often make them unable to directly use basic security measures such as implementing firewalls or using strong cryptosystems to encrypt their communications with other devices - and the low price and consumer focus of many devices makes a robust security patching system uncommon.

14.SAFETY

IOT systems are typically controlled by event-driven smart apps that take as input either sensed data, user inputs, or other external triggers (from the Internet) and command one or more actuators towards providing different forms of automation. Examples of sensors include smoke detectors, motion sensors, and contact sensors. Examples of actuators include smart locks, smart power outlets, and door controls. Popular control platforms on which third-party developers can build smart apps that interact wirelessly with these sensors and actuators include Samsung's Smart Things, Apple's Home Kit, and Amazon's Alexa, among others. A problem specific to IOT systems is that buggy apps, unforeseen bad app interactions, or device/communication failures, can cause unsafe and dangerous physical states. Detecting flaws that lead to such states, requires a holistic view of installed apps, component devices, their configurations, and more importantly, how they interact.

15.ENVIRONMENTAL SUTAINABILITY IMPACT:

A concern regarding Internet-of-things technologies pertains to the environmental impacts of the manufacture, use, and eventual disposal of all these semiconductor-rich devices. Modern electronics are replete with a wide variety of heavy metals and rare-earth metals, as well as highly toxic synthetic chemicals.This makes them extremely difficult to properly recycle. Electronic components are often incinerated or placed in regular landfills. Furthermore, the human and environmental cost of mining the rare-earth metals that are integral to modern electronic components continues to grow. This leads to societal questions concerning the environmental impacts of IOT devices over its lifetime. Although IoT devices can help in some cases to reduce the energy consumption of certain applications, the impact of having billions of devices connected and consuming power from batteries and from the grid will have a huge impact on energy consumption and CO2 emissions. The technology developed by Omniflow can house all kinds of DC powered IOT devices inside the protective shell that also integrates power generation from integrated vertical wind turbine and solar photovoltaic as well as energy storage using built-in batteries.

16.IOT ENABLING

IOT enabling is an executing the automation function of the processor by using the coding language.In programming language, we define the each sensor connection and the input & output pins of an Arduino.The coding send the information to the mobile application Blynk, in this the user receive the SMS or e-mail alert. As per the receiver, the automation or manual control can be executed. If the receiver can't respond to the message the automation can be executed.For coding, we use the C programming language which is easy to understand easily accessible language for us. Hence we used this.

17.PROCESSING

Each Sensors are connected to the Node MCU, sensor can sense & analyse the data from the plants and the data send to the Node MCU. Arduino is connected to the Node MCU processor by USB, the data from the sensor received by the Node MCU & it can send to the Arduino. Arduino is already preprogrammed by C language due to the coding, the data is send to the mobile application. From the mobile application, the SMS or e-mail alert send to the user. As per the user, the automation or manual control can be executed. If the user can't receive to the message the automation can be executed. If the user receives it correctly, if he or she wants to pour the water to the plants or fill the water in the water reservoir. He or She goes to the app, in that there is an option for water pouring or filling water.

18.PROGRAM DUMPING

Arduino refers to an open-source electronics platform or board and the software used to program it. It can be woks under the programming language of C, C++, JAVA, PYTHON. In this C Programming Language is used. C is a Structure Oriented Programming Language, for using Node MCU "C" Programming Language is better to be used. The Program can be first coded in a system, then the coding can be dumped & inserted in Arduino. Then the Arduino & Node MCU both microcontroller can be connect to each other by USB. Sensing information from the Sensor can be send to the Node MCU, then the information can send to the mobile application as SMS & e-mail alert.

19.AUTOMATIC CONTROL

Automatic Control is an automation, which can be controlled by an IOT things. In this, the automation can be fulfilled by using the pre-programming Arduino and mobile application. Mobile Application is used for receiving the data from the Arduino & send SMS & e-mail alert to the user. If user can't respond to this SMS (or) mail, the automation option is available in this application. It can be provided the required water to the plants automatically.

20.MOBILE APPLICATION

In our project we used the Blynk application as a mobile application. Blynk is a new platform that allows to quickly build interfaces for controlling and monitoring hardware projects from IOS and Android device. With Blynk, though, the software side is even easier than the hardware. Using the Blynk app, we can create a project dashboard and arrange buttons, sliders, graphs, and other widgets onto the screen. Using the widgets, we can turn pins on and off or display data from sensors.

21.LAYOUT OF THE SYSTEM

We proposed this system under the IOT enabling by usage of sensors, Node MCU, Arduino, Mobile Application. The layout of this system is made for basically under the small farm is shown below,

23.PROJECT SETUP

The above Layout of the system is explained only the power supply & project set up & mobile application of the user. The Project set up is explained clearly as below, The project set up includes Sensors & IOT platform. Sensors include DTH11, MQ2, Fire sensor, pump controller. IOT platform of Node MCU & Arduino. The function of IOT Platform & sensors are explained in this set up.

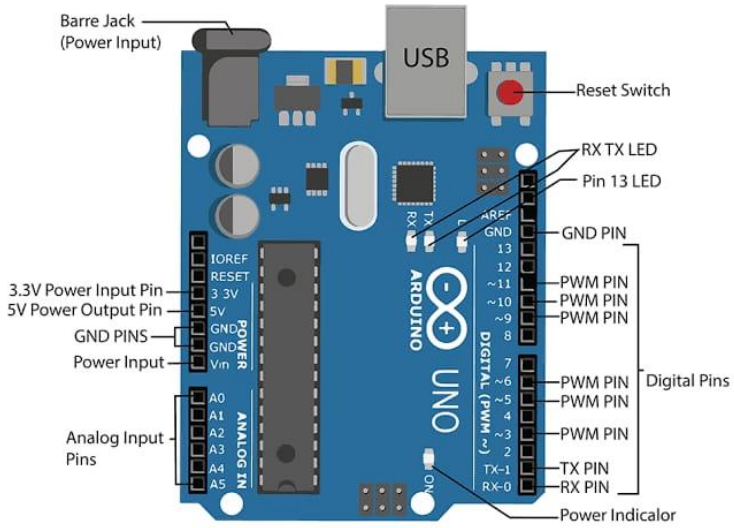
24.SENSORS & SETUP:

25.NODE MCU SETUP:

Node MCU is directly connected to the Arduino, in which both are the IOT platforms. Both are play a vital role, by which to made an automatic control & managing the plants by using sensors. Sensors can sense & give the information about the condition of each plants to the Node MCU, which is already connected to the Arduino. Arduino is a pre-programmed device, while receiving the information from the Node MCU it will process under the coding language and send information to the Blynk application. ESP8266 is a highly integrated chip designed for the needs of new connected world. It offers a complete and self-contained Wi-Fi networking solution, allowing it to either host the application or to offload all Wi-Fi networking function from another application processor. ESP8266 has a powerful on-board processing and storage capabilities that allow it to be integrated with the sensors specific devices through its GPIOs with minimal development up-front and minimal loading during run time. ESP8266 is used for controlling & connecting the sensors with Mobile application software.

26.ARDUINO SETUP

Arduino is pre-programmed by C programming language. It plays a vital role in the automation is done by it.Arduino is an open-source platform used for building electronics project. Arduino consists of both a physical programmable circuit board and a piece of software, or IDE (Integrated Development Environment) that runs on the computer, used to write and upload computer code to the physical board. It consists of different pins, in which of 6 analog pins, 14 digital pins, 3 ground pins and each input & output pins. Digital pins, which can read and write a single state, on or off. Analog pins, which can read a range of values, and are useful for more fine-grained control.



27.PUMP CONTROLLER PURPOSE & USES

Pump controller is placed in the Water reservoir. In this project we used this in a water bucket, because we done this for a group of four plants. A water pump controller senses the level of water in a tank and drives the water pump. In this, we used Water pump controller for sensing the water level in the reservoir. Pump Controller can used in any type of motor, In this DC motor & pump can be used. It is used for on & off the pump for pumping the water manually & automatically. In this single phase motor can be used. DC Pump has long life span than AC Pump Controller.

28.MOBILE APPLICATION

In our project we used the Blynk application as a mobile application. Blynk is a new platform that allows to quickly build interfaces for controlling and monitoring hardware projects from IOS and Android device. With Blynk, though, the software side is even easier than the hardware.

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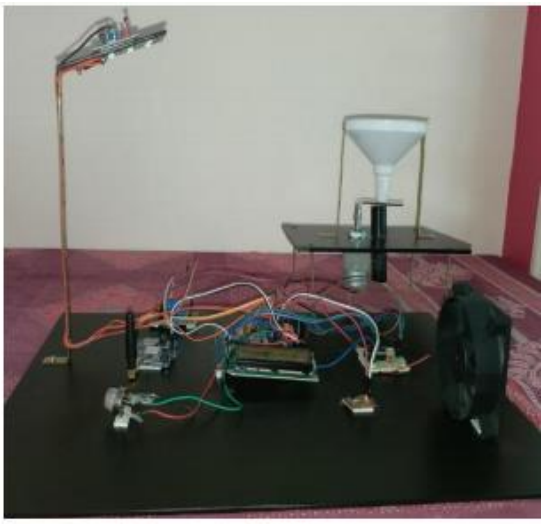
Automatic Control is an automation, which can be controlled by an IOT things. In this, the automation can be fulfilled by using the pre-programming Arduino and mobile application. Mobile Application is used for receiving the data from the Arduino & send SMS & e-mail alert to the user. If user can't respond to this SMS (or) mail, the automation option is available in this application. It can be provided the required water to the plants automatically.

30.OUTPUT:

The proposed system provides overall protection of the farm and minimizes the effects of environmental fluctuations. It ensures the health of the poultry in good condition, the physiological parameters like temperature, humidity, moisture, light intensity in farm are well monitored and controlled with least human intervention. Thus, this automated system can be very useful for farmers as they can easily access and control the system remotely using their handheld mobile devices. The system also does reduce human intervention, saves time, optimizes resource utilization and increases poultry production. Further in the near future, using more advanced sensors and technological concepts, all the environmental output data can be collected in a more reliable state. This will enable anyone with minimum farming knowledge to start up a poultry business. Hence, the future demand for chicken-meat and the economic growth of any nation will be hugely benefited.



31.FUTURE WORK

The system is fully an automatic system to monitor and control the environmental changes such as temperature, ammonia gas, intensity of light and food feeding without human intervention. This paper can be extended by automating the disposal of waste and automatically detecting the diseases of birds by monitoring the weight of the birds

32.CONCLUSION

The embedded system is an innovative technology for chicken farming, which changes a traditional farm to a “Smart Farm” or “Intelligent Farm”. In addition, the system could work on the application of the smart phones helping the owner to monitor real time environmental contexts such as temperature, humidity, ammonia gas, light instance etc. It describes an Integrated Solution for Smart Poultry Monitoring Using WSN (wireless Sensor Network). Monitoring environmental parameters in a real time industry are crucial. Various environmental parameters for effective growth of chickens have been identified and defined. It also explains the method of Food Control Mechanism for a poultry farm. Threshold values of temperature, lighting, ammonia gas and food are monitor and control by the microcontroller. As well as remote monitoring is done and with the help of this facility, the person in-charge can observe the situation of internal structure of poultry by sitting in a one room as data will be display on a web portal .The intelligent system can reduce cost, time, and labour is highly user friendly to the farmers. This ideal system will improve the human food requirements by improving quality and quantity of chicken. This system will also help in decreasing environment pollution and improving health of poultry labour and chicken consumer

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