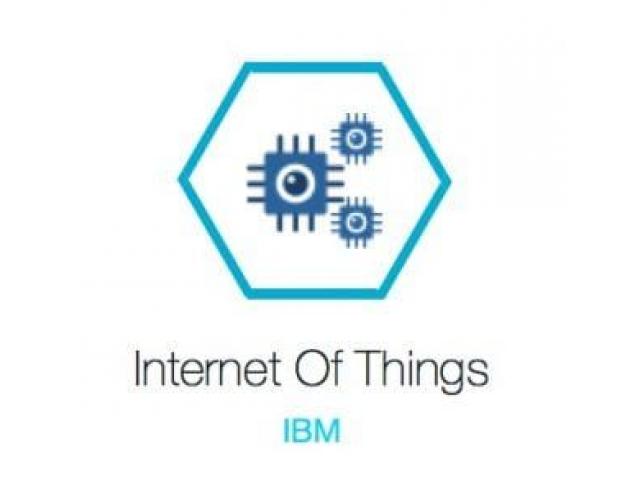
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IOT ENABLED

SMART POULTRY FARM

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D.Akhila

* **ABSTRACT:**

In contemporary agriculture, automation plays a vital role. This paper focuses on the integration of wireless sensors and mobile system network to control and remotely monitor environmental parameters in a poultry farm. This system will warn the person in-charge about the various environmental parameters like temperature, humidity, etc. by sending message to the registered mobile number. The person in-charge can initiate a required action by sending a message back and when the system doesn’t receive a command in a particular time period it will initiate the action automatically. Water level is also monitored and controlled as they play an important role in cooling the poultry farm. Remote monitoring is achieved by acquiring all sensor values and passing the values to the web with the help of CC3200, which can be later viewed in Google spreadsheets. Thus the system design provides an efficient automated agriculture monitoring system.

* **INTRODUCTION:**

From last few years, the chicken production in the world has been increasing gradually because of standardized farming management and good manufacturing practices. According to world’s agricultural produce survey, chicken is the most favourite produce, since it is a nutrient rich food providing high protein, low fat and low cholesterol, and lower energy than other kinds of poultries.

From last few days around the world, there has been an increased level of awareness regarding the safety of food products like chickens and there has been a high demand for good quality chicken food. This paper is highlighted the technology based solution for low cost, asset saving, quality oriented and productive management of chicken framing.

This study intended to explore utilizing an Intelligent System which used an Embedded Framework and Smart Phone for monitoring chicken farm to control environmental parameters using smart devices and technologies.

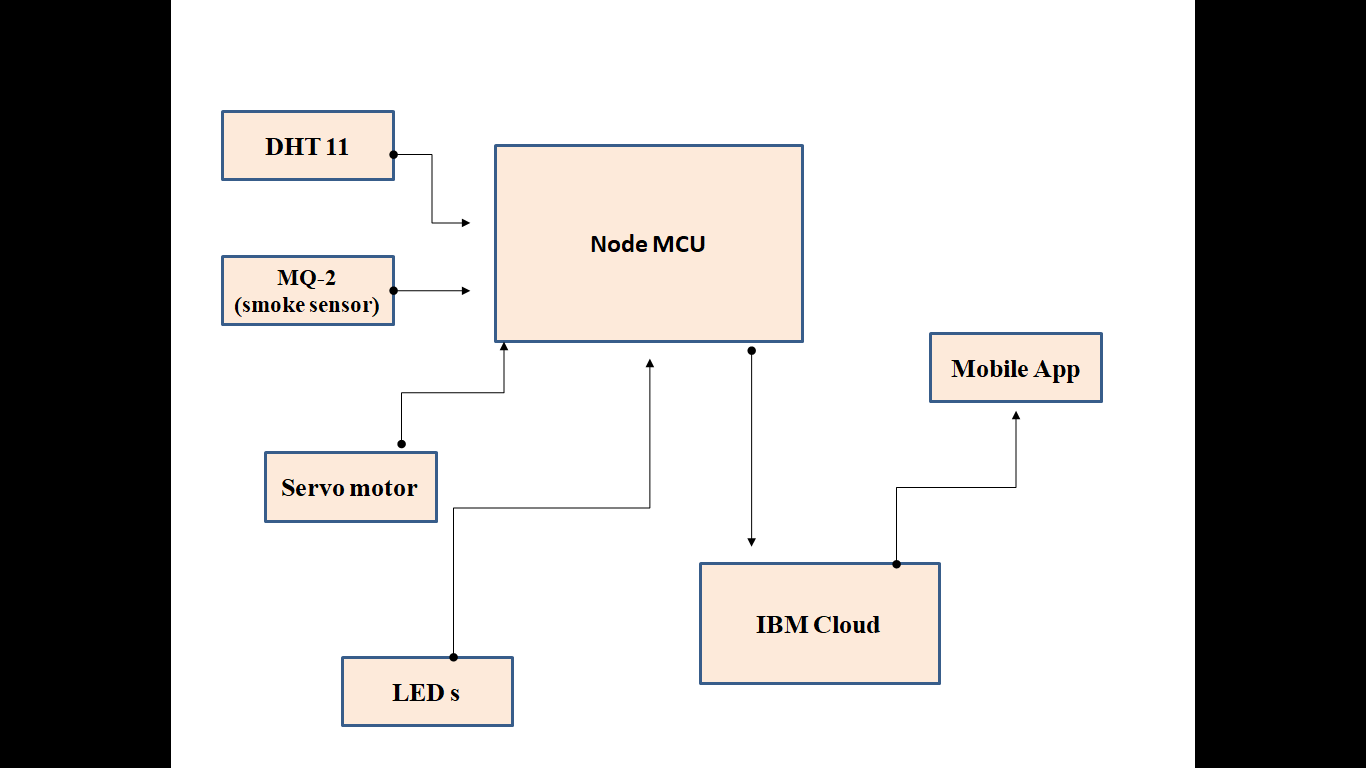
India is considered as an agricultural wealthy Country in terms of food and important spot in India as the eggs and chicken meat are critical and rich wellsprings of protein, vitamins and minerals. Poultry gives rich natural excrement and is an essential wellspring of pay and job to a huge number of farmers and different persons occupied with united exercises in the poultry business. Chicken is the most broadly acknowledged meat in India.

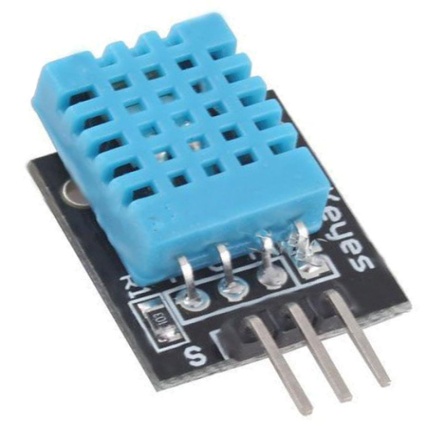
The health of chicken depends on the environment in the poultry farm. If the environmental condition is not suitable then there may be problem with growth of the chicken and there health issues. Healthy chicken growths rapidly and having good demand in the market. Poultry farm are design in a such way that, environmental conditions can be altered by providing facilities like ventilation, cooling and lightening on rough, wall and floor.

The birds are surrounded by micro level climate and it is very much important for the health of the birds. This paper proposes the new model by using advanced modern technology to make traditional chicken farming smarter. Smart farm gives the environmental parameter statistics like temperature, humidity, smoke, weather condition etc to the desktop computer through advanced sensors and microcontroller. The farm is connecting with smarter devices like application program, sensors, microcontroller which gives automation to the chicken poultry farming.

* **Hardware components :**
* Node MCU
* DHT 11
* Servo Motor
* LED’s
* MQ-7
* **Software components:**
* Arduino IDE
* Android Studio
* IBM Watson

**BLOCK DIAGRAM**



**BLOCK DIAGRAM DESCRIPTION:**

* **DHT11:**

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.

Each DHT11 sensors features extremely accurate calibration of humidity calibration chamber. The calibration coefficients stored in the OTP program memory, internal sensors detect signals in the process, we should call these calibration coefficients. The single-wire serial interface system is integrated to become quick and easy. Small size, low power, signal transmission distance up to 20 meters, enabling a variety of applications and even the most demanding ones. The product is 4-pin single row pin package. Convenient connection, special packages can be provided according to users need.

**TECHNICAL SPECIFICATIONS:**

* Measurement Range : 20-90%RH 0-50 ℃
* Humidity Accuracy: ±5％RH
* Temperature Accuracy: ±2℃
* Resolution: 1
* Package: 4 Pin Single Row
* **SERVOMOTOR**:

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration.It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

Servomotors are not a specific class of motor although the term *servomotor*is often used to refer to a motor suitable for use in a closed-loop control system.

Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing.

A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is a signal (either analogue or digital) representing the position commanded for the output shaft.

The motor is paired with some type of encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller. If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the positions approach, the error signal reduces to zero and the motor stops.

The very simplest servomotors use position-only sensing via a potentiometer and bang-bang control of their motor; the motor always rotates at full speed (or is stopped). This type of servomotor is not widely used in industrial motion control, but it forms the basis of the simple and cheap servos used for radio-controlled models.

* **MQ-7**:

**MQ**-**7** is a Carbon Monoxide (CO) sensor, suitable for sensing Carbon Monoxide concentrations(PPM) in the air. The **MQ**-**7** sensor can measure CO concentrations ranging from 20 to 2000ppm. This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance.

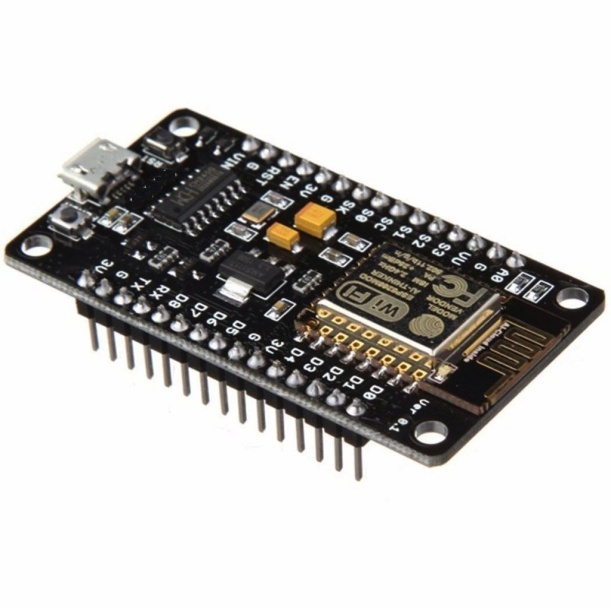
The drive circuit is very simple , just a voltage divider; all you need to do is power the heater coil with 5V DC or AC , add a load resistance, and connect the output to an ADC or a  simple OPAMP comparator.

This sensor comes in a package similar to our MQ-3 alcohol sensor, and can be used with the rhydoLABZ breakout board. The enveloped MQ-7 Gas Sensor have 6 pins, 4 of them are used to fetch signals, and other 2 are used for providing heating current. A standard measuring circuit of MQ-7 Gas Sensor sensitive components consists of 2 parts.

Connecting five volts across the heating (H) pins keeps the sensor hot enough to function correctly. Connecting five volts at either the A or B pins causes the sensor to emit an analog voltage on the other pins. A resistive load between the output pins and ground sets the sensitivity of the detector.

The resistive load should be calibrated for your particular application using the equations in the datasheet, but a good starting value for the resistor is 10 Kω.

* **Node MCU :**

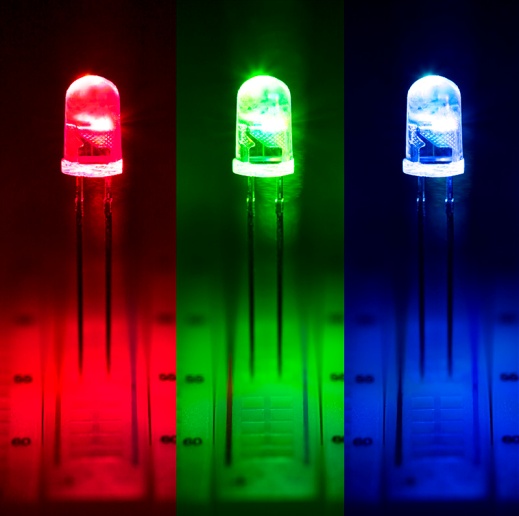
**NodeMCU** is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266.

NodeMCU was created shortly after the ESP8266 came out. On December 30, 2013, Espressif Systems began production of the ESP8266. The ESP8266 is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications . NodeMCU started on 13 Oct 2014, when Hong committed the first file of nodemcu-firmware to GitHub. Two months later, the project expanded to include an open-hardware platform when developer Huang R committed the gerber file of an ESP8266 board, named devkit v0.9. Later that month, Tuan PM ported MQTT client library from Contiki to the ESP8266 SoC platform, and committed to NodeMCU project, then NodeMCU was able to support the MQTT IoT protocol, using Lua to access the MQTT broker. Another important update was made on 30 Jan 2015, when Devsaurus ported the u8glib to NodeMCU project ,enabling NodeMCU to easily drive LCD, Screen, OLED, even VGA displays.

* **ESP8266 Arduino Core:**

As Arduino.cc began developing new MCU boards based on non-AVR processors like the ARM/SAM MCU and used in the Arduino Due, they needed to modify the ArduinoIDE so that it would be relatively easy to change the IDE to support alternate tool chains to allow Arduino C/C++ to be compiled for these new processors. They did this with the introduction of the Board Manager and the SAM Core. A "core" is the collection of software components required by the Board Manager and the Arduino IDE to compile an Arduino C/C++ source file for the target MCU's machine language. Some ESP8266 enthusiasts developed an Arduino core for the ESP8266 WiFi SoC, popularly called the "ESP8266 Core for the Arduino IDE". This has become a leading software development platform for the various ESP8266-based modules and development boards, including NodeMCUs.

* **LEDS**:

A light**-**emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. This effect is called electroluminescence. The colour of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor. White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device.

Appearing as practical electronic components in 1962, the earliest LEDs emitted low-intensity infrared light. Infrared LEDs are used in remote-control circuits, such as those used with a wide variety of consumer electronics. The first visible-light LEDs were of low intensity and limited to red. Modern LEDs are available across the visible, ultraviolet, and infrared wavelengths, with high light output.

Early LEDs were often used as indicator lamps, replacing small incandescent bulbs, and in seven-segment displays. Recent developments have produced white-light LEDs suitable for room lighting. LEDs have led to new displays and sensors, while their high switching rates are useful in advanced communications technology.

* **IMPLEMENTATION:**

The designed system is divided into control, alert module and monitoring module ,control module comprises of analog temperature sensor along with Node MCU . Here temperature sensor is used to measure the temperature in the farm house. So, depending on the output i.e, glowing of LED due to high temperature, automatically the servo motor starts (here the fan is taken as servo motor).This is very useful to monitor the environmental parameters like temperature. For effective growth of chickens in poultry farm all the above parameters should in desired level if not it will be difficult for the survival of the chickens. To avoid the situation, in this research a system is being designed which will provide the status of the each parameters and alerts the person if any critical situation arises.

* **SOFTWARE PROGRAM:**

#include <ESP8266WiFi.h>

#include <PubSubClient.h>

#include "DHT.h"

#include <Servo.h>

Servo myservo;

#define DHTPIN D8

#define DHTTYPE DHT11

DHT dht(DHTPIN, DHTTYPE);

#define temp\_led D7

const char\* ssid = "MLRITM-PLACEMENT";

const char\* password = "Mlritm@123";

String command;

#define ORG "q6w3k7"

#define DEVICE\_TYPE "smart\_poultry"

#define DEVICE\_ID "1234"

#define TOKEN "12345678"

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

char topic[] = "iot-2/evt/Data/fmt/json";

char authMethod[] = "use-token-auth";

char token[] = TOKEN;

char clientId[] = "d:" ORG ":" DEVICE\_TYPE ":" DEVICE\_ID;

WiFiClient wifiClient;

PubSubClient client(server, 1883,wifiClient);

void setup()

{

myservo.attach(D4);

Serial.begin(115200);

dht.begin();

Serial.print("Connecting to ");

Serial.print(ssid);

WiFi.begin(ssid, password);

while (WiFi.status() != WL\_CONNECTED) {

delay(500);

Serial.print(".");

}

Serial.print("WiFi connected, IP address: ");

Serial.println(WiFi.localIP());

pinMode(temp\_led,OUTPUT);

Serial.print("poultry farm");

Serial.println("poultry farm");

}

void loop()

{

int pos;

delay(2000);

//gas sensor start

int analogSensor = analogRead(A0);

Serial.print("Pin A0: ");

Serial.println(analogSensor);

delay(500);

if (analogSensor >800)

{

Serial.println("Please switch on the motor");

}

else

{

Serial.println("Motor is in Off Condition");

}

delay(100);

//gas sensor end

//dht11 start

float t = dht.readTemperature();

Serial.println(t);

delay(500);

if(t>35)

{

Serial.println("Temperature is HIGH");

myservo.write(45);

digitalWrite(temp\_led, HIGH); //Red

delay(200);

}

else

{

Serial.println("Temperature is LOW");

digitalWrite(temp\_led, LOW);

myservo.write(90);

}

PublishData(t, analogSensor);

}

void PublishData(float t, float analogSensor)

{

if (!!!client.connected()) {

Serial.print("Reconnecting client to ");

Serial.println(server);

while (!!!client.connect(clientId, authMethod, token)) {

Serial.print(".");

delay(500);

}

Serial.println();

}

String payload = "{\"d\":{\"temperature\":";

payload += t;

payload+="," "\"analogSensor\":";

payload += analogSensor;

payload += "}}";

Serial.print("Sending payload: ");

Serial.println(payload);

if (client.publish(topic, (char\*) payload.c\_str()))

{

Serial.println("Publish ok");

}

else

{

Serial.println("Publish failed");

}

}

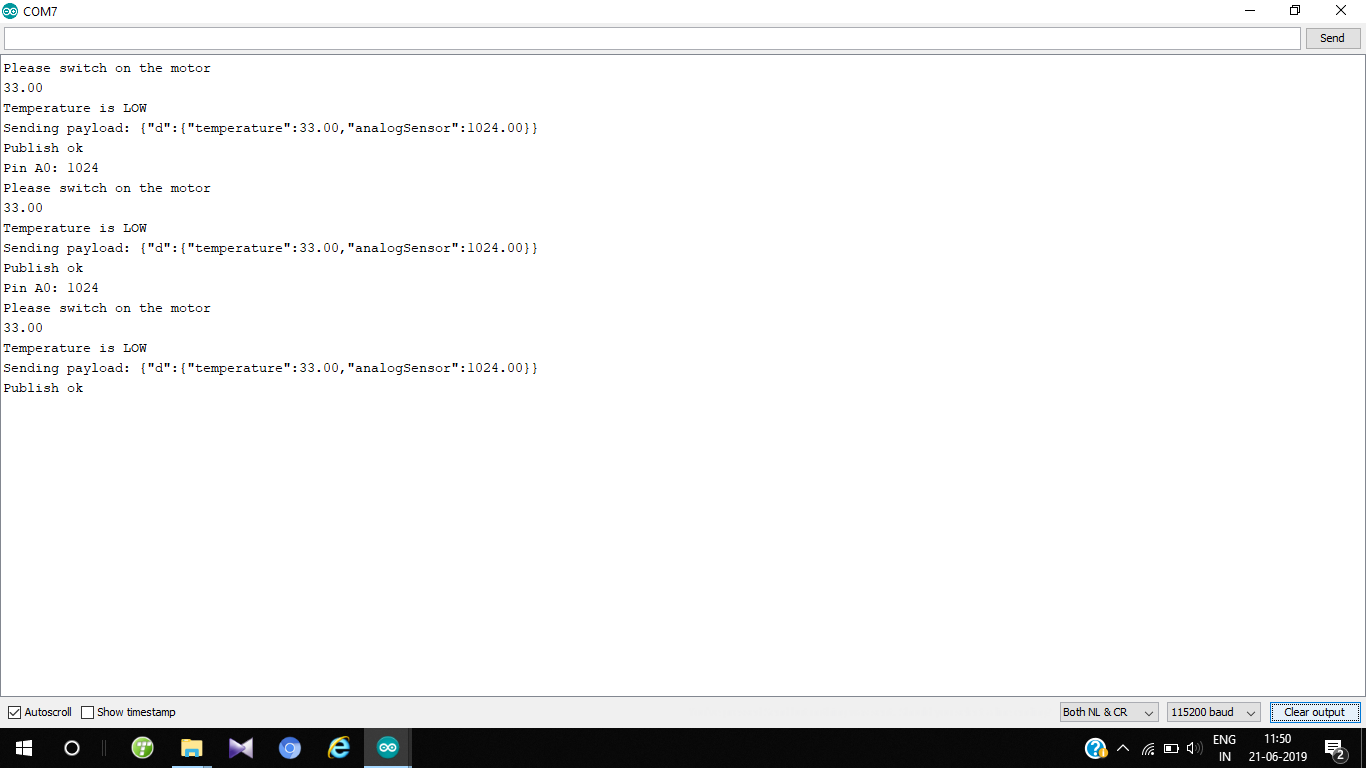
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Figure : Serial Monitor Output

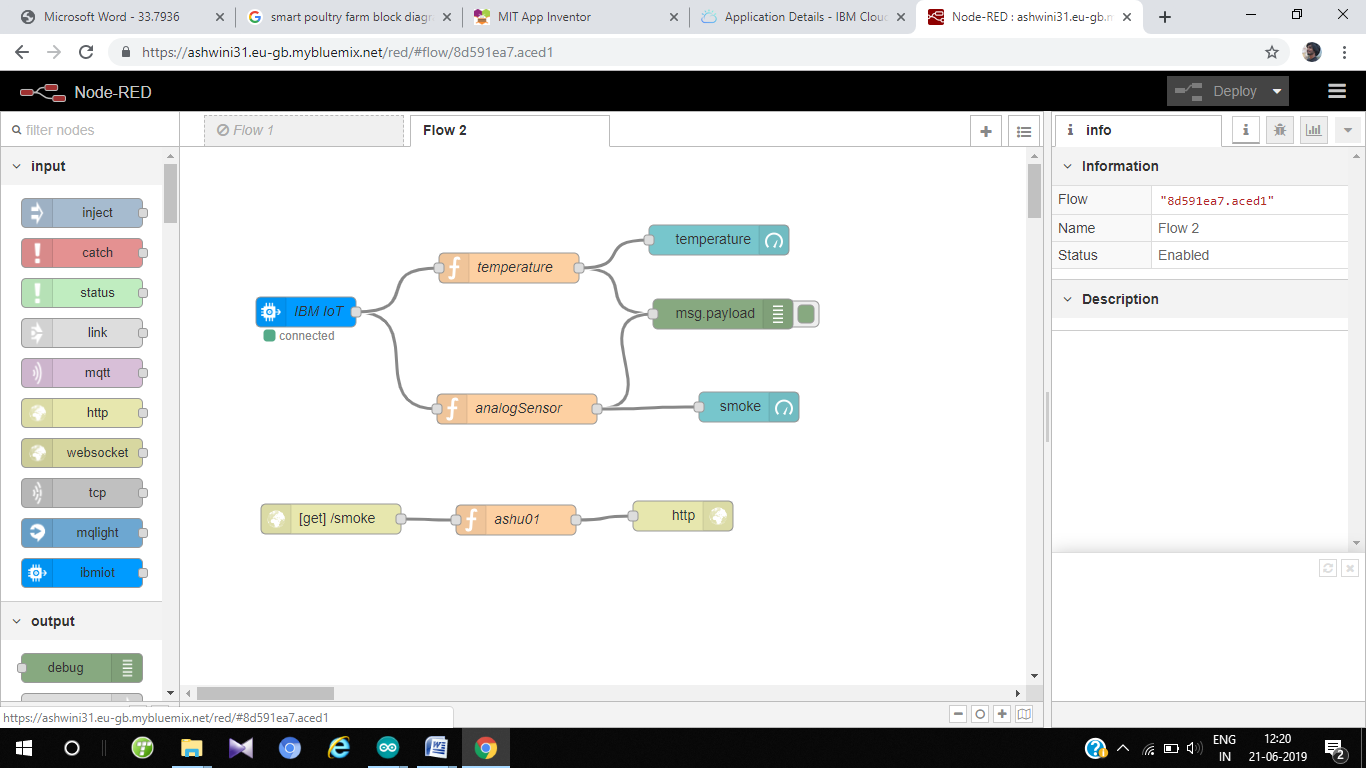
* **Node-RED:**

Figure : Before Deploying

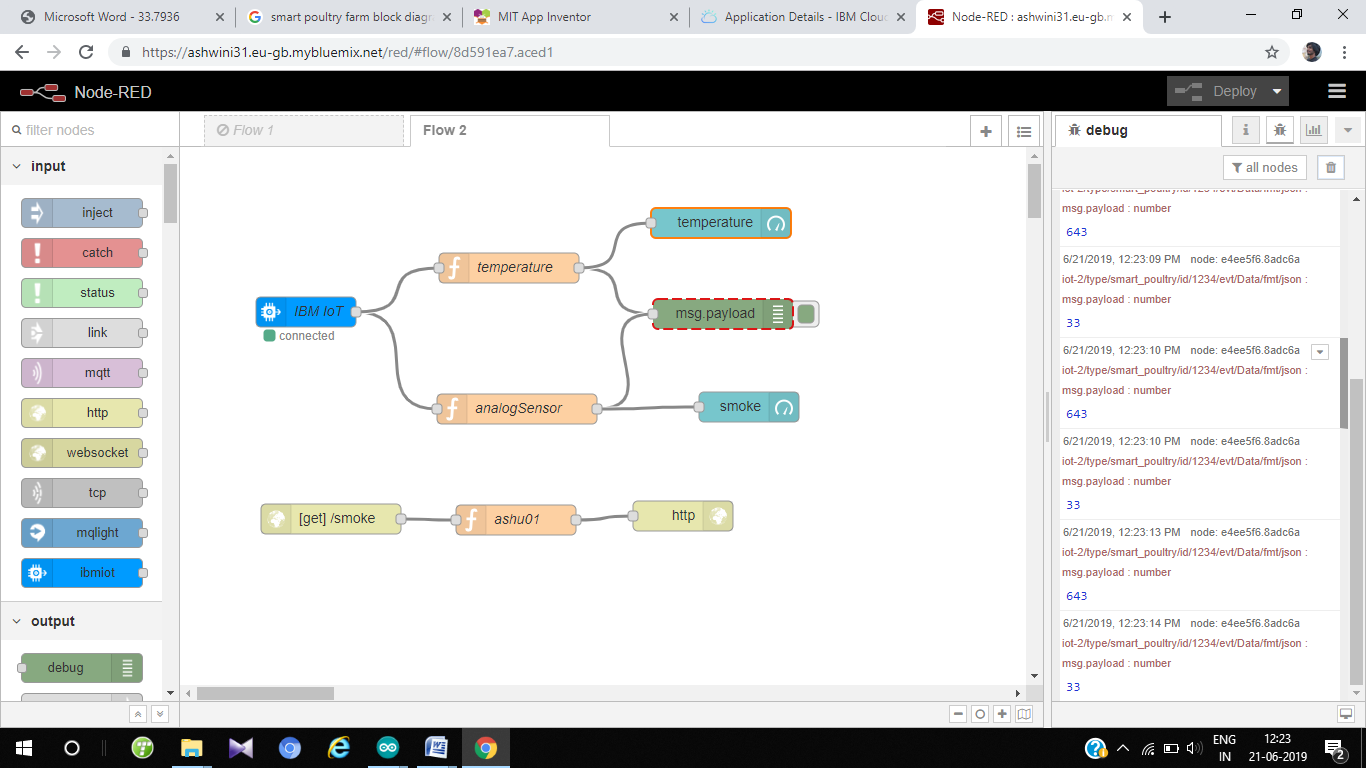


Figure: After Deploying

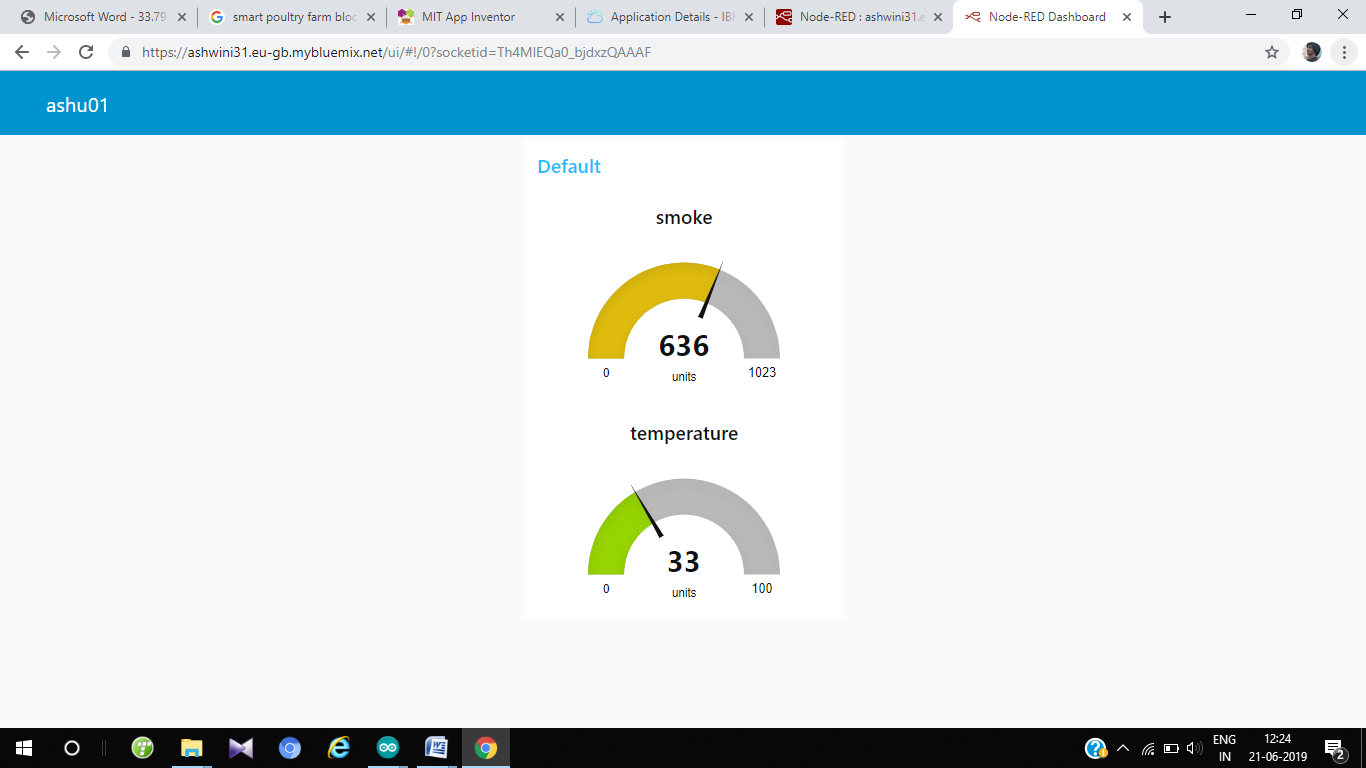


Figure: Node-RED Dashboard

* **MIT APP INVENTOR:**

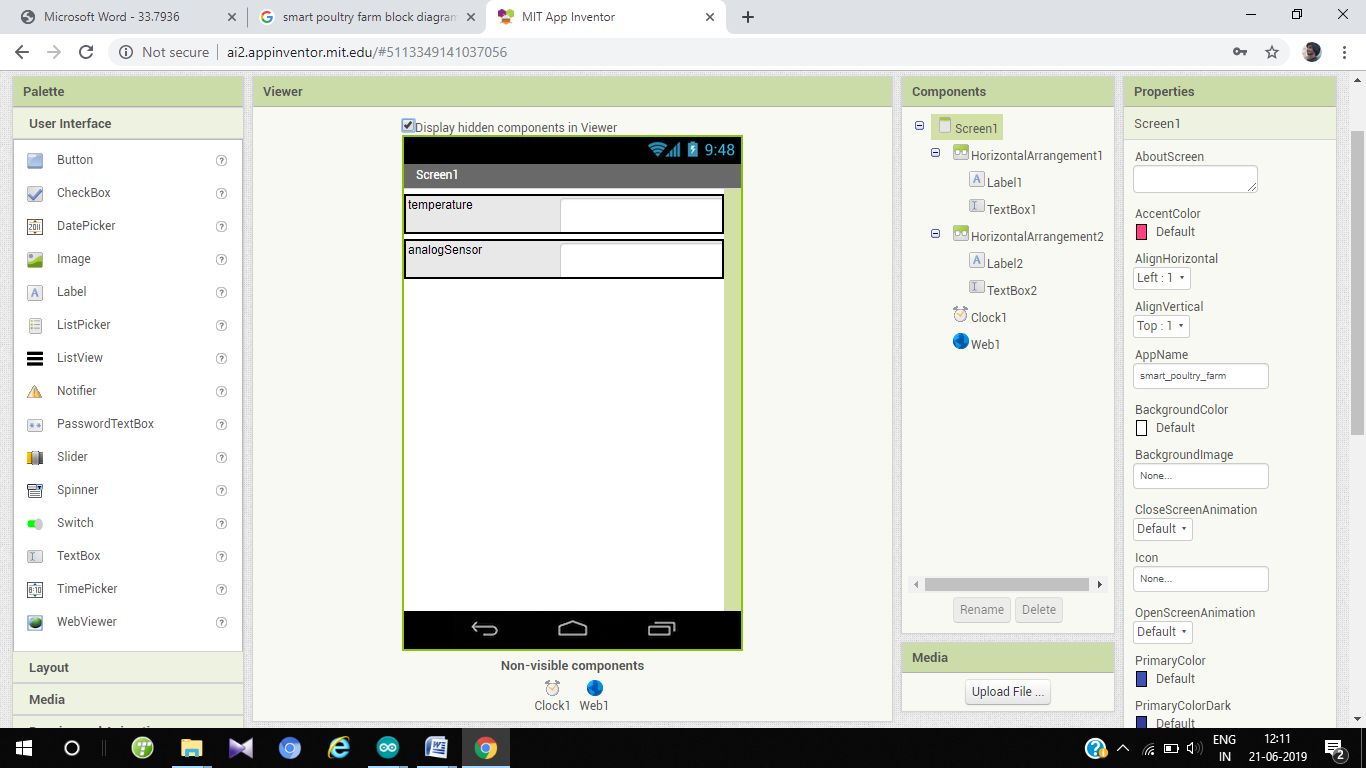


Figure: MIT Designer section

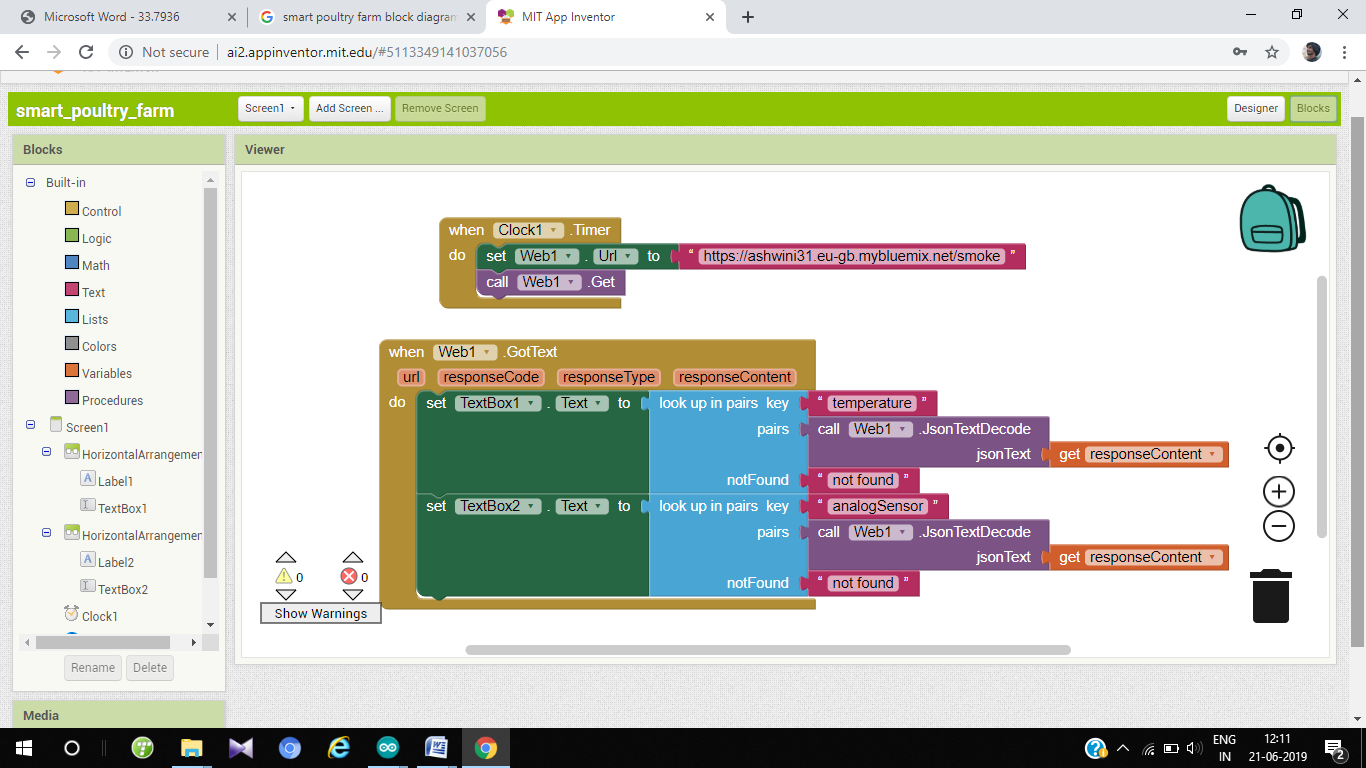


Figure:MIT Block Section

* **FUTURE SCOPE:**

There have been various survey’s that have been carried out in places like Saudi Arabia and Japan and it was inferred that most of the chickens were usually affected by the avian influenza virus. Poultry farms usually provide plenty of animal waste and by using that, goober gas can be developed and can be used for daily energy requirements. Hence, it’s very important to maintain the proper environment for the chickens. The health of the chicken at an early age is something to be taken care of as there is chance of chicks competing with each other for survival. Air inflow to the poultry farm also is important so while constructing the farm itself proper care should be taken. Studies have shown that, the effective growth of the chickens depends on the amount of ammonia present in the surroundings. Hence this also provides a scope for future study.

* **CONCLUSION:**

Monitoring environmental parameters in a real time industry are crucial . In this various environmental parameters for effective growth of chickens have been identified and defined . It also explains the method to automatically switch on the fans based on threshold values of temperature. As well as remote monitoring is done and with the help of this facility , the person in-charge can observe the situation and can react quickly if anything went wrong .

The main goal is to deploy IOT enabled farm control to improve overall operations efficiency , feed management , security and improvement in productivity. It also contributes to sustainable poultry, meat production, where farmer’s income and animal health is increased and environmental burden is decreased.