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intelligent iot based real time poultry monitoring system using ubidots

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ABSTRACT

Poultry farm is proposed for controlling different environmental conditions. There are different choices to maintain the climatic conditions like purifying, freezing, light, covering ceiling etc. Such processes are available to control climate in poultry. Maintain right climate is important for health of chickens. Proper climate will help for good growth of chicken. Normally, manually poultry causes human error can occur in understanding of climatic conditions. Carbon dioxide is harmful gas and it is more near bottom area of surface, it is hard to monitor the level of Carbon dioxide near chickens in traditional poultry techniques. Light has important scope in climatic conditions of poultry. Light impacts on climate around the birds, it also helps for vision. Feed must be fresh, good quality and balanced. Providing good food to birds will help to get proper growth and healthy chicken and finally huge production in firm. Feed should have vitamins and minerals for proper growth of chicken.

KEYWORDS: humidity, ammonia gas, data analysis, Internet of Things and Artificial Intelligence.

INTRODUCTION

Intelligent farm needs sensors to audit and authorized poultry conditions. It targets to observe the weather inside poultry using sensors. It takes proper care if these conditions not matched with standard limits. For example, if temperature of farm is high or low of pre-set, It will be taking corrective actions to maintain temperature. This can be implemented by initializing the processes like ventilations, heating and cooling. Sensors are used to observe and regulate NH3 (ammonia gas). The pre-defined standard factors of NH3, Humidity, Temperature, and water level indicator etc. are managed and maintained. Animal waste generates poisonous gas like ammonia in the farm. Production of ammonia is done by decomposition and reduce nitrogenous substances and uric acid contain in litter. The production of ammonia can be achieved by litter, moisture, pH, and temperature. It is required that the humidity should ranges from 50-70% and temperature between 13-27°C. High temperature and humidity boosts the growth of bacteria. High bacteria count causes production of ammonia by decomposition of the organic substances. The ammonia concentration should not exceed 35 ppm over the interval of 50 Minutes wherein general preferred limit is 15 ppm. The mean value of Hydrogen Sulphide is minimum 10 ppm to 15 ppm in fifty minutes. The reference value for Carbon Dioxide (CO2) should be maintained under 2500 ppm. Methane (CH4), Hydrogen Sulphide (H2S), Carbon Monoxide (CO) may be produced in farm.

METHODS

In our system, Various gases link methane, CO2, Ammonia(NH3), Humidity and temperature is measured and been collected in database.

Calculated values are verified with standard predefined values and if any difference observed corrective actions done as required. This data is collected and be stored on cloud for our use.

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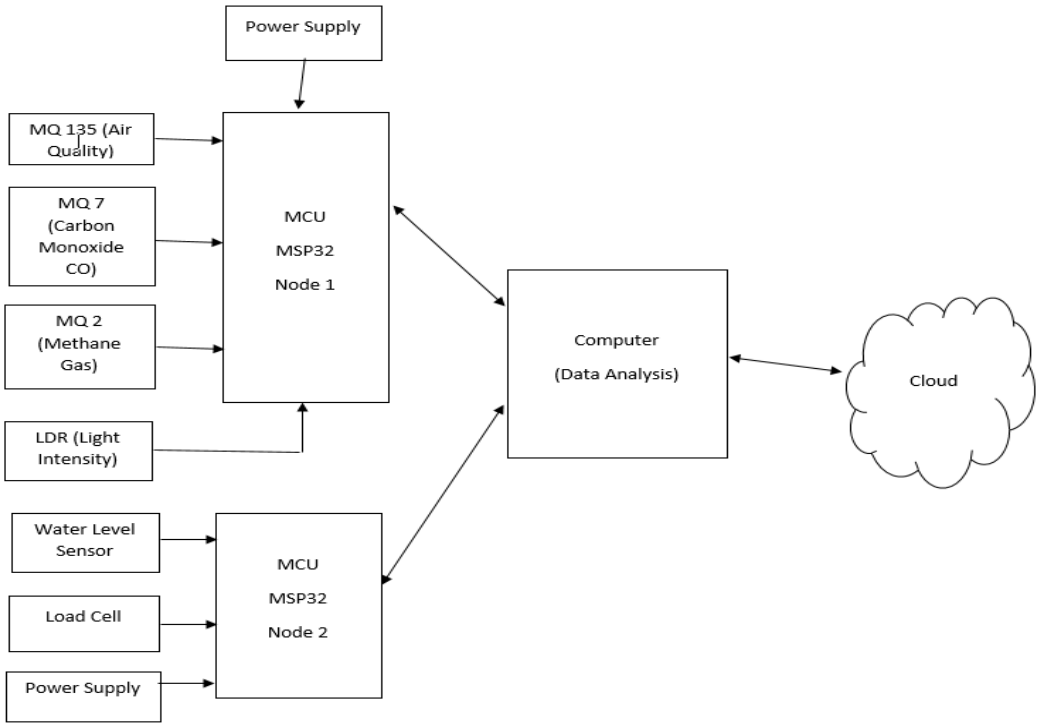


Hardware Used:

ESP32

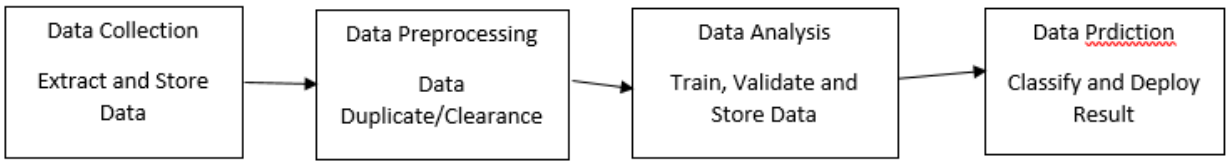
MQ4- Semiconductor Sensor for Natural Gas(Methane)

MQ7- Semiconductor Sensor for Carbon Monoxide

MQ-135 GAS SENSOR

Load Cell

Water Level Sensor



A steps to execute structure of machine learning problem are to collect raw data, identify features, name the sources, adopt sampling strategy and split the data. These steps are dependent upon your machine learning problem and to be executed before doing data transformation. Data Pre-processing is a machine learning technique. It breaks data to generate new variables which are not present in the training set. It produces new features for both administered and unsupervised learning. Its goal is to boost data by keeping model accuracy constant. A key step in machine learning is Feature Engineering which is process of design of artificial features in algorithm that improves performance for better result. Data scientists work more on data which becomes significant to achieve accuracy of models. After feature engineering process, develop predictive model in which machine learning model is implemented. Machine learning works on historic data and it is process where ML models are designed from previous experiences. ML model works on pattern based data and

predicts upon future for given dataset. It collects data from multiple sources and follows fine-tuned process of data. ML algorithm works on data that is being feed and accordingly problem statement, prediction of data, classification of data and other models that comes under ML world space. Training is an important step in machine learning. In training, to find patterns and making predictions prepared data is sent to machine learning model. To complete the task by observing machine learning data with training. After training the model, performance is checked and marked.

To get accurate and proper results, testing and training data need to modify continuously. If same data is sent to machine learning model then the accuracy will not hamper but if conditions changed then there will be change in accuracy of system.

In our proposed system, tree bagger classifier algorithm from supervised machine learning is used to predict the nature of smart poultry monitoring.

The experimented data from developed hardware is acquired from microcontroller-based system from sensor interfaced to it. Programming of microcontroller is performed in Arduino IDE software using embedded C language, Real time data is monitored and observed at Ubidots cloud.

Software Used:

Arduino

Ubidots

Ubidots is an Internet of Things (IoT) data analysis and visualization organization. We use sensor data for informationwhich is used to business decisions, machine interactions, educational research, and increase economics of global resources. To protype and measure IoT projects researchers and industrialist uses technology Internet of Things known as Ubidots. By using Ubidots, we can transmit data to cloud from all devices which are connected to Internet.

We can design any activity and caution based on your live data on visual tools.

To read and write data operations Ubidots has RESTful API such as data source, variables, values, events. The API support both HTTP and HTTPS and API Key is compulsory. Our information is secured with two replica, encrypted storage and optional TLS/SSL data support. We can personalize its permission group of every module of the platform, confirming the correct data is displayed to correct user. Ubidots is very easy and affordable to use the power of IoT in your business or research.

Specifications

1]User-friendly IoT Application Development and Deployment Platform.

2]Configure one Device Type and onboard 1000 devices with identical device properties and settings to scale a solution with ease.

3]Transform, Calculate, and Analyze data easily with serverless cloud analytics engine, UbiFunctions.

4]Customize the look and feel of any Application with white-label branding.

5]Access real-time and historical device and sensor data with 2 years storage and retention.

6]Any end-user or client uses dashboard, devices, events it gives licence and restrictions.

7]A cloud-based platform to give users and operators access to Apps anywhere with Internet connection.

8]Free to start!

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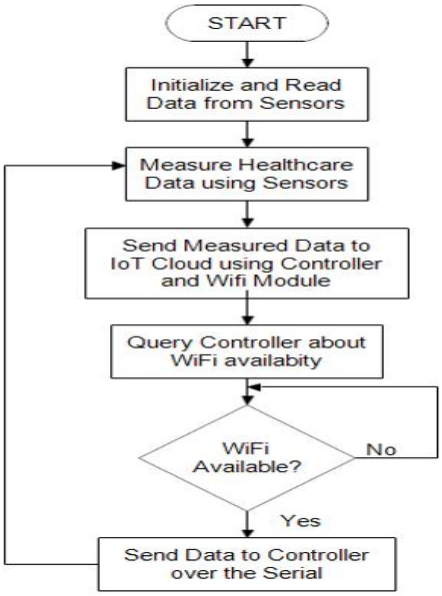
Flow Chart:

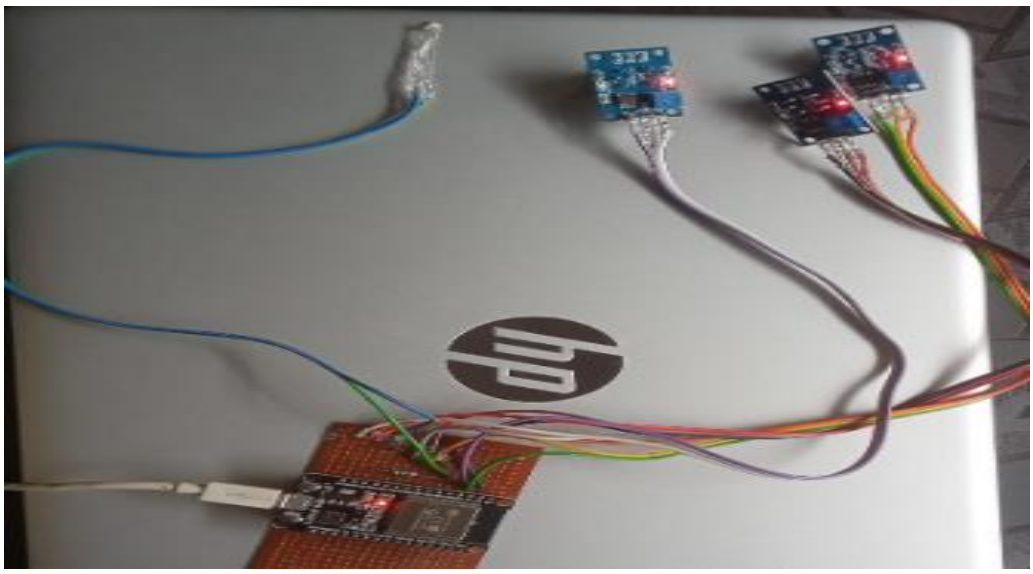


Initially, data is acquired from microcontroller based embedded system device where all sensors are interfaced. After measuring the health parameters data from sensors, data is monitored and verified on serial monitor on Arduino IDE software. Sensed data from health sensors is sent to Ubidots cloud using MQTT protocol via internet connection using WiFi. But if WiFi connection is not available then it will again check for connection and try to connect the WiFi.

RESULTS

We have mentioned all results for our project with different condition. Proposed system is analysed MQ2, MQ7, MQ135 and LDR with water level and load cell data and can predict the smart poultry farming.

Monitored data can be visualized on IoT based Ubidots software using url and application.



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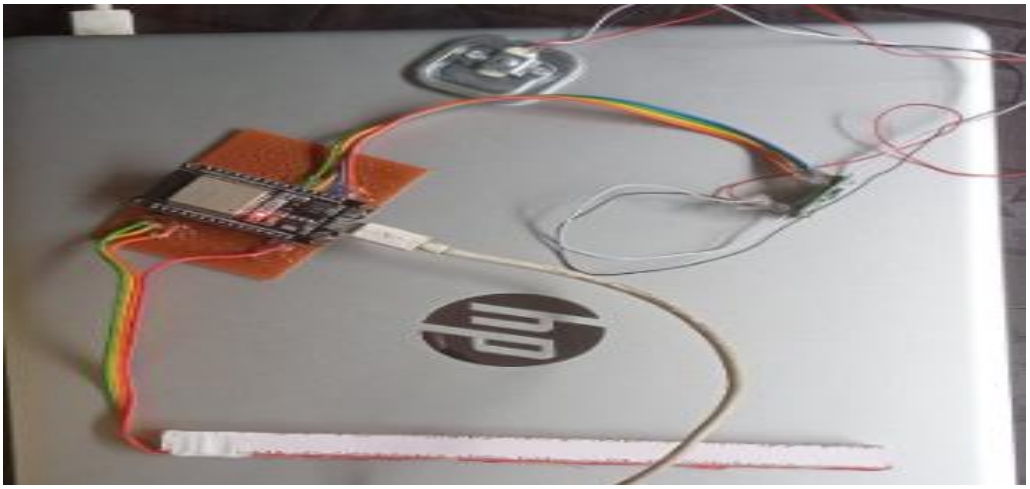

Fig : Laptop interfaced with embedded system device.

Microcontroller based hdware system

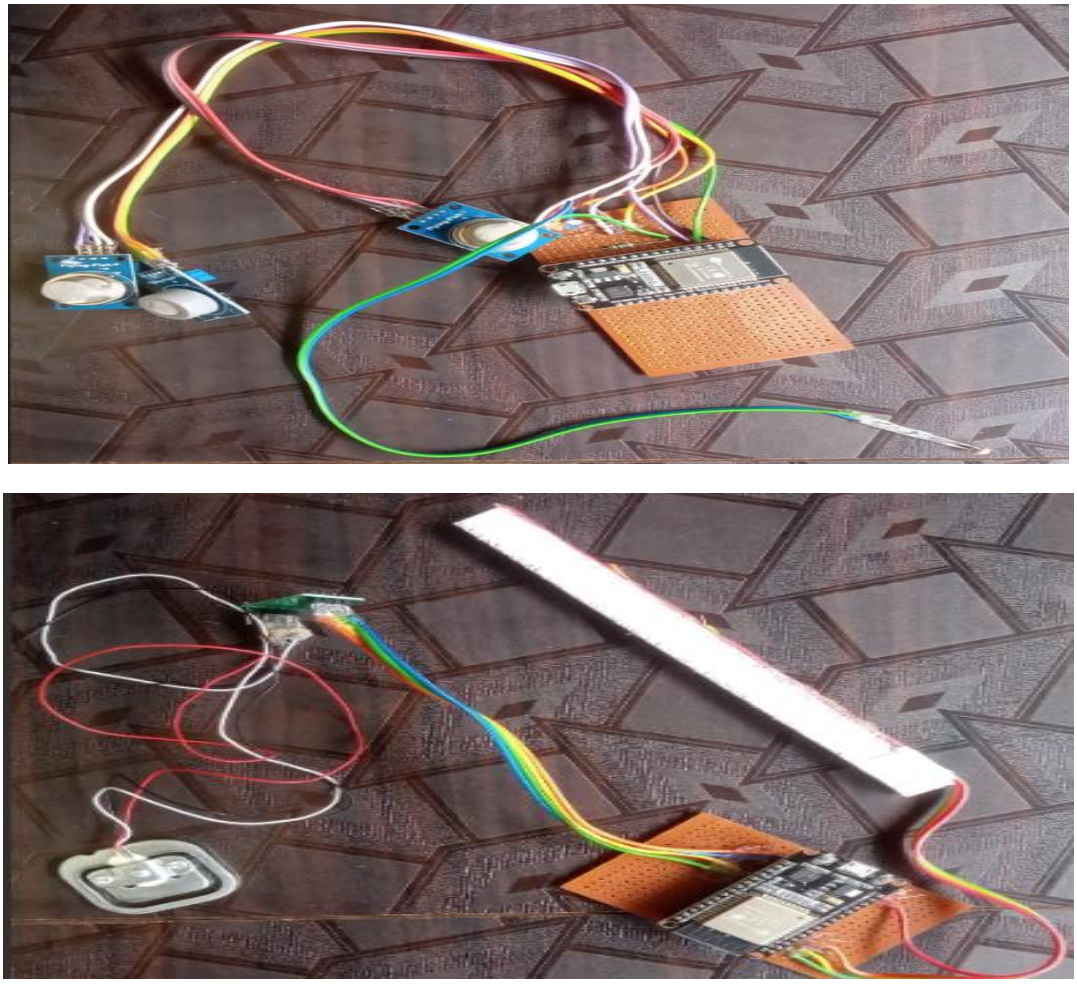

Fig: Microcontroller based hardware system.

IoT Cloud Platform for Data monitoring

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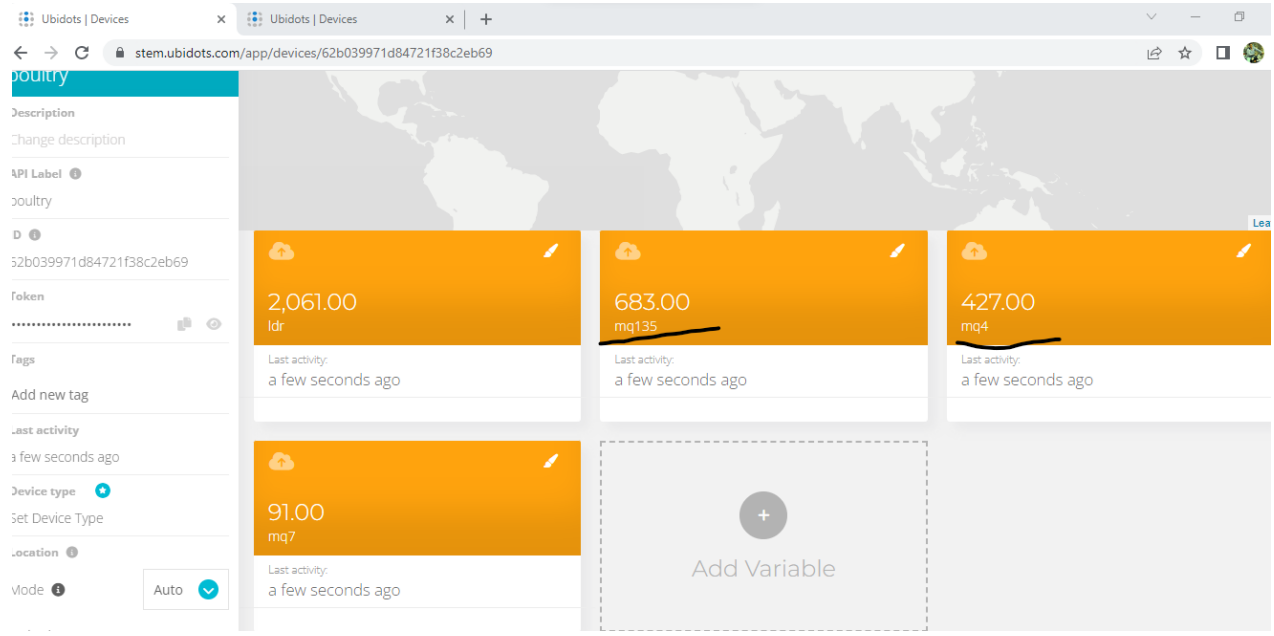

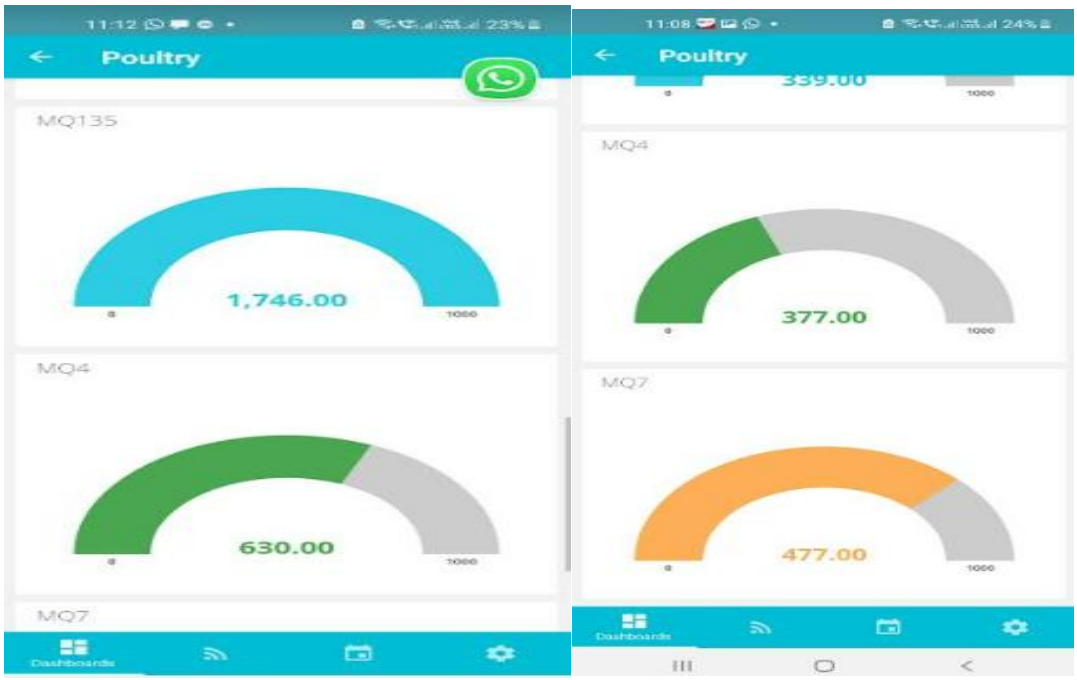

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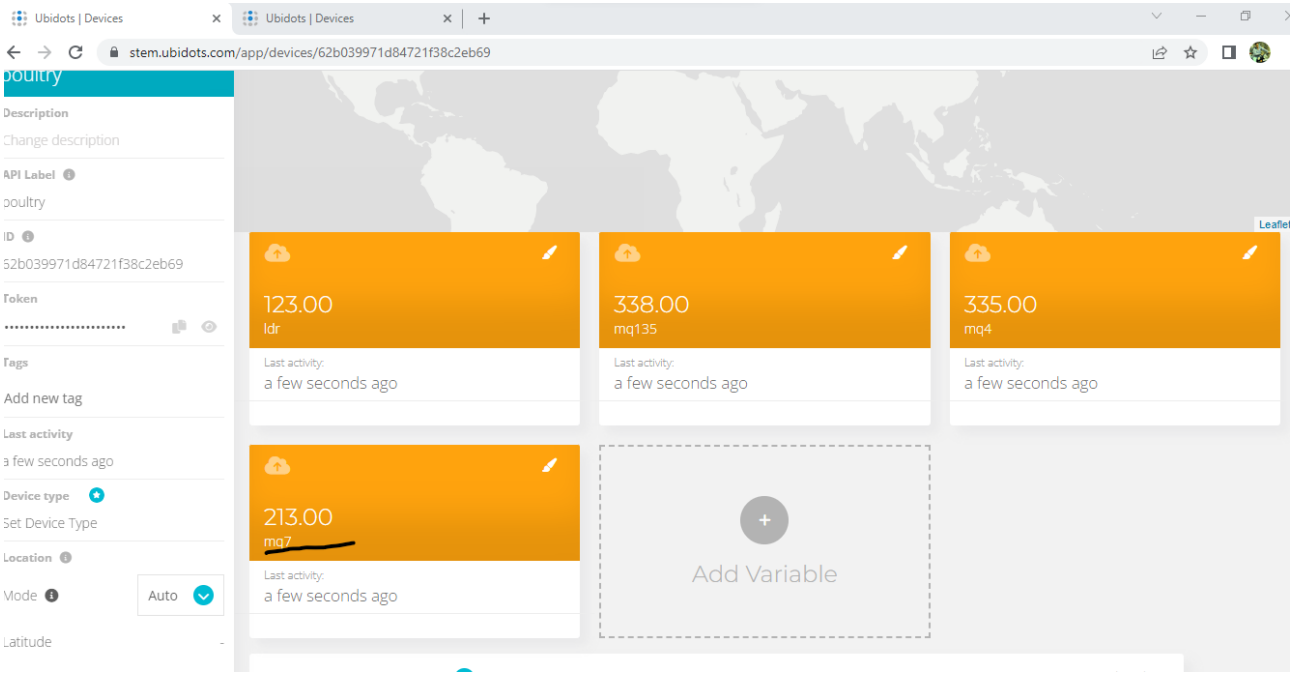

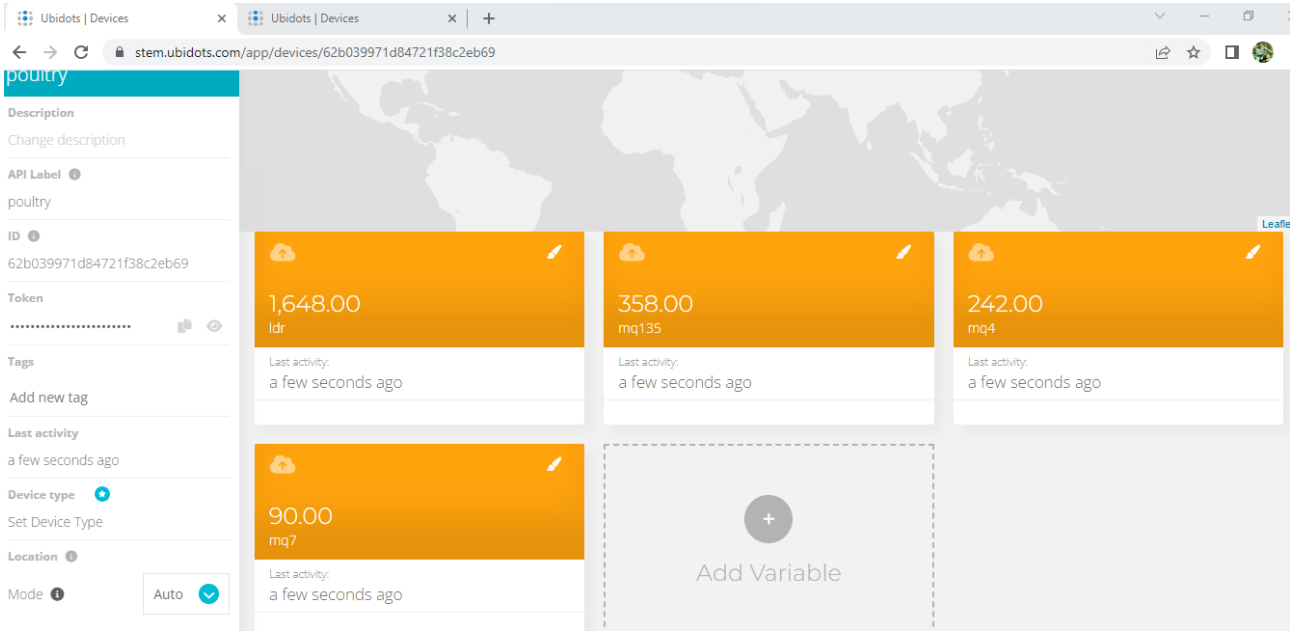

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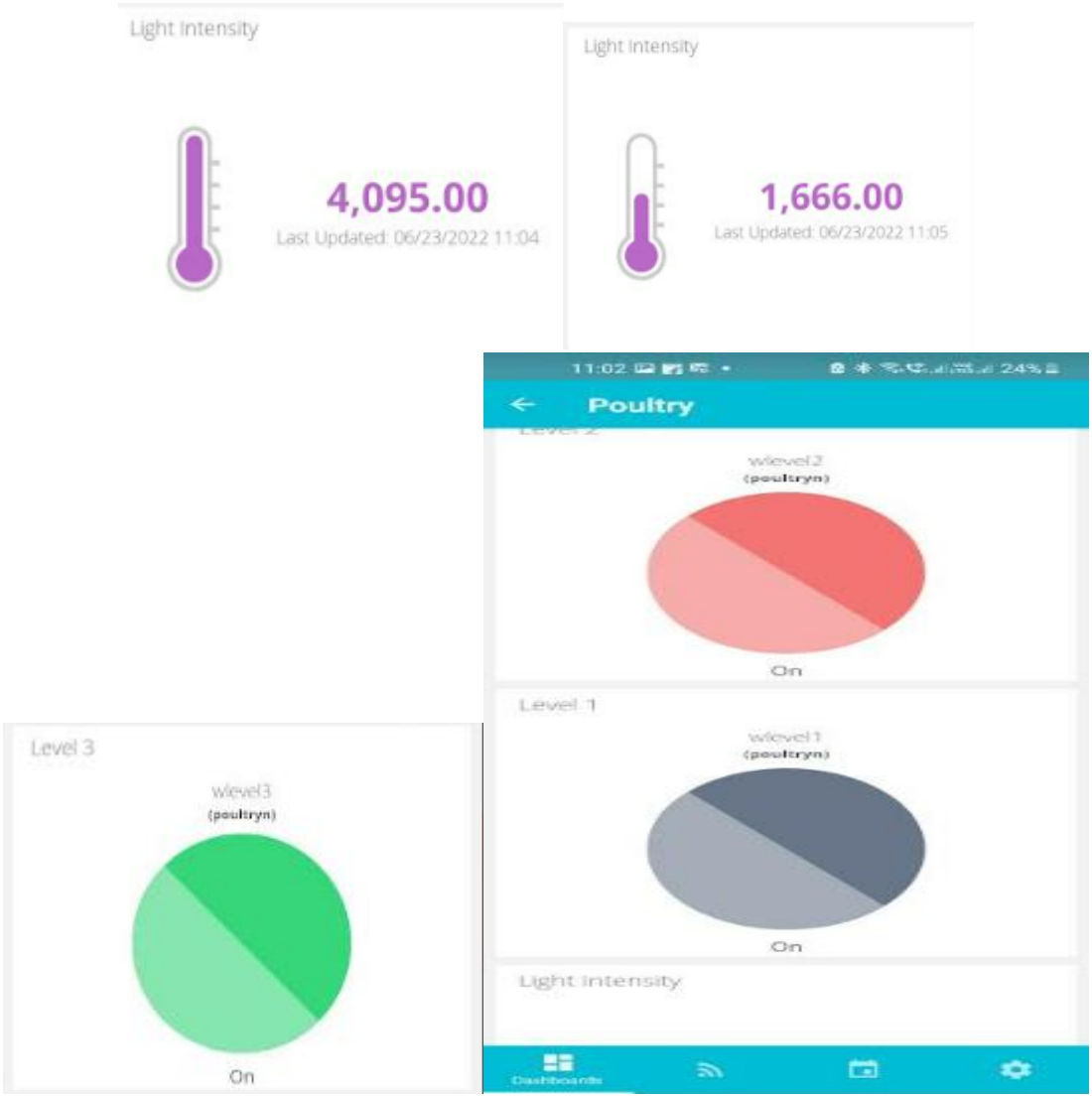

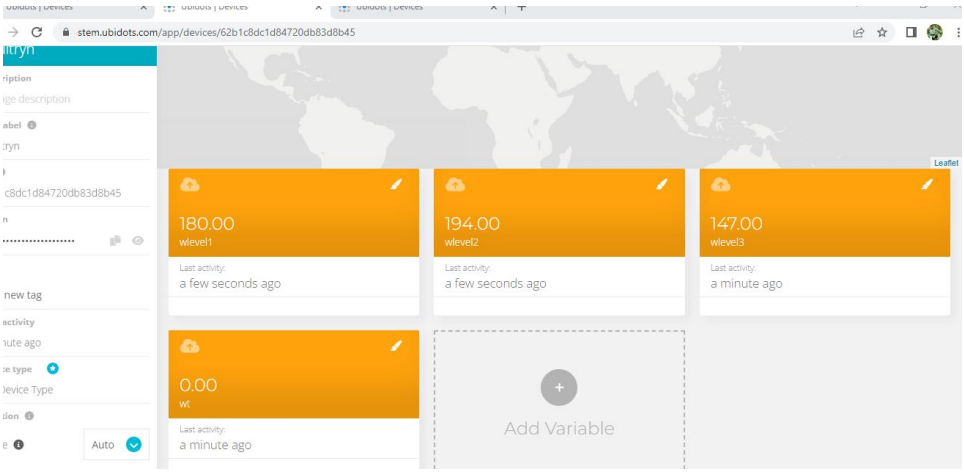

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DISCUSSION AND CONCLUSION

Finally, the collected data are used to train the system and tend to do the prediction. Proposed system is analysed MQ2, MQ7, MQ135 and LDR with water level and load cell data and can predict the smart poultry farming. The classification techniques used for prediction are tree bagger classification algorithms. The planned models were enforced in the MATLAB R2018 software. All fetched data is displayed to farm owner on his mobile and web portal using Ubidots.

Performance Parameters	Value
Accuracy	94.5%
Training Time	5.25 sec
Testing Time	3.45 sec

By using ESP-32 we can monitor reading received from sensors and perform corrective actions. Different environmental parameters like Light intensity, Weight, Water level and gases like ammonia, Methane and carbon monoxide can be monitored.

Observing chicks as per cycle and giving response to owner. It reduces manpower like memorizing and noticed different cycle in production. Weight of chicks is measured for good quality production through strain gauge and viewed on mobile application.

Advantages:

This system changes conventional farm into an intelligent farm.

It gives rapid and correct data of different conditions to farm holder.

The System is cheap and low budget for farmers.

The smart monitoring of different parameters like light intensity, weight, different gases by using WSN.

Manufacturing and fitness of poultry product improved. It is easy to clean farm.

FUTURE SCOPE

In this project, we are only doing real-time monitoring of different parameters link light intensity, air quality and gases like methane and carbon monoxide. Considering future scope, this monitored data can be stored Data can be stored on cloud and can be used for analysis. By analysing data from cloud, predictions done and reducing different challenges faced in poultry. For future use, we can monitor chickens using camera in poultry.

We can add fire alarm system and vaccination status of chickens.

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