Shrewd Commodity System for Remote Monitoring of Chicken Homesteads Condition in Arabian Peninsula Based on IoT

Rajesh R.K, Rajamonikala T.M, Bhraguram Thayyil
Shinas College of Technology
Oman
rajesh.kala@shct.edu.om
bhraguram.thayyil@shct.edu.om
Saju Mohanan Mohanan
Higher College of Technology
Oman
saju.mohanan@hct.edu.om

ABSTRACT: *This work plans to give points of interest on the best way to fabricate a robotized Environment Controlled Poultry Management System (ECPMS) utilizing minimal effort ware equipment and open source programming. A thorough framework was manufactured utilizing Raspberry Pi, utilized as a Linux installed framework board and Arduino-Uno board for interfacing with various sensors. The framework has been altogether explored for different physical parameters related with powerful poultry administration which incorporates temperature, stickiness, dampness content noticeable all around and air quality. It was found that the framework screens these parameters, as well as manages these parameters viably. The structure was seen to be exceptionally valuable for ranchers as they could without much of a stretch get to and control the framework remotely utilizing their handheld cell phones. The framework lessens human mediation, spares time, enhances asset use and expands poultry generation.*

1. Introduction

As per world's agrarian create, chicken is the most supported deliver, since it is a supplement rich sustenance giving high protein, low fat and cholesterol, and lower vitality than different sorts of poultries. Likewise, it is very simple to care for and engender its species. [2] for a long time, the chicken generation has been expanding on a normal of 4.63% yearly as a result of institutionalized cultivating administration and great assembling works on, prompting more chicken utilization and an expanded fare number of both household and universal goals. Then again, a lacking of work in chicken generation forms has influenced

new chicken fare, which is observed to be the main issue. [3] Another noteworthy deterrent cannot be right information sharing and people insight in chicken cultivating which impacts productivity.

2. Related work

This examination has concentrated on the utilization of current innovation to help oversee creature cultivating, which implies cultivate administration mechanization in different ways. Manakant Intarakamhaeng and et al [4] concentrated the model of ranch administration robotization innovation with RFID, Result; the appropriation of RFID, or radio-recurrence ID of items and creatures including 5 sorts of creature: cows, wild ox, sheep, pigs and rabbits were effectively independently recognized and recorded consequently. MdSaifudaullahBinBahrudin and Rosni Abu Kassim [5] displayed a fire caution framework in an ongoing checking framework that distinguished the nearness of smoke noticeable all around because of flame and caught pictures by means of a camera introduced inside a room when a fire happens. The implanted frameworks used to build up this fire alert framework were Raspberry Pi and Arduino Uno. The key component of the framework is the capacity to remotely send a ready when a fire is identified. At the point when the nearness of smoke is identified, the framework will show a picture of the room state in a website page. The framework will require the client affirmation to report the occasion to the Firefighter utilizing a Short Message Service (SMS). The benefit of utilizing this framework is that it will diminish the likelihood of false aware revealed of the Firefighter. The camera will just catch a picture, so this framework will expend just a little stockpiling and power.

Kumar and Hancke [6] exhibited a creature wellbeing observing framework (AHMS) for checking the physiological parameters, for example, rumination, body temperature, and heart rate with encompassing temperature and dampness. The created framework could likewise break down the anxiety level comparing to warm dampness list (THI).

The IEEE802.15.4 and IEEE1451.2 guidelines based sensor module was additionally grown effectively. The zigbee gadget and PIC18F455 microcontroller were utilized as a part of the execution of sensor module. The graphical UI (GUI) is executed in Lab VIEW 9.0 as indicated by the IEEE1451.1 standard. The constant checking of physiological and behavioral parameters can be available on the GUI PC. The gadget is exceptionally useful and a cheap medicinal services of domesticated animals. A model was created and tried with high exactness comes about. From the above.

There are numerous new advancements that can be utilized as a part of a more productive administration of ranches. The creators contemplate has concentrated on the significance of current innovation of Raspberry Pi, Arduino and Smart Phone consolidated with chicken cultivating.

3. Problems in Poultry farming

Conventionally bred broiler chickens: Most of the chicken available in the stores today comes from flocks that grow to market weight in about 48 days on average, using fewer natural resources – therefore more sustainably. Compared to 25 years ago, today's chickens now require seven percent less feed per pound to grow. Considering our national broiler flock eats about 57 million tons of feed per year – that is a lot of resources saved.

Slow growth/Heritage broiler chickens: "*Slower-growing*" chickens or "*Heritage breeds*" are chickens that can take almost twice as long to reach market weight – about 81 days typically – because they do not convert feed to muscle as quickly. Because of this, these breeds require more feed, fuel, water and land per pound of meat to sustain their growth. As such, these products are typically 3x more expensive than their counterparts.

Most of the Poultry farms are doing variu methodologies to make premature chicken.

Artificial lighting - chickens are often kept in near continuous lighting, with only 1-4 hours of darkness provided each night. The extra light confuses the chickens into thinking it is morning so they eat more food. The lack of darkness also keeps the birds tired as they are lacking in sleep. They are therefore less likely to walk around or move (as exercise of any kind could cause weight reduction). The lighting that is provided is a low lux lighting which isn't a fully bright light. This also ensures low exercise and high feed intake as it is bright enough to keep them awake but not so bright that it encourages them to walk around.

Overcrowding also ensures the birds can't exercise as there is so little room the birds aren't able to move around easily. Overcrowding also causes greater build-up of dust and ammonia reducing air quality which can cause respiratory disorders.

Birds are often walking over the top of each other causing difficulty for chickens attempting to sleep.

Drug use - chickens have coccidiostats put into their feed. Coccidiostats are a nicarbazin which is an antibiotic type drug. They are regularly used in the broiler industry. Traditionally they are used to treat coccidiosis (a parasitic disease resulting from infestation of the alimentary canal). Often birds pass small numbers of oocysts in their faces without negative effects. Coccidiosis becomes important when animals live in conditions that permit the build-up of oocysts (in the faces) in the environment, for example, the intensive farming of chickens.

Now experts are warning that the overuse of antibiotics in poultry farms around the world is creating a generation of superbugs that are resistant to treatment by virtually every drug in the medical establishment's armory.

With up to 80 per cent of the raw chicken on sale in some countries carrying these resistant bacteria, they can be transferred to humans during the handling of infected meat or the eating of undercooked produce.

The bacteria will then survive in the gut before potentially triggering illnesses such as persistent urinary infections or, more seriously, blood poisoning, also known as sepsis.
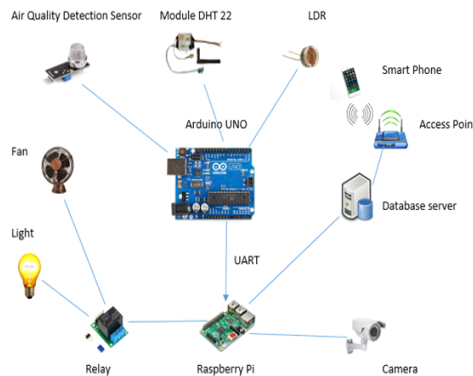
4. Concept Diagram

Figure 1. Full Block Diagram of the System

5. System Overview

Appeared in figure 1, parts of the programmed cultivating framework on Raspberry Pi Model-B and Arduino Uno are illustrated. The framework can tell utilizing a continuous disturbing framework to advanced cells detailing, for example, the present and day by day most noteworthy/least temperature, stickiness, and climate nature of the homestead environment. Clients can likewise control the channel fan switches and tweak the warning framework to the advanced cell.

6. Methodology

Raspberry Pi
Raspberry Pi utilized as a part of this work is Model 3 which is a correction of the first Raspberry Pi. A Raspberry Pi is a Visa measured PC initially intended for training, propelled by the 1981 BBC Micro. Raspberry pi 3 [4] depends on the Broadcom BCM2837 framework on a chip (SoC) that incorporates an ARM Cortex-A53, 1.2GHz processor, Video Core 4 GPU, and having 1 GB LPDDR2, 900 MHz RAM. It utilizes Micro SD card for boot media and tenacious stockpiling. Alternate elements incorporates 700 MHz clock speed, 4 individual USB 2.0 ports, 10/100 Base T Ethernet port, 2.4GHz 802.11n WIFI module, Low vitality Bluetooth 4.1 module, HDMI sound and video yield, has 40 GPIO pins utilized as both computerized information or yield working at 3.3 V.

Arduino
Arduino is an open-source prototyping stage in view of simple to-utilize equipment and programming. In this work UNO variation of Arduino is utilized. Arduino UNO [5][6] is a microcontroller based formative prototyping load up, utilizations an

ATMEGA328P controller chips having working voltage of 5V, and has a clock speed of 10 MHz. Arduino Uno can be modified with Arduino IDE, [7] as ATmega328 accompanies preboned with a boot loader takes out the need of utilizing an outer equipment software engineer. Here each program is known as portray.

Temperature Humidity Sensor Module

Ecological conditions specifically influence creature vocation adding to some ceaseless pandemics, for example, Bird Flu and Hand Foot and Mouth Disease. In this manner, DHT22 is use as a control for measuring temperature (for both Fahrenheit and Celsius esteem) and mugginess. The estimation unit will be shown in a computerized flag frame.

Gas Sensor Module

The module fills in as an Air Quality Detection Gas Sensor, this is delicate to gas unsafe to human, connected to gauge NH3, NOx, Alcohol, Benzene, CO, and CO2. The module is additionally utilized for controlling climate conditions and air cleaners in structures. The estimation unit is introduced in a simple flag. In this examination, three blue pencil structures were utilized, comprising of MQ-2, MQ-135, and MQ-136 on account of its gas estimation contrasts.

Photosensitive Sensor Module (LDR)

A light sensor was utilized for estimation of light force particularly for stripped eye light, its unit is called Lux [8]. Light Dependent Resistor (LDR) is a light touchy resistance changing electronic resistance when there is a light rate, called Photo Resistor or Photo Conductor. The resistor was produced using Semiconductor, Cadmium Sulfide (Cds) or Cadmium Selenide (CdSe). These two substances are semiconductors covered in an artistic sheet as a base.

Equipment Connection

The Raspberry Pi and Arduino were associated by means of UART. The association was a serial correspondence as Full Duplex since there was two-ways that information could be transmitted through stick TX and RX. An immediate association between the Raspberry Pi and Arduino was restricted, due to its electrical potential contrasts, which is 3.3 volts for the Raspberry Pi and 5 volts for the Arduino. Bi-directional Logic Level Converter ought to be utilized to separate them.

Figure 2. Bi-directional Logic Level Converter

7. System Implementation

Building an ECPMS requires plan, improvement and execution on different equipment and programming framework. The framework incorporates an Arduino UNO board consistently faculties the information from the sensors associated with it, advances it to Raspberry Pi over USB interface which investigations the information got, if physical parameters cross the limit values, an information base passage is made and the same is told to the client utilizing GCM Service. Client may react to RPI server to make essential move or may change the framework to auto mode.

The Raspberry Pi board is functioning as a co-facilitator hub, introduced with Rasbian wheezy which is a LINUX based Operating System (OS). This OS is introduced on a SD card utilizing SD formatter. SD formatter is utilized to design the card and win32diskimager to stack the Operating framework. After this, first boot arrangements are made which incorporates root segment expansion, head/headless mode booting, camera setup, framework refresh and overhaul.

In this design database server and web server are actualized on a solitary board PC (RPI) utilizing LAMP engineering [12], which diminishes the unpredictability and cost of arrangement. Light is an acronym utilized for Linux, Apache, My SQL and PHP is

server arrangement used to setup web-application. It is an open source Web advancement stage that utilizations Linux as the working framework, at the heart of the LAMP stack is server programming called Apache functions as the Web server whose occupation is to process http asks for, My SQL as the social database administration framework and PHP as the protest situated scripting dialect. These four Open-Source applications, usually alluded to as the LAMP stack, frame a capable and modest contrasting option to restrictive site arrangements. Almost all facilitating suppliers utilize a variety of the LAMP stack, regardless of whether it be shared facilitating or a committed server. All the co-appointment capacities are performed in Raspberry Pi executed utilizing python programming. Python gets information values from Arduino over serial port through USB interface. It then investigations to check whether the information is in passable breaking points. On the off chance that the information crosses as far as possible, an information base section is made and is advised to the client utilizing GCM administrations.

In this work RPI needs to advise the client at whatever point sensor information crosses the limit values in a dependable way. Google Cloud Messaging (GCM) administrations [13] are utilized to push information from server to approved clients gadgets at whatever point irregular condition is watched. GCM benefit handles all parts of lining of messages and conveyance to customer's applications running on target gadgets, and it is totally free. GCM design is delineated in figure 2. GCM includes 2 primary procedures:

Enlistment Process
Android device sends customer id, application id to GCM server to enroll the gadget. On effective enrollment GCM server returns enlistment id Android contraption. Presently contraption will send the enlistment id to RPI server. RPI server will store this enrollment id in its database for further utilization.

Warning Process
At the point when client is should have been informed, RPI server drives message to GCM server with gadget enlistment id. GCM server then conveys this message to enrolled device utilizing gadget enlistment id.

The web Applications are produced on the customer side to give clients a helpful web interface to the framework utilizing Java systems and speaks with Raspberry Pi utilizing a HTTP structure over GSM Internet. This application can get sensor values from Arduino and ready to control light, fan and view video encourage over his hand held gadget anyplace on the planet. In the wake of advising the client, RPI sits tight for a specific span of time. In the event that client educates to play out the important activity with the time, a specific GPIO stick is enacted which is associated with a hand-off, drives an actuator (fan, light). On the off chance that the client does not react in indicated time, the framework will go into auto mode.
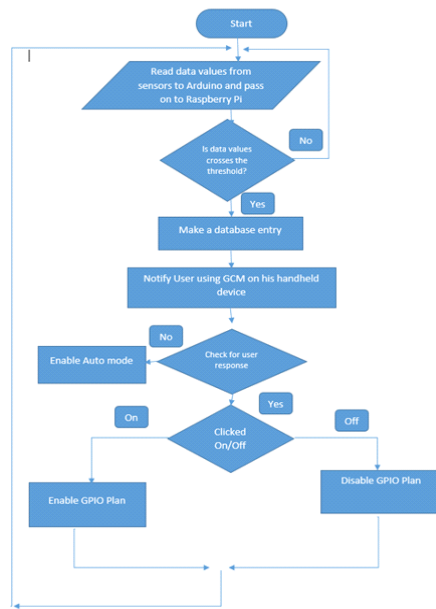

Figure 3. System Flow Chart

Reconnaissance highlight is executed utilizing a USB web camera and a summon line benefit called movement utilized as a part of Linux working framework used to screen video motion from at least one cameras. We utilized an edge rate of 100 fps and a determination of 640x480. Yield organize utilized is .jpg where each casing overwrites the past one henceforth sparing in memory.

Framework is outlined such that facilitator hub and sensors work freely of the web application. Authentic client can get to the sensor values from the information base by signing into Raspberry Pi. The web application can progressively refresh the sensor values and plot the charts without exasperating the sensors and actuators. This outline engineering enable client to arrange the framework to a particular application effortlessly. Figure 3 demonstrates the stream diagram of general framework working.

8. Results and Discussion

Arrangement incorporate position of sensors, aggregator hub, facilitator hub and Actuators. Remove between two hubs is set to 10 meters. Figure 4 demonstrates the depiction of sensor setup with LCD office for perusing Sensor values. Figure 5 demonstrates the association between aggregator, organizer hub and actuator hubs.
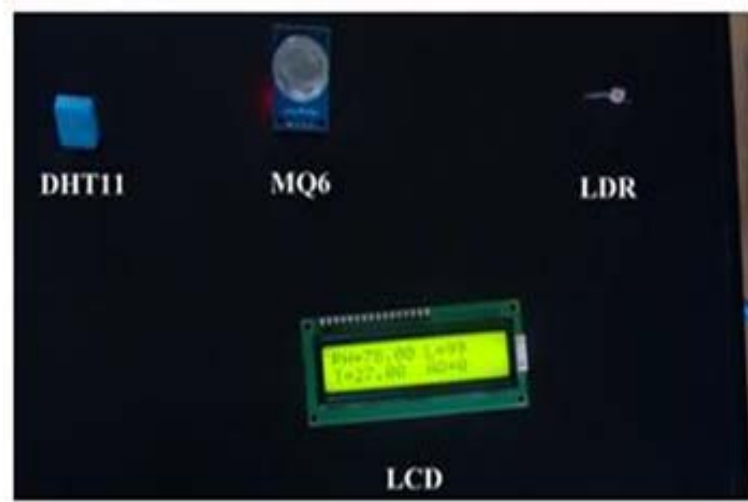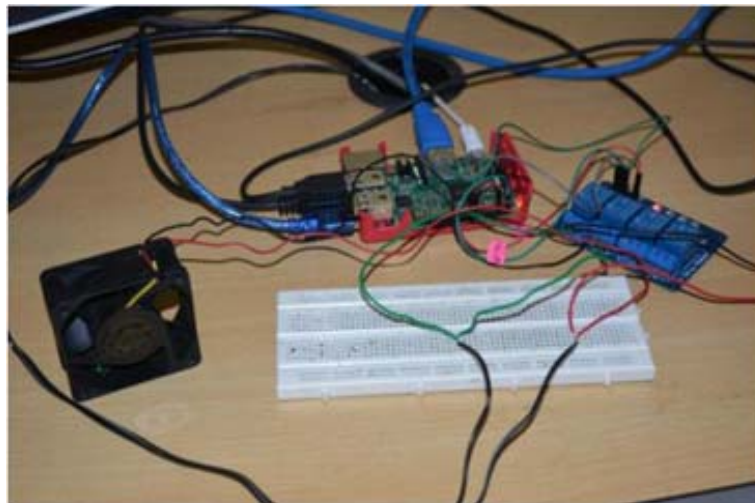

Figure 4. Sensor Setup Figure

Figure 5. Connection between RPI and Actuator

Figure 6 demonstrates the home screen of the client application where every one of the components specifically mode (auto/manual), sensor details, camera, diagrams catches are accommodated rich client encounter.

Figure 6. Sensor Values over Cloud for a Period of Time

Table 1 demonstrates the normal measure of time slipped by in correspondence between organizer hub (RPI) and client gadget over various sorts of system.

		Connection Type (User Device)	
		Wi-Fi	Cellular Data
Connection Type (RPI)	Wi-Fi	4	13
	Cellular Data	11	16

Table 1. Wi-Fi and Mobile Network Connection Message Delivery time (seconds)

9. Conclusion and Future works

This Paper exhibits an IoT framework setup including Sensors, Arduino UNO, Raspberry Pi and Actuators. The framework has bunches of recipient elements incorporates conservative framework, simplicity of organization, upkeep, customization brings about sparing expense and human endeavors. Reconciliation of database server, web server and administrations on a solitary board PC (RPI) is one noteworthy favorable position which decreases multifaceted nature of joining, arrangement and administration. As a piece of future work, correspondence between sensor module and organizer can be made remote by using Bluetooth, xbee or wifi modules in light of the necessity. The framework engineering introduced can be effortlessly utilized as a part of different robotization plans with little alteration to the need. As RPI has constrained capacity, cloud information stockpiling can be utilized. The web interface can be created to demonstrate the area of the sensor topographically and interface can be improved for rich client encounter.

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Authors Bibliography

Mr. Rajesh R K received his Master of Computer Applications degree from Anna University in 2006. He has 11 years of teaching experience. He has good quality of teaching with various institutions all over India and abroad. He also got his certifications in CCNA. He is a research consultant of various international level universities and CISCO Certified CCNA Instructor.

Dr. T M Bhraguram received his Master of Science in Computer Science and Master of Engineering in Computer engineering. He has 2 years Industry experience and more than 9 years of teaching experience. He is a state level project champion and occupied a good quality of teaching with various institutions. All over India and abroad. He also got his Master of Business administration. He is a research consultant of various international level universities.

Dr. Saju Mohanan received his Doctorate in Computer Science and Master of Computer Applications. He has 12 years of teaching experience. He has good quality of teaching with various institutions all over India and abroad. He has served Lecturer/ ICT officer at Madawalabu University in Ethiopia He also got his certifications in CCNA. He is a research consultant of various international level universities. He has more than 10 Research publications in his name. Currently he is working as Lecturer at higher college of technology Muscat.