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A novel approach of IOT in Agricultural field

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Abstract: A weather station may be defined as a tool, which gives us with the data of the weather in our neighbouring environment. as an example, it is able to offer us with facts approximately the surrounding temperature, barometric pressure, humidity, and so on. therefore, this tool basically senses the temperature, strain, humidity, moderate intensity, rain fee. there are numerous kinds of sensors gift within the prototype, the use of which all the aforementioned parameters can be measured. it is able to be used to show the temperature or humidity of a selected room/area. With the help of temperature and humidity we're capable of calculate one-of-a-kind statistics parameters, collectively with the dew element. in addition, to the above-stated functionalities, we're able to show the slight depth of the vicinity as nicely. we've got had been given additionally enabled to display display screen the atmospheric pressure of the room. We also can show the rain price. 4 sensors are related to the ATmega328 especially temperature and humidity sensor (DHT11), stress sensor (BMP180), raindrop module, and mild primarily based definitely totally resistor (LDR).

Keywords: Agriculture data analysis, Irrigation System, Thing Speak, Cloud Platform, Internet of Things

I. INTRODUCTION

With the advent of the fast-paced internet, more and more people around the world are connecting. The net of factors (IoT) takes this as an intervention, and connects now not the most successful people but digital devices able to communicate between them. With the falling cost of wi-fi enabled devices this fashion will gain a lot of momentum. The main idea behind the Internet of Things (IoT) is to attach various electronic gadgets to the network and extract data from these devices (sensors) that can be extracted in any way, upload to any cloud carrier where it is easy to check and process collected data. in the cloud provider you can still use those facts to inform people in various ways including using a buzzer or sending them an email or sending them an SMS etc. As mentioned earlier, IoT does not allow for human Interaction, however also human-device communication and device tool interaction. These specific developments in the development of new means of communication will have a profound impact on each sector and the transport and services, energy, health care and more. for example, within power, the IoT was created to create smart Grids that can detect and respond to changes in the near and comprehensive standards of energy use, which will be an integral part of international energy policy. looking beyond the example of the aforementioned power, there are many recreational areas where IoT can make a huge impact and smart homes, including IoT to strengthen the level of automation; Wear technology and watchwatches and health teams; indeed, one of the largest energy sources in the IoT is attached to health care. Many electronic behemoths around the world have already invested heavily in online infrastructure. With players playing Intel, Rockwell Automation, Siemens, Cisco and selectable electronics in the near-eruption arena, where analysts predict there could be 26 billion connected devices, more than four per person in the world, and the industry is considered to - $ 19 Trillion, in savings and revenues with companies such as Samsung and Google leading the pc. With this new technology platform, however, it comes with its own challenges and limitations, including what to do with the amount of information available. weight, depth of light and so on. and uploaded these numbers to a cloud provider, IBM Bluemix. within the cloud facts are analyzed and if the information obtained is above or below a certain limit, depending on the number, email, SMS and twitter up up are published immediately. in advance people who live at home and are busy with their household chores or people who are busy with their office work were unaware of the environmental boundaries outside their home or office. They have no idea if the outside temperature is too high or too low or normal or if it is raining outside or not now or what the cost of moisture outside the roads is. This device can be easily found in those situations. will notify us whenever the temperature is too low or too high via email, SMS and twitter publishing. it will also automatically notify you whenever there may be rain within the environment and remind us to carry an umbrella or raincoat. it will also greet us with accurate morning and desirable nighttime messages because it also has LDR that measures the depth of the surrounding area. The challenge center is Arduino primarily based on Atmega328 which is a low-cost wi-fi module and all other sensors are connected to this tool. Code C is written in Arduino IDE and uploaded

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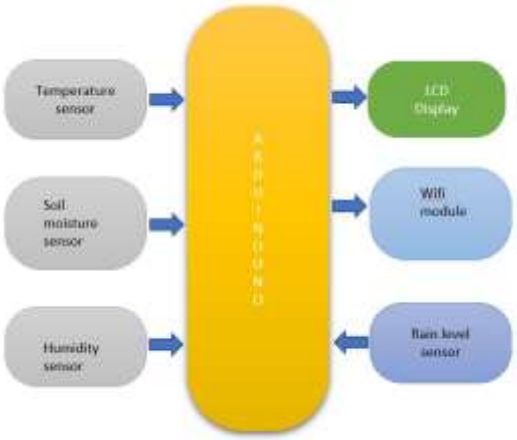
Fig.1. block diagram



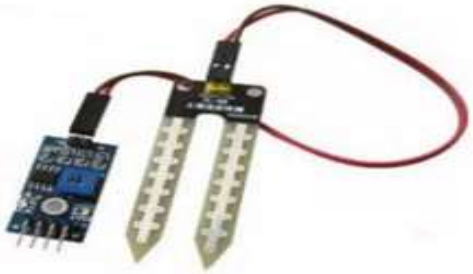


Fig.3. soil moisture sensor

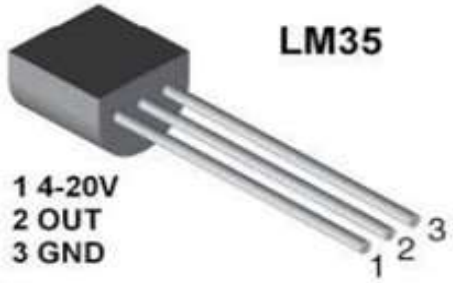


Fig.4. temperature sensor

Fig.5. humidity sensor

Fig.6. rain detection sensor

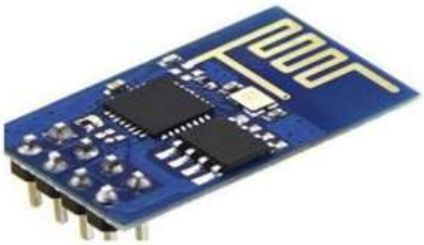


Fig.7. wifi module

Fig.9.architecture of proposed framework

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Fig.10.topology of the proposed system

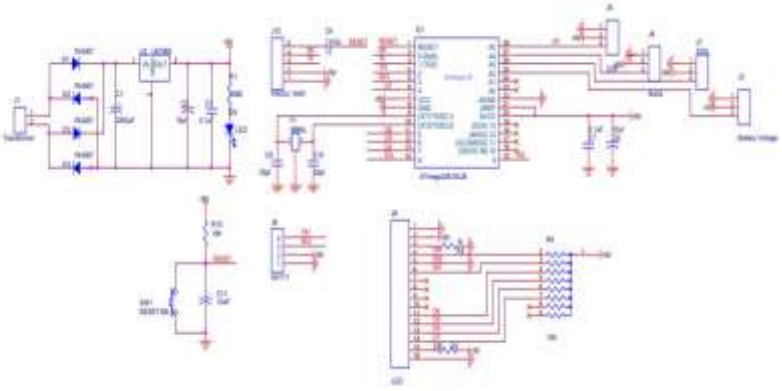

Fig.2. schematic diagram

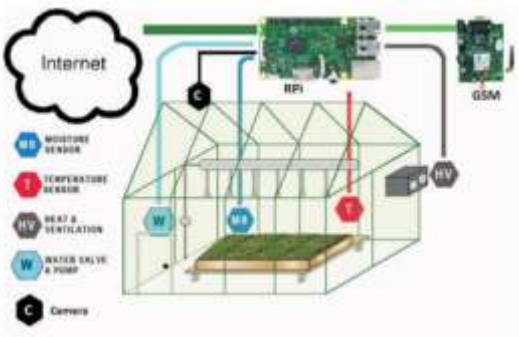

Fig.8.IOT smart agriculture monitoring system

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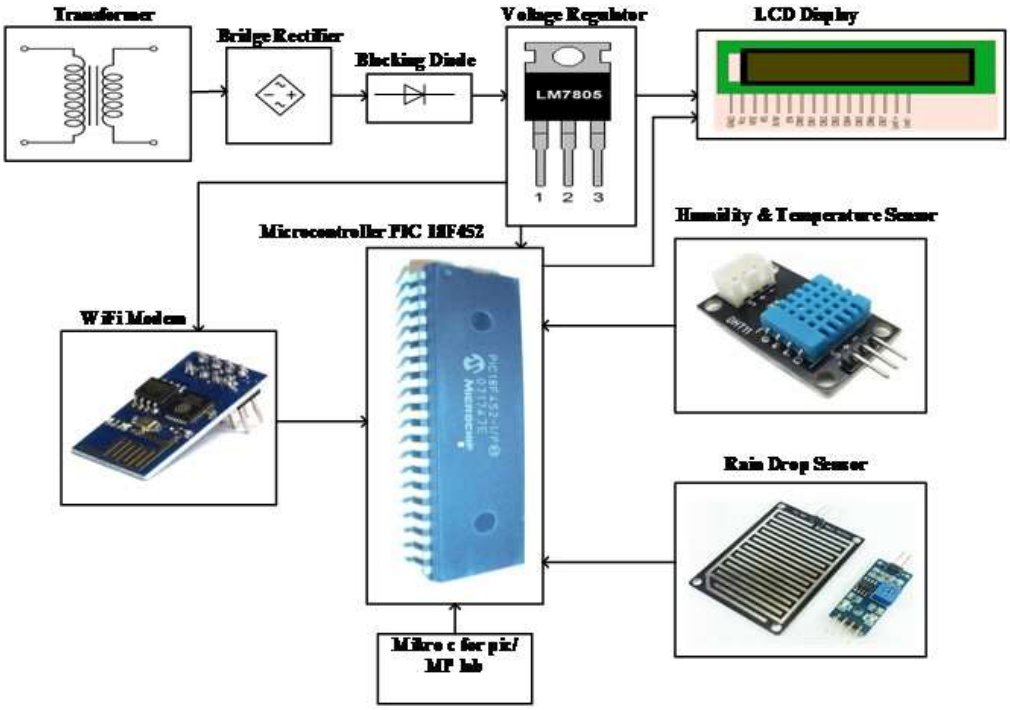

Fig.11.block diagram with components

Table 1. collection of if-then rules.

Rule	Range	NPK sensor input	Nitrogen level	Phosphorous level	Potassium level
1	0-0.1	Very low	Low	Low	Low
2	0.1-0.3	Low	Medium	Low	Low
3	0.3-0.5	Medium	Medium	Medium	Low
4	0.5-0.8	High	High	High	Medium
5	0.8-1	Very high	High	High	High

Table 2. Fuzzification

NPK sensor value	Fuzzy range	Linguistics
610-620	0-0.1	Very low
620-625	0.1-0.3	Low
625-630	0.3-0.5	Medium
630-635	0.5-0.8	High
635-640	0.8-1	Very high

Table 3. Simulation Parameters.

Si no	Parameters	Values
1	Simulation time	300s
2	Scenario dimension	1500m x 1500 m
3	Channel frequency	2.4 GHz
4	Pathloss model	Free space
5	Propogation limit	-111 dB m
6	Node type	Static
7	Battery model	Linear model
8	Battery charge monitoring interval	60 s
9	Full battery capacity	1200 mAh
10	Transmission power	15 dBm

Table 4. weather parameters used or training process

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Notation	Description
D	Population considered
n	Size of population
R	Set of binary strings
Pmi	Probability of mutation
K	Capacity of coding
Pc	Probability of cross over operator

Table 5. deployment parameters.

Parameter	Value	Voltage
nodeMCU	-	135-215 mA
Temperature and humidity	DHT22	2.5mA
Relay module x 5	1 channel	5.0 mA
Solenoid	Plastic ¼	1.3 mA
Architechture	Crop field	-

Table6. sample results of pest detection model accuracy in sugarcane

Sr no	Disease name	accuracy
1	Aphids	96..4%
2	Wooly aphids	100%
3	Rust	94.3%
4	Mosaic	94.8%

Table6. sample results of pest detection model accuracy in cotton

Sr no	Disease name	accuracy
1	Leaf spot	92.2%
2	Mildew	93.8%
3	Wilt disease	98.6%
4	Reddening	99.1%

Table 7. statistics of the sample video stream

Parameter	Value
Picture resolution	1280*720 pixels
Frame refresh rate	24 frames
Total frames	3016
Number of I frames	252
Number of P frames	754
Number of B frames	2010
Avg. I frame size	31,992 bytes
Avg. P frame size	23,463 bytes
Avg. B frame size	2623 bytes
GOP size	12 frames
GOP structure	IB BPB BPB BPB B
Total packets	22,848

Table 8. structure of node data in the database

Attribute name	Type	Properties
ID	Int(5)	The ID of an individual record
Node ID	Int(5)	The ID of the node
Time	Timestamp	The timestamp in milliseconds
Temperature	Double	The temperature in degree Celsius
Humidity	Double	The humidity in percentage
Moisture	Double	The moisture level
PH	Double	PH level

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Literature Review:

	Authors	Findings	Paper Title
1	Lavanya G, et.al [1] [08-JAN-2019] https://doi.org/10.1016/j.suscom.2019.01.002	This paper provides an Internet of Things (IoT) system based primarily on the design of a unique Nitrogen-Phosphorus Potassium (NPK) sensor with a Resistor (LDR) light and Light Emitting Diode (LED). The type of hardware proposed and software system installed inside the microcontroller has improved to Raspberry pi three Python applications. The advanced model is tested on three different soil samples such as pink soil, mountain soil and desert soil. miles realized that a high-end machine leads to a change of line by appreciating the attention of the soil response. The state of the sensory community is created by the use of Quinet simulator to analyze the full functionality of the NPK sensor in an exit mode, stop retreating and jitter. From the type of tests performed, miles realized that the advanced IoT tool was intended to be helpful to farmers by over-fertilizing crops. [1]	An automated low cost IOT based fertilizer intimation system for smart agriculture
2	Sayankumar Roy, G, et.al[2] [12-MAR-2020] https://doi.org/10.1016/j.iot.2020.100201	In this article, we have proposed a unique approach to rainfall prediction using the Genetic Algorithm (GA) to determine the need for manual water supply is necessary or not. A sensor-based system will be developed to check whether the GA-based system is completing its predictions correctly by sensing moisture levels from the soil. If the soil moisture level falls below the predetermined value, then irrigation of the plants is done by quadrotor UAV. The gardening system is also used in this article, which uses a pump to spray water. Various spatial structures help to improve the rain forecast system to improve efficiency by more than 80% of the proposed Io pat system to make the system more efficient. [2]	Genetic algorithm-based internet of precision agriculture thing for agriculture 4.0

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3	Abhishek Raghuvanshi, G, et.al[3] [27-OCT-2020] https://doi.org/10.1016/j.matpr.2020.10.849	In this paper, we present an assessment of the key security issues that exist in the set of beliefs, the social layer and the IoT development application layer. 2020 Elsevier Ltd. All rights reserved. Peer selection and evaluation under the auspices of the science committee on the growing advances in technology, era and engineering. [3]	Internet of things for smart cities security issues and challenges.
4	Jirapond Muangprathub, G, et.al[4] https://doi.org/10.1016/j.compag.2018.12.011	in this paper, they have got proposed developing a machine optimally watering agricultural plants primarily based on a wi-fi sensor network. The gadget was applied and tested in Mahatma District, Surat Thani Province, Thailand. The results showed the implementation to be beneficial in agriculture. The moisture content fabric of the soil grows to be maintained because it must be for vegetable increase, lowering costs and growing agricultural productiveness. moreover, this artwork represents using agriculture thru virtual innovation.[4]. .	Iot and data analysis for smart farm
5	S kumar reddy maldi G, et.al[5] [28-MAY-2018] https://www.researchgate.net/publication/326686850	Agriculture tracking (ISAM) device collects photographs from fields and uploads to a brilliant server that routinely detects and classifies pests in the photos the use of machine analyzing algorithms. this will additionally assist the farmer to percentage such information with specialists to get pointers that receives rid of the inexperienced use of pesticides. This precision farming yields better productiveness, and additionally conserves and protects natural sources. Use of IoT in agriculture will deliver all of the facts in the blink of an eye fixed constant constant. This machine is stronger than the traditional agriculture method.[5].	Iot based smart agriculture monitoring framework with automation

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6	Abhijeet Pathak, G, et.al[6] [19-AUG-2019] http://creativecommons.org/licenses/by-nc-nd/4.0/	inside the proposed system, a Cuckoo seek algorithm has been superior, permitting the allocation of water for farming below any conditions. The diverse parameters along with temperature, turbidity, pH., moisture turned into accumulated with the useful resource of using net of things (IoT) platform, prepared with related sensors and wi-fi verbal exchange structures. on this IoT platform the sensor facts have been displayed inside the cloud surroundings through the usage of ThingSpeak. The data received within the ThingSpeak used inside the proposed Cuckoo search set of policies, permitting the selection of appropriate flowers for particular soil.[6].	Iot based smart system to support agriculture parameters
7	Muhammad Rusyadi Ramlia, G, et.al[7] https://doi.org/10.1016/j.compag.2020.105287	This paper presents an adaptive community mechanism for a clever farm device through the usage of LoRaWAN and IEEE 802.11ac protocols. The device has been evaluated for the real deployment scenario. The end result demonstrates that the proposed system brings the reliability in terms of common latency and average accrued wide variety of sensors records [7].	IoT-based adaptive network mechanism for reliable smart farm system
8	Dr. Sanjay N. Patil, G, et.al[8] DOI 10.17148/IJARCCE.2019.8419	This mission includes sensors inclusive of temperature, humidity, soil moisture and rain detector for collection the field facts and processed. those sensors are combined with nicely-hooked up internet generation in the shape of wireless sensor community to remotely manage and monitor facts from the sensors.	Smart Agriculture Monitoring System Using IOT
9	MD Safayet Ahmad, G, et.al[9] https://doi.org/10.1007/978-981-15-3607-6_8	This device allows numerous devices and sensors to deliver information over the net. It allows farmers to screen their area remotely from their domestic by manner of using a telephone or a pc.[9].	IoT-Based Smart Agriculture Monitoring System with Double-Tier Data Storage Facility
10	Sanika Ratnaparkhi, G, et.al[10] https://doi.org/10.1016/j.matpr.2020.11.138	IoT is a new and upcoming fashion in era that exhibits its software program in nearly each discipline. This paper explores its software program application within the agricultural sectors. smart agriculture is known as precision agriculture as it uses precise records to acquire conclusions. It shows the diverse sensors which useful aid IoT and agriculture, their	Smart agriculture sensors in IOT: A review

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		applications, stressful conditions, benefits and drawbacks.[10].	
11	Miguel A. Zamora-Izquierdo , G, et.al[11] https://doi.org/10.1016/j.biosystemseng.2018.10.014	The tool has been completely instantiated in an real prototype in frames of the European Drain Use project, allowing the control of a real hydroponic closed device thru managing software program for very last farmers linked to the platform.[11].	Smart farming IoT platform based on edge and cloud computing

Mathematical Expression:

$$X = \begin{bmatrix} x_{1,1} & \cdots & \cdots & x_{1,j} & x_{1,n-1} & x_{1,n} \\ x_{2,1} & \cdots & \cdots & x_{2,j} & \cdots & x_{2,n} \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ x_{N-1,1} & \cdots & \cdots & x_{N-1,j} & \cdots & x_{N-1,n} \\ x_{N,1} & \cdots & \cdots & x_{N,j} & x_{N,n-1} & x_{N.n} \end{bmatrix}$$

$$MOA(C\_Iter) = Min + C\_Iter \times \left(\frac{Max - Min}{M\_Iter} \right)$$

$$x_{i,j}(C\_Iter+1) = \left\{ \frac{best(x_j) - MOP \times ((UB_j - LB_j \times \mu + LB_j))}{best(x_j) + MOP \times ((UB_j - LB_j \times \mu + LB_j))} \right\} \quad r3 < 0.5$$

$$LB_j \le x_{ij} \le UB_j, \quad j = 1, 2, ..., n$$

$$X = \left\{ x_{11}, x_{1j}, ..., x_{1n} \right\}$$
$$s.t. \quad g_i(X) \le 0, \; j = 1, 2, ..., m$$
$$h_k(X) = 0, k = 1, 2, ..., l$$
$$LB_J \le x_{ij} \le UB_j, \quad j = 1, 2, ..., n$$

$$f(X) = f(X) \sum_{j=1}^{m} Pe_j \max\left\{ g_i(X), 0 \right\} + \sum_{k=1}^{n} Pe_k \max\left\{ h_k(X) - \varepsilon, 0 \right\}$$

$$MOP\,(C_{Iter}) = 1 - \frac{C\_Iter^{1/\propto}}{M\_Iter^{1/\propto}}$$

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II. CONCLUSION

Objective Function:

The device proposed is a complicated solution for monitoring the weather conditions at a selected area and make the statistics seen everywhere in the global. The generation behind that is internet of things (IoT), which is a complicated and green answer for connecting the things to the net and to connect the entire international of factors in a community. right here things is probably something like virtual devices, sensors and automobile digital system. The system offers with monitoring and controlling the environmental situations like temperature, relative humidity, moderate intensity and CO diploma with sensors and sends the facts to the internet web page and then plot the sensor records as graphical facts. The records updated from the carried-out gadget can be accessible inside the internet from anywhere in the worldwide. because it an automated tool, no manpower can be required. clever way to screen the environment.

Constraints:

It should have internet connection all the time.

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