IoT BASED SMART AGRICULTURE SYSTEM

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Abstract :
Smart farming, perfection farming and farming4.0 all involve the integration of advanced technologies into being tilling armature. The thing is to increase product effectiveness and product quality, as well as reducing overall costs. To this end, the addition of Smart technologies into Irish farming has been ineluctable with increased pressure being placedon farming practices to remain profitable, as well as cleave to environmental regulation. The global Smart Agriculture Solution Market is said to have stood at around US$10.2 Billion in 2016, and is projected to reach a valuation of US$38.1 Billion by the end of 2024. The growing relinquishment of advanced technology in farming, from agrarian drones, perfection sowing systems, bus- steering, automatic feeding systems and fruit- picking robots(amongst others), have all incentralized traditional agri- companies to invest in smart farming technology. The deployment of advanced agri- tech has the implicit to allow for an increased focus onnon-profitable tasks, similaras ranch conservation and environmental practices. The reduction of heavy labour and tedious tasks can also lead to advancements in the health and work/ life balance of farming staff.

Introduction:

With the exponential growth of world population, according to the UN Food and Agriculture Organization, the world will need to produce 70 further food in 2050, shrinking agrarian lands, and reduction of finite natural coffers, the need to enhance ranch yield has come critical. Limited vacuity of natural coffers similar as fresh water and pastoralist land along with decelerating yield trends in several staple crops, have further exacerbated the problem. Another impeding concern over the farming assiduity is the shifting structure of agrarian pool. also, agrarian labor in utmost of the countries has declined. As a result of the declining agrarian pool, relinquishment of internet connectivity results in farming practices has been touched off, to reduce the need for homemade labor. IoT results are concentrated on helping growers close the force demand gap, by icing high yields, profitability, and protection of the terrain. The approach of using IoT technology to insure optimum operation of coffers to achieve high crop yields and reduce functional costs is called perfection farming. IoT in farming technologies comprise technical outfit, wireless connectivity, software and IT services. BI Intelligence check expects that the relinquishment of IoT bias in the farming assiduity will reach 75 million in 2020, growing 20 annually. At the same time, the global smart farming request size is anticipated to triple by 2025, reaching$15.3 billion(compared to being slightly over$ 5 billion back in 2016).

Fig1.IoT based smart agriculture will be the future

Smart Farming grounded on IoT technologies enables farmers and growers to reduce waste and enhance productivity ranging from the volume of toxin employed to the number of peregrinations the ranch vehicles have made. and enabling effective application of coffers similar as water. electricity, etc. IoT smart farming results is a system that's erected for covering the crop field with the help of detectors(light. moisture. temperature. soil humidity. crop health. etc.) and automating the irrigation system. The growers can cover the field conditions from anywhere. They can also

elect between homemade and automated options for taking necessary conduct grounded on this data. For illustration, if the soil humidity position diminishments, the planter can emplace detectors to start the irrigation. Smart farming is largely effective when compared with the conventional approach. IoT have the eventuality to transfigure farming in numerous aspects and these are the main bones

. Data collected by smart farming detectors, in this approach of ranch operation, a crucial element are detectors, control systems, robotics, independent vehicles, automated tackle, variable rate technology, stir sensors, button camera, and wearable bias. This data can be used to track the state of the business in general as well as staff performance, outfit effectiveness. The capability to prevision the affair of product allows to plan for better product distribution. Agricultural Drones Ground- grounded and upstanding- grounded drones are being used in farming in order to enhance colorful agrarian practices crop health assessment, irrigation, crop monitoring, crop spraying, planting, and soil and field analysis.
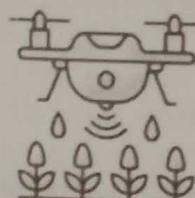
Fig 2. Agricultural drone

3 Beast shadowing and geofencing ranch possessors can use wireless IoT operations to collect data regarding the position, well- being, and health of their cattle. This information helps to help the spread of complaint and also lowers labor costs.

Fig 3. Livestock tracking becomes very easy with IoT application

4.Smart Greenhouses- A smart hothouse designed with the help of IoT intelligently observers as well as controls the climate, barring the need for homemade intervention.

Fig 4. Smart greenhouse can be designed with IoT applications

Prophetic analytics for smart farming Crop predication play a crucial part, it helps the planter to decide unborn plan regarding the product of the crop, its storehouse, marketing ways and threat operation. To prognosticate product rate of the crop artificial network use information collected by detectors from the ranch. This information includes parameters similar as soil, temperature. pressure, downfall, and moisture. The growers can get an accurate soil data either by the dashboard or customized mobile operation.
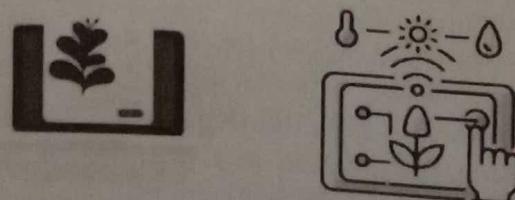
Fig 5. Production quality and quantity increases with proper predictive analytics and corresponding actions.

growers have started to realize that the IoT is a driving force for adding agrarian product in a cost-effective way. Because the request is still developing, there's still ample occasion for businesses willing to join in. 3.3 Nokia 5110 TV Display
Interface with Arduino This TV device is substantially used in Arduino but it can be connected with any3.3 V regulator. These LCDs are used in Nokia3110/5110 cell phones. It's a veritably cheap snap TV module made of 84 x 48 pixels. It can be used to display plates and textbook together. This display is grounded on the PCD8544 motorist.

Fig 6. TV Screen

Leg configuration of this device is nearly like the 16x2 TV module only rather of 8 data legs one periodical data in(Din) leg and one timepiece are there. The list of the legs and their description are listed below.

RST:Pintypeactivelow,so0VResetstheLCD
CE:CheapEnableisusedtoenablethedevicebeforesendinganythingtotheLCD
DC:Data/CommandisusedtoselectbetweenRataRegisterorCommandRegister
DIN:DataInisusedtosendinformationseriallytothedisplay.ItcouldbeDataorCommand
CLK:Clockisusedtosynchronizethedisplaywiththecontroller
VCC:Topower,thepin5Vor3.3Visappliedhere
BL:ThispinisusedtopowertheBacklightofthedisplay

- Nokia5110Display
- Arduino
- Resistors
  1. 1kOhmsx5Nos.
     2.33oOhms/Potentiometer1k
- JumperWires
- BreadBoard

ConnectionDiagram:
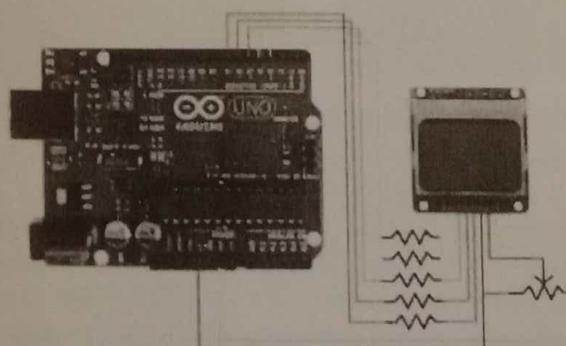
Fig 7.Connectionofthe LCD screenwiththeArduino

ESP- 01 ESP- 01 Module is principally a low- cost esp8266 module, with erected- in WIFI. It was created as an Arduino WIFI module but it can also be programmed to work as standalone. Although this module is cheap but working with it's a little delicate. As it isn't a breadboard-friendly module it would be a bad choice for a freshman. .Only3.3Vpowerisrequired

Fig 8. ESP- 01
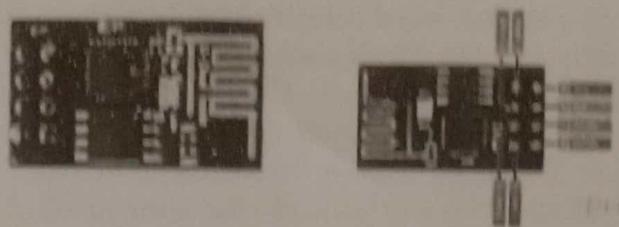
- Pin1:GroundPin
- Pin2:GPIO2Pin
- Pin3:GPIOoPin
- Pin4:RXDisUARTdatareceivepin.
- Pin5:VccisforpoweringtheModule.Only3.3Vpowerisrequired.
- Pin6:RSTisforexternalreset.It'sactiveLowinnature.
- Pin7:CH_PDisanactive-highpinforChipenable.
- Pin8:TXDisUARTdatasendpin.
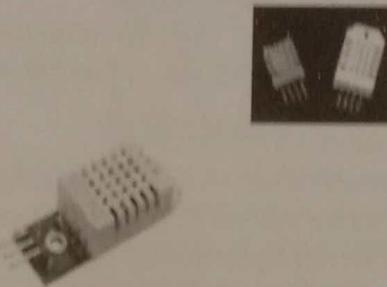
Fig 9. DHT22

DHT11:
- Ultra-low-cost
- 3 to 5V power and I/O
- 2.5mA max current use during conversion (while requesting data)
- Good for 20-80% humidity readings with 5% accuracy
- Good for 0-50°C temperature readings ±2°C accuracy
- No more than 1 Hz sampling rate (once every second)
- Body size 15.5mm x 12mm x 5.5mm
- 4 pins with 0.

DHT22:
- Low cost
- 3 to 5V power and I/O
- 2.5mA max current use during conversion (while requesting data)
- Good for 0-100% humidity readings with 2-5% accuracy
- Good for -40 to 80°C temperature readings ±0.5°C accuracy
- No more than 0.5 Hz sampling rate (once every 2 seconds)
- Body size 15.1mm x 25mm x 7.7mm
- 4pinswith0.1"spacing

As you can see, the DHT22 is a little more accurate and good over a slightly larger range. Both use a single digital leg and are' sluggish' in that you can not query them further than formerly every alternate or two.

Pinout VCC supplies power for the module. You can directly connect it to the 5V leg on the Arduino. Data jut transmits the temperature and moisture data in digital form. GND is the Ground Leg and needs to be connected to the GND leg on the Arduino.

3.6 DC Motor :

DC motors are a crucial element for numerous agrarian operations, frequently offering a most effective form of stir, particularly when solar and battery power is utilised. Some of our own drives are reckoned on under grueling conditions- for illustration, they've been in use on Mars for times(although not for agrarian purposes, yet). But DC motors also serve in toug h agrarian conditions Fig.
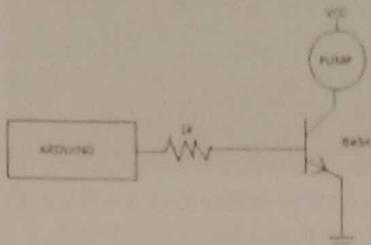

Fig 10 . Circuit Diagram of DC motor

faultlessly and efficiently. Motors, gearheads, detectors, batteries and regulators all constitute the introductory structure blocks for complex operations. Our own mobile apps include pall connectivity and give our guests access to a range of functions, including reclamation of current driving data and positions, customisation of parameters and line operation. All factors are vindicated by our specialists and also impeccably matched to each other. This allows us to offer druggies a system result from a singlesource. Work Flow:

In the power circuit, 9v power comes from the appendage, andflows to two channels first a 7805 controller and a 1117 controller. From the 7805 controller 5v current passes to DHT22 detector, soil humidity detector, Arduino and the pump. While from the 1117 controller3.3 v passes to ESP8266 device. Digital and analog data is fed from the soil humidity detector and the temperature and moisture detector to the regulator, the regulator processes the data and primarily has 3 labors. temperature readings and humidity situations are displayed on the TV device while the data is also pushed into ESP8266 device with the help of UART scripting and also it's fed into the pall, while the regulator controls the pump through a npn transistor which is the third from of affair.

6. OBSERVATIONANDREADING

You can see Fig.11 and Fig.12 shows the picture of the final prototype.

Fig 11 .Prototype in off condition   Fig 12.Prototype in on condition

6.1 Basic Operation :

The ESP- 01 of the prototype at first connects to UART website through Wi- Fi. Then, we're connecting it with the website ThinkSpeak(https//thingspeak.com/pages/learn_more). ThingSpeak ™ is an IoT analytics platform service   that allows you to total, fantasize and dissect live data aqueducts in the pall. ThingSpeak provides instant visualizations of data posted by your bias to ThingSpeak. With the capability to execute MATLAB ® law in ThingSpeak you can perform online analysis and processing of the data as it comes in. ThingSpeak is frequently used for prototyping and evidence of conception IoT systems that bear analytics.
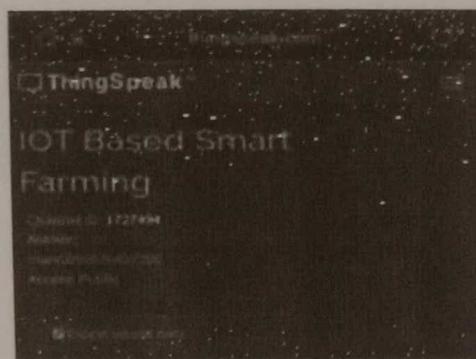
Fig 13. Think Speak provide sauser- friendly platform

6.2 Operation 1 Temperature and moisture Reading :

The DHT- 22 helps us to get the temperature and moisture value at any particular time. Keeping a check in the temperature and moisture value will help the stoner in taking care of beast and special shops. From DHT22, the signal gets passed to ESP8266 which further passes the signal to the website from where the stoner can get notified indeed when down from the field.
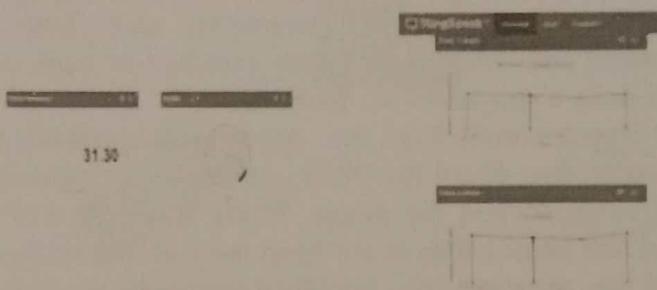

Fig. 14 Record of temperature and humidity Fig. 15 Temperature and Humidity Graph
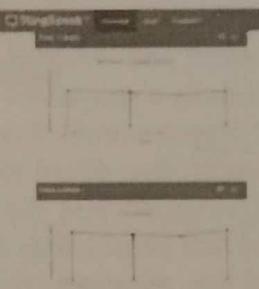
6.3 Operation 2 Soil humidity Determination :

The soil humidity detector determines the humidity content of thesoil.However, it sends signal to the DC motor i, If the value is below the thresholdvalue.e., the pump and automatically the pump gets on and waters the field.
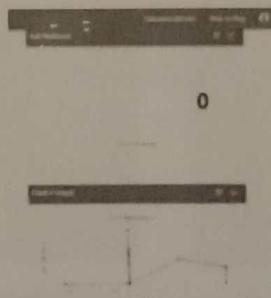

Fig. 16 Moisture content of the field along with the graph
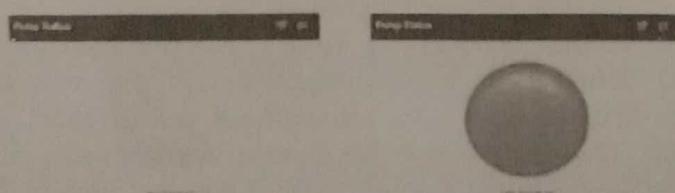
Fig. 17 Pump automatically gets on when the soil moisture content is below the threshold level.

7. CONCLUSION:

The Farm Monitoring System can be used for fortune factors of farming. This would be a relief for growers since it decreases the cargo of homemade sweats A contrivance to screen humidity situations within the soil changed into constructed and the assignment furnished a possibility to take a look at the prevailing structures, at the side of their features and downsides. The stated contrivance

may be used to turn on/ off the water sprinkler in keeping with soil humidity situations thereby automating the fashion of irrigation that's one of the most time ingesting conditioning in farming. Agriculture is one of the most trouble- consuming hobbyhorse. The device makes use of statistics from soil humidity detectors to wash soil. The proposed assignment may be further lesser with the aid of including pump to the machine to grease motorized irrigation. The automated irrigation device may be touched off when the humidity content of the soil is going under the point stage. The threshold degree can be decided in the law written for Arduino. So, whenever the figure for humidity goes under the point degree, the pump gets mechanically on and irrigation is performed to an ok degree. To ameliorate the effectiveness and effectiveness of the machine, the noted recommendations can be placed into attention. Alternative of controlling the water pump may be given to the planter by way of which they're suitable to turn on or off the pump to be suitable to start or help the manner of irrigation without being there on ranch at that gift time. The planter can know earlier about the negative climate situations. In similar cases planter might also want to avert the machine ever or routinely. The conception of the operation of IOT for irrigation can be dragged in addition to other tasks in tilling together with ranch creatures ' operation, fireplace discovery and climate manage. This could limit mortal intervention in farming sports.

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