JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

DIGITALIZED FARMS USING AI

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Abstract : This paper presents an effect system implementation arrange for the digitalized farms In advancement with the rapid emergence of IoT-based technologies Smart farming industry created revolutionary changes with existing farming methods. However, the quality of farming methods and framing products were decreased. So our "Digitalized farms using AI" system hardware integrated with a software application that provides suggestions to farmers when the hardware system analyses the soil. After analyzing the characteristics and quality of the soil with the hardware system consisting of various sensors like DHT11 sensor and Soil moisture sensor, it provides the analyzed data to the application via the Internet. Then this application compares the data in the database and provides user suggestions and also remotely monitor and control equipment like drip irrigation system and electric fencing, etc. The database system analyses the data provided by the hardware as input and gives the user suggestions like, which crop is best suited for this soil, its organic farming methods and irrigation methods, etc. After that, it can also predict any animal intrusion by using a PIR sensor. This application mainly uses data analytics and database management techniques to derive suitable crops and their cultivation methods from the data sets that were collected from the research centers and organic farmers. And also helps to monitor and control farmland using IoT.

Keywords: Internet of Things (IoT),AI, Electrical fencing, Smart Farming.

I. INTRODUCTION

Food is the essential thing for every living being to survive and Agriculture is the only way to produce food. As we all know agriculture is the backbone for a healthy and significant food supply. A healthy and good quality crop can be produced only by organic farming using the traditional way of agriculture. But nowadays, the traditional method seems impossible due to a rise in temperature and varying climatic conditions. As a result, the practice of agriculture has been diminished, which results in the usage of chemicals and genetically modified crops. This results in the production of poor quality and unhealthy crops. With the advancement of new technologies now a days sensor systems have become more intelligent and compact in size as compared to other traditional sensor systems. In this research work, an IoT (Internet of Things) based low-cost and power-efficient hardware system integrated with IoT and mobile application is presented to solve the issue in performing organic agriculture. There are so many inventions in the field of agriculture but these technologies fail to provide a traditional way to do agriculture. Central Intelligent Agency (CIA) fact book ranked India a number 2 out of 238 countries. India takes of 17% of the world's population, but with 4% of fresh water resources. Out of which 80% of water is used for agriculture. A country like India has very good natural resources, but not used in a congruous way. In most of the agricultural lands, the crops are over watered without checking the soil moisture. This leads to the waste of water resources which can be utilized in some other areas where there is in need of water. So by using Soil Moisture Sensor and DHT11 Sensor we measure soil moisture, humidity, and temperature of the soil and suggest water the crops at right time and for a specific duration. This helps us from damaging the crops by improper irrigation. This also increases the quality of the crop and its growing time. This method has been advanced to protect the field from fire accidents and animal and bird intrusions by using PIR Sensor. The merging of solutions of all the above-mentioned points at issue can give rise to a smart agricultural system reducing human labor. This system can be connected to the internet which provides the means for the farmers to control their crops from far-off places. We mainly aim at bringing traditional agriculture back through smart farming using IoT. In this paper, we provide the best farming by proposing a system that collects the data by using a clustering algorithm to control agriculture using IoT. This system is a combination of various technologies using sensors, IoT, and data analytics to gather data and process the data to give suggestions regarding which is the suitable crop for the soil and its irrigation method by Information and Communication Technologies to provides simple and cost-effective techniques for farmers to enable precision agriculture also guide new farmers and remotely monitoring their field, harvest crops, and control farming equipment with the help of the smart farming application. The information such as temperature, humidity, soil moisture level, the water level of the farm land is intimated to the farmers by the smart farming application and instructs the farmers to follow traditional agriculture to improve the yield, quality of crops, and also the overall production rate. This data sends the live data to smartphone via cloud service and AI is used to store the values.

II. LITERATURE SURVEY

[1] Abhiram, Jyothsnavi kuppili and N.Alivelu manga, "Smart farming system using IOT for efficient crop growth", Institute of electrical and electronics engineers(IEEE) volume 5.issue 10,2020.
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[3] Muthunoori Naresh, P Munaswamy, "Smart Agriculture System using IoT Technology", International Journal of Recent Technology and Engineering (IJRTE), Volume-7 Issue-5, January 2019.
[4] Sweksha Goyal, Unnathi Mundra, Prof. Sahana Shetty, " Smart agriculture using IOT", International Journal of Computer Science and Mobile Computing, Vol.8 Issue.5, May 2019.
[5] Anand Nayyar, Er. Vikram Puri, " Smart Farming: IOT Based Smart Sensors Agriculture Stick for Live Temperature and Moisture Monitoring using Arduino, Cloud Computing & Solar Technology", November 2016.

III. EXISTING SYSTEM

The system proposed uses a microcontroller (NodeMCU) which has a Wi-Fi module (ESP8266) over it. Smartphone with blynk is used as user interface. Soil moisture sensor, humidity and temperature sensor (DHT11) and rain detection sensors along with DC motor and deek robot are used. This DC motor is connected to a water pump which pumps water to the crops when the DC motor is ON. The soil moisture sensor senses the moisture level in the soil. Depending on the level of moisture, NodeMCU decides whether to water the crop or not. By using appropriate functions and conditional statements in the code written for the NodeMCU functioning, the watering of the crop starts by NodeMCU making DC motor ON when the moisture content is below a threshold value and is made OFF when there is enough moisture content in the soil. The humidity and temperature sensor gives the humidity and temperature values of the atmosphere which determine whether the crop is suitable for growth. Some crops grow only in particular weather conditions and some give better yield only for a particular temperature range. The raindrop sensor measures the intensity of rain. If there is enough rainfall to provide soil with required water, the crops are not watered. Even after raining, if the crops are not having sufficient water then water is pumped again by making DC motor ON. Data reaches the blynk cloud from NodeMCU through Wi-Fi from Wi-Fi module present on NodeMCU. The data then goes to blynk app in smartphone where the user can see the humidity, temperature, soil moisture levels and get the notifications if there is rainfall and if the DC motor is ON. From this app, the farmer can control the DC motor through various buttons and switches. When the NodeMCU gets the command from the app then the appropriate analysis is done and the DC motor is controlled. The data again travels through Wi-Fi again in the same path.

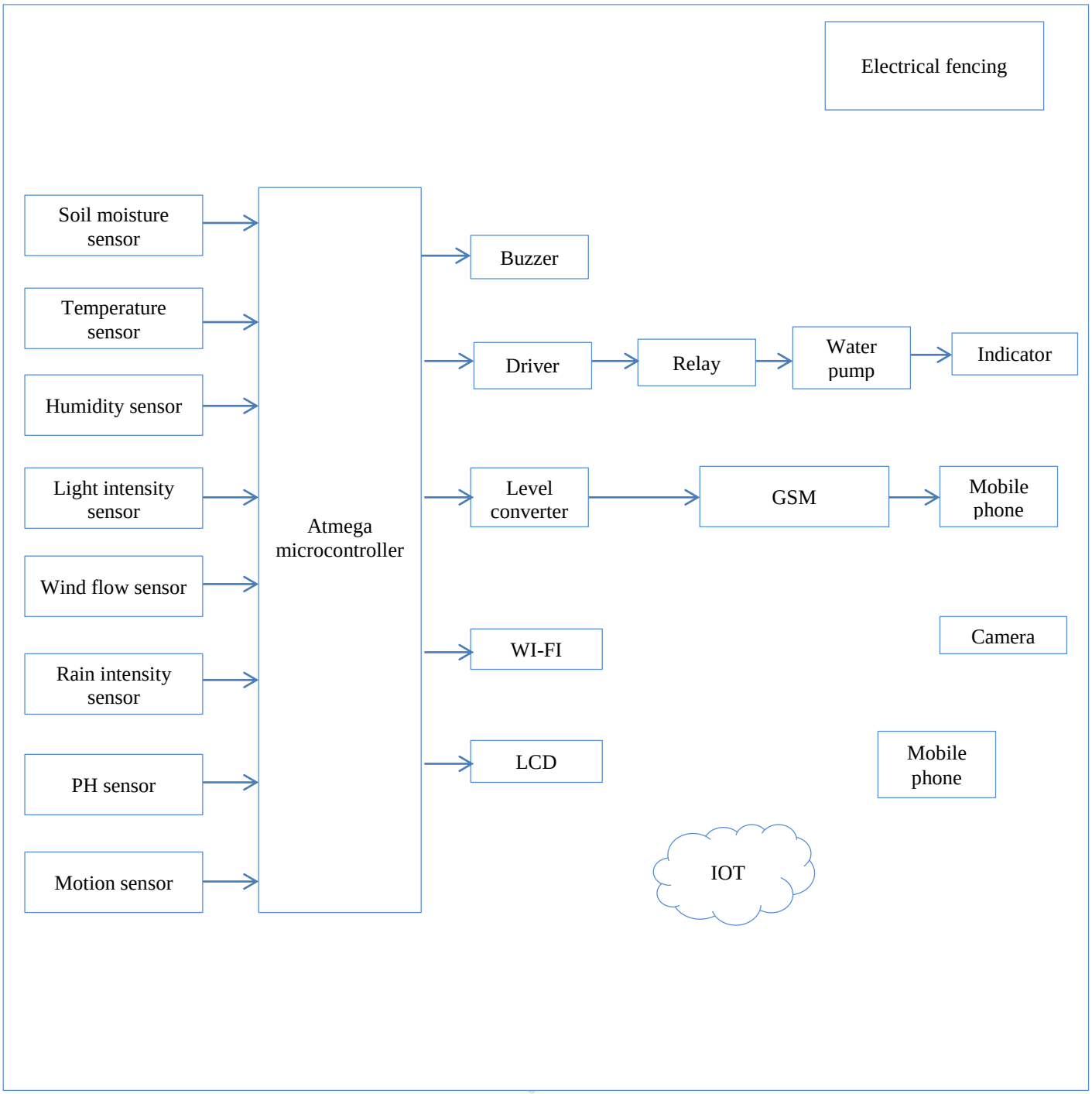
3.1 Disadvantages

- It predicts only temperature, humidity, soil moisture and rain
- Very expensive.
- No devices are here to monitor the crop field.
- It does not contain any protective device such as electrical fencing.

IV. PROPOSED SYSTEM

The development of a Digitalized farms system using sensors, microcontroller within an IOT system is presented. The aim of the implementation is to demonstrate the smart and intelligent capabilities of the microcontroller to allow the decisions to be taken on watering the plants based on the continuous monitoring of the environmental conditions in the field. It also aims at a predefined irrigation schedule as per the farmers convenience, uploaded into the application developed for the same. This receiver unit also has a duplex communication link based on a cellular Internet interface, using general packet radio service (GPRS) protocol, which is a packet-oriented mobile data service used in 2G and 4G cellular global system for mobile communications (GSM). The data being uploaded to the cloud allows the user to continuously view the parameters from the comforts of his/her home or wherever on the go. The system has the capacity to adapt based on the user input which the farmer can input through the smart agriculture application. The farmer can select a profile based on the season and the crop for irrigation and schedule and plan the water resource utilization sensibly. The volumetric water content in the soil is a primary factor which gives a suggestion that the water is required for the crops. In the absence of this system the farmer has to manually inspect these for all the crops by inspecting the soil in the fields which is tedious, time consuming and straining. This can be taken care by the intelligent system which informs the user whenever the water content goes below the threshold set by the farmer himself. Intrusion of animals especially cows, monkeys, dogs etc to the fields is a very common issue and one of the factors for disruption or disturbance to the yield. This requires one person to continuously guard the fields at all the times which will not be accurate and the productivity of one person is wasted. This can be overcome by this system which has a motion sensor to detect the presence of any animal in the fields and send notifications to the farmer in their presence. The distance range for which the farmer needs to detect the animals can be allowed to set by the farmer himself in the application in the beginning.

V. BLOCK DIAGRAM



Proposed system block diagram

VI. MODULES DESCRIPTION

The hardware components used in the system is Temperature sensor, Humidity sensor, Motion sensor, Rain intensity sensor, Ph sensor, Soil moisture sensor, IOT,ATmega328P, Power supply, Electric motor.

6.1 DHT11 Sensor

The main purpose of the Digital Humidity and Temperature (DHT11) sensor is to measure the temperature and humidity of the surrounding air. In this system, this sensor uses a capacitive humidity sensor and thermistor to measure the temperature and humidity by measuring the relative electrical resistance of the surrounding air in cultivation land. This data is used to predict which crop to be cultivated in farmland for this season. This sensor gives the accurate climatic change to do agriculture with perfection. It uses the android application to alert the farmers by predicting the changes in climatic conditions and suggests a seasonal crop cycle method.

6.2 Soil Moisture Sensor

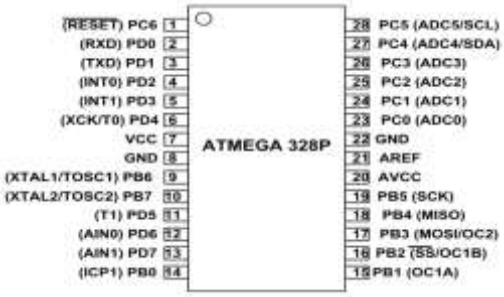
Soil Moisture Sensor helps to measure the moisture content of the soil. It gives the data about the water content and moisture level of the soil by measuring the volumetric water content in which the crops are cultivated. This water content is analyzed by measuring dielectric permittivity using capacitance and creating voltage proportional to the permittivity. From the predicted moisture content it suggests a suitable crop be cultivated and provide irrigation. These sensors monitor access and alert the farmer when the water content of the soil increased or decreased.

6.3 PIR Sensor

A Passive Infrared (PIR) Sensor is a motion detector sensor used to detect the movement of animals, birds, insects, and other objects by measuring the infrared light or radiant heat emitted from the object by converting the wavelength into output voltage and trigger the alarm. It can be used to protect the farm land from birds, animals, and insects. When the crops are affected by a large number of insects, it gives an alert to the farmers.

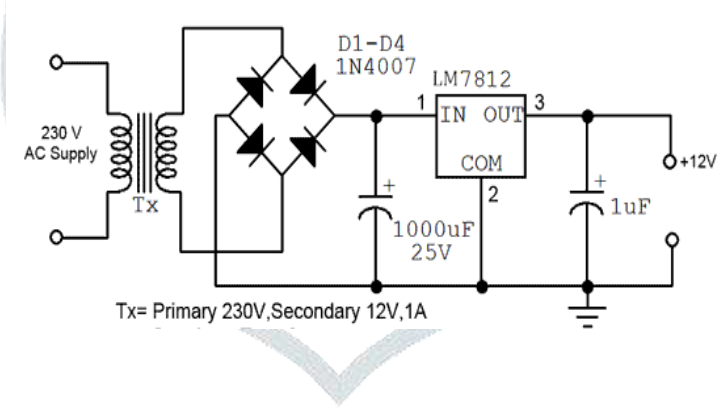
6.4 ARUDINO MEGA 2560 MICROCONTROLLER

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 Analog inputs, 4 UARTS (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila.



6.5 POWER SUPPLY

All electronic circuit need DC power supply either from battery or power pack units. It may not be economical and convenient to depend upon battery power supply. Hence, many electronic equipment contain circuits which convert the AC supply voltage into DC voltage at the required level.

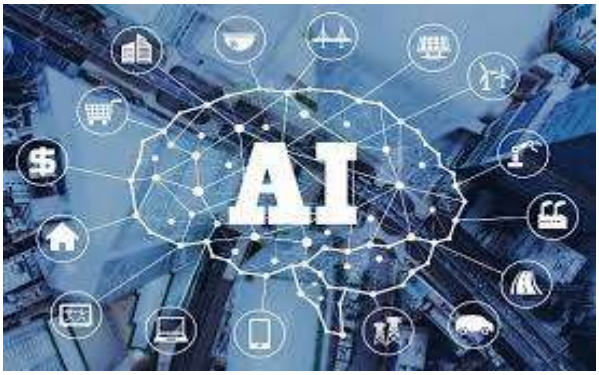


6.6 DIGITALIZED SYSTEM

AI based smart cultivation system uses few sensors which gives the amount of moisture in the soil, the humidity and temperature of the region, and a rain detecting sensor which and can be used in deciding whether the crop is suitable for growing. All these sensors along with Arduino are connected to the internet and a smartphone.

6.7 ARTIFICIAL INTELLIGENCE

Crop Selection, where AI-based solutions are ideal for selecting crops based on parameters like soil type, monsoon dates, availability and affordability. Crop Monitoring, where data can be collected using technologies like IOT, drones, and satellite imaging, from the fields, and then monitored and analysed by AI-based applications to identify the right solutions.



VII. CONCLUSION

The motivation assists our farmers in becoming advanced at the supervisory level so that they can manage things appropriately with an understanding of the farms. The cost of management is the most important consideration here. As a result, the scope has been limited to computer resources, such as storage, processing, and data transport. The AI based smart cultivation system for crops has built on the long standing desire of farmers to ensure their land remains productive into the future the production system can be improved to support more types of products and provide more services. By taking advantage of IOT technology, the efficiency of agricultural production can get a significant improvement. With constantly improving, agriculture IOT must be able to lead agriculture production to a new era. Additionally, agricultural products quality can be improved because farmers observe whole cycle from seeding to selling using this IOT based agricultural production system. This project includes the advantages such as low power consumption, easy to install in any field, high reliability, compact in size and built with GSM has no boundary limitation. This project has compatibility to modify by adding few components to explore it for next generation.

VIII. REFERENCES

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