Mathematical Statistician and Engineering Applications
ISSN: 2094-0343
2326-9865

A Study on IOT based smart Irrigation System & Weather forecasting Using ESP 8266

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Article Info
Page Number: 222 - 232
Publication Issue:
Vol 72 No. 1 (2023)

Abstract

In recent Days Dense farming usually consumes a lot of resources formaintenanceis required.The grow task is based on time frequency, not actual plantneeds.Also,thedisadvantages,weather in conditions such as too cold temperatures orhumidityabovesupportedvaluesif you don't control it in time, it will damage your crops. Allthesetasksareevenharder tomaintainConquer large areas.(IOT) based system to monitor the crop's health by monitoring the following factors such as: Temperature, Humidity and Soil Moisture and all the live data can be viewed in single application. A surveillance automation system mayhelpFarmers warn them when predetermined conditions are met.Withsomething moreIntegration can also enable some electronic controls,includingweighing machines' Measures to secure the harvest. This project aims to create acompletelyopen sourceand complete.Collectdatafromthefieldusing(IoT)architecture;Send them to a central server. You can use the ESP8266 PicoWboard, is more accurate and efficientcomparedtoothermicrocontrollerboard. By using this IOT system and AI software the crop health can be tracked, monitored, crop field can be watered and also any doubts or problems faced by farmers regarding agriculture can be solved.

Article History
Article Received: *15 October 2022*
Revised: *24 November 2022*
Accepted: *18 December 2022*

Keywords-IOT, ESP8266, Soil Moisture Sensor and AI.

1. INTRODUCTION:

"Smart Irrigation System and Weather Fore Casting" this is an Internet of Things (IOT) based system to monitor the crop's health by monitoring the following factors such as: Temperature, Humidity and Soil Moisture and all the live data can be viewed in single application. The system also helps in preventing drought during summer times by supplying water to the field remotely with a single click through the application. In addition to that all sorts of farming issues can be diagnosed with an Artificial Intelligence (AI) based chat application which supports English and Tamil languages (in updates we planned to introduce Hindi and other languages too). So the user can ask their queries in their preferred language which are supported by the application. So, by using this IOT system and AI software the crop health can be tracked, monitored, crop field can be watered

and also any doubts/ issues faced by farmers regarding agriculture can be solved.

ESP8266 NodeMCUrequires 2.5V to 3.6V Operating Voltage, On-board 3.3V- 600mA regulator, 80mA Operating Current, 20 µA Current during Sleep Mode. Power to the ESP8266 NodeMCU is supplied via the on-board Micro USB connector.

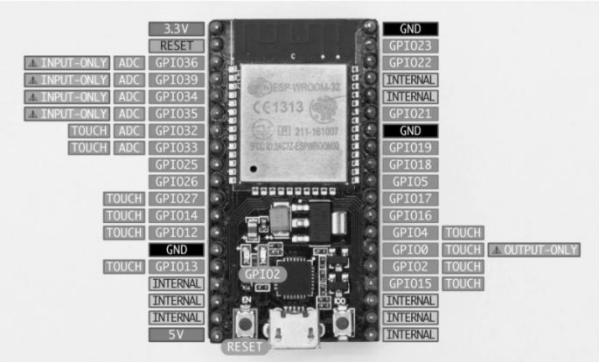

Fig 1: NODE MCU ESP8266

ESP8266 NodeMCU is equipped with 32 Kb RAM, 80 Kb DRAM and 200 Kb Flash Memory. ESP8266 NodeMCU has Pin D0 to Pin D10 Digital Pins, 12 PWM Pins, A0 Analog Pin. It has 5 Ground Pins, 3 number of 3.3 V Pins, 1 Vin Pin for adding 1 external supply of +5V which is not connected to USB. The ESP8266 NodeMCU has total 17 GPIO pins

2. LITERATUREREVIEW:

ThissystemusesArduinotechnologytocontrolirrigation and the greenhouse roof [1] using statistical dataRecordedbysensors(temperature,humidity,humidityandlightintensitysensors)Weather forecast for decision making. Use Kalman FilterEliminates noise from sensors. Agricultural system(Agrisis)[2]Usingtemperature,Phandhumiditysensors,Hybridinferenceforinputtingdatafromsensors.The system monitors sensor information on the LCD andcomputerMuhammad(2010),[3] suggests simpleapproach. "Automatic irrigationcontrolproblem irrigation"Neural Network Controller".The proposed system iscomparedto ON/OFFcontrollers,On/offcontrollerbasedsystemsfailmiserablyforthefollowingreasons:its limitations. On the other hand, ANN-based approachled to better and more implementation possibilities and efficientcontrol.Thesecontrollersarenotrequiredupfront Knowledgeofthesystemandinherentcompetence withANNsBasesystemcansave a lot ofresources(energyandwater) canprovideoptimalresultsforalltypesoffarmingarea.

Sanjukumar(2013),[4]Proposed“advancedtechnology”Automatic motor pump based on soil moisture contentpurposeofagriculturalland”and succeededincombinationwithaflowsensor, extra-ordinarySystemfeaturesincludeautomaticclosedcircuitirrigationSystem,temperatureandwaterconsumptionmonitoring. The user can simplypresetthehumiditylevelandregularly updatedfromthecurrentvaluesofallparametersontheLCDadvertisement.Anotherimportantsoilparamet

erswillbecomeimportant inthe future soil pH, soil electrical conductivityintegrated intothe systemS.NaliniDurga(2018) proposeda “smart irrigationsystem'.Agriculture site is"IoT"basedonsoilmoisture. The sector that contributes the most to India's GDP, but whenconsideringthetechniques usedinthisfield,Idon'tthinkthedevelopmentisthatbig. One day whentechnologyis vastly improved, ithasagreatimpactonvariousfieldssuchasagriculture,Healthcare, etc. Agriculture is the main occupation in our Country.India'smainsourceofincomedependsonit,sothedevelopmentofagricultureimportant.Today,mostirrigationsystemsalsooperatedmanually.ThetraditionaltechniquesavailableareDrip irrigation, sprinkler irrigation, etc.Technologymustbecombinedwith(IoT).Youcanusewaterefficientlyinmanyways.

IoThelpsaccessInformationandcriticaldecision-makingprocesses,to get different values from sensor suchassoilmoisture, Waterlevelsensor, water quality etc.Awirelesssensornetworkisintegratedinthepaper[6].ZigBee to transfer soil moisture and temperaturevalue.DataissenttothewebserverviaGPRS viamobile network, datamonitoring. ItcanbeaccessedovertheInternetusing agraphics application. Chandhini. K [2016] explained in detail in her Study on Agricultural Production System Using IoT as Inclusive Technology”. The IoT (Internet of Things) based agricultural convergence technology is a technology to create a high value such as improvement of production efficiency, quality increase of agricultural products in the whole process of agricultural production.

Aditi Mehta, et.al[2016], proved the chances to create a better world for human beings, where the objects around us understand our desire and hence act accordingly without any explicit instructions. So automation had been implemented and human beings had been replaced by automatic machineries, the yield has been improved. The collected data provides the information about different environmental factors which in turns helps to monitor the system. The smart farm, embedded with IoT systems, could be called a connected farm and connected farms could provide more intelligent agriculture services based on shared expert knowledge.Mr.N.Sivakumar, Mr.P.Thiyagarajan, Ms.R.Sandhiya, [2018] implemented in the research level it is not given to the farmers as a product to get benefitted from the resources. Hence this paper deals about developing smart agriculture using IoT and given to the farmers.

K. JyostsnaVanaja, et.al [2018], elaborated that the Smart Agriculture developing model is a real time monitoring system. It is possible to control many operations of the field remotely from anywhere, anytime by IOT. It offers a futuristic way of life in which an individual gets to control his electronic devices using a smart phone; it also offers an efficient use of energy. It applied in all areas of industry, including smart agriculture, smart parking, smart building environmental monitoring, healthcare transportation and many more.Muhammad Ayaz et.al [2019], discussed about the scope to improve the agricultural yield with fewer resources and labor efforts, substantial innovations have been made throughout human history. Nevertheless, the high population rate never let the demand and supply match during all these times.

RitikaSrivastava, et. al [2020] in their paper have explained the need for smart agriculture to

expand and develop from what it is currently .Then cities use this data to improve infrastructure, public utilities and services, and more. For Farmers, it is difficult for them to understand technical terms and usage of technology, and also it is a cost effective affair.Rakesh Kumar Saini and Chandra Prakash, [2020],explained about the improvement of Internet of Things (IoT) generation in agriculture operations and have added the use of sensors in each stage of the agriculture technique like how a lot time and properties a seed receipts to turn out to be a totally- full-grown plant. Smart Farming majorly depends on Internet of Things (IoT) as an importance casting off the need of biological landscapes of growers and cultivators and therefore growing the productivity in every attainable means.

SumitWailthare et.al [2018] described about the basic of Chat Bot and argued that Goals of Chatbot had always been to resemble an intelligent human person and make it hard or impossible for the other party of the conversation to understand their real nature. These Chabot can prove sufficient to fool the user into believing they are “talking” to a human being, but are very limited in improving their knowledge base at runtime, and had usually little to no means of keeping track of all the conversation data. This will be done in verbal and textual form Verbot Engine Currently Verbot only works in Microsoft Windows Verbot is coded almost in C# language and requires Microsoft .Net 1.1 or higher to execute. Whenever a knowledge base is clicked or added it will be loaded into the verbot player's memory now when you type (chat) with verbot your inputs will be compared to the inputs in the VKB or CKB files.

Prashanth S, et.al [2020], Chatbots are predominantly used in business and corporate organizations including government, non-profit and private ones. Their functioning can range from customer service, product suggestion, product inquiry to personal assistant. Many of these chat agents are built using rule based techniques, retrieval techniques or simple machine learning algorithms in this paper the need for Chatbot in education domain and designed to provide user satisfaction.

Adam Palanica, et.al [2019] developed the backgroundChatbots, also known as conversational agents, interactive agents, virtual agents, virtual humans, or virtual assistants, are artificial intelligence programs designed to simulate human conversation via text or speech. Chatbots can also communicate in multiple different languages to better suit the needs of individual patients. Patients may also feel that chatbots are safer interaction partners than human physicians and are willing to disclose more medical information and report more symptoms to chatbots. This may be because of the perceived lack of quality or accountability that is characterized by computerized chatbots as opposed to traditional face-to-face interactions with human physicians.

Rajaram. K et.al [2010] proposed a detection system for identifying malicious node in mobile ad hoc networks and also proposed power-aware routing system using on-demand multipath routing protocol for efficient packet transfer without any packet loss and for better communication in MANET.

Palaniswami, S et.al [2012] suggested an enhanced distributed certificate authority scheme for authentication in mobile ad hoc networks and trust based cross-layer security protocol malicious

node detection. The modified security scheme for data integrity for manet was suggested for security in network communication.

Premanand, R. P et.al [2020] Enhanced data accuracy based PATH discovery using backing route selection algorithm in MANET was proposed for better network communication.

Anand, R. P et.al [2020] suggested Effective timer count scheduling with spectator routing using stifle restriction algorithm in manet for timely scheduling packets and rapidly communication at emergency situations.

Rajaram, Aet.al. [2019] presented Energy efficient and node mobility-based data replication algorithm and a high certificate authority scheme for authentication for MANET an approach for stable path routing scheme for improving packet delivery.

Objectives: Althoughchatbot technology for health care is continually advancing, little is known about the perspectives of practicing medical physicians on the use of chatbots in health care. As physicians are the primary point of care for patients, their approval is an important gate to the dissemination of chatbots into medical practice. The findings of this research will help to either justify or attenuate enthusiasm for health care chatbot applications as well as direct future work to better align with the needs of HCPs.

Khaleequr A. Ansari, et.al [2022], proposed a conversational agent or Chatbotwhich is a program that generates response based on given input to emulate human conversations in text mode. Users want their answers quick and meaningful. A normal human does not have ability of quick guiding. And hence lead the creation of Chabot. Chabot is gathered information from different online sources and databases. The reason we selected this topic is to get correct information of the field. It can be improved in the future to take care of oral conversations.

Disadvantages of Existing System:

- The smart agriculture needs availability of internet continuously. Rural part of most of the developing countries does not fulfil this requirement. Moreover internet connection is slower.
- The smart farming based equipments require farmers to understand and learn the use of technology. This is major challenge in adopting smart agriculture farming at large scale across the countries.
- Security: As the IoT systems are interconnected and communicate over networks. The system offers little control despite any security measures, and it can be lead the various kinds of network attacks.
- Privacy: Even without the active participation on the user, the IoT system provides substantial personal data in maximum detail.
- Complexity: The designing, developing, and maintaining and enabling the large technology to IoT system is quite complicated.
- Smart farming makes use of high techs that require technical skill and precision to make it a

success. It requires an understanding of robotics and ICT. However, many farmers do not have these skills. Even finding someone with this technical ability is difficult or even expensive to come by, at most. And , this can be a discouraging factor hindering a lot of promising farmers from adopting it.

3. PROPOSEDSYSTEM:

Theproposedsystem uses the IOT based agriculture monitoring system makes use of wireless sensor networks that collects data from different sensors deployed at various nodes and sends it through the wireless protocol. It sends SMS alert on the phone about the levels. The sensors sense the level of water if it goes down , it automatically starts the water pump. If we want to close the water forcefully on IOT there is a button given from where water pump can be forcefully stopped.

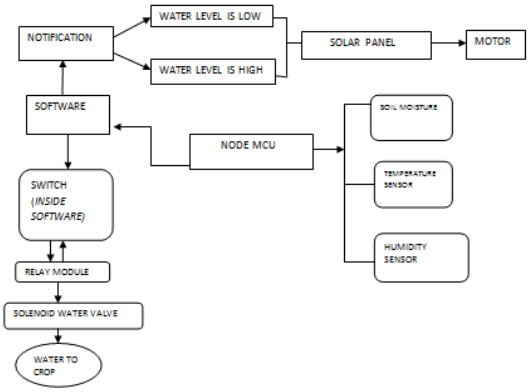

Fig 2: (IOT) based Agriculture Monitoring System

Sensors also sense the temperature level and the moisture level, if the temperature is high / moisture level gets low it sends the alert message to the users to product the crop. Proposed architecture, WiFi module/mobile dataCommunication module can be used as communicationMediabetweenfielddevicesandservers.

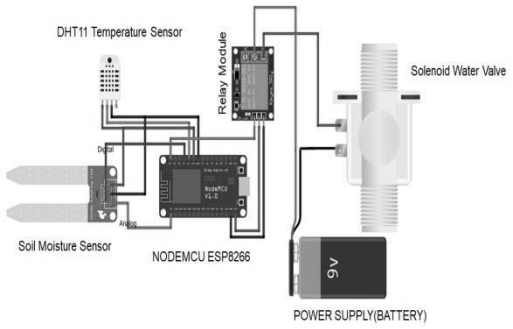

Fig 3: Circuit Diagram

Intheexperiments,theWiFimodule usedtotransmitdata to the server [20], WiFi module or mobile data. Data can be sent using the communication module, Gatewaynode tothe server.

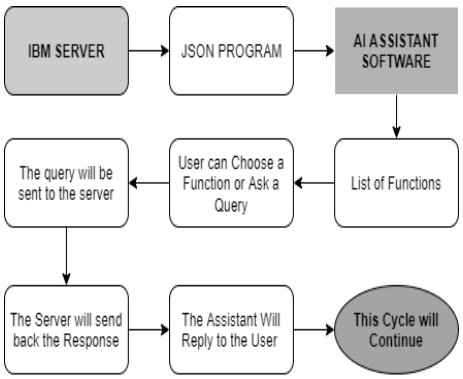

Fig 4: Assistant App Work Flow

4. SMARTIRRIGATIONSYSTEM:

Automatic irrigation system with WSN and GPRS, the module withthe main purpose istheoptimizationof water usagecrops[10].Thissystem Soil Moisture and Distributed WirelessSensorNetworks WSN'stemperaturesensor.Gatewayunitsareusedto it. Datatransferandtransmissionfromthesensorunitto thebase station Commandstoactuatorsforirrigationcontrolanddata management sensorunit[11].

Modules:

- Sensors and input: The Soil Moisture Sensor and DHT11 Temperature Sensor are connected to the NODEMCU ESP8266 Wi-Fi Board along with Relay Module.
- Monitoring and Collecting information: The data or signals received from the sensors are transmitted to the mobile device with the help of NODEMCU ESP8266 Wi-Fi Board.
- Data Analyzation and Classification: The data that the user received are analyzed with the preset or already given value (maximum and minimum).
- Water level detection and Water flow: Detect Soil Moisture Using Soil Moisture Sensor
- H24 Cretionz Assistant: Notifies the user to turn-on and ask if any query about agriculture (I.e. climate condition, types of irrigation or soil types with suitable crops), the query passed to server.
- Blynk Software application:Blynk is a platform for the development of smartphone application that works with a wide range of microcontrollers. It allows the user to create one or more projects.
- Output: The project uses advanced IOT sensors such as Temperature, Humidity and Soil Moisture and all the live data can be viewed in single application.

Algorithmusedbythe system to controltheamountofwater per submission requirements and conditionprogrammed send commands through microcontrollers andactuators adjustthewaterquantitywiththevalveunit[12].

All thesystemispoweredbyphoto-voltaicmodules.CommunicationDuplexing is done over cellular networks.CommunicationnetworkApplication manages the continuous irrigationmonitoring programming of irrigation schedulescan be done via the website. Subsequent sectionIntroducing Bluetoothtechnology[15].Wirelesssensor Network Crop Monitoring Application helps the

farmersprecisionagriculture.

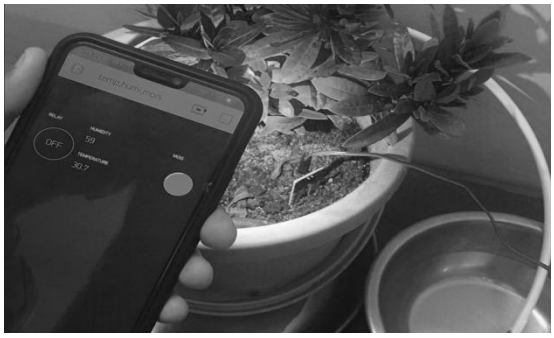

Fig 1: Irrigation of Plant and Monitoring Output

Themainworkingprinciplesbehindthis system are previously existing soil moisture sensor connectionEmbeddedinthesystem,theArduinomicrocontroller,also connected to other electronic components. Theyarelistedabove,asshowninFigure1 Floor- Measurement. The humidityisgeneratedviaasensor, Soilmoistureinformationandparameters a microcontroller that controls the pump. If level, whenthesoilmoisturedropsbelowacertainvalue, themicrocontrollersendsasignaltotherelaymodule.Afterthat,thepumpisactivatedandacertainamountof water is pumpeduptothesystem[16].Assoonassufficientwaterissupplied, the pump no longer does its job, power has a job overallsystempowersupplyandrecommendedvoltage must respect the input supply area ofMicrocontroller, i.e.7V to12V. The application remotely monitors the entire farm locations with Internet of Things (IoT). The applicationworks on Sensornetworkandtwotypesofnodes,saveenergyAlgorithms that are used in nodes to save energy [19], Treebase.A protocol is used for node-to-base data collectionTrainstation.2-nodesystems,1nodeforeverything including the environmentalandsoilparametervaluesand other mode Consists of a camera to take pictures and monitortheharvest[18].Thissystemdoesnotcontainanyenvironmentalchanges and only the Sensorreadingsaretakenintoaccount. This system is notavailablefor systemusers and programapplication.Thereisnocontrolsystemforapplication.

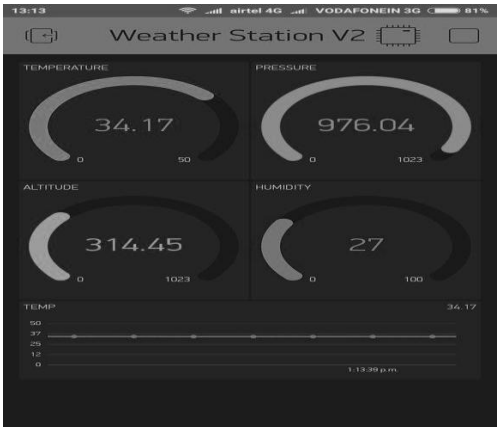

Fig 2: Environmental and soil parameter values

5. CONCLUSION:

The proposed system is built using IBM servers & cloud service. This project helps to make smart agriculture which needs less man power to monitor the crops. The project uses advanced IOT sensors such as Temperature, Humidity and Soil Moisture and all the live data can be viewed in single application. The system also helps in preventing drought during summer times by supplying water to the field remotely with a single click through the application. In addition to that all sorts of farming issues can be diagnosed with an Artificial Intelligence (AI) based chat application which supports English and Tamil languages (in updates we planned to introduce Hindi and other languages too) so the user can ask their queries in their preferred language which are supported by the application. So, by using this IOT system and AI software the crop health can be tracked, monitored, crop field can be watered and also any doubts/ issues faced by farmers regarding agriculture can be solved.

6. FUTURE SCOPE:

Machine learning therefore requires a large amount of data to recordMeteorological dataperformance. Regional or area-based forecasts are done to make more accurate suggestions for agriculture Which crops can be grown by analyzing data soil and weather conditions. In the research work it can be further industrialized with a camera feedCheck the discoloration of leaves and plants, Send results accordingly to fight the disease somewhere. Field areas can be protected from Intruders using AI and surveillance.

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