

Analysis of Soil Moisture Data Using IOT & KNN Algorithm

¹Harika Adepu, ²Dr.P. Niranjan & ³Dr.P.Shireesha

¹Student, M.Tech in Software Engineering, Kakatiya Institute of Technology & Science (India)

²Professor, Department of CSE, Kakatiya Institute of Technology & Science, Warangal (India)

³Associate Professor, Kakatiya Institute of Technology and Science (India)

ARTICLE DETAILS

Article History

Published Online: 15 April 2019

Keywords

soil moisture data, KNN Algorithm, Internet of Things.

ABSTRACT

Most of the Indian economic climate depends upon farming. Around 58% of country houses have farming as their primary ways of income. A farming export comprises 10% of the nation's exports as well as is the 4th biggest exported primary asset. Crop production and also return plays an essential function in farming. Variable specifications like temporal as well as spatial in crop production need to be considered in boosting the efficiency at a lower expense. The term Precision Farming System (PFS) shows up in such a circumstance in the crop administration. The PFS can be Site-Specific Crop Management (SSCM). Keeping an eye on the soil criteria is one of the most vital facets of agriculture. Soil criteria such as wetness web content, temperature level, moisture and also pH play an essential duty in farming production expense and also enhanced return. Real-time tracking of these criteria can be done utilizing suitable sensing units attached to the Internet utilizing a Wi-Fi connection. Such an approach comes under the research study of Internet of things (IoT). The here and now day cellular telephone technology as well as the expansion of 3G and also 4G networks for backwoods makes it very easy in keeping an eye on and also regulating of farming specifications utilizing with IoT technology.

1. Introduction

In this paper, we have actually created and also created a system which instantly checks the wetness existing in the soils making use of Cloud IoT.

IoT links points to the internet for interacting with the picking up tools with appropriate methods as well as trading information with each various other by utilizing cordless sensing unit networks. Utilizing an IoT various specifications are kept track of consistently in actual time with no hold-up. IoT provides the info in all markets of farming, health care, house devices and so on. IoT as well as Cloud computer modern technologies offer brand-new possibilities in IoT-based applications and also solutions. Cloud computer offers safety, surveillance as well as upkeep of information. The primary use the Cloud technology is an efficient use source as well as price decrease. It has high adaptability, ease of access as well as gadget self-reliance. We call the mix of Cloud computer as well as IoT modern technologies with each other as a brand-new design: 'Cloud IoT'. This Cloud IoT is anticipated to interrupt both presents as well as the future Internet.

There are straight as well as indirect measuring strategies that are utilized to determine the soil moisture. The Gravimetric, nuclear as well as electromagnetic methods are straight measuring methods. Capacitive, resisting, tensiometric and also hygrometric are an indirect determining method.

A gravimetric strategy which is a straight dimension strategy can be a recommended approach for gauging soil Water Material (SWC). In this strategy, the weight of the soil with the container is determined prior to as well as after drying out at 105°C for 24 humans resources. $\frac{W}{S}$ fraction of the weight of water (M) to the weight of dry soil (M) gives the

gravimetric water content ($W = \frac{M}{M_s}$). Yet this method is not

appropriate for normal surveillance of soil moisture; specifically in farming areas since it is tiresome as well as troublesome procedure. Conversely, soil moisture can be determined to utilize the indirect method with the aid of sensing units. In the here and now job, we have actually made use of the hygrometric method to determine soil moisture. This is completed utilizing reduced- expense as well as low-power sensing unit: FC-28. The sensing unit offers an on-board center for interfacing. A lot of the lands of southerly India are either red or black; therefore we have actually carried out the experiment making use of red as well as black soil. Andhra Pradesh is gifted relative to rains as well as soil. The State is controlled by red soil covering concerning 66% of location, adhered to by black soils of 25% as well as alluvial soils of 9% as versus 80% of black as well as alluvial soil in all India level the here and now job, we have actually taken into consideration just red and also black soil.

Soil moisture is a crucial variable in regulating the exchange of water as well as heat in between the land surface area as well as the ambiance via dissipation and also plant transpiration. For this reason, it plays a crucial function in the advancement of weather condition patterns as well as the production of rainfall. Farming performance generally depends upon the top quality of soil, which depends on elements like soil moisture as well as pH worths.

The major goal of this task is to identify the top quality of soil by utilizing pH worths (action of the level of acidity or alkalinity of water-soluble compounds), where we are making use of a sensing unit which is linked to a microcontroller. Currently, this sensing unit is placed right into the soil for getting the worths which are kept in various gadgets which are

linked to the Wi-fi modem around it. After that these worths are compared to the various pH worths as well as evaluation is done making use of KNN. Hereafter evaluation, we end which kind of plants can be gathered because of certain soil. Doing this, we might assist farmers to pre-quote which land can be utilized wherefore objective.

2. Hardware Description

DHT11 Digital Temperature and Humidity Sensor

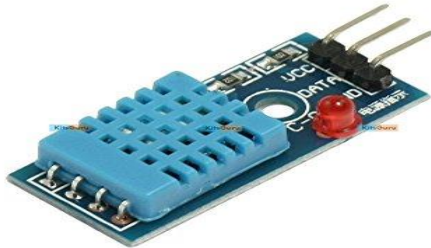


Figure - 1

Light influence Long term direct exposure to sunshine or solid ultraviolet radiation, as well as break down efficiency.

Welding info Hand-operated welding, in the optimum temperature level of 300 °C under the problems of call time will be much less than 3 secs.

Item upgrades Information, please the assessment Aosong electronic devices division

Return to handling Positioned under severe working problems or chemical vapor sensing unit, which permits it to go back to the standing of calibration by the complying with a trainer. Preserve 2 hrs in the moisture problems of 45 °C as well as 70% RH moisture problems to preserve greater than 5 hrs.

The influence of direct exposure to chemicals The capacitive moisture sensing unit has a layer by chemical vapor disturbance, the expansion of chemicals in the picking up layer might cause wander as well as the lowered level of sensitivity of the determined worths. In a pure setting, impurities will gradually be launched. Return to handling as explained below will certainly increase this procedure. The high focus of chemical contamination (such as ethanol) will certainly cause the total damages of the delicate layer of the sensing unit.

Applications COOLING AND HEATINGS, dehumidifier, screening as well as assessment devices, durable goods, automobile, automated control, information loggers, climate terminals, residence devices, moisture regulatory authority, clinical and also various other moisture dimension and also control.

The temperature level impacts Family member moisture of the gas to a huge degree depending on temperature level. For that reason, in the dimension of moisture, ought to be to guarantee that the job of the moisture sensing unit at the exact same temperature level. With the launch of the warmth of digital parts shares a published motherboard, the installment ought to be as for feasible the sensing unit far from the digital

elements and also installed listed below the warmth resource while keeping great airflow of the unit. To minimize the thermal conductivity sensing unit and also published motherboard copper plating ought to be the tiniest feasible, as well as leaving a space in between both.

Attributes Affordable, lasting security loved one moisture as well as temperature level dimension, exceptional top quality, rapid action, solid anti-interference capacity, cross country signal transmission, electronic signal result, as well as accurate calibration.

Job as well as storage space problems Outside the sensing unit the suggested range of job might result in a short-lived drift of the signal as much as 300% RH. Go back to regular working problems, sensing unit calibration condition will gradually towards recuperation. To accelerate the healing procedure might describe "return to refining". Extended use non-normal operating problems, will certainly speed up the aging of the item. Prevent putting the elements on the long-lasting condensation as well as completely dry setting, in addition to the adhering to the atmosphere. A salt spray B, acidic or oxidizing gases such as sulfur dioxide, hydrochloric acid Advised storage space atmosphere Temperature level: 10 ~ 40 °C Moisture: 60% RH or much less.

Electrical wiring safety measures The high quality of the signal cable will certainly influence the top quality of the voltage result, it is suggested to make use of excellent quality secured wire.

DHT11 electronic temperature level and also moisture sensing unit is a composite Sensing unit includes an adjusted electronic signal result of the temperature level as well as moisture. Application of a specialized electronic components collection technology and also the temperature level as well as moisture picking up technology, to make sure that the item has high dependability as well as outstanding lasting security. The sensing unit consists of a repellent feeling of damp elements and also an NTC temperature level dimension gadgets, as well as get in touch with a high-performance 8-bit microcontroller.

3. Soil Moisture Sensor

This sensing unit can be utilized to check the dampness of the soil, when the soil is having water lack, the component outcome goes to a high degree, else the outcome goes to a reduced degree. By utilizing this sensing unit one can immediately sprinkle the blossoming plant, or any kind of various other plants calling for automated watering method. Component three-way result setting, the electronic result is straightforward, analog result extra exact, serial result with precise analyses.

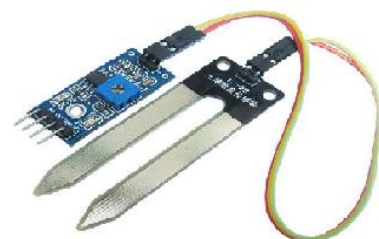


Figure - 2

Soil moisture sensing units assess the water material in the soil. A soil moisture probing is actually composed of several soil moisture sensing units. One usual sort of soil moisture sensing units in the office make use of is actually a Regularity domain name sensing unit including a capacitance sensing unit. Yet another sensing unit, the neutron wetness scale, take advantage of the mediator residential properties of water for neutrons.

Soil moisture capacity might be actually figured out using its own result on dielectric consistent through evaluating the capacitance in between 2 electrodes dental implanted in the soil. Where soil moisture is actually mainly such as complimentary water (e.g., in soft sand soils), the dielectric constant is actually straight relative to the wetness capacity. The probing is actually usually offered a regularity fervor to enable the size of the dielectric constant. The readout coming from the probing is actually certainly not direct along with water capacity as well as is actually affected through soil kind and also soil temperature level. Consequently, mindful gradation is actually demanded and also long-lasting security of the gradation is actually suspicious.

Features:

- Sensitivity adjustable.
- Has fixed bolt hole, convenient installation.
- Threshold level can be configured.
- Module triple output mode, digital output is simple, analog output more accurate, serial output with exact readings.

Applications

- Agriculture
- Landscape irrigation

Specifications

Parameter	Value
Operating Voltage	+5v dc regulated
Soil moisture	Digital value is indicated by out pin

Table - 1

4. PH Sensor

A pH meter is actually a medical tool that assesses the hydrogen-ion activity in water-based services, suggesting its own level of acidity or even alkalinity showed as pH. The pH meter determines the variation in electric possible in between a pH electrode as well as a referral electrode, consequently, the pH meter is actually in some cases described as a "potentiometric pH meter". The variation in electric prospective connects to the level of acidity or even pH of the service. The pH meter is actually utilized in several requests varying coming from lab testing to quality assurance.

Potentiometric pH meters determine the current in between pair of electrodes and also feature the outcome exchanged the matching pH worth. They make up an easy digital amp and also a set of electrodes, or even conversely a

mixture electrode, as well as some type of screen adjusted in pH devices. It typically possesses a glass electrode as well as a source electrode, or even a blend electrode. The electrodes, or even probings, are actually put right into the option to become examined.

The concept of the electrodes is actually the vital component: These are actually rod-like constructs generally made from glass, along with a light bulb including the sensing unit near the bottom. The glass electrode for evaluating the pH possesses a glass light bulb especially created to become discerning to hydrogen-ion attention.



Figure - 3

On immersion in the option to be evaluated, hydrogen ions in the examination remedy exchange for various other favorably billed ions on the glass light bulb, producing an electrochemical possible throughout the light bulb. The digital amplifier finds the distinction in electric possible in between both electrodes produced in the dimension as well as transforms the prospective distinction to pH systems. The size of the electrochemical perspective throughout the glass light bulb is linearly pertaining to the pH according to the Nernst formula.

The recommendation electrode is aloof to the pH of the remedy, is made up of a metal conductor, which links to the display screen. This conductor is submerged in an electrolyte option, commonly potassium chloride, which enters into call with the examination service via a permeable ceramic membrane layer. The display screen includes a voltmeter, which presents voltage in devices of pH.

On immersion of the glass electrode as well as the recommendation electrode in the examination remedy, an electric circuit is finished, in which there is a prospective distinction produced as well as discovered by the voltmeter. The circuit can be taken going from the conductive aspect of the recommendation electrode to the bordering potassium-chloride option, via the ceramic membrane layer to the examination service, the hydrogen-ion-selective glass of the glass electrode, to the remedy inside the glass electrode, to the silver of the glass electrode, and also lastly the voltmeter of the screen gadget. The voltage differs from examination option to evaluate option depending upon the prospective distinction developed by the distinction in hydrogen-ion focus on each side of the glass membrane layer in between the examination service and also the option inside the glass electrode. All

various other prospective distinctions in the circuit do not differ with pH and also are fixed for through the calibration.

For simpleness, lots of pH meters make use of a mixed probe, created with the glass electrode and also the referral electrode had within a solitary probe. An in-depth summary of mix electrodes is given up the post on glass electrodes.

The pH meter is adjusted with options of recognized pH, commonly prior to each usage, to make a certain precision of dimension To gauge the pH of a remedy, the electrodes are utilized as probes, which are dipped right into the examination services as well as held there adequately wish for the hydrogen ions in the examination remedy to equilibrate with the ions externally of the light bulb on the glass electrode. This equilibration supplies a secure pH dimension.

pH electrode and reference electrode design

Information of the construction, as well as resulting microstructure of the glass membrane layer of the pH electrode, are preserved as profession keys by the producers. Nonetheless, specific elements of style are released. Glass is a strong electrolyte, for which alkali-metal ions can bring existing. The pH-sensitive glass membrane layer is typically round to streamline the manufacture of a consistent membrane layer. These membrane layers depend on 0.4 millimeters in density, thicker than initial styles, so regarding make the probes resilient. The glass has a silicate chemical performance

on its surface area, which supplies binding websites for alkali-metal ions and also hydrogen ions from the options. This gives an ion-exchange ability in the series of 10^{-6} to 10^{-8} mol/cm². Selectivity for hydrogen ions (H⁺) occurs from an equilibrium of ionic fee, quantity demands versus various other ions, and also the synchronization variety of various other ions. Electrode producers have actually created make-ups that appropriately stabilize these elements, most significantly lithium glass.

The silver chloride electrode is most typically utilized as a referral electrode in pH meters, although some layouts make use of the saturated calomel electrode. The silver chloride electrode is easy to produce and also gives high reproducibility. The referral electrode normally contains a platinum cable that has called with a silver/ silver chloride combination, which is submerged in a potassium chloride option. There is a ceramic plug, which acts as a call to the examination option, giving reduced resistance while protecting against blending of both services.

With these electrode styles, the voltmeter is spotting prospective distinctions of ± 1400 millivolts. The electrodes are additionally created to quickly equilibrate with examination options to help with the convenience of usage. The equilibration times are normally much less than one 2nd, although equilibration times raise as the electrodes age.

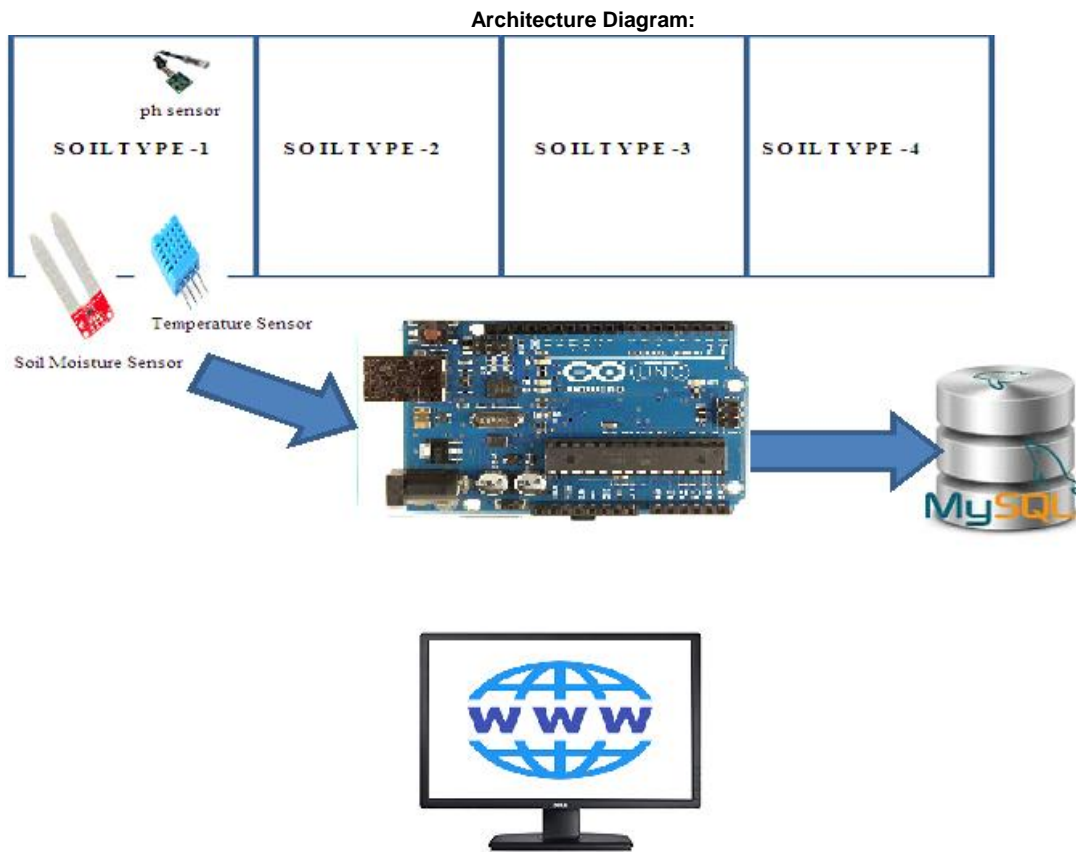


Figure - 4

BLOCK DIAGRAM:

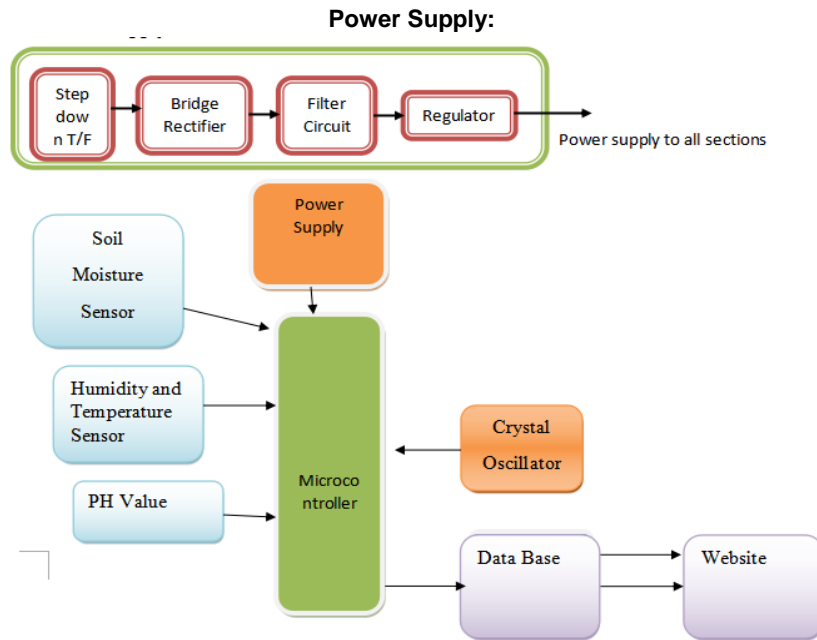


Figure - 5

5. Working Process

- We will take 4 Different Types of Soil in our Prototype (Example Red, white, Clay, Sandy, Silty.)
- Now in each Soil we will get all the values of 3 Sensors and send to Micro control from control we will send to MY SQL Data Base and save...
- **Now Website Side (PHP/JSP we will do)**
- In website we will upload a Data Set a "SampleDataSet.xlsx"
- We get Our Live Values from Our MYSQL Data Base (from our KIT)
- And By using (KNN) We will find out the Crop namefrom our in our Soil with results of Our Sensor Values

Note: - From KIT Values have to get and store in MYSQL Data Base

Sample table

SNO	Soil Name	Soil Moisture	Temperature	Humidity	PH Value
1	Red	10	30	10	30
2	Black	12	34	12	35

Table - 2

Schematic Diagram :

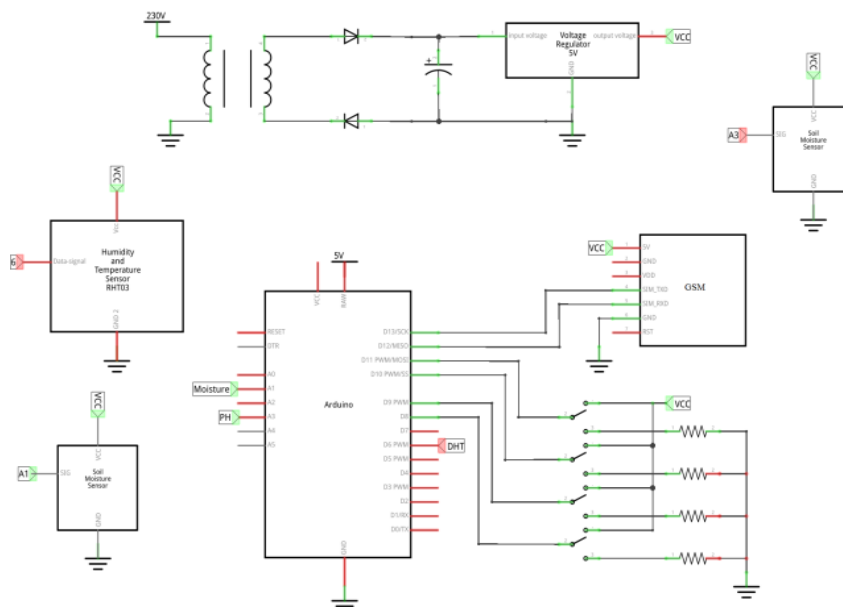


Figure - 6

6. Conclusion

Making use of an IoT various criteria are kept track of routinely in genuine time with no hold-up. IoT offers the info in all markets of farming, medical care, residence devices and so on. IoT as well as Cloud computer innovations supply brand-new possibilities in IoT-based applications and also solutions.

This Cloud IoT is anticipated to interfere with both the present and also the future Internet. In this paper, we have actually made as well as created a system which instantly checks the dampness existing in the soils making use of Cloud IoT.

References

1. R. Zhang, J. Guo, L. Zhang, Y. Zhang, L. Wang, and Q. Wang. A calibration method of detecting soilwater content based on the information-sharing in wireless sensor network. *Computers and Electronics inAgriculture*, 76(2):161–168, May 2011.
2. <https://www.jove.com/science-education/10011/determination-of-moisture-content-in-soil>
3. Standards Association of Australia. AS 1289 B1.1-1977. Determination of the Moisture Content of a Soil: Oven Drying Method (standard method).
4. Black C.A. 1965. "Methods of Soil Analysis: Part I Physical and mineralogical properties".
5. American Society of Agronomy, Madison, Wisconsin, USA.
6. Burt, T. P. and Butcher, D. P.: Topographic Controls of Soil-Moisture Distributions, *J. Soil. Sci.*, 36, 469–486, 1985
7. Yeshwanth Rao Bhandayker, "AN OVERVIEW OF THEINTEGRATION OF ALL DATA MINING AT CLOUD-COMPUTING" in "Airo International Research Journal", Volume XVI, June 2018 [ISSN : 2320-3714]
8. Yeshwanth Rao Bhandayker, "Artificial Intelligence and Big Data for ComputerCyber Security Systems" in "Journal of Advances in Science and Technology", Vol. 12, Issue No. 24, November-2016 [ISSN : 2230-9659]
9. Sugandhi Maheshwaram, "A Comprehensive Review on theImplementation of Big Data Solutions" in "International Journal of Information Technology and Management", Vol. XI, Issue No. XVII, November-2016 [ISSN : 2249-4510]
10. Sugandhi Maheshwaram, "An Overview of Open Research Issues in BigData Analytics" in "Journal of Advances in Science and Technology", Vol. 14, Issue No. 2, September-2017 [ISSN : 2230-9659]
11. Yeshwanth Rao Bhandayker, "Security Mechanisms for Providing Security tothe Network" in "International Journal of Information Technology and Management", Vol. 12, Issue No. 1, February-2017, [ISSN : 2249-4510]
12. Sugandhi Maheshwaram, S. Shoban Babu, "An Overview towards the Techniques of Data Mining" in "RESEARCH REVIEW International Journal of Multidisciplinary", Volume-04, Issue-02, February-2019 [ISSN : 2455-3085]
13. Yeshwanth Rao Bhandayker, "A Study on the Research Challenges and Trends of Cloud Computing" in "RESEARCH REVIEW International Journal of Multidisciplinary", Volume-04, Issue-02, February-2019 [ISSN : 2455-3085]
14. Sugandhi Maheshwaram, "A Review on Deep Convolutional Neural Network and its Applications" in "International Journal of Advanced Research in Computer and Communication Engineering", Vol. 8, Issue No. 2, February-2019 [ISSN : 2278-1021], DOI 10.17148/IJARCC.2019.8230
15. Anusha Medavaka, P. Shireesha, "Analysis and Usage of Spam Detection Methodin Mail Filtering System" in "International Journal of Information Technology and Management", Vol. 12, Issue No. 1, February-2017 [ISSN : 2249-4510]
16. Anusha Medavaka, P. Shireesha, "Review on Secure Routing Protocols in MANETs" in "International Journal of Information Technology and Management", Vol. VIII, Issue No. XII, May-2015 [ISSN : 2249-4510]
17. Anusha Medavaka, P. Shireesha, "Classification Techniques for ImprovingEfficiency and Effectiveness of HierarchicalClustering for the Given Data Set" in "International Journal of Information Technology and Management", Vol. X, Issue No. XV, May-2016 [ISSN : 2249-4510]
18. Anusha Medavaka,P. Shireesha, "Optimal framework to Wireless RechargeableSensor Network based Joint Spatial of theMobile Node" in "Journal of Advances in Science and Technology", Vol. XI, Issue No. XXII, May-2016 [ISSN : 2230-9659]
19. Anusha Medavaka,"Enhanced Classification Framework on SocialNetworks" in "Journal of Advances in Science and Technology", Vol. IX, Issue No. XIX, May-2015 [ISSN : 2230-9659]
20. Anusha Medavaka,P. Shireesha, "A Survey on TraffiCop Android Application" in "Journal of Advances in Science and Technology", Vol. 14, Issue No. 2, September-2017 [ISSN : 2230-9659]
21. Anusha Medavaka,Dr.P.Niranjan, P. Shireesha, "USER SPECIFIC SEARCH HISTORIES AND ORGANIZING PROBLEMS" in "International Journal of Advanced Computer Technology (IJACT)", Vol. 3, Issue No. 6 [ISSN : 2319-7900]
22. Anusha Medavaka,"Monitoring and Controlling Local AreaNetwork Using Android APP" in "International Journal of Research", Vol. 7, Issue No. IV, April-2018 [ISSN : 2236-6124]