SATELLITE IMAGERYBASED ON IOTFORWEATHERPREDICTIONAND IRRIGATION SYSTEM

Manasa S [1]

Varsha T [2], Hitesh Kumar J [3], Jhansi R [4], Sindhu N[5]

[1]Assistant Professor, Department of Electronics and Communication Engineering, East West Institute of Technology, Karnataka, India

[2-5]BE.Student, Department of Electronics and Communication Engineering, East West Institute of Technology, Karnataka, India

***

Abstract - ***Irrigation is one of the key factors to obtain highlevels ofproduce from agriculture. Both under-irrigation and over-irrigation can create problems to crops, thus affecting a farmer's harvest.Theriskofover-irrigation ishigh whenit's about torain.Theadventofweather prediction using Satellite isfound to be precise as compared to the conventional sensor-based weather prediction systems. In this project, we propose an irrigation model that analyses the possibility of rain using satellite imagery and accordingly irrigate the lands.Inthis project, wealso allowsurveillanceon thecropssoastonotoccurlosses. Itis easyto use for anyone with a Smartphone and doesn'trequire maintenance once setup.***

Keywords— NodeMCU, Jupyter Notebook, DHT11, ThingSpeak.

1. INTRODUCTION

Rainfall prediction is important in Indian civilization and it plays major role in human life to a great extent. It is demanding responsibility of meteorological department to predict the frequency of rainfall with uncertainly. It is complicated to predict the rainfall accurately with changing climatic conditions. It is challenging to forecast the rainfall for both summer and rainy seasons. Researchers in allover the world have developed various models to predict the rainfall mostly using random numbers and they are similar to the climate data. The proposed model is developed using the multiple line regression. The proposed method uses Indian meteorological date to predict the rainfall. Usually machine learning algorithms are classified into two major categories:1) unsupervised learning 2) supervised learning. All the clustering algorithms come under supervised machine learning. Different classification of machine learning algorithms

describes the rainfall prediction research based on the neural network for Indian scenario. Even though many models have developed, but it is necessary for doing research using the machine learning algorithm to get accurate prediction. This project hardware requirements are as follows ; 1) Arduino uno board 2) NodeMCU version of ESP8266 3) DHT11 sensor 4) soil moisture sensor. The Arduino Uno is an open-source microcontroller board based on the microchip ATmega328P microcontroller. The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits. DHT sensor it is a module used for measuring temperature and humidity of the surrounding area. And the soil moisture sensor measures the volumetric water content in soil for the cause of water flow to be happened through pumps. So the working procedure is illustrated in the methodology section. This paper implements the real time weather prediction system that can be used in applications like mainly for agriculture purpose its plays a major role, homes, industries etc. The system mainly works on the basis of live sensor values and the pre-recorded values of Kaggle website where the satellite images(cloudy&non-cloudy) values fetched in the csv file format. So the principle of working model in detail illustrated in methodology section.

2. LITERATURE SURVEY

[1] Forecasting Raining Using Multilayer Perceptron Artificial Neural Network Model
Author: Ali, Z., Hussain, I., Faisal, M., Nazir, H. M., Hussain, T., Shad, M. Y., ...&HussainGani, S.
Published in: Advances in Meteorology, 2017.

These days human beings are facing many environmental challenges due to frequently occurring raining hazards. It may have an effect on the country's environment, the community, and industries. Several adverse impacts of

raining hazard are continued in Pakistan, including other hazards. However, early measurement and detection of raining can provide guidance to water resources management for employing raining mitigation policies. In this paper, we used a multilayer perceptron neural network (MLPNN) algorithm for raining forecasting. We applied and tested MLPNN algorithm on monthly time series data of Standardized Precipitation Evapotranspiration Index (SPEI) for seventeen climatological stations located in Northern Area and KPK (Pakistan). We found that MLPNN has potential capability for SPEI raining forecasting based on performance measures (i.e., Mean Average Error (MAE), the coefficient of correlation ( ), and Root Mean Square Error (RMSE)). Water resources and management planner can take necessary action in advance (e.g., in water scarcity areas) by using MLPNN model as part of their decision-making.

[2] Operational raining monitoring in Kenya using MODIS NDVI time series.
Author: AnjaKlisch and Clement Atzberger
Published In:Remote Sens, 2016

Reliable raining information is of utmost importance for efficient raining management. This paper presents a fully operational processing chain for mapping raining occurrence, extent and strength based on Moderate Resolution Imaging Spectroradiometer (MODIS) normalized difference vegetation index (NDVI) data at 250 m resolution. Illustrations are provided for the territory of Kenya. The processing chain was developed at BOKU (University of Natural Resources and Life Sciences, Vienna, Austria) and employs a modified Whittaker smoother providing consistent (de-noised) NDVI "Monday-images" in near real-time (NRT), with time lags between zero and thirteen weeks. At a regular seven-day updating interval, the algorithm constrains modeled NDVI values based on reasonable temporal NDVI paths derived from corresponding (multi-year) NDVI "climatology's". Contrary to other competing approaches, an uncertainty range is produced for each pixel, time step and time lag. To quantify raining strength, the vegetation condition index (VCI) is calculated at pixel level from the de-noised NDVI data and is spatially aggregated to administrative units.
Besides the original weekly temporal resolution, the indicator is also aggregated to one- and three-monthly intervals. During spatial and temporal aggregations, uncertainty information is taken into account to down- weight less reliable observations. Based on the provided VCI, Kenya's National Raining Management Authority (NDMA) has been releasing disaster contingency funds (DCF) to sustain counties in raining conditions since 2014. The paper illustrates the successful application of the raining products within NDMA by providing a retrospective analysis applied to raining's reported by regular food security assessments. We also present comparisons with alternative products of the US Agency for International Development (USAID)'s Famine Early Warning Systems Network (FEWS NET). We found an overall good agreement (R 2 = 0.89) between the two datasets, but observed some persistent (seasonal and spatial) differences that should be assessed against external reference information.

[3] Prediction Of Rainfall Using Machine Learning Techniques
Authors:
Moulana Mohammed, RoshithaKolapalli, NiharikaGoll, Siva SaiMaturi
Published in : INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 9,ISSUE 01, JANUARY 2020

Rainfall prediction is important as heavy rainfall can lead to many disasters. The prediction helps people to take preventive measures and moreover the prediction should be accurate. There are two types of prediction short term rainfall prediction and long-term rainfall. Prediction mostly short-term prediction can give us the accurate result. The main challenge is to build a model for long term rainfall prediction. Heavy precipitation prediction could be a major drawback for earth science department because it is closely associated with the economy and lifetime of human. It's a cause for natural disasters like flood and drought that square measure encountered by individuals across the world each year. Accuracy of rainfall statement has nice importance for countries like India whose economy is basically dependent on agriculture. The dynamic nature of atmosphere, applied mathematics techniques fail to provide sensible accuracy for precipitation statement. The prediction of precipitation using machine learning techniques may user regression. Intention of this project is to offer non-experts easy access to the techniques, approaches utilized in the sector of precipitation prediction and provide a comparative study among the various machine

learning techniques.

[4] Machine Learning based Rainfall Prediction Authors: R.Kingsy Grace1 Published in: ICACCS 2020

The recurrent network shows better accuracy when compared to BPNN. The MSE is high in BPNN. Model have introduced rainfall prediction using short term method because of its challenges in the prediction. To solve this convolutional neural network model was used to predict the short term rainfall by collecting set of weather features from multiple surrounding observations. It was compared with public weather forecast model and proved significantly better. The Mean Square Error (MSE), accuracy, correlation are the parameters used to validate the proposed model. From the results, the proposed machine learning model provides better results than the other algorithms in the literature.

Authors: ShabibAftab, Munir Ahmad, Noureen Hameed Published in: (IJACSA) International Journal of Advanced Computer Science and Applications

Rainfall prediction is one of the challenging tasks in weather forecasting. Accurate and timely rainfall prediction can be very helpful to take effective security measures in advance regarding: ongoing construction projects, transportation activities, agricultural tasks, flight operations and flood situation, etc. Data mining techniques can effectively predict the rainfall by extracting the hidden patterns among available features of past weather data. This research contributes by providing a critical analysis and review of latest data mining techniques, used for rainfall prediction. Published papers from year 2013

to 2017 from renowned online search libraries are considered for this research. This review will serve the researchers to analyze the latest work on rainfall prediction with the focus on data mining techniques and also will provide a baseline for future directions and comparison

3. COMPONENTS REQUIRED

The components required and the proposed system

ARDUINO UNO BOARD

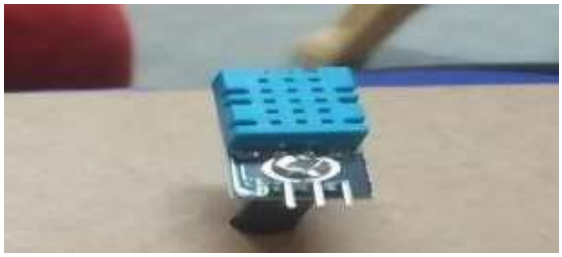
The Arduino Uno is an open- source microcontroller board based on the Microchip ATmega328P microcontroller. The board is equipped with sets of digital and analog input/ output pins that may be interfaced to various expansion boards and other circuits**.**

i. NodeMCU

NodeMCU is an updated version of Arduino with inbuilt Wi-Fi chip.It is cheaper than other modules performingthe same function.

DHT11 SENSOR

DHT sensor It is a module used for measuring temperature and humidity. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air'shumidity and temperature.



i. SOIL MOISTURE SENSOR

Soil moisture sensor measure thevolumetric water content in soil. A small charge is placed on the electrodes and electrical resistance through the sensor is measured. As the soil moisture decreases, water is drawn from the sensor and resistance increases

4, METHODOLOGY

Our proposed strategy focuses on a novel machine learning procedure for Raining classification and prediction, thus overcoming the existing problem. By utilizing Random Forest algorithms, we will make our model in order to increase the performance and accuracy.

4.1 Block diagram of proposed system

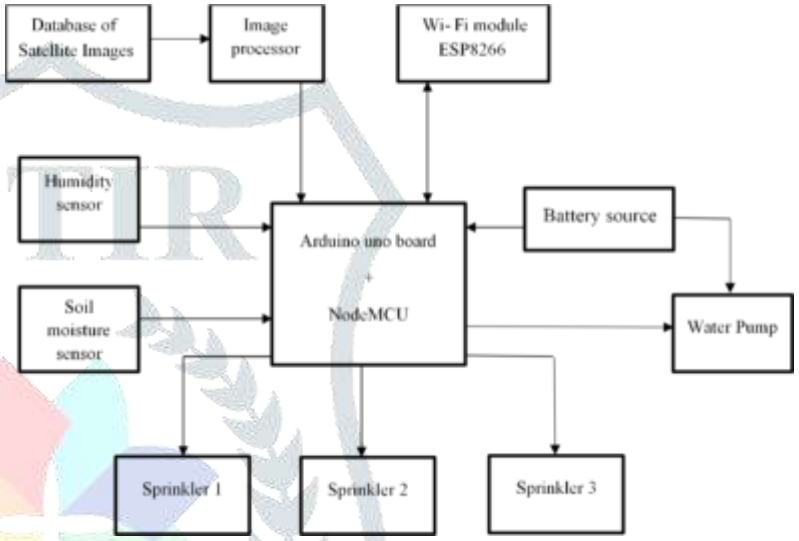
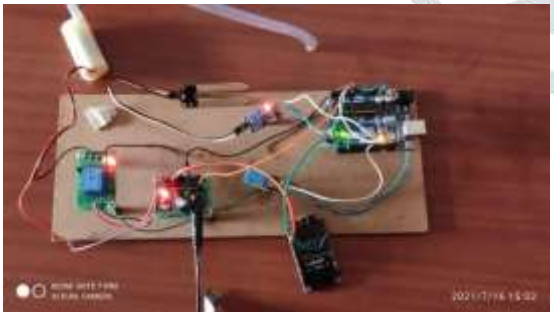


Fig.4.1 Detailed Block Diagram of Proposed System

The database images are fed into image processor which houses machine learning algorithm that can predict weather conditions for next few hours. If the rainfall is predicted, then the controller is automatically directed through server to keep the irrigation system to be turned off. If the rainfall would be there within next few hours, the humidity moisture content in environment is detected. If the moisture content is found to be less, irrigation system must be turned ON. The irrigation system consists of 3 sprinkler taps and 1 water tank, which has pump to supply water. This pump will be powered through solar panels which is connected to a voltage sensor. The
intention of this project is to provide the farmers

far away from the fields, a chance to keep an eye on their plants.

The recommended structure is applied in three fragments, A control box retains the automated mechanisms in a sealed housing, as per presented in. A regulating unit can be placed near the farm or at anyplace by connecting the DHT11 sensor, a soil moisture sensing device, and Sprinkler. Current study describes IoT is implemented via soil moisture sensorsto measure soil moisture in crops and to control the activation and deactivation of water sprayers robotically. A solenoid valve was employed to manage the flow of water by avoiding unnecessary actions. A ‗DHT11 sensor was helpful to manage a dampness of the mushroom crop. Implementation of. Another portion is the Web app this obtains info on NodeMCU agriculture. Access of Internet via a Wi-Fi connection. A web app has been applied to control agricultural packages and control crop water or to assess what makes irrigation mechanism better. Figure delivers an example of a Blynk showing water requirements and IoT information for each structure. This mode of application consisted of two things: manual and automatic. A computer organism was made active parallel installations of IoT devices through determined values of field
instruments were set up excluding user intervention.



FLOW CHART

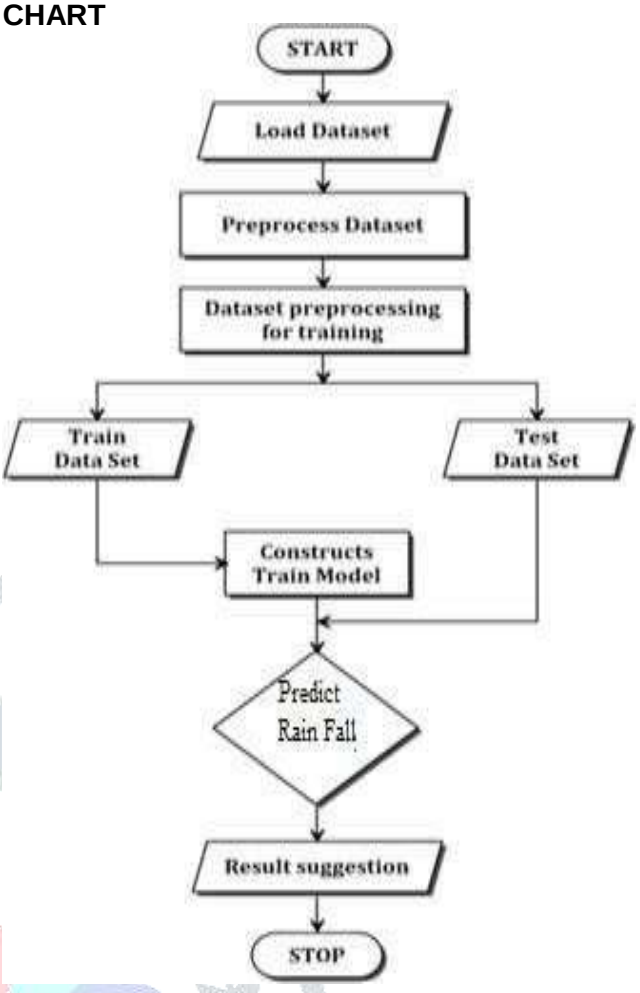
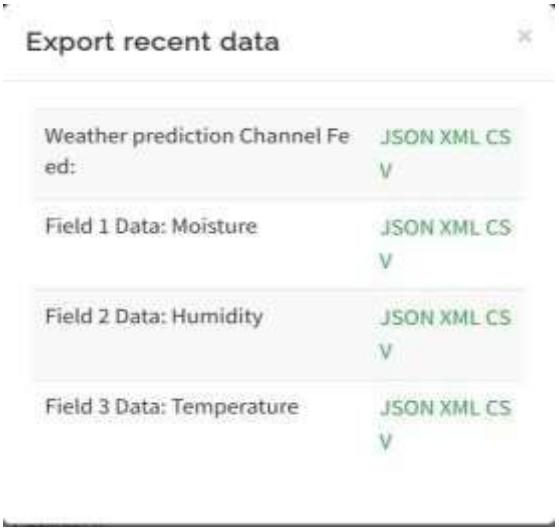


Fig: 4.5 Process flow

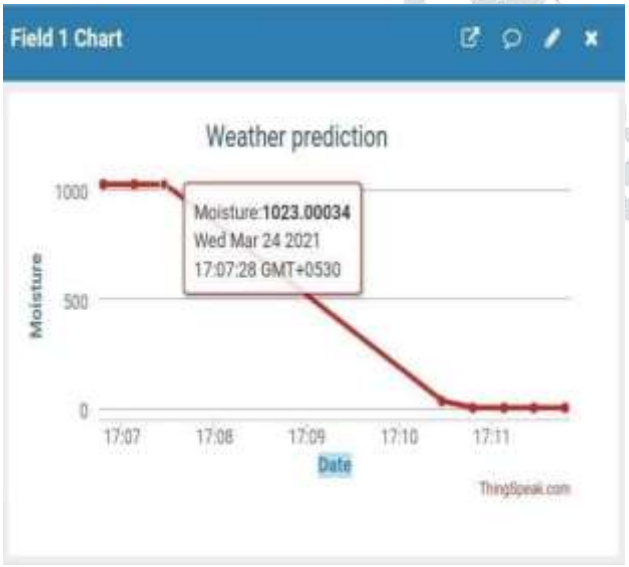
RESULT ANALYSIS



	A	B	C	D
1	created_at	entry_id	field1	field2
2	2021-03-24 11:36	1	1023.00034.000	
3	2021-03-24 11:37	2	1023.00034.000	
4	2021-03-24 11:37	3	1023.00034.000	
5	2021-03-24 11:40	4	31	
6	2021-03-24 11:40	5	0	
7	2021-03-24 11:41	6	0	
8	2021-03-24 11:41	7	0	
9	2021-03-24 11:41	8	0	

Fig.5: Values of Weather Prediction

A. SOIL MOISTURE SENSOR



	A	B	C	D	E
1	created_at	entry_id	field1		
2	2021-03-24 11:36	1	1023.00034.000		
3	2021-03-24 11:37	2	1023.00034.000		
4	2021-03-24 11:37	3	1023.00034.000		
5	2021-03-24 11:40	4	31		
6	2021-03-24 11:40	5	0		
7	2021-03-24 11:41	6	0		
8	2021-03-24 11:41	7	0		
9	2021-03-24 11:41	8	0		

Fig.5: Graph & values of Soil moisturesensor

A. HUMIDITY

C.TEMPERATURE

CONCLUSION AND FUTURE SCOPE:

Rain fall prediction plays the major role in agriculture production. The growth of the agriculture products is based on the rainfall amount. So it is necessary to predict the rainfall of a season to assist farmers in agriculture. In this, a system for raining prediction and resource allocation system has been proposed. Comparison between various raining indices and prediction models has been done by stating their advantages and disadvantages and finally raining index which is a combination of several other raining indices has been proposed and random forest prediction model has been chosen for this system. Resource allocation algorithms have been compared and round robin algorithm with dynamic quantum size has been chosen. The overall model design has been proposed. Successful implementation of this model will be helpful for people to place the effects of raining and to optimally allocate resources to benefit the raining prone victims

ACKNOWLEDGEMENT:

Authors of this paper would like to thank reviewers for their suggestions and comments which improve the quality of our paper. We would like to thank our institution as they allow us to carry out our project in the institute. We offer our humble and sincere thanks to our department for all possible cooperation.

REFERENCES

[1] Y. Shekhar, E. Dagur, and S. Mishra, “Intelligent iot based automated irrigation system,” in International Journal of Applied Engineering Research 12(18):7306- 7320 January 2017

[2] Jinsil Lee and Sam Pullen, “Real time ionospheric threat adaptation using a space weather prediction for GNSS- based air traffic landing system.”

[3] Mohammed RASM and Toshio KOIKE, “Improving numerical weather forecast using multi-passive microwave satellite observations and data assimilation methods.”

[4] Michael Schoor and Bin Yang, “A weather satellite- based platform for signal processing education.” Germany: University of Stuttgart.

[5] J.E. Jordan and D.L. Marcotte, “Delivery of weather image information to a mobile platform using satellite broadcast.” Arash Samani, “No-reference quality metrics for satellite for satellite weather image.