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IMPLEMENTING ML BASED PRECISION AGRICULTURE, IOT INTEGRATED AUTONETICS IRRIGATION SYSTEM AND SENSORIZED WATER PUMPS TO CONSERVE RESOURCES

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ABSTRACT

At the Present day, most of the farmers choose the manual process of irrigation, in which the land has to be irrigated quite often. Sometimes this conventional approach tends to consumption of more water hence automatic irrigation system observes the soil moisture content in the soil. This automatic irrigation helps to the farmers to irrigate the plants in better way. Irrigation of plants takes more time and it has to be done in a justifiable time. Manual process needs large number of human resources. To carry out all the steps effectively by humans manually.

INTRODUTION

Paper Description

At the Present day, most of the farmers choose the manual process of irrigation, in which the land has to be irrigated quite often. Sometimes this conventional approach tends to consumption of more water hence automatic irrigation system observes the soil moisture content in the soil. This automatic irrigation helps to the farmers to irrigate the plants in better way. Irrigation of plants takes more time and it has to be done in a justifiable time. Manual process needs large number of human resources. To carry out all the steps effectively by humans manually.

Nowadays, some systems use techniques to reduce the time carrying water plants, which

also reduces the number of workers in the field. Water is an important resource that is very enormous. Mass irrigation is a way of using plants to water. This method represents a great loss of water, since the given water exceeds the needs of the plant. Excess water and effort are becoming more expensive.

Combining traditional methods with software technologies such as the Internet of Things and wireless sensor networks can promote agricultural development. To maintain this scenario, the device-based "Internet of Things" concept has been tested and analyzed, and the detected information can be analyzed and then transmitted to the user. The project can be used to remotely control and monitor farmland. The system is designed to provide intelligent irrigation and provide real-time notification based on analysis and information processing without manual intervention.

IOT is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifier and the ability to transfer the data over a network without requiring human to human or human to computer interaction.

In recent years, there has been an increasing focus on technologies that boost Indian agriculture in revolutionary approach. Among various technological development and intervention in Indian Agriculture, 'Internet of Things'(IoT) is a revolutionary technology that represents future of communication and computing. Its application in Indian farming has tremendous ways to improve yields, increase productivity and farming processes in cost-effectiveness with new technology. In particular, IoT can make agricultural and farming industry processes more efficient by reducing human intervention through automation.

Need and necessities of New Technologies in Indian Agriculture

Furthermore, the adverse effects of agricultural technology incorporated in electrical, mechanical-chemical variants on the ecology make it irrelevant for long-term sustainability. Today, throughout the developing world, including India, it is scaled down and referred to as mainstream technology. in agriculture. Despite these advances in technology, Indian agriculture still faces challenges such as viability, labor shortages, energy, and other input constraints.

The agricultural world to come is expected to belong to new technological concepts such as digital Internet of Things (IoT) technology and precision agriculture, technologies that will elevate agriculture in developed countries to a new level. In the global effort to transform agriculture along the new technological path, India cannot be left behind, starting with these kinds of Internet of Things devices. In fact, technologies such as the Internet of Things have enormous potential to meet current and future challenges facing Indian farmers as the agricultural profession becomes an income-generating business.

1.2 Internet of things (IOT)

The Internet of Things is the interconnection with the Internet network of computing devices embedded in everyday objects, allowing them to send and receive data. It is an integrated system with sensors, software, and electronic devices connected to physical devices. It can exchange knowledge with other connected devices, operators or manufacturers, so that they can get better performance. (fig. 1) .

Today there is a high demand for internet application development, so IoT emerges as a major technology as it produces various internet applications. Internet of things is the internet connectivity to devices and consists of electronics and other forms of hardware and the interaction with them is taken over internet. IoT is an autonomous control feature by which any device can be control without human interaction. Things in IoT refers to the combination of hardware, software data and services.

IoT system compromises of four different components

Sensors/devices

Sensors is a device that detects and collects data to respond for some input from environment. The input can be any of the form like heat, light, pressure, temperature. The output is in the signal form which can be readable by humans at sensor location or it can be transmitted electronically over network

Connectivity

The data obtained is sent to cloud and sensors can be connected to cloud using cellular satellite, wi-fi, Bluetooth or directly through internet.

Data Processing

Programming plays out some sort of handling like once information jumps on cloud, for example, checking the temperature perusing is inside the worthy range.

User Interface

The data got will be made valuable to the clients by alarming them through email, content, notice. A client can have interface to beware of framework.

1.3 About Machine learning

Machine learning (ML) is the investigation of machines calculations that are naturally improved by experience. It is viewed as a subset of A1. Machine learning calculations produce information designs upheld by a numerical model, called "preparing information", to frame forecasts or choices without unequivocal programming. Machine learning calculations are utilized in fine applications like email sifting and PC vision. In these applications, it is troublesome, if certainly feasible, to foster customary calculations to play out the necessary assignments.

1.3.1. Machine learning Algorithm used in this Project

K Nearest Neighbors

The KNN algorithm is suitable for both classification and regression problem however it is widely used fro classification

Working of KNN

let's take a simple case to understand this algorithm. Following is a spread of red circles (RC) and green squares (GS):

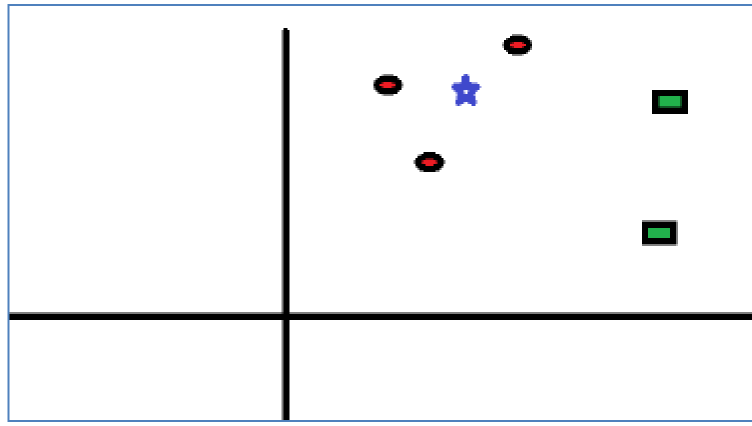

Figure 1.1 : Spread of red circles and green squares

You intend to find out the class of the blue star (BS). BS can either be RC or GS and nothing else. The "K" is KNN algorithm is the nearest neighbors we wish to take vote from. let's say K = 3. Hence, we will now make a circle with BS as center just as big as to enclose only three data points on the plane. Refer to following diagram for more details:

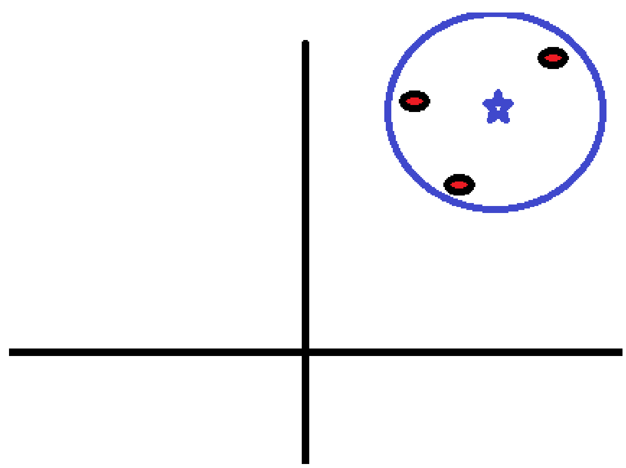

Figure 1.2: Circle to enclose 3 data points on the plane

The three closest points to BS is all RC. Hence, with good confidence level we can say that the BS should belong to the class RC. Here, the choice became very obvious as all three votes from the closest neighbor went to RC. The choice of the parameter K is very crucial in this algorithm. Next we will understand what are the factors to be considered to conclude the best K.

Choosing the value of K

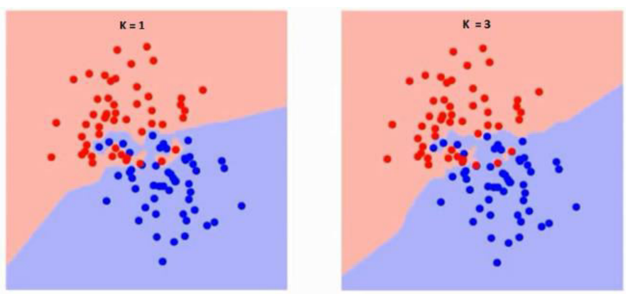

Figure 1. 3: Process of choosing value of KI

By observing above image we conclude that value of K has great impact on end result hence boundary of the curve is becoming smooth with different values of K preferably higher values, hence while choosing value of K magnitude of training data too matters, the standard way of choosing K value is K=sqrt (N)/2, where N is the number dataset present in the collection

LITRATURE SURVEY

Anushree Math and Pruthviraj U et al. [1] in 2018, distributed an IEEE paper, in this paper they have proposed the shrewd dribble water system framework to flood the plants. To accomplish this, they have utilized different sensors which constantly give the current boundaries of components overseeing fitness of plants. In light of the data got by the sensors water is provided to the plants.

Ashwini B V et al. [2], this paper intends to beat the test of Indian agribusiness which relies upon the storms. Where the ranchers don't have adequate wellspring of water. subsequently, to water the entire framework the miniature control based. This framework can be worked from far off area through remote transmission.

Arif Gori, Manglesh Singh, Ojas Thanawala, Anupam Vishwakarma, Prof. Ashfaque Shaikh et al. [3], this venture targets saving the time and keeping away from issues like steady watchfulness. It likewise helps in preserving water via consequently giving water to the plants/field contingent upon the water necessities.

Priyadharsnee .K , Dr. S. Rathi et al [4], this venture targets observing the dirt boundaries like soil dampness, temperature and electrical conductivity and robotizes the water system measure. Alongside the dirt boundaries, plant bug discovery is likewise remembered for their venture.

G. Ravi Kumar, T Venu Gopal, V Sridhar, G Nagendra et al [5], this paper plans to screen the dirt's dampness content during its dry and wet conditions with the guide of a dampness sensor circuit, and compute the comparing relative mugginess, and inundate it dependent on its inclination utilizing a PC based LabVIEW framework, IoT, GSM and a programmed water gulf arrangement.

Krishna Singh, Samyak Jain, Varun Andhra, Shilpi Sharma et al [7], this paper is organized upon Indian agrarian framework and Indian climate conditions. This model applies the innovation of the IoT and information science to execute continuous examination of the gathered information.

Nikhil Agrawal and Smita Singhal et al. [8] in 2015, recommended that the plan for home computerization framework utilizing prepared to-utilize, practical and energy effective gadgets including raspberry pi, Arduino microcontrollers, honey bee modules and hand-off sheets. Utilization of these segments brings about in general financially savvy, adaptable and powerful execution of framework. The orders from the client are prepared at raspberry pi utilizing python programming language.

Karan Kansara, Vishal Zaveri, Shreyans Shah, Sandip Delwadkar, Kaushal Jani et al [12], this paper expects to give a programmed water system framework subsequently saving time, cash, and force of the rancher. The customary homestead land water system advances require manual mediation. At whatever point there is an adjustment of temperature and mugginess of the encompassing these sensors detects the adjustment of the temperature and dampness and gives an interfere with sign to the microcontroller.

2.1 Feasibility Study

Feasibility study is a study of project where it will check whether the proposed project is technically and economically feasible or not. In feasibility study we analyses the project to determine the ability to complete the project successfully with all the feasible cost and technical services.

Feasibility study main goal is analyzing the entire feasible test for economical and operational and function feasibility so that the proposed project cost will be not much expensive. Feasibility study is a decision making of project documentation where it will provide idea to perform the task by using this feasibility report.

It also provides the economical and all the technical cost and resources we needed to perform our task to propose our project. Feasibility study also used for identifying the scope of our project.

Feasibility study is over all examination of project strength and weakness of project and required cost to develop our project and also it will provide the problems available in the existing system and what features we need to include in the existing system to overcome from the problem of existing system.

Well-designed feasibility study is that which provides the required resources and all the documentation details and cost estimation and detailed history of our project is a feasibility study.

2.1.1 Operational feasibility

The proposed system is an effort to make use of web applications and internet services to design a well generalized web site which act as communication media between users and the order system and law.

Since users have rights to make complaint against the crime after being verified as a authenticated users .only the register users can make a complaint over online regarding crime and miss guidance and even for providing illegal information on web sites which may create problems to the accessed users.

One more benefits of using web sites is that any complaint regarding crime and illegal work complaints should be made online only by using provided facilities on web sites which avoids the waste of time . There is no need to visit particular stations frequently to complaint against crime. Complaints given by users will be handled by the authorized officials and they provide solution to their problems.

Operational feasibility monitors all these progress to provide good service to the public/users so they can access the useful information through web sites and design their own applications and users are allowed to download the useful information they can upload their works and ideas on web sites they can also give feedback to the accessed websites.

2.1.2 Technical Feasibility

The technology feasibility to the proposed system could be summarized as below.

- **Server Scripting**

In the proposed system python language used to make server side scripting and python language supports object oriented language as well as procedural language and it is compatible language and also it supports various data types and also it supports to for each loop concept which is very useful to provide navigation through arrays of various types.

2.2.5 Django Framework:

Django is web frame work for developing web application,it fallows Model View Templae approach to develop web application. It has all required eco system to develop python web application easily

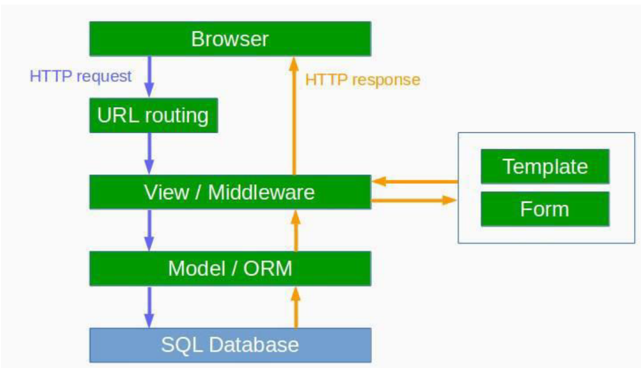

Figure 2.1 : Architectural view of Django

Description: The framework describes the request and responses from user to server.

All whole numbers irrespective of sign are known as integers, fractional numbers irrespective of sign with 6 digits decimal points are known as floats, fractional numbers irrespective of sign with 16 digits decimal points are known as doubles.

In Arduino we have 2 user defined functions called setup() and loop(), setup() function gets called only once we code is launched to device and loop() function gets called continuously.

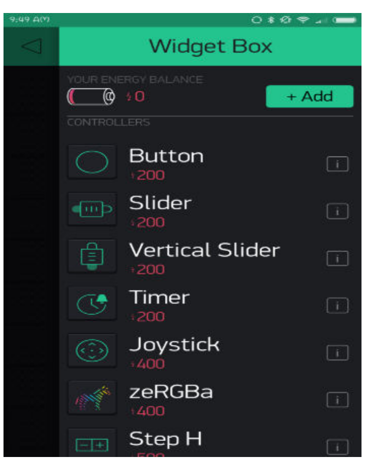

Figure 2.3: Blynk platform widgets

Blynk is a easy to use android app for controlling and communicating with development boards, it has various widgets support with which user interface could be easily created and helps to mask digital and virtual pins with real time development board. Over various media such as wifi, usb, bluetooth helps to control actuators from remote place.

SYSTEM DESIGN

4.1 SYSTEM PERSPECTIVE

The main aim of the system perspective is to reduce the complexity of the system. Here the system is described as a whole not as an isolated individual system. Hence the relationship between the system and the environment is to be considered. This system perspective study also gives information regarding its behavior and properties; this may also include the interactions that the proposed system does with the present environment. This part of the report gives information about the system that is proposed and its relationship with the surrounding environment. The main components of this mobile application are as follows:

IMPLEMENTATION

6.1 Pseudo code used in the project

6.1.1Program to Read sensor data using ESP32 and upload to Blynk

```
Function readData()
{
pinMode(33,INPUT)
value=analogRead(33)
writeToBlynk(V0,value)
}
```

6.1.2 Pseudo code to read temp and humidity

```
Function readTempandHumidity()
{
pinMode(27,INPUT)
Intialize(DHT11)
Hum=DHT11.readHum()
Temp=DHT11.readTemp()
writeToBlynk(v1,hum)
writeToBlynk(v2,temp)
}
```

6.1.3 Pseudo code to connect to wifi

```
Function connectToWifi()
{
SSID=”yourSSID”
Password=”YOURpassword”
while(Wifi(ssid,password) not Connected ) )
{
Delay(500) }
}
```

6.1.4 Pseudo code to build model

```
Function Classify()
{
Dataset=readcsv( file name)
X,Y=split_train_test( data set )
Model=fit(X,Y)
Save_picklefile( Model.pkl)
}
```

6.1.4 Pseudo code to recommend crop using build model

```
Function Recommend()
{
Testdata=getHumidity_Temp()
model=loadPicklFile(filename )
crop=model.predict( Testdata);
print(cropname)
}
```

6.1.4 Invoking request to Django Server

```
Function GetResult ()
{
deployModel( pickle file)
ConfigureHostAddress()
MakeGetRequest()
print(cropname)
}
```

6.2 Screenshots

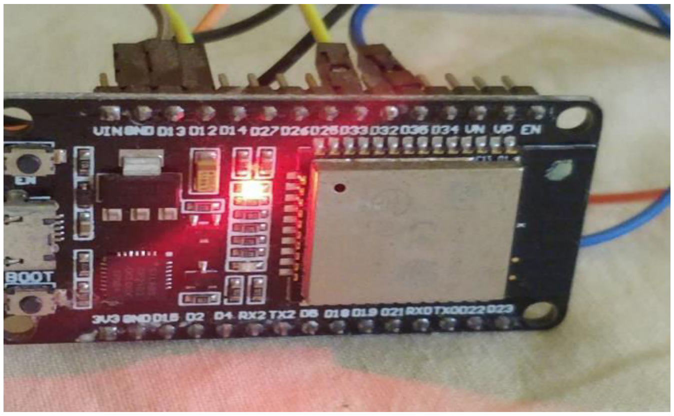

Fig 6.2.1 ESP32 Board

CONCLUSION

The proposed application is aimed to help framers monitor and control the irrigation irrespective of his location. To achieve this we have used ESP32 kit, Moisture sensor, Web server and android application. The system deployed at the fields fetches the soil moisture content using moisture sensor and upload to host server server using ESP32 kit, all these details are accessible to farmer via android app, he has privilege to turn on or off the motor using buttons provided in the application. This application is intended to save water and manage the crops effectively.

Along with IoT control system we have developed a machine learning model using KNN classifier which recommends the crop. by analyzing humidity and temperature

Appendix A

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