SMART FIELD IRRIGATION MANAGEMENT SYSTEM AND LEAF DISEASE DETECTION USING IOT

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ABSTRACT: The main objective of this work is to reduce the manual work of the farmer by using smart irrigation to the crops in the fields. To reduce the manual work we are using the automatic water supply to the crops by monitoring the moisture level and rain using sensors. Besides that it monitors the healthiness of the crop by using an image processing system This project can be developed by the real time monitoring of healthiness of the crops in the agriculture field and updates the status to the cloud server and also providing necessary water to crop at required time. Structural characterization: the estimation of parameters such as: canopy volume, plant height, leaf area coverage, biomass, among others, leads to decisions in order to enhance the agricultural process. For example, canopy volume has been used to improve the spraying of phytosanitary products (i.e., pesticides and fertilizers) on trees in terms of inputs saving and environmental costs . Additionally, the leaf area coverage has been used for crop growth monitoring and yield estimation since it reflects many aspects of the physiological processes of vegetation. Further, biomass mapping and monitoring provide the means for detecting changes in the plantation status due to storms, drought or plagues. Moreover, since bio- energy obtained from specific crops has become one of the most frequently used power sources, estimating its biomass arises as a productivity evaluation parameter. Cameras have been widely used in agricultural detection and characterization. From the color information provided, additional parameters such as texture and geometrical features can be also obtained, which have proved to be suitable in certain applications (e.g., detection, positioning, guidance). However, the main drawback of using this type of sensor is the influence of the varying ambient lighting conditions, especially in outdoor environments.

Keywords: Smart irrigation system, Canopy volume, Leaf detection, Advanced sensing in agriculture.

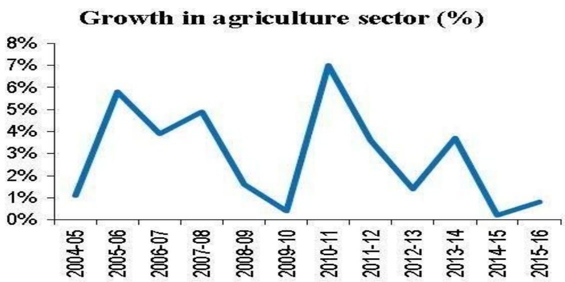
1. INTRODUCTION

Now-a-days farmers are facing many problems to manage their crops due to lack of rainfall, unaware of moist level, pH level of water and various diseases due to pests.

Farmers are unable to monitor their fields due to their busy life or busy work they can't find time to spend or to monitor their fields.

So, we thought to develop an application with using latest technology IOT through which farmers can monitor their fields from home as well as they know the status of the plants and how their field is growing can check daily, through app daily they will receive the message of what is the status of water pump what is the water quality and quantity through water level sensors, ph sensors.

Through image processing method, we can also know the status of the plant whether it is healthy or affected by any diseases, the farmer can see the status of the plant if any disease occurring means he will get an alert message he can respond according to that particular disease.



Pictorial representation of agricultural growth from the year 2004-2016

SOURCE: Agricultural Statistics at a Glance 2015,Ministry of Agriculture; PRS

2. RELATED WORKS

J. Balendonck et.al [1]describes prospective applications of an intelligent dielectric sensor for measuring water content, electrical conductivity and temperature in soil. The sensor incorporates an application specific integrated circuit for dielectric measurement. It has an embedded microprocessor which handles calibration, data processing, control and communication as well as rewritable memory for storing calibration data. The sensor can be used in agricultural practices for continuously monitoring water related parameters in soil and growing substrates in which field-busses or digital networks are used to read-out multiple sensors. A prototype of the sensor was tested in a LONWORKS/sup (R)/ network environment.[2]

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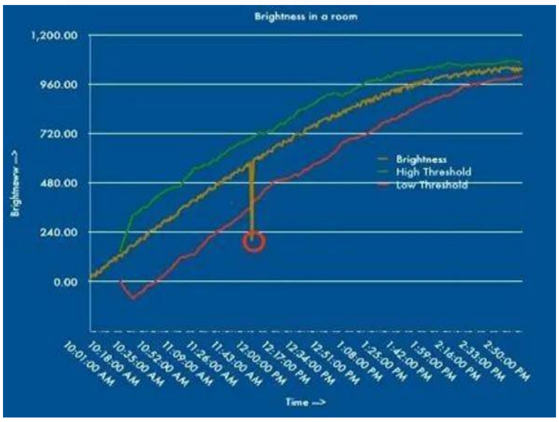
M. A. Abdurrahman et.al[3] Noise is an inevitable factor in an image. Several methods have been proposed to remove noise from an image. Of those, wavelet transform based demising is found to be remarkable since it works on different resolution levels. In this model different hybrid thresholds have been proposed and experimented for Gaussian noise of different variance. These threshold algorithms are ranked based on their Signal to Noise Ratio(SNR) and Root Mean Square Error (RMSE) and the best threshold algorithm is suggested for denoising an image.

Udhav Bhosle et.al [4]describes a survey of image registration techniques. Image processing used to match two or more pictures taken ,for eg: at different times from different sensors ,or from different viewpoints .Various applications of image processing are target recognition, monitoring global land usage using satellite images, matching stereo images to recover shape for navigation, and aligning images from different medical modalities for diagnosis.

A . Mondal et.al [5] describes the spatial distribution of different crops in a region where a multi-cropping system is required for management and planning. In the present study, multi dated LISS-III and AWiFS data were used to crop identification. The cultivable land area extracted from the land use classification of LISS-III image was used to generate spectral-temporal profile of crops according to their growth stages with normalised difference vegetation index (NDVI) method. The reflectance from the crops on 9 different dates identified separate spectral behaviour. This combined NDVI IMAGE was then classified by Fuzzy C-Mean(FCM) method again to get 5 crop types for around 12,000 km^2 area on Narmada river basin of Madhya Pradesh. The accuracy assessment of the classification showed overall accuracy of 88 % and overall Kappa of 0.83.

The crop identification was done for one Ravi 2012.

season from 23 October 2011 to 10 March



SOURCE- Hackster.io

(Implementation of ML in IoT (SMART IRRIGATION SYSTEM) - Hackster.io)

The Above graph depicts the brightness of light in the room with a hight hreshold and low threshold and brightness v aries when it is outside the room.

3. PROPOSED SYSTEM

In the proposed system we can monitor plants using image processing method and that data is stored in IOT. And external sensors are used to monitor the plants exact status.that can be operated automatically.

More operations can be performed using Automation Has intelligence to avoid flooding of fields .By using IOT we can monitor.

In this system, we use the ARDUINO MEGA (ATmega2560) microcontroller which acts as the brain of the system, because the entire system program instruction is stored in it. Moisture sensor and image processing are used here to know the wet status of the tree so that the pump motor can work automatically to irrigate the tree. Water level sensor Rain sensor to check the water level at ring as well as the tank to refill the tank automatically and detection of rain stops the working of the pump motor. LDR sensor to check the percentage of intensity of light use for photosynthesis .which can be displayed on the LCD display. All the data is fetched from the sensors stored in the controller and is updated to the cloud so the entire system operation is either controlled or monitored using IOT.

4. METHODOLOGY

In this project we are using iot technology. In this ,we can monitor the plants using image processing methods and that data's stored in IOT and external sensors are used to monitor the plants exact status. It can be operated automatically.

More operations can be performed using Automation.Has intelligence to avoid flooding of field .we use ARDUINO MEGA (ATmega2560) microcontroller which acts as the brain of the system, because the entire system program instruction stored in it.Moisture sensor and image processing are used here to know the wet status of the tree so that the pump motor can work automatically to irrigate the tree. Water level sensor Rain sensor to check the water level at ring as well as the tank to refill the tank automatically and detection of rain stops the working of the pump motor. LDR sensor to check the percentage of intensity of light use for photosynthesis .which can be displayed on the LCD display. All the data are fetched from the sensors stored in the controller is updated to cloud so daily farmers get the status of their fields .In this methodology we are connecting wires to respective pins for sending and receiving the signals.

4.1. MODULE EXPLANATION

4.1.1. HARDWARE TOOLS ARDUINO MEGA:

The Arduino mega is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins. 16 analog inputs.16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

WATER LEVEL SENSOR:

a water level sensor can be used to identify the point at which a liquid falls below a minimum or rises above a maximum level**. level** measurements can be done inside containers or it can be the leve**l** of a river or lake.

RAIN SENSOR:

This **sensor** is used as a water preservation device and this is connected to the irrigation system to shut down the system in the event of rainfall.

LCD DISPLAY:

LCD uses a **liquid crystal** to produce a visible image.**LCD Advantages** Brightness Produces very bright images due to high peak intensity. Very suitable for environments that are brightly lit

PUMP MOTOR:

The water pump is a portable device and can be applied in several household applications. These pumps are used for pumping the huge amount of water from one place to another. The main purpose of a water pump is versatile. A quality pump which can be selected carefully may be perfect for draining water from a low flooded region, refilling the swimming pool, and bathtub, circulating pesticides or other fertilizers.

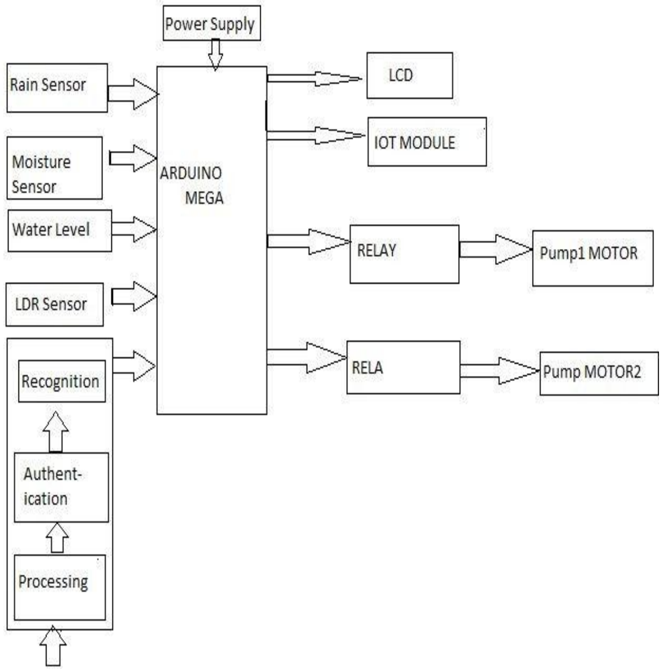
LDR SENSOR:

These devices are used where there is a need to sense the presence and absence of light is necessary .

RELAY:

So **relay** is a switch which controls (open and close) circuits electromechanically. **The** main operation of this device is to make or break contact with **the** help of a signal without any human involvement in order to switch **it** ON or OFF.

BLOCK DIAGRAM:

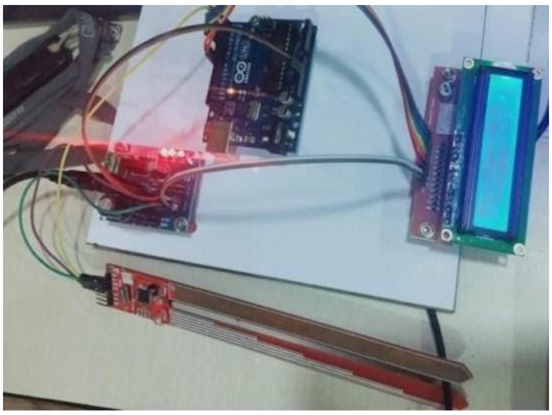


DEPICTION OF WORKING METHODOLOGY

5. RESULT

Farmers will get live sms notifications on moisture level of the land using moisture sensor, Intensity of light for photosynthesis using LDR sensor, water level at the ring and tank to refill the tank automatically using Rain Sensor and finally wet status of the tree using image processing thus enabling easy managing of the fields.

SAMPLE IMAGE HARDWARE SETUP OF WORKING MODULE



6. FUTURE ENHANCEMENT

Our project is dealing to improve the below enhancements in paper.

There are as follows:

Firstly,we are able to predict the best outcome(fruit/plant) of the hybrid plant which is formed by pollinating two plants either through self pollinating or cross pollinating. we can also predict with which it should be cross pollinated to give a good result.

It is also able to predict the disease which affects the plants.

Hybridising is the process by which new marketable plants are developed with particular desired qualities.

Secondly, we can also predict which plant must be grown in that land based on the moisture level present in the soil.

Thirdly, identification of the can be done by which leaf gets affected.

7. CONCLUSIONS

The purpose of this research work is to propose a smart farming method based on the Internet of Things (IoT) to deal with the adverse situations.

Smart farming can be adopted which offers high precision crop control, collection of useful data and automated farming techniques. This work presents an intelligent agriculture field monitoring system which monitors soil humidity and temperature.

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