An Advanced Crop Field Monitoring System in Agriculture through Java Beans and GSM Modem

Bollamreddi VVS Narayana, K. Sreenivasa Ravi, P. Gopi Krishna

Abstract: the fortitude of the Indian economy field is Agriculture. Diseases & pests are the huge problem in greenhouse as well as in crop fields, which has to be resolve without effecting the greenhouse & crops. Cauliflower crop & greenhouses needs frequent Protection updates in data about the health conditions of the crop, and wireless sensor networks is there for real-time monitoring systems of crops and through the wireless communication protocols is the ones that can deliver such information to the client location as will to cloud also. The main aim of this paper is to demonstrate the procedures of preventing the appearance of diseases in a cauliflower crop/ greenhouse by implementing a wireless monitoring system consists of an integrated wireless camera. Wireless sensor network system is doing a real-time monitoring of the parameters in the cauliflower crop/greenhouse of temperature /soil moisture/temperature/humidity/ at canopy level &humidness beside leaf and flower diseases all the live data has been stored in a memory card this paper refered to "Offline Mode." Camera is utilized to disease detection of leaf / flower. The trivial experimental setup of cauliflower crop was established in the greenhouse to perform the required tests and to test the applicability of the all the requirements of the existing and proposed systems. For assurance of the optimal conditions for the of diseases in greenhouse equipped with an natural lighting system which is designed for the greenhouses / irrigation system / crops. Wireless cameras are the ideal support for monitoring and at the same time, it offers all the support data and for decision taking regarding cauliflower greenhouse/crops data that is development mode (Online Mode).

Index Terms: Cauliflower crop & greenhouse setup, Wireless sensor network, Wireless camera, Temperature sensor, Soil Moisture sensor and Humidity Sensor.

I. INTRODUCTION

In this paper attempt made to progress a WSN system that monitor ecosystem conditions in cauliflower agro medow like temperature, soil level & humidity near to leaf and flower contaminated section. Well organized performance of the IoT used for observe the ecosystem conditions by means of the minimized sensing system and consequence with ongoing parameters, affected plant contaminated areas, its data evaluations are polled to e-mail accounts. This Framework planned since for the higher outcomes of crops according to few limitations from environment computations vital, that straightforwardly affect its development. Leaf and diseases moreover cause significant damage and economic misfortunes in cauliflower crops around the world. Inescapable detecting empowered by Wireless Sensor Network (WSN) technologies cuts over a few locations of modern day's living cultures so that we can get the ability to have being, derive & recognized ecosystem pointers, from insubstantial ecologies to everyday assets (Agriculture) to densely populated situations. The production of those communication mechanism & activating lattice work creates the IoT. According to the advancements in image processing techniques and in WSN is a substitute trend within the span of existence is perceive. A massive improvement in users of internet & alterations on the internetworking topologies modifying the lattice of everyday objects. Internet of Things is all concerning physical devices reproof one to another repeatedly, person to computer communications & peer to peer communications are extended to "things." IoT submits to the lay to the rest of unambiguously embed computing like wireless gadgets at interims the existing framework. So, This strategy is joined with added framework & image processing methods for recognition of totally different system parameters like plant leaf/flower disease reorganization.

II. LITERATURE SURVEY

The paper "**Image process Techniques for Detection of Leaf Disease,**" written by Arti N. Rathod acknowledge in 2013, the survey of diversified innovative methods of plant / leaves disease identifications methods. In this paper, we can get the essential features of "malady detection of square measure speed & accuracy." From this, we can see the improvement of automatic, efficient, fast and correct detection of the sickness of unhealthy plant/leaf. [**1**].The paper "**Wireless Sensor Based Remote Monitoring System for Agriculture Using ZigBee and GPS**" written by G. V. Satyanarayana gave us a gift structure approach to expand and appliance a wireless sensor fundamental structure connected to the primary node deception of Zigbee, which is interfaced to (CMS) through (GPRS) / internet networking for (GSM).

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This system also acquires (GPS) specifications combine with the zone and transfer them to a (CMS) [2]. The paper "**Leaf disease Severity measurement Image processing**" written by Sanjay B. Patil in year 2011 has introduced an innovative image process approach for plant disease zone identification. In this paper, the Sugarcane crop has selected for an experimental result. We have implemented the same ideology of image process approach throughout which contains 4 important steps which is. 1. Image procurement, 2. image analysis, 3. leaf zone carving, 4. contaminated zone & portion respectively [3]. Author Pradnya Ravindra Narvekar has pointed out to allegation that the adequate manner engaged in the identification of grape contaminated part through leaf trait investigation. The leaf picture is obtained & foreseen to work out the wellbeing continuing of each plant [4].The paper "**Detection of the unhealthy region of plant leaves And classification of plant leaf diseases using texture features**" written by S. Arivazhagan has presented an function of texture investigation and allocations of the plant infected leaf. By this manner the plant infected areas are identified at the starting lap there itself, & according to the autocrat administration tools adapt to rectify the autocrat issues although curtail the risks to entity & according to the atmosphere [5].

The IEEE paper "**IOT Based Monitoring System in Smart Agriculture**" written by S.R.Prathibha Anupama Hongal,M. P. Jyothi has been represented the idea of IoT in 2017 Internet of Things (IoT) plays a integral role in agile culture field. Brilliant farming is a most developing concept because of Internet of Things technology. This sensor are efficient to provide the information / data and live data about culture fields wirelessly. The main focus of this paper is to make utilization of emerging technology in automation, i.e. Internet of Things and smart culture fields by using mechanization procedures. Observing substantial factors like temperature humidity and so forth. Are the primary aspect to increase the harvest of profitable crops? This paper includes observing temperature & humidity in the cultural field over wireless. The camera is coordinated to seizure the images & videos then sent to through Multimedia services to cropper mobile through Wi-Fi [6].

III. OVERVIEW

Cauliflower diseases are an immediate hazard to sustenance security; anyway, their fast-distinctive evidence remains troublesome in clustered parts of the world as a result of the non-participation of the critical foundation. Development of strict procedures in the field of leaf/flower-based picture characterization has indicated amazing outcomes. This paper utilizes the offline approach in distinguishing among solid and diseased leaf/flower from the database created. Our proposed paper incorporates different phases of performance to be specific database creation, feature extraction, preparing the classifier and disease reorganization. The created databases of diseased and edible leaves/flowers are all things considered prepared under Random Forest to group the infected and good cauliflower pictures. For separating

highlights of a picture, we use Support Vector Machine (SVM). In general, utilizing AI to prepare the substantial informational collections accessible freely gives us a reasonable method to distinguish the infection present in cauliflower plants on an enormous scale.

IV. ALGORITHMS

- *Image Acquisition*: by sampling methods we are capturing the cauliflower crop and sampling the area in a unit keep the area in JPEG format. To gain accurate performance of disease identification system requires to overcome the significant problems, such as selecting the right database & accurate measurements of the image and admits a plenty images/videos in each & every experiment conducted. The technique utilized in this area for image modification and unify dimensions for images/ videos in all the databases of images/videos has been explained.

- *Image Segmentation:* It is compulsory to segregate the different partitions with uncommon consequence within the leaf/flower image databases. Image slicing guided to detect the boundaries and clusters of leaf/flower automatically, & the boundaries of the leaf/flower in the image to remove the "outer region". This process is helpful in gathering all the features from the "iris" for disease detection in a precise manner. The main aim of the segmentation is the removal of unwanted regions like the areas outside the leaf/flower. After successful part of detections of segmentation process next step depends on quality/properties of the leaf/flower image. Then the segmentation process fixes the leaf/flower/pupil boundaries and then converts the area to a compatible template into the normalization step. Many studies have been reviewed / surveyed the image segmentation processes; these all studies are focused on developing the new advanced techniques used in image segmentation to improve the performance accurately.

These studies classified into two parts:
- 1 starting of the segmentation process.
- 2 Techniques used.

- *Leaf/Flower area Segmentation:* The Input image is initially created in grayscale image. The image is taken as guided boundaries keeping the diseased leaf on the white background, which makes a massive contrast in grey values of 2 terms, 1. object, and 2. background. That slicing and comparison of image/video of leaf/flower starts from the entire area of the object because it is the darkest part. Depend upon the, the disease is identified, and the outer boundary of the leaf/flower is fixed, and then determines the disease using different types of techniques. Next final step is to identify and differentiate the noises from the leaf/flower.

- *Diseases area segmentation:* The Segmentation of the diseased area with marks is accomplished int his process. For the completions of experiment, it is must to slice the diseased zone accurately. In this thesis, we used two classifiers. Those are (SVM) and (image processing). These classifiers are tested by the features gathered from leaf/flower patterns from database; every classifier is trained many times by the set of leaf/flower images/videos after that tested with another database parts of leaf/flower images/videos.

- **Support Vector Machine***:* (SVM) was born in 1992 by3 members called 1. Vapnik, 2.Boser, 3.Guyon. Support Vector Machine is a learning-based method which is used to classifications. It is related to "linear classifiers family" area. In another side, (Support Vector Machine) which is also a prediction tool which employs ML theory for gaining best predictability while eliminating (valid data for classifiers). Support Vector Machine was a part of "NIPS" community, but now it becomes one of the most advanced learning machines technique. Which uses pixel maps as Input purpose and this algorithm used in a different type of frameworks like facial reorganization and patterns classification identifier.

- **Support Vector Machine** approach is utilized to resolve the different types of patterns classification errors. Using Support Vector Machine to solve a particular practical /theoretical problem, and to resolve many questions depends on the origin of the problem statement. The major difficulty for using Support Vector Machine is selecting a proper kernel for the best applications which is must to use Support Vector Machine. Support Vector Machine has more advantages like it is so easy to the train& it is suitable for multi-dimensional data and it is having the ability to control between classifier complexity & errors. Support Vector Machine needs a sustainable kernel function. This function guiding/ handling information as though it were guided into the multi-dimensional space, by operating formal space and this leads to accurate algorithm. As mentioned before, this database contains 30 images that are recovered from the cauliflower crop live feed. The database is classified into 2 sets 1. Testing set 2. Training set. If the first set contains 1 image, and the second set consists 5 images it means different methods have been applied to database to evaluate the accurate results of the proposed system. Two methods applied separately, after obtaining results comparison will be done with each database with another database to determine which method is the suitable and results should be accurate between different methods.

V. IMPLEMENTATION

The Structure of an automatic crop management system shows combined Open CV embedded client application with image processing is as shown in Figure. All sensors (wireless camera) sense and collect data (leaf and flower information) from environment around the cauliflower crop and give it to the client application as a input and performs different necessary functions like 1. Image segmentation 2. Image acquisition leaf/flower frontier with different types of sensors

and interconnecting to online mode. By conducting various conversion and testing results sent to client & to the online storage. There are 2 types modules (online/offline) are utilized to capture the data from the camera and to transfer the image/video data to the monitoring device. This application can be applied to perform image processing technique on the contaminated flowers /leaves. We can use Personal computer or laptop. The wireless camera takes vivid images of cauliflower leaves and flowers. This Images are sent to the computer for next step. Our application displays the output results finally on the cloud computing pages. There are4important steps for image processing on flower /leaf which includes: a) good database (edible leaves & edible flowers) and b) diseased database (diseased leaves & diseased flowers).
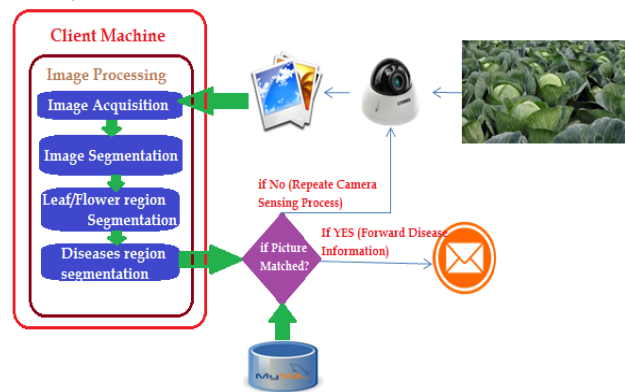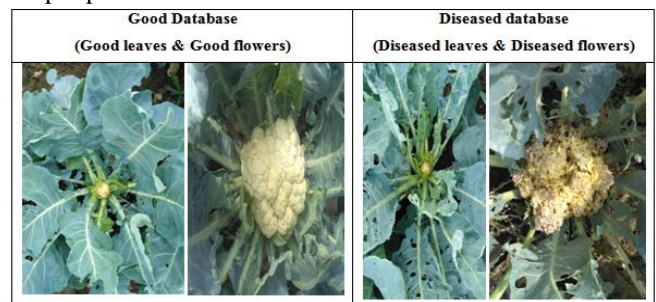

Fig: Structure of the Automatic Crop Management System

GSM Architecture flow: This modem is a portable communications modem& it is represented as the comprehensive framework for wireless communications. The GSM module was born at Bell Labs in 1970. It is utilized worldwide. GSM is an automated mobile utilization tool for transmitting/receiving voice and data. This module works at the range of frequencies of 850MHz, 900MHz, 1800MHz and 1900MHz& 2100MHz.GSM framework was developed for (TDMA) system for communication reason.

This module digitalizes and decreases the data, at that point transmit it down through a specific channel with distinct huge amount of customer data, on its own specific scheduled timing. The advanced framework can convey 1Mbps - 120 Mbps speed of information.

Good Database (Good leaves & Good flowers)	Diseased database (Diseased leaves & Diseased flowers)

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GSM consists of four different kinds of cell sizes which consists1. (Macro), 2. (Micro), 3. (Pico) and 4. (Umbrella) cells. Each Cell changes according to the development area. The inclusion zone of each cell changes as per the usage condition.

TDMA: TDMA strategy depends on the relegating different time slots to every client on a same frequency to adjust data transmit/receive& voice transmit/receive correspondence and can convey 1Mbps- 120Mbps rate of speed.

A GSM accompanying parts:

a) *Mobile Station:* Mobile Station is a portable device which consists of the transmission/receiving modules and the preprocessor/controller and is constrained by a SIM card. And working under the mobile service network.

b) *Base Station: This* station will act as a interconnection between the mobile station & system. It consists the Transmission & receiving Stations which consists the radio handsets, and which handles data/ voice communication for mobiles. In addition, the BS Controller which controls the main Base system Transmission & receiving stations and act as an interface between the portable/mobile station & portable exchange server too.

c) *Network Subsystem'*s will establish the very use full and best carrier mobile network connection with the portable/mobile stations. The Mobile Service Switching Center is the critical Network Subsystem which permit to access to various sub systems like ISDN, ISN&PSTN. Additionally, comprises of the Home Locality Registration and the Visitor Locality Registrations which saves the call roughing and roaming facilities of GSM. In addition, it consists its own IMEI number distinguishes the Equipment's Identity Registers in which a record of all the activated portable devices of equipment.

GSM Module:

• Higher/Larger range product.
• National &International roaming
• Compatibility with (ISDN)
• Supports to administrations and base stations.
• Phonebook for the executives
• (FDN) for time saving in emergency situations
• RTC with alert intimations.
• Higher quality disclose
• Encryption is made available for secure calls
• Short message system (SMS)

The secure techniques introduced to the GSM network make it the most advanced secure broadcasting communications standard. The privacy of the call & secrecy of receiver is simply guaranteed on communication channel networks, this is noteworthy advance to accomplishing to the most advanced security levels.

The above block diagram consists of bellow Components in the proposed framework.

1. LPC2148 microcontroller
2. Buzzer
3. GSM module
4. Serial to USB controller
5. LCD
6. Power supply and 7) Camera.

GSM Modem: GSM Modem is a portable device which can be either a modem /mobile device in which is utilized to influence a PERSONNEL COMPUTER or some different types of preprocessor to communicate over a network system. A SIM card which works on a system in network administrator. SIM is associated with a PERSONNEL COMPUTER through sequential, UNIVERSAL SERIAL BUS / Bluetooth network. A GSM modem is a mobile device with programming driver to interface with a serial port NO/UNIVERSAL SERIAL BUS port NO on your COMPUTER. Modem is most desirable over a phone network. This GSM modem had a broad scope of utilization in data/ voice exchangers, supply &network management, most advanced security applications, climatic stations monitors & internet mode remote 4sdata logging.

Fig: GSM Module

GSM Module: This modem adequately interfaced to Uc through Max232. SIM card fixed in modem. After getting information through SMS from cell phone sends that particular data to the Uc through the pre described communication channel.

The GSM modem will get directions to 'STOP' &to "START" to "yield" at Uc When the program is running , This order has been sent by the client which is depends upon a suggestion received by the modem. 'ALERT' is a customized info if the information is SET to "low". Then the total parameters will be displayed over the LCD.
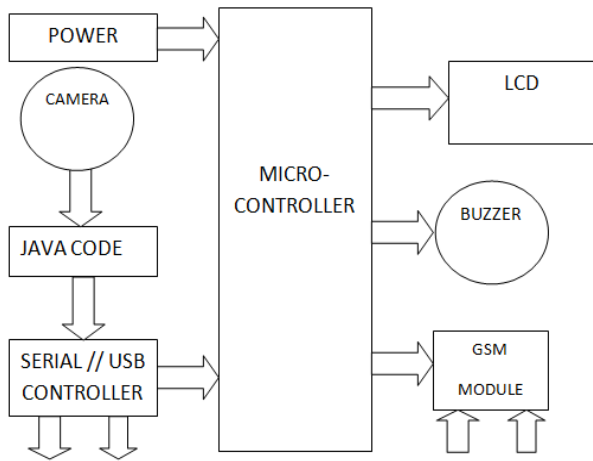
Fig: Proposed Block Diagram

APPLICATIONS:

GSM MODULE is in Automation and Security: These days GSM portable has turned out to most essential one with us same as our watch/tote, This MODULE terminal gives a broadcast communication channel interaction to the world. The prerequisite to the customer to reach by text/call to anybody whenever they needed. As it says application depends on GSM MODULE innovative for transmit of SMS from sender to beneficiary. SMS transmitting & receiving are useful for pervasive access to control the devices machines and allowing breach control in home security. The main framework proposes 2 sub-framework steps. An Apparatus control subsystem enriches to control the client home machines/devices wirelessly; the security ready system gives the most advanced programmed security reorganization to be safer for better future. The framework is fit enough to empower the client through SMS/MESSAGE for many cell phones to monitor/change the condition/control of the home appliances, as instructions given by the client and prerequisites/preprogrammed. Another one is security notification which is must to the identification, the framework gives the permits for an automatic creation of MESSAGES. In this way cautioning the client behalf of security in case of breech.

VI. RESULTS

Results of Cauliflower crop management application that displays all new values of various crop environmental parameters like leaf and flower diseases level area continuously displayed on the graphical displays. The same data is transferred to the computer by means of a wireless network. For experimental results, we can select any plant like vegetable plants like cauliflower. After completion of image process technique then forecasting the weather and the cauliflower plant contaminated area, the properties &name of

particular diseases is additionally persistent. For this reason, we should acquire image of flower /leaf through camera and contrast the flower /leaf with database of pictures/videos. Once if we got the identical one with database records, then particular disease properties & name & its causes which is saved previously in database like disease name, properties, & precautions has to be take are sent an email.

VII. CONCLUSION AND FUTURE WORK

A straightforward accomplishment for a internet of Things utilized for monitoring the cultural field parameters situations employing socio economical device sensing system is accomplished with successful results. Summarize the offline & the networking methods for a dependable measure of cauliflower crop diseases by right device sensors &sending the data via net is being granted. Restrospcting the previous literature, tend to come to capture the opportunity and is best method to intimate the farmer about the condition of the cauliflower & his field. Results are delivering to the farmer through mail. Computerization of the agro domain can be easily accomplished by implementing suitable hardware device sensors & monitoring software through maybe with wired OR by wireless communication protocols depends upon the conditions and the availabilities of the fields.

In feature scope, we have to implement the online application over the offline application with the following advanced facilities.

a) *Web camera:* The idea of a web camera in the cauliflower crop field / greenhouse was there from the starting, but the reason for it was moved into the "future ideas" because of budget "constraints". While it is not necessary to control over the functionality of the greenhouse, we can prove to be a valuable additional since a person can get a visual best idea of what might be the best & bad is happening.

b) *Messages*: If threshold values crossed then it can be further extended to that data would be immediately sent to the farmer to take an effective decision / action in timely manner to come out from the effective significant risk/damage.

c) *GSM Mobile phone*: In future, we can easily control the system through the mobile phones.

This would be more advantageous as the person is anyone is able to monitor/control the system through mobile phone. Android app can be developed for the same function for futuristic purpose.

d) *CCTV*: CCTV can be placed in the cauliflower crop greenhouse which capture the movement in the greenhouse will so if anything, wrong is going in a greenhouse, then the farmer will come to know.

REFERENCES

1. S.D.T. Kelly, N.K. Suryadevara and S.C. Mukhopadhyay, "**Towards the Implementation of IoT for Environmental Condition Monitoring in Homes**", 2013, FIEEE

2. Sanjay B. Patil, Dr. Shrikant K. Bodhe, "**Leaf Disease Severity Measurement Using Image Processing**", International Journal of Engineering and Technology, Vol.3 (5), 2011, pp. 297-301.

3. Pradnya Ravindra Narvekar, Mahesh Manik Kumbhar, S. N. Patil, "**Grape Leaf Diseases Detection & Analysis using SGDM Matrix Method**", International Journal of Innovative Research in Computer and Communication Engineering (An ISO 3297: 2007 Certified Organization), Vol. 2, Issue 3, March 2014.

4. S. Arivazhagan, R. Newlin Shebiah, S. Ananthi, S. Vishnu Varthini, "**Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture features**", Agric Eng Int: CIGR Journal Open access at http://www.cigrjournal.org Vol. 15, No.1, pp. 211-217, March 2013.

5. IoT primer, "**The Internet of Things: Making sense of the next mega-trend**", Equity Research, September 3, 2014.

6. Arti N. Rathod, Bhavesh Tanawal, Vatsal Shah, " **Image Processing Techniques for Detection of Leaf Disease**", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 11, November 2013.

7. G. V. Satyanarayana, SD.Mazaruddin, "**Wireless Sensor Based Remote Monitoring System for Agriculture Using ZigBee and GPS**", Conference on Advances in Communication and Control Systems, 2013 (CAC2S 2013).

8. Karthikeswari M, Mithradevi P, "**Automated Irrigation System In Agriculture Using Wireless Sensor Technology**", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 3, Issue 12, December 2014.

9. P Gopi Krishna el al "**Smart Farming Based on Embedded Technology for Detection of Leaf Disease and Control**" in Journal of Advanced Research in Dynamical & Control Systems, Vol. 10, 02-Special Issue, 2018 pp.534-540.

10. P Gopi Krishna el al "**Development of Real Time environment monitoring systems using with MSP430**" in International Journal of Engineering & Technology, 7 (2.8) (2018) 72-76.

11. "**farming efficiency and the determinants of multiple job holding by farm operators**"Barry K. Goodwin Ashok K. MishraAmerican Journal of Agricultural Economics, Volume 86, Issue 3, 1 August 2004, Pages 722–729, https://doi.org/10.1111/j.0002-9092.2004.00614.xPublished: 01 August 2004.

12. AGRI-IOT: "**a semantic framework for internet of things-enabled smart farming applications**"2016 IEEE 3rd World Forum on Internet of Things (WF-IoT).