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Automatic Irrigation System

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Abstract: **Automatic irrigation technique is very useful in agriculture. In this, it is designed and Implemented with some security features. In the existing system, irrigation technique is followed by identifying the moisture level of soil. In proposed system, the image of plant is captured by phone. When the picture is taken, it is compared to the already stored picture and take decision according to that. Android based application is developed, image processing is developed to get exact status of plant either wet or dry. In modification part, Motor Status is sent as notification Alert to the Land Owner based on the Wet / Dry Status of the Leaf. Secret Lock is provided to the Motor Room. Vibration Sensor is attached with the chamber. Automatic Alert is passed to the owner in case of any theft activity.**

***Keywords*—Automatic irrigation, Image processing, Smartphone, Android App, Secret lock.**

I. INTRODUCTION

Water saving is one of the important work. Very small amount of water is useful for all living organisms and it is the human being who is mainly responsible for wastage of water. There are many sources by which human makes the water hazardous for other living organisms and also there are many ways by which human being is responsible for wastage of water. One major reason of which is unnecessary wastage of water in agriculture field due to unawareness of farmers about sufficient supply of water. There are many plants that are very sensitive to water levels and they required specific level of water supply for proper growth, if it is not then they may die or results in improper growth. It's hardly possible that every farmer must possess the perfect knowledge about growing specifications of plants in case of water supply. In Indian economy seventy percent part is depend on agriculture and under this condition if there will be any system which will help to provide precise level of water to plants then it will be very useful and definitely leads to beneficial for our economy. So to help them we are making an attempt by introducing our project "Automatic Irrigation System". By using sensors in our work we will make them aware about humidity level. So according to changing conditions of humidity they will be able to schedule the proper timing for water supply.

- Web based service to monitor automatic irrigation system for the agriculture field using sensors. The water will be supplied according to the moisture level of the plant. So, first the moisture level of the plant should be identified and it is very helpful for irrigation.[1]
- Atrial Fibrillation Detection using a Smart Phone.An iphone 4s can be used to detect atrial fibrillation (AF) based on its ability to record a pulsatile PPG signal from a fingertip using built in camera .Using this criterion, the leaf's wet and dryness can be identified.[2]
- Automatic Crop Irrigation System in India, agriculture is one of the most important thing but there is more power failure .So water cannot be supplied to the land .To eradicate this problem,solar panel is used. If the power failure occurs, it takes current from solar.[3]
- Using a mobile phone Short Messaging Service (SMS) for irrigation scheduling.One way of achieving this is for irrigators to use objective scientific data to schedule their irrigations. In this, the model soil, plant, weather conditions and provide both timing and volume advice can be used.The details will be sent to your mobile as a notification.[4]
- Agricultural irrigation impacts on land surface characteristics detected from satellite data products.This paper aims to validate whether satellite observation on capable of detecting the

impact of irrigation on land surface attribute.Through the satellite, the moisture level of soil will be detected.With this, the moisture level will be detected from leaf ,with our camera.[5]

- A rapid maximum power measurement system for high concentration photovoltaic modules using the fractional open circuit voltage technique and controllable electronic load.In this, Monitoring and measuring the maximum power of solar modules in real time is essential for evaluating performances of a solar electric system.This technology is used in our project to minimizing the electricity cost. [6]

II. SYSTEM OVERVIEW

The irrigation sensor is based on an embedded camera of a smartphone, can enclosed in a waterproof and light-tight buried chamber. The camera with a controlled illumination source takes an image to estimate the water contents of the leaf. The dark and light pixels are differentiated by means of a Eigenface detector algorithm, corresponding to that the leaf wet-dry can be identified.A developed irrigation App uses the smartphone computing capability and connectivity.

1) Smartphone

To implement the irrigation sensor, the basic smartphone ZTE-V791 was selected, which integrates an ARM Cortex-A9 processor with 512 MB of RAM and 4 GB of internal memory, runs at 1GHz on Android 2.3.6 Gingerbread with application programming interface. A touchscreen of 3.5" is provided, with 320 x 480 pixels, with a standard. Li-Ion battery of 1200 m Ah. And other features includes GSM/GPRS and EDGE bands, Wi-Fi 802.11 b/g/n, Hotspot, WAP 2.0 and a 3.0 megapixel rear-facing camera with 2048 x 1536 pixels.

2) Chamber

The smartphone and the controlled illumination circuit are enclosed in the chamber, which is made of rigid PVC plastic with a rectangular cuboid profile of 0.30 x 0.40 x 0.26 m (W x L x H) dimensions and weighing 2 kg. The front chamber face has a window of anti-reflective glass, which dimensions are 0.20 x 0.18 m (L x H) and located at 0.04 m above the bottom edge and 0.03 m from the left edge.

3) Router Node

The wireless router node was developed by means of an ZigBee Wi-Fi radiomodem (Digi International, Eden Prairie, MN), linked with the Wi-Fi access point of the smartphone and an ZigBee-PRO S2 radiomodem to link the node to the gateway. Both radiomodems are interfaced using a microcontroller to transfer a data packet that includes the router node identifier, the photo, date, and time. The energy is provided with a similar power supply employed for the illumination circuit.

4) Irrigation App

The App was programmed by means of the Android Studio SDK, which allows the development of multiplatform applications. In addition, the ZTE-V791 driver was installed to emulate and debug the App. The irrigation App was developed in Java. Initially, the algorithm takesphoto periodically. This loop,customizes the camera to a specific resolution, enables Wi-Fi network to create a WLAN hotspot. After, the algorithm takes a RGB image,it compare it to stored images and send notification to owner.

III. LITERATURE SURVEY

1. Atrial Fibrillation Detection using a smart phone

ATRIAL fibrillation is the most common sustained arrhythmia. Over 3 million Americans are currently diagnosed, and the prevalence of AF is increasing with the aging of the U.S. population. Through its association with increased risk for heart failure, stroke and mortality, AF has a profound impact on the longevity and quality of life of a growing number of people. Although new AF treatment strategies have emerged over the last decade, a major challenge facing clinicians and researchers is the paroxysmal, often short-lived, and sometimes asymptomatic nature of AF. Our current inability to diagnose AF in minimally symptomatic patients with paroxysmal AF has important clinical implications, since even brief episodes of asymptomatic AF are associated with increased risk for stroke, heart failure, hospitalization, and death. Moreover, the treatment of patients with disabling symptoms from AF, including shortness of breath, syncope, and exertion intolerance, is often impeded by delays in diagnosis. Although the population burden of known AF is substantial,studies have shown that more frequent monitoring can improve AF detection. There is therefore a pressing need to develop methods for accurate AF detection and monitoring in order to improve patient care and reduce healthcare costs associated with treating complications from AF. Such a method would have important clinical and research applications for AF screening as well as in assessing treatment response (e.g. after cardioversion or AF ablation) and need for anticoagulation. For these reasons, the importance of developing new AF detection technologies was emphasized by a recent National Institute of Health Heart Lung & Blood Institute Expert panel. In our work, we developed a smartphone application to measure pulsatile

time series and then use this data to detect AF real-time. We have recently successfully demonstrated that using a smart phone's camera to image a fingertip pressed to it will yield pulsatile signals that are similar to heart rate fluctuations. In addition, the use of pulsatile signals from smartphones has recently attracted the attention of many researchers. Note that the approach does not require the need for additional hardware as the optical video monitoring of the skin with a standard digital camera contains sufficient information related to variability in the heart rate signal, and it consequently provides accurate heart rate time series. The only requirement is that the camera's illumination and optical sensor be within fingertip range of each other. In this paper, we introduce the feasibility of AF detection on an iPhone 4s. Specifically, we developed a comprehensive iPhone application for collection of pulsatile time series followed by real-time detection of AF using the following three

statistical methods: RMSSD, ShE and SampE. We evaluated the AF detection performance with an iPhone 4s on 25 AF subjects undergoing electrical cardioversion.

2. *Tools for Improving Water Use Efficiency: Irrigation Informatics implemented via SMS*

Irrigation accounts for between 60 and 70% of all consumptive water use in Australia. Recent emphasis has been placed on improving the efficiency and performance of irrigation systems for improving water use productivity, therefore ensuring the best use of this limited resource. One way of achieving this is for irrigators to use objective scientific data to schedule their irrigations. In this regard Decision Support Systems (DSS) that model soil, plant and weather conditions and provide both timing and volume advice can be used. A focus of the Cooperative Research Centre for Irrigation Futures' Irrigation Informatics project is achieving DSS use.

Many DSS have been developed to help with irrigation scheduling in Australia such as CSIRO's WaterSense, Destiny and MaizeMan. The biophysical modelling that they use is advanced and can lead to great water use efficiency (WUE) gains, for example due to the use of WaterSense, "cane farmers in the Ord reduced their annual applications of irrigation water to sugarcane from 35 to 40 mega litres per hectare to an average of 21 mega litres per hectare without loss of sugar production" (Sugar Research and Development Corp, 2007)

Despite this, they have seen very poor uptake (Hayman 2004 and Inman-Bamber 2005). Two reasons for this are thought to be that irrigators perceive DSS as difficult to use and that computer based DSS information is not readily available to an irrigator when it is most needed.

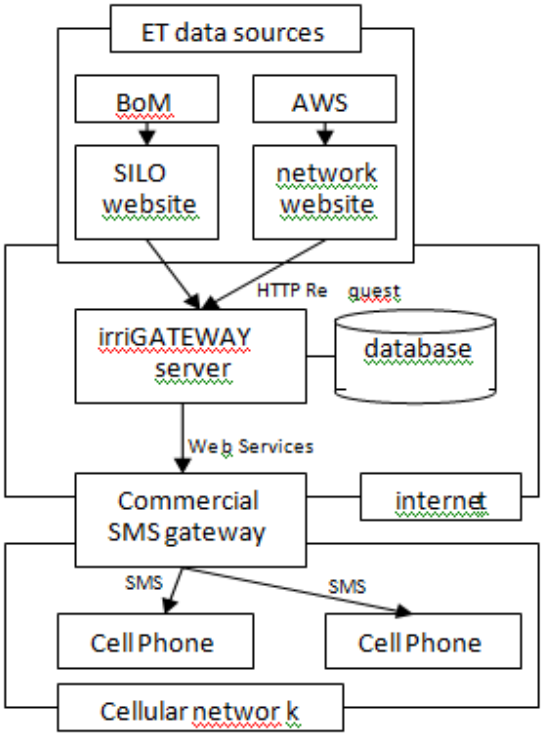
This paper describes the use of the Short Messaging Service (SMS), familiar to most cellular phone users, to deliver biophysical data to irrigators in a format with high end-user utility. The system addresses the two reasons thought to contribute to poor DSS uptake mentioned above by keeping the interface as simple as possible and presenting it on a mobile delivery platform thereby ensuring it can be accessed where and when needed.

The system uses reference crop evapotranspiration (ETo) measurements, along with empirically determined crop coefficients, to model actual crop water use which is delivered to irrigators via SMS. All model calculations are undertaken on a remote server with inputs taken from local weather stations or satellite services thereby minimising the information required from the irrigator.

This paper presents the SMS makeup and presentation, followed by a description of the system architecture to be used for experiments in the 2007/2008 irrigation season. This is followed by the design of experiments for the 2007/2008 irrigation season to test the end-user utility of SMS given in the parts: 1) An experiment to test DSS communication via SMS against other forms of communication, namely the internet, fax and email, 2) An experiment using a series of SMS formats to test 'facilitative' versus 'directive' modes of decision support, 3) An experiment to gauge the extent to which SMS can be used interactively between the irrigator and a DSS.

Preliminary feedback on many of the ideas presented here was collected from several irrigators and information about how the systems have been modified as a result is given.

Finally this paper suggests future SMS and related mobile computing functions, how SMS communication may be added to existing DSS to enhance their functionality, as well as how SMS fits into a new generation of informatics tools for agricultural DSS.

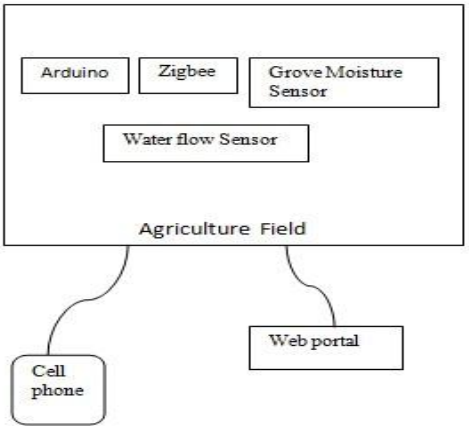


3. *Web Based Service to Monitor Automatic Irrigation System for the Agriculture Field Using Sensors*

The paper describes the automatic irrigation system using the Arduino microcontroller with grove moisture sensor and water flow sensor. The communication will be established using the ZigBee protocol and the control will be sent based on the moisture level of the soil using Arduino microcontroller .The two ZigBee radio's used in the network will be treated as master and slave in combination with the Arduino microcontroller. Here when a particular moisture level is reached, depending on the value of the moisture level water flow will be allowed in the pipe and the flow range, water pressure will be updated along with the time in a database and also displayed in the web portal. The owner of the agricultural field can anytime check the moisture level and the motor status. The motor's functionality status will also be a sent to the farmer's mobile using GSM.

Wireless Sensor network is a self-configuration network with a collection of numerous nodes (motes) which communicate with one another and is connected to main location through a gateway. The gateway commonly used in WSN is ZigBee or a low power Wi-Fi. The nodes consists of sensors and actuators for sensing, monitoring and analyzing the environmental conditions .Sensors produce analog voltage with respect to the data which it senses. A radio transceiver is present in the nodes which have an antenna internally or an externally. The power supplies to the nodes are provided by battery or any other external electricity. The size of nodes may vary in different size and it is cheap in cost.WSN may follow any topology like star network or multi hop wireless mesh network. Initially WSN used Tiny OS and recently many operating systems like
Lite OS, Contiki, and RIOT are used .Generally the OS in WSN is an embedded Linux based operating system. The nodes used in WSN should withstand harsh weather conditions, node failures, low power and should be adaptable .These factors decide the efficiency, responsiveness and robustness of the Wireless network.

A Web portal is a website created for any particular purpose. It gathers information from several other public sources. Unlike a usual website, web portal can be accessed by individual user by just registering in that portal and logging in. Examples of web portal are yahoo, Netscape, CNET etc. The access is restricted in web portal and the information is shared for individual purpose or for any organization. It is possible to select and organize the resources present in a portal. Web portals are considered to be gateway for World Wide Web. Web portal differs in their types depending upon the resources that they share and to whom they share with. It can be Government web portal, cultural portals, corporate, stock, general portals etc. A personal web portal provides information only to any particular user or visitor whereas a regional web portal may serve information to particular geographical area. A large number of access providers are present for providing portals to web.



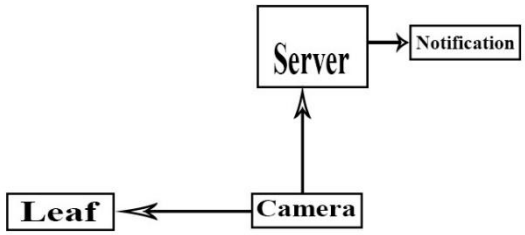
IV. PROPOSED SYSTEM:

In this proposed system, the image of plant is captured by camera to see whether it is wet or dry. An Android App was developed in the smartphone to operate directly the computing and connectivity components, such as the digital camera and the Wi-Fi network. The mobile App wakes-up the smartphone, activating the device with

user-defined parameters. Then, the built-in camera takes a picture of the leaf. . The mobile device is implemented to estimate optically the water contents of the leaf through an image processing. The chamber was developed employing an Android smartphone exploiting their built-in components. In this we propose an automatic irrigation system using solar power which drives water pumps to pump water from bore well to a tank and the outlet valve of tank is automatically regulated using controller .And water detector sensor will detect the flow of the water.Secret Lock is provided to the Motor Room.

V. EIGEN FACE DETECTOR ALGORITHM:

The image of the leaf will be captured from a distance without touching. In addition, face recognition serves whether the leaf will be wet or dry.The images that have been recorded and archived can later help to identify the function. The image will be sent to the server. In that there will be some trained images, with that the taken image will be compared .If the image matches means it will send the notification to the user.



PCA Use for ImageCompression

Datavolumereductionisacommontaskinimageprocessing. thereisahugeamountofalgorithms based on various principles leading to the image compression. algorithms based on the image color reduction are mostly loss but their results are still acceptable for some applications. The image transformation from color to the gray-level (intensity) image belongs to the most common algorithms. Its implementation is usually based on the weightedsum of three color components r, g, b according torelation

$$I=w1R+w2G+w3B \qquad (1)$$

The r, g and b matrices contain image colour components, the weights *wi* were deter-mined with regards to the possibilities of human perception. The PCA method providesanalternative way to this method. The idea is based on $x = a^t y + m_X$ where the matrix a is replacedbymatrix a] in which only *l* largest (instead of *n*) eigenvalues are used for its forming. Thevector$\hat{x}$of reconstructed variablesis then givenbyrelation

$$\hat{x}=A_k{}^T y+m_X \qquad (2)$$

true-colourimagesofsize*mxn*areusuallysavedinthethree-dimensionalmatrixpwithsize*mxn*x3whichmeansthattheinformationaboutintensityofcolourcomponentsisstoredinthe3 givenplanes.thevectorofinputvariablesxiny=a(x−m_X)can beformedasthe*n*=3-dimensional vector of each colour. forming three 1-dimensional vectors x1,2,3 fromeachplanep(*m,n,i*)withthelengthof*m.n*canbeadvantageousforbetterunderstandingandprogramming. the covariance matrix c_X and corresponding matrix a are then evaluatedandthe3 ***dimensionalreconstructedvector$\hat{x}$accordingtoeq.(2)canbecalledasthefirst***,the second and the third component of the given image. the matrix theory implies that theimageobtained by reconstruction with the matrix a1 (Only the first – largest eigenvalue was usedforitsdefinition)containsthemajorityofinformationsot hisimageshouldhavethemaximumcontrast.thispropertiesco uldbesignificantinthefollowingimageprocessing.

Thereisaselectedrealpicturepanditsr,g,bcomponentsi nthefig1.itsthreereconstructedcomponentsobtainedaccordi ngtoeq.(2)foreacheigenvaluesarepresentedinfig.2.thecomp arisonofintensityimagesobtainedfromtheoriginalimageasw eightedcoloursumevaluatedbyeq.(1)andasthefirstprincipal component.

Theeigenvaluessortedindescendingorderbelongingtothesel ectedimagearepresentedintable1.

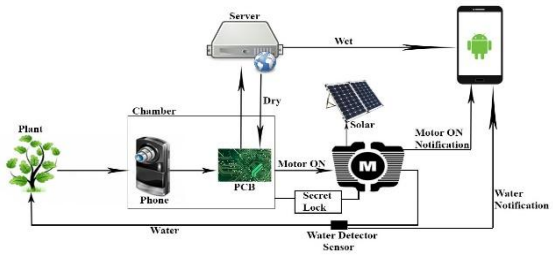
TABLE 1:

$\lambda 1$	$\lambda 2$	$\lambda 3$
0.6103	0.3231	0.0418

VI. OVERALL SYSTEM ARCHITECTURE:

This is very useful in agriculture. In this, it is designed and implemented with some security features. In the existing system, irrigation technique is followed by identifying the moisture level of soil.But,we use Eigen face detector take the image of plant is captured by camera to see whether it is wet or dry. An Android App was developed in the smartphone and connectivity components, such as the digital camera and the Wi-Fi network. Suppose,power failure occurs irrigation system using solar power which drives water pumps to pump water from bore well to a tank and the outlet valve of tank is automatically regulated using controller.Water detector is used to identify

the flow of the water level.And security lock provided to the motor room.



VII. CONCLUSION:

In the present days especially farmers are facing the major problems in watering their agriculture fields,it's because they have no proper idea about when the power is not available so that they cannot pump water. To ensure the security of the pumps and other equipments, there is a password protected lock system allowing the control to the authorized person. An automatic irrigation system will save you plenty of time that you in the past would have spent watering your crops. You can have your timers set, so that watering will take place. You can go on holiday knowing that your lawns and flowers will be maintained and flourishing when you return. With this system there is no money or water wasted, everything is timed, programmed and so every drop of water is used only when it is needed.

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