SMART CROP-FIELD MONITORING AND AUTOMATION IRRIGATION SYSTEM USING IoT

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Abstract – *Agriculture plays vital role in the development of agricultural country like India. Issues concerning agriculture have been hindering the development of the country. The only solution to this problem is smart agriculture by modernizing the current traditional methods of agriculture. Hence the proposed method aims at making agriculture smart using automation and IoT technologies. Internet of things enables various applications like crop growth monitoring and selection, irrigation decision support, etc. A Raspberry-Pi based automatic irrigation system is proposed to modernization and improves productivity of the crop. The main aim of this work is crop development at low quantity water consumption and automatic pest identification. The major advantage of this system is implementation of precision agriculture with cloud computing, that will optimize the usage of water, pesticides while maximizing the yield of the crops.*

***Key Words*: Precision Agriculture, Irrigation System, IoT, Raspberry-Pi, Cloud Computing.**

INTRODUCTION

India's major source of income is from agriculture sector and 70% of farmers and general people depend on agriculture. In Indian irrigation system, the farmers have chosen most of the methods manually such as grip, terraced, ditch irrigation system etc. In order to improve the crop productivity there is an urgent need to change manual method to automation. Also, considering the water availability throughout India, it is one of the valuable resources to protect and save for future needs. Embedded based automatic irrigation system is suitable for farmers since it is available at low cost and can easily be installed. This system helps the farmer by providing water to crops at stringent time and quantity. Automation irrigation system observes the moisture sensors and temperature variations around the crop area that takes the precise time to turn the motor ON or OFF. This automation avoids human errors and also it checks the soil moisture level. Internet of things allows as to control the systems from remote area over the internet. It can control the sensors which are used at various areas at blinding roads, railway grids and water control systems. So it can avoid the human errors and errors appearing during system operation. IoT is the emerging area that penetrates over other area and made them efficient. It is developing now-a-days by inclusion of new sensors, sensor network, RF based communications. It can exhibits smart intelligence, precise sensing along with good identification.

The principle objective of this work is to present an approach which minimize the unmerited usage of water and automate the process of pest detection and rectification in agricultural fields. It also involves developing a smart irrigation method adoptable for water scarce location by efficient usage of water resources thereby increasing the overall productivity.

The paper aims a high precision monitoring the data and control agriculture with IoT technologies. The Raspberry-Pi and cloud based IoT system to monitor the real time data from crop field. The system mainly focuses moisture variations correlate with temperature changes data by smart sensors and controls irrigation systems. In order to provide cloud based computing to system the precision level has increased as suitable to use the system by farmer.

LITERATURE SURVEY

A proliferation of literature is available in plant leaf disease detection. We will highlight some of the key configuration. A methodology for detecting plan diseases early and accurately using diverse image processing techniques has been proposed by Anand H. Kulkarni et al. [1], in which Gabor filter has been used for feature extraction and ANN based classifier has been used for classification with recognition rate up to 91%. Homogenize techniques like canny and sobel filter has been used to identify the edges by P. Revathi et al [2]. Then these extracted edge features have been used in classification to identify disease spots. Proposed homogeneous pixel counting technique for cotton disease detection (HPCCDD) algorithm has been used for categorizing the diseases. They claim the accuracy of 98.1% over existing algorithm.

Asem Khmag [3], proposed a recognition system for leaf images based on its leaf contour in which the recognition of plants is directly associated to society's life. Leaves from plants is proved to be a feasible source of information used to identify plant species. The recognition system of leaves is accomplished automatically using the experts of experts of human being. The leaf contours of the same plants are computed using support victor machine (SVM) where the similar sequences of the same contours usually carry the same features while different plant sequences have different contours. Tushare H Jaware et al. [4] proposed a novel, in which improved K-means clustering technique is used to solve the low-level image segmentation. Spatial gray-level dependence matrices (SGDM) method has been used for extracting statistical texture features by Sanjay B. Dhaygude et al. [5] also RGB images has been converted into Hue Saturation Value (HSV) color space representation. Mokhled S. A. Tarawneh. [6] presented empirical investigation of olive leaf spot disease by using auto-cropping segmentation and fuzzy c-means classification .A new technique have been proposed by S.M.Ramesh et al. [7] for enhancement of color images by scaling the discrete cosine transform coefficients which provides better enchancement compared to image capture by digital camera.

In order to classify the grape and wheat diseases black propagation networks have been used by Haiguang Wang et al. [8] A. Menukaewjinda et al. [9] tried back propagation neutral network (BPNN) for efficient grape leaf color extraction and they also explore modified self-organizing feature map (MSOFM) and genetic algorithm (GA) and found that these techniques were providing automatic adjustment in parameters for grape leaf disease color extraction. Support vector machine (SVM) have been found a very promising technique to achieve efficient classification of leaf diseases.

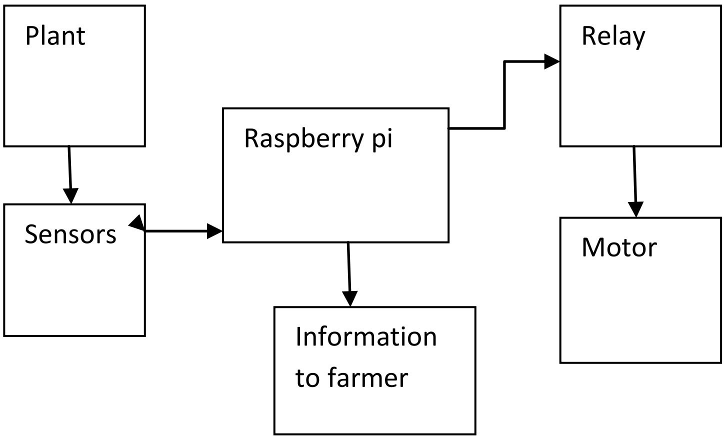
EXISTING SYSTEM

In the present era one of the greatest problem faced by the world is water scarcity and agriculture being a demanding occupation consumes plenty of water. Therefore a system is required that uses water judiciously. Smart irrigation systems estimate and measure diminution of existing plant moisture in order to operate an irrigation system, restoring water as needed while minimizing excess water use.

The soil moisture based irrigation control uses volumetric techniques which are relatively simple but these quantities are related thr0ugh soil water characteristics curve that is specific to a soil type. Also the sensors used require routine maintenance for proper performance. Intelligent automatic plant irrigation system concentrates water in plants regularly without human monitoring using a moisture sensor. The circuit is built around a comparator op-amp (M324) and a timer which drives a relay to switch on a motor.

Fig 1 describes the smart irrigation system. The system uses a hardware component, which is subjected to variations with the environmental conditions. A real-time wireless smart sensor array for scheduling irrigation prototyped a real-time, smart sensor array for measuring soil moisture and soil temperature that uses of-the-shelf components are developed and evaluated for scheduling irrigation in cotton. This system is specific for a crop and hence its usage is limited. Proper scheduling of irrigation is critical for efficient water management in crop production, particularly under conditions of water scarcity. The effects of the applied amount of irrigation water, irrigation frequency and water use are particularly important. To improve water efficiency there must be a proper irrigation scheduling strategy. So our project devices a simple system, using a microcontroller to automate the irrigation and watering of small potted plants or crops with minimal manual interventions.

Fig 1 SMART IRRIGATION SYSTEM

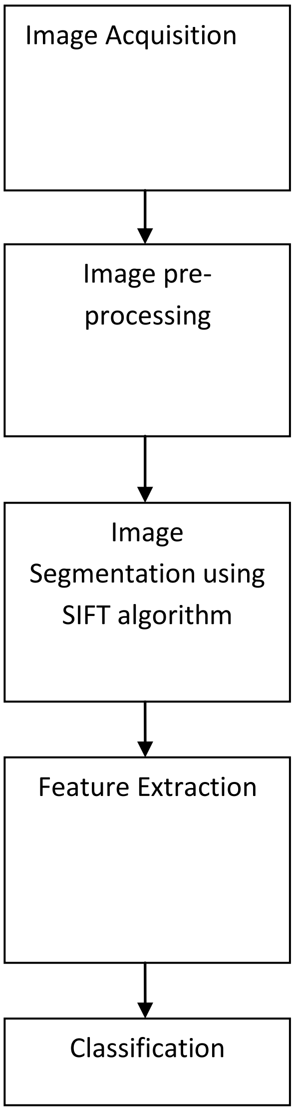


PROPOSED SYSTEM

The traditional approach of monitoring the agricultural environment requires individuals manually taking measurements and checking them at various times. This system helps the farmer by providing water to the crops at stringent time and quantity. It also avoids the human errors and check soil moisture. It can exhibit smart intelligence, precise sensing along with good identification.

There are five main steps used for the detection of plant leaf diseases. The processing scheme consist of image acquisition through digital camera or scanner, image pre-processing includes image enchancement, image segmentation where the affected and useful area are segmented, feature extraction and classification. Lastly, the presence of diseases on the plant leaf will be identified. Here we present step by step approach for segmenting the diseased image and to extract its features. Fig 2 describes the steps involved in identification of diseased leaf.

Fig 2 DISEASED LEAF DETECTION



The scale invariant feature transform (SIFT) is a feature detection algorithm in computer vision to detect and describe local features and images. SIFT key points of objects are first extracted from a set of reference images and stored in a database. An object is recognized in a new image by individually comprising each feature from the new image to this database and finding candidate matching features based on Euclidean distance of their feature vectors from the full set of matches, subsets of key points that agree on the objects and its location, scale and its orientation in the new image are identified to filter out good matches. The determination of consistent clusters is performed rapidly by using an efficient hash table implementations of the generalized Hough transform. Each clusters of three or more features that agree on an object and its pores is then subject to future. Detailed model verification and subsequently out lairs are discarded. Finally the probability that a particular set of features indicate the presence of an object is computed, given the accuracy of fit and number of probable false matches. Object matches that pass all tests can be identified as correct with high confidence.

RESULT AND DISCUSSION

The real time results and the status of the system were taken on 4G mobile phones. The system displays the temperature and humidity level of the crop field based on the input from the temperature and humidity sensors respectively. The status of crop health can also be monitored from remote places by using image recognition system. Here two sensors are used to control the irrigation system so that trouble shooting can easily be done whenever it is necessary. Threshold voltages are chosen for calibration of the sensors by considering the past month temperature and soil moisture values. Threshold values vary depending on the crop and plantation. Graphical output is shown in Fig 3.

Fig 3 OUTPUT

CONCLUSION

A precision agriculture irrigation system is developed with low complex circuitry. Two sensors and raspberry pi microcontrollers are successfully interfaced All observations and experimental tests proves that proposed system is a complete solution to field activities, irrigation problems etc. Implementation of such a system in a field will definitely help to improve the field of crops and the overall production. With the help of this system irrigation system can be completely automated and also provides real time information about the land and crops that will help farmers to increase the production rate.

REFERENCES

[1] Anand H. Kulkarni, Ashwin Patil R. K., "Applying image processing technique to detect plant diseases", International Journal of Modern Engineering Research, vol.2, Issue.5, pp: 3661-3664, 2012.

[2] P. Revathi, M. Hemalatha, "Classification of Cotton Leaf Spot Diseases Using Image Processing Edge Detection Techniques", IEEE International conference of emerging trends in Science, Engineering and Technology, pp-169-173, No. 6, December 1990.

[3] Asem Khmag, "Recognition System for Leaf Image Based on its leaf contour and centroid", IEEE 15th Student Conference on Research, AZ zawia, Libya.

[4] Tushar H. Taware, Ravindra. D. Badgujar and Prashant G. Patil, "Crop disease detection using image segmentation" ,National Conference on Advances in Communication and Computing, World Journal of Science and Technology, pp-190-194, Dhule, Maharashtra, India, 2012.

[5] Prof. Sanjay B. Dhaygude, Mr. Nitin P. Khumbar, "Agricultural plant leaf disease detection using image processing ", International Joural of Advanced Research in Electrical, Electronics and Instrumentation Engineering, S & S Publication vol. 2, Issue 1, pp:599-602, 2013.

[6] Mokhled S. Tarawneh "An empirical investigation of olive leaf spot disease using auto-cropping segmentation and Fuzzy c-means classification", World Applied Sciences Journal, vol. 23, no. 9, and pp: 1207-1211, 2013.

[7] S. M. Ramesh, Dr. A. Shanmugan, "A new technique for enhancement of color images by scaling the discrete cosine transform coefficients", International Journal of Electronics and Communication Technology, IJECT vol 2, Issue 1, March 2011.

[8] Haiguang Wang, Guanlin Li, Zhanhong Ma, XIalong Li, "Image recognition of plant diseases based on back propagation networks, 5th International Conference on Image and Signal Processing, pp: 894-900, Chongqing, China, 2012.

[9] A. Menukaewjinda, P. Kumsawat, K. Attakitmongcol, A. Srikaew, " grape leaf disease detection from color image using hybrid intelligent system", Proceedings of Electrical Engineering/Electronics, Computer, Telecommunication and Information Technology, vol 1, pp: 513-516,Krabi, Thailand, 2008.