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Automatic Farm Managment System in Modern Cities Using Image Processing

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ABSTRACT: Recent technological advances have paved the way for developing and offering advanced services for the stakeholders in the agricultural sector. A paradigm shift is underway from proprietary and monolithic tools to Internet-based, open systems that will enable more effective collaboration between stakeholders. This new paradigm includes the technological support of application developers to create specialized services that will seamlessly interoperate, thus creating a sophisticated and customisable working environment for the end users. We present the implementation of an open architecture that instantiates such an approach, based on a set of domain independent software tools called ''generic enablers'' that have been developed in the context of the FI-WARE project. The implementation is used to validate a number of innovative concepts for the agricultural sector such as the notion of a services' market place and the system's adaptation to network failures. During the design and implementation phase, the system has been evaluated by end users, offering us valuable feedback. The results of the evaluation process validate the acceptance of such a system and the need of farmers to have access to sophisticated services at affordable prices. A summary of this evaluation process is also presented in this project. The system consists of sensor networks and a software control system. The sensor network consists of temperature sensor,humidity sensor,soil moisture sensor. The readings obtained from the sensors or the inline cameras are feed for image processing methods and algorithms for grading. A few to name them are classifiers like neural network and fuzzy based classifier. The hardware control center communicates with a middleware system via serial network interface converters. The middleware communicates with a hardware network using an underlying interface and it also communicates with a web system using an upper interface. The top web system provides users with an interface to view and manage the hardware facilities ; administrators can thus view the status of agricultural status in order to remotely manage the temperature, humidity and irrigation.

***Keywords*:** *Agriculture,GSM,Image processing,sensor*

INTRODUCTION

A.DEVELOPMENT BACKGROUND:

China is a large agricultural country containing 20% of the world's population. Consequently the yield and quality of crops is forcing agriculture, industry and the information industry to pursue common goals, which are to maximize agricultural output whilst maintaining quality. At present, domestic agricultural greenhouse management mainly uses a traditional mode of manual management ,this is based on experience to periodically and manually adjust the light, temperature, humidity as well as irrigation, fertilization and to use artificial cultivation. This method not only leads to higher management costs, but also brings a series of problems, such as low production efficiency, waste of resources and environmental pollution.

At present, many companies already produce the hardware equipment needed by the Internet of Things, such as sensors with communication module and control equipment with the ability to self-network. Therefore, the main problem using the Internet of Things is the design and realization of the overall system. In fact, hardware vendors generally provide middleware technology of software and hardware interaction. (Middleware is a kind of software that needs to be installed on a specific computer [17] [18].) This study combines hardware, middleware and web technologies to explore a new model of agricultural management automation, although this research is carried out in the small area of agricultural greenhouses, it could be applied more generally to achieve intelligent agricultural automation.

B. PROJECT DEVELOPMENT

In existing system, the form house is controlled with only sensors and microcontroller. The following sensors are 1.Temperature sensor 2.humidity sensor. The sensors will detects soil moisture content (i.e.) water contents of the soil and drive the water motor. The temperature sensor will detect the form house temperature and drive the water motor.

1. It will not update cultivated vegetable online.
2. It does not find out insect damage on the leaf.
3. It will not update cultivated vegetable online.

In this project, represents form house maintenance automatically with the help of microcontroller. The microcontroller which helps to water irrigation for the plant as well as chemical motor (pesticide). The following sensors are used: 1.Temperature sensor 2. Humidity sensor 3. Soil moisture sensor. The soil moisture sensor which helps to find out soil moisture content (i.e.) water content of the soil reduced and driven the water motor automatically. The temperature and humidity sensor detects temperature of form house and also drive the water motor automatically. Matlab is used to find out the insect damage in the leaf using image processing. It will detect automatically insect damage on the leaf particular plant. The Matlab also used for to detect the cultivation of vegetable or fruit. The microcontroller will update through GSM about cultivation of vegetable or fruit.

1. Water irrigation automatically done.
2. It will intimate the cultivated vegetables automatically through GSM.
3. It will detect insect damage on the leaf.

C.HARDWARE REQUIRMENTS:

- Arduino UNO
- Humidity Sensor
- Soil moisture sensor
- Temperature Sensor
- LDR
- Relay
- Ethernet shield
- Motor
- Power Supply Unit

D.SOFTWARE REQUIRMENTS:

- Arduino IDE
- Embedded C
- MATLAB

E.INTRODUCTION TO SENSING:

Remote sensing data is *fundamentally important* to monitor the Earth as an entire system. Literally, there are thousands of uses for remote sensing, but here are just **100 of remote sensing applications.**For example, the Arctic is an unforgiving destination to travel to. Because of the obvious safety risks of field activity, scientists leverage remote sensing for **sea ice monitoring**. ship tracking and even national defense.

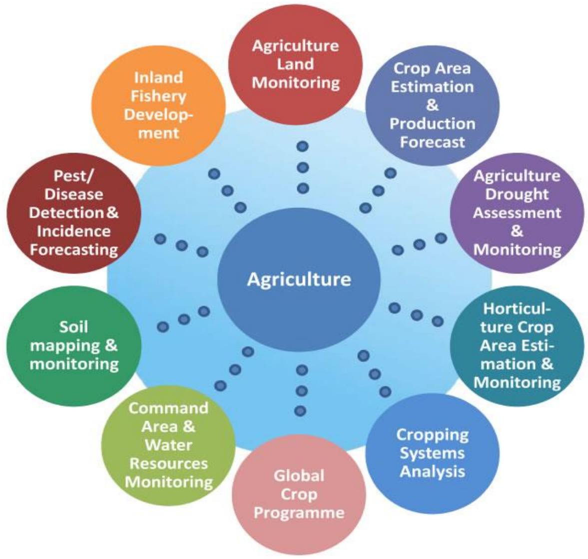

Figure 1:Agriculture sensing diagram

Sensors are used to measure and/or detect a huge variety of conditions including: temperature, pressure, level, humidity, speed, motion, distance, light or the presence/absence of an object and many other types. There are many versions of each type which may use a different sensing principle or may be designed to operate within different ranges.

Although soil water status can be determined by direct (soil sampling) and indirect (soil moisture sensing) methods, direct methods of monitoring soil moisture are not commonly used for irrigation scheduling because they are intrusive and labor intensive and cannot provide immediate feedback. Soil moisture probes can be permanently installed at representative points in an agricultural field to provide repeated moisture readings over time that can be used for irrigation management.It will detect the soil moisture content(i.e,humidity of soil) and it will send notification to motor.

Figure 2:Soil moisture sensing in field

Temperature is the most often-measured environmental quantity. This might be expected since most physical, electronic, chemical, mechanical, and biological systems are affected by temperature. Certain chemical reactions, biological processes, and even electronic circuits perform best within limited temperature ranges. Temperature is one of the most commonly measured variables and it is therefore not surprising that there are many ways of sensing it.Temperature sensing can be done either through direct contact with the heating source, or remotely, without direct contact with the source using radiated energy instead.

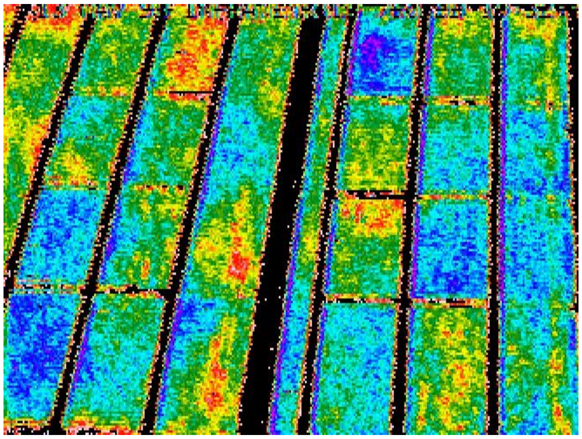

Figure 3:Sensing picture view

A humidity sensor (or hygrometer) senses, measures and reports both moisture and air temperature. The ratio of moisture in the air to the highest amount of moisture at a particular air temperature is called relative humidity. Relative humidity becomes an important factor, when looking for comfort.

Light dependent resistors, LDRs, or photoresistors are often used to detect light and change the operation of a circuit dependent upon the light levels.

I. BLOCK DIAGRAM

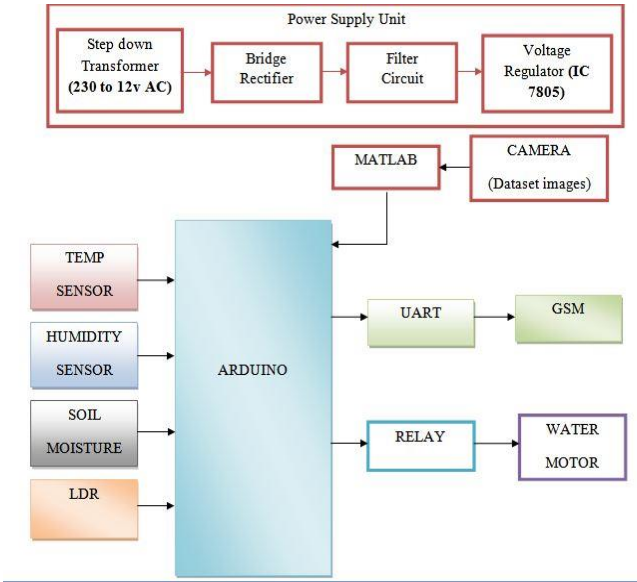

Figure 4:Block diagram architecture

In this project we are using soil moisture sensor where moisture in soil is monitored and if gets reduced to the normal level motor will turn on to pour water. Temperature, Humidity, LDR values are monitored and if the value reaches abnormal it will send notification message by GSM.

Image processing concept is also used to predict the cultivation state of the vegetable which will predict the vegetable status and send a command to the microcontroller. The status of the vegetable is send to the in charge person to notify them to get the vegetables.

Figure 5:size detection and grade flow

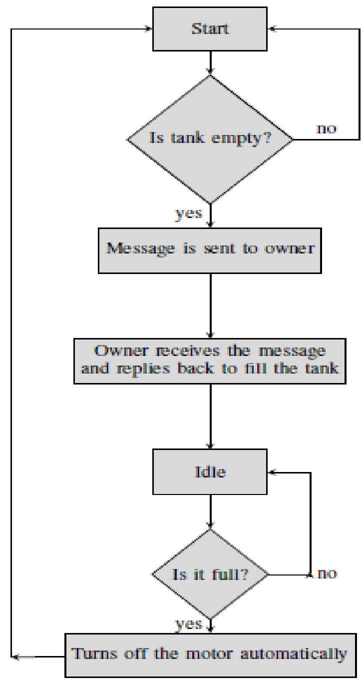

Figure6:Use of GSM motor

A. COLOR DETECTION:

In the process of fruit color is detected according to RGB values [5], here fruits are sorted according to color and size. So for e.g. two fruits are considered say tomato having red color and guava having green color, so in this step work is going to find out color of a fruit by using RGB values of an image taken from the camera, this image can be processed by using MATLAB software and accordingly color can be detected i.e. green or red.

Color detection algorithm:

1) Start
2) Read the input color image using imread function.
3) Read the input pixel of color image in three different planes (RGB) and store it into threevariable r, g, and b.
4) Read the small region of fruit to detect color of fruit.
5) Store in different variable r1, g1, b1.
6) Calculate the mean of r1, g1, b1 and store intovariable r2, g2, b2.
7) Compare the value with threshold.
8) If g2>threshold, Color detected is green.
9) If r2>threshold, Color detected is Red.
10) End.

B.FRUIT COUNTING:

A fruit counting pipeline based on deep learning that accurately counts fruit in unstructured environments. Obtaining reliable fruit counts is challenging because of variations in appearance due to illumination changes and occlusions from foliage and neighbouring fruits. We proposed novel approach that uses deep learning to map from input images to total fruit counts. The pipeline utilizes a custo crowd-sourcing platform to quickly label large data sets. Ablob detector based on a fully convolutional network extracts candidate regions in the images. A counting algorithm based on a second convolutional network then estimates the number of fruit in each region. Finally, a linear regression model maps that fruit count estimate to a final fruit count. We analyze the performance of the pipeline on two distinct data sets of oranges in daylight, and green apples at night, utilizing human generated labels as ground truth. We also show that the pipeline has a short training time and performs well with a limited data set size. Our method generalizes across both data sets and is able to perform well even on highly occluded fruits that are challenging for human labelers to annotate.

Figure 7: UAVs can fly between rows of trees autonomously and produce fruit counts at scale, from onboard camera imagery.

C. FRUIT SIZE DETECTION:

According to apple state criterion, size grading is judged by the detected diameter of an apple

Table 1:Size Grading Criterion

Criteria	Diameter
Big	≥ 60 mm
Small	≤ 50 mm

Arduino microcontroller is used to control and coordinate the overall operation of the system.arduino microcontroller is used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The sensor inputs ang image processing inputs are give to arduino controoler which further process on it and it decides weather to on/off relay motor.It also sends command to GSM which further sends notification to user.

II. LITERATURE SURVEY

In paper [1] ***Fruit quality inspection using image processing,*** Images are used to get data and informations.

In paper[2] ***Fruit quality management system based on image processing*** **,** Grading is performed by taking size as a primary attribute.

In paper[3] ***Machine vision based autonomous fruit inspection and sorting*** , Colour detection algorithm is used.

In paper[4] ***Automatic irrigation based on soil moisture for vegetable crops*** , Root zone is monitored by soil sensor.

In paper[5***] Sensor based autonomous field monitoring agriculture data acquisition and wireless transmission***, Bluetoth technology is used for communication.

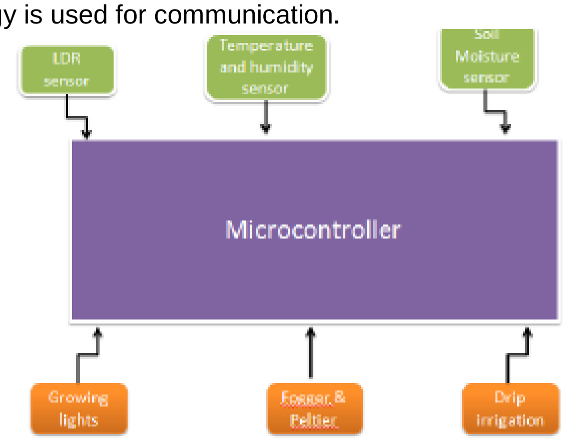

Figure8:Sensors controlling devices

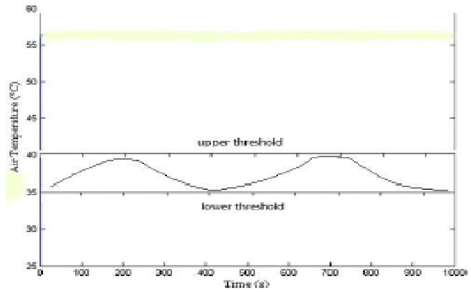

Figure9:Temperature variation

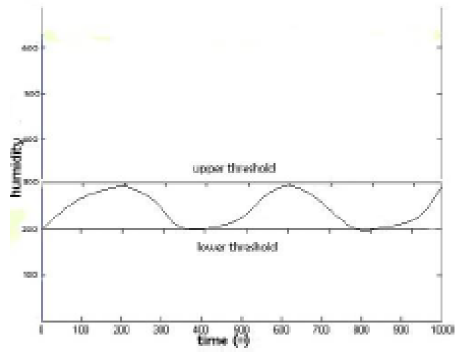

Figure10:Variation in humidity

Figure11:Implementation setup

III. MODULE DESCRIPTION:

a. sensing module:

Soil moisture level is monitored and if gets reduced to the normal level motor will turn on to pour water. Temperature, Humidity, LDR values are monitored and if the value reaches abnormal it will send notification message by GSM.

b. image detecting and processing module:

In our proposed system consists of acquisition, preprocessing, GLCM and LBP. The fruit images were acquired using a CCD color camera and captured the image is converted in to gray scale image to assist in the computation of its feature parameter. The features are extracted by using gray level co-occurrence matrix algorithm such as contrast, energy, correlation, homogeneity. To measure texture information using this LBP operator and texture classification is performed based on the distribution of texture.

c. message sending to recepient module:

The status of the vegetable is send to the in charge person to notify them to get the vegetables.

IV. SOFTWARE DESIGN

The system software includes site monitoring system data acquisition software, remote data acquisition receiver software, and web application software. The site monitoring system data acquisition are made up of user interface module, network communication module, data collection module, data processing module and system configuration module. Remote data acquisition receiver is made up of user interface module, network communication module, system configuration module, and database access module, which can communicate with the site monitoring system data acquisition software through the network communication nmodule with TCP/IP protocol. The web application software include three parts of user authentication, data access, data query and download, which access the database throughADO.NET, and the remote data acquisition can communicate with the database through ADO.NET. The user terminals can get the real time monitoring data from the web. Parts of a business for customers follow the guiding ideology of simple, clear, focused and designed to show mobile. It shows customers information in a page and the information include each greenhouse each detection point real-time data of air temperature and humidity, soil temperature, 24-hour, a week, or a month's curve and so on. Customers can set alarm value, and the data can be sent to the manager's cell phone via SMS when the data is more than alarm value. Customers are free to set the number of terminals and receive SMS alerts to mobile phone number. Service platform is also reserved for the mobile publicity window, can be integrated weather forecasting, agriculture information and advertising.

V. CONCLUSION:

The text has studied on the lOT technology application in agriculture, and selected mobile wireless communication technology to achieve greenhouse-site monitoring. Remote monitoring system with internet and wireless communications combined is proposed. At the same time, taking into account the system management, information management system is designed. The collected data by the system provided for agricultural research and management facilities. Research shows the greenhouse monitor system based on lOT technology has certain precision of monitor and control. According to the need surrounding monitor , this system has realized the automatic control on the environmental temperature, humidity factors. And the system has offered a good growth condition, it is easy to operate, the interface is friendly, offering the real time environmental factors in the greenhouse. It can revise environmental control parameters, this system realizes the operation online, also have these characteristics: run reliably, high performance ,improve easily.

VI. Advantages and Disadvantages:

The digital image analysis technology to generate precise descriptive data on pictorial information have contributed to its more widespread and increased use .Quality control in combination with the increasing automation in all fields of production has led to the increased demand for automatic and objective evaluation of different products. In agreement it found that a computer vision system with an automatic handling mechanism could perform inspections objectively and reduce tedious human involvement [11].

A human grader inspection and grading of produce is often a labour intensive, tedious, repetitive and subjective task [13]. In addition to its costs, this method is variable and decisions are not always consistent between inspectors or from day to day [17,7]. The computer vision inspection of food products to be cost effective , efficient and consistent. The computer vision has been used widely in agricultural and horticulture to automate many labour intensive process [16]. Computer vision is seen as an easy and quick way to acquire data that would be otherwise difficult to obtain manually [10]. Gerrard et al., [12] recognized that machine image technology provides a rapid, alternative means for measuring quality consistently. Another benefit of machine vision systems is the nondestructive and un-disturbing manner in which information is attained making inspection unique with the potential to assist humans involving visually intensive work [18]. Also if the research or operation in being conducted in dim or night conditions artificial lighting is needed.

VII. Prospects for future work:

Agriculture in India is still carried out in conventional way and lags behind in integrating modern technologies. Around 55 percentage of Indian population has been engaged in agriculture and allied activities which constitute only 15 percent of GDP so it becomes much important for the stakeholders involved to come out of the conventional agricultural practices and modernize the agriculture using technology. The economic contribution of agriculture to India’s GDP is steadily declining with the country’s broad-based economic growth while large number of people continues to work in agricultural sector. Hence, there is an immediate need to improve the system, which can increase the yield and produce healthy organic food.

A. Problems faced in agricultural sector

_Places like Punjab, which receive ample amount of water through river and canal irrigation system, faces problem of soil salinity due to excess irrigation. Places with limited water supply like Rajasthan, faces problem of acute water shortage for agriculture.

_ Excessive use of fertilizers, insecticides and pesticides makes the soil dependent on them, erodes fertility, increases resistance in insects and pests, pollutes ground water and nearby water bodies whenever it rains.

_ Different plants require different amount of moisture, humidity, temperature and light wavelength, and lack of awareness of this information or negligence of a person cultivating land can cause plants to die before maturing.

_ Once the harvest is produced, farmers are further exploited by middlemen in Agricultural produce marketing committee (APMC) markets (mandis) due to which truckloads of money is earned by those middlemen and farmers are forced to sell their products at throwaway price specially during Zaid season when they grow perishable vegetable and fruits. Although management has some exploration of intelligent greenhouse, there are still many problems to be solved , The resolution of these issues is conducive to comprehensive promotion system:

(1) The greenhouse for experimental system of smaller, limited number of sensors, Zigbee networks simpler, which must be improved in the area of large greenhouse, which will increase the complexity of the system, which is the follow-up to resolve problems [26].

(2) Intelligent greenhouse management systems can now do temperature and humidity automatic control, but still require human intervention such as fertilizing, weeding, automation still needs to be improved [28].

(3) Systematic security mechanisms need to be further strengthened, in a small area when using the system security issues may not be prominent, if the system is being widely promoted, you must research to strengthen security mechanisms.

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