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IMPLEMENTATION IOT (INTERNET OF THINGS) SMART FARMING SYSTEM ON MODERN AGRICULTURE

Christovel S[1],Yusrizal Pratama[2],Jagat Firmansyah[3], Dian Pratiwi[4],Ari Purno Wahyu W[5]

[12345]Fakultas Teknik InformatikaUniveristasWidyatama

[1]christovel.situmorang@widyatama.ac.id, [2]yusrizal.pratama@widyatama.ac.id,

[3]jagat.firmansyah@widyatama.ac.id, [4]dian.pratiwi@widyatama.ac.id, [5]ari.purno@widyatama.ac.id

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Keywords: Smart Agriculture, Internet of Things, Image processing.

ABSTRACT

Agriculture is still the main source of income for people in Indonesia who work as farmers, but along with the times, agriculture has become one of the hobbies favored by some people. Various types of plants namely flowers, fruits and vegetables are the choices for some people who are planted in their gardens. In maintaining the plants base on providing regular water has become a necessity the soil and plants don't lack water which can result in withered plants. The most common obstacle to crop maintenance is the inaccuracy in water supply to plants. the current monitoring system able to using drones and IOT (Internet Of Things) to maping large agricultural areas, the drones will take pictures in the form of images and process them with image processing techniques, then the system will provide an overview of the condition of agricultural land conditions and soil temperature with visual display information.

Keywords: Smart Agriculture, Internet of Things, Image processing.

INTRODUCTION

Agricultural system is a process of how managing a natural resource that utilized for human purposes with attention to the state of the surrounding environment, the amount of land agriculture itself has now expanded its functioning to offset human needs for food and clothing, the concept of agriculture is currently being developed more towards modern to manipulate amount and quality with utilization of computerized technology[1].

The agricultural system in Indonesia has run before colonial era, where the agricultural system became apart of Indonesian culture and being one important sector, whereas in ancient times Indonesian farmers already have ability inside cultivate agricultural land and the invaded irrigation system. In the current modern era the agricultural system in Indonesia will using computerized assistance to monitor plant conditions, soil temperature and irrigation systems, the application is expected to manipulate the amount of crop and improve quality and prevention if indicated will experience crop failure, The failure can be caused by a pest attack and finding a causethese failures and prevent prevention of crop yieldsthe next to be better[2].

From the statistics data form the last decade according to the statistical the price of food continues to increase due to poor grain production. A number causative factor are responsible including: misuse of fertilizers, low soil fertility, intense sunlight, waste of water and climate change. This problem can be minimized by providing water when the plant is growing properly. In means not excessive and in accordance with soil moisture and temperature around the plant. Currently the process of giving water to plants is still a lot by manual means that process alone which is sometimes not appropriate when the soil and plants need water. With this problem, we need a system that can determine soil moisture, provide water would be able to monitor using cloud computing access the Thingspeak web by combining the concept of IoT (Internet of Things)[3].

computer technology enables the use of cloud data used to store the amount of data collected from several sensors, from the data will be carried out an analysis process about land agriculture, storage systems that utilize cloud computing technology the analysis process can be done remotely [4] [5].

BACKGROUND RESEARCH

Smart Agriculture is a concept where agricultural equipment which usually uses traditional methods is replaced with equipment and equipped with instruments and connected via the internet. The field of agriculture has an important role for a country to meet the food and economic needs of its citizens. Especially a country where most of its residents earn a living as farmers. Smart Agriculture is built with a soil moisture sensor to detect water content. If the soil is in a water shortage, the sensor will respond and will be sent to the broker so that water can be supplied automatically[6].

computer systems that connect with sensors are inseparablethe application of IoT technology, where this device has a very important roleto be a storage device for transmitting and exchanging datafrom the sensor to the server. IOT devices are currently createdin such a way that it has the ability to read data completely and accurately.and all devices able to retrieve data in realtime accurately. whileIoT technology developed today is possible wireless networkingapplication of tools and sensors in wide are placement conditions[7].

computer protocols that use technology iot has its own advantages, system consider very effective in use because of this cheaper, the use of data servers can use data that is online also known as the MQTT protocol, Protocol This is an open source connection system are (M2M) machine to machine where existing devices on the sensor still rely of the type of transmitter used.
The monitoring system in this study was not only rely on IOT-based sensors but directly a mapping system with relying on cheap and affordable technology, one of them is using UAV technology where this system has reliability inside monitor the temperature and health of plants with applying remote sensing technology, advantages use of drones themselves among other scan map an area without being constrained by the weather and able to reach areas that can't doing by humans, in the modern eracurrently drones are widely used for monitoring large areas of land such as agricultural areas, forests and mining, the accuracy of the data taken by drone can be very accurate and even provide information on agricultural land and detect the existence of pests[8].

Grading measurements using photogrammetric technique, the last is manipulation and calculation of the level of maturity in taking a picture, this technique that is needed is image cropping, croping image depends on the background color used at the time of the acquisition process, this function is used to minimize the cleanliness of the object to be studied, but this process becomes difficult if done at harvest because harvesting will be difficult, and at this time imaging a clean object becomes solution using the algorithm system to overcome the above problem[9].

computer vision methods will make computerization process faster, by providing the ability and capability to use inexpensive and widely used electronic devices in various fields, this system uses simple but standard sensors and eliminates the quality of tools, the key of this system relies on quality and speed and accuracy data reading, the application can use cameras with high frame resolutions and software designs that are easy to use and implement[10].

In the grading process that is called preprocessing, this process is operated by selecting fruit that can be based on color and size, the size data is then classified, all selection data will be displayed in the form of values or diagrams that have values, the data collection system is carried out using an impermeable place light so that the data taken isn't an error caused by the reflection of light from the image itself, the reflection of the light will make an inaccurate grading reading process, the surface of fruit that is not good will be corrected by fulling with treshold technique and color segmentation process. [11].

Observing plant diseases with the naked eye is very difficult whereas to bring in experts is very expensive especially in some developing countries, farmers may require a long time and expensive consultation fees Planting classification can automatically be done with a high-resolution camera with multispectral and stereo cameras, the process of color segmentation functions to separate the color of the

separate leaves and only in the area of the affected leaf, The process of detecting a disease using algorithm for the process of color segmentation can automatically detect and classify the types of pests in plants, and is a very important aspect, color segmentation is a process that is able to separate color groups in the same image unable in plain view, the computer has the ability to recognize an object with a variety of different methods

RESEARCH METHODS

Drone technology

In the method carried out several stages of testing on the smart farming system, this smart farming system applies a cloud data using system, where the system is able to work by reading soil fertility data and detecting pests in plants. The stages of the system are as follows:

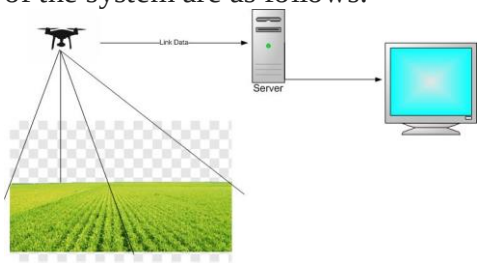

Figure 1.1 Use of Plant Health Monitoring by Drone

In Figure 1.1 above is the process of monitoring health plants using drones, the use of the drone itself has reliability because it has a wide range of data retrieval and can be used in agricultural areas and in hills areas, the image data to be taken by the drone will then be processed by a computer Then the analysis stage is carried out, the analysis process used by the amount of water content and surface temperature.

METHODS FOR PLANT HEALTH SCREENING

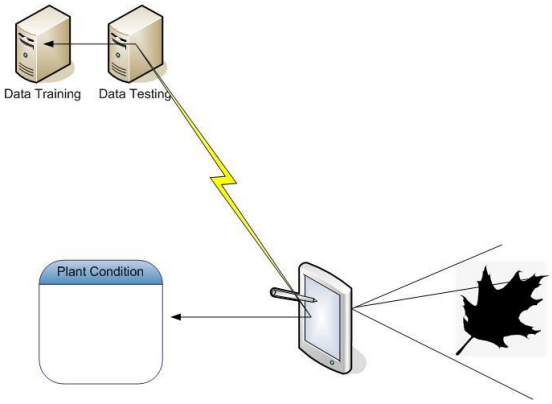

Figure 1.2 The process of smart farming identification of diseases in plants by computer methods

In the picture above is a method of testing the smart farming system to detect the type and health of plants, this method is very important considering the disease

detection system in plants is still using ordinary expert systems and only based on text, the system can't be used in realtime mode. In the system detected using a mobile device has convenience of being able to be used in realtime by image-based data collection, the accuracy of data collection data on this system has an accuracy of above 90%, the application can be used at any time with a varied number of plant type datasets.

Image Recognition &Indentification

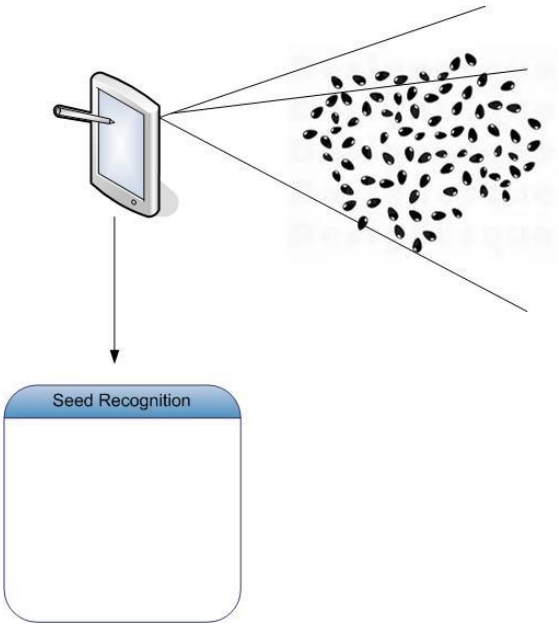

Figure 1.3 Identification Process of Harvest Quality

in Figure 1.3 is the process of identification of cropping, this system will monitor the quality of the crop.the function of this system will be used as a benchmark for the quality of the crop and used as a further evaluation material

SYSTEM IMPLEMENTATION

Figure 1.4 Use of drones for agricultural land mapping

in figure 1.4 is the use of drones to map the land area of agricultural areas, the use of drones facilitates the system of reading data and the process of detecting plant health as well as the water content and soil temperature in the land area

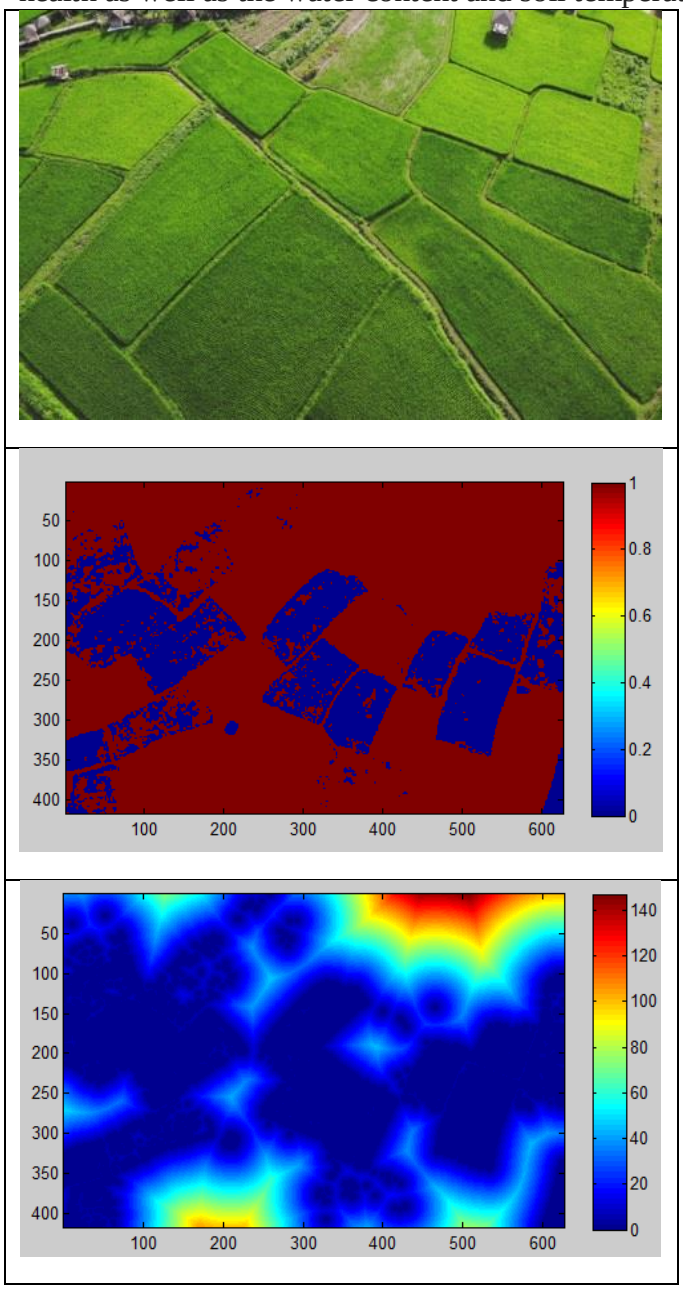

Figure 1.5 Testing plant temperature

in figure 1.5 the process of measuring plant temperature, for experimental object took a sample data from the internet and tested the image with image processing techniques, the picture shows the condition of plants in fertile conditions with a blue plant color, in the third picture shows the condition of soil temperature which is normally blue and hot soil conditions with red color are seen in the field area.

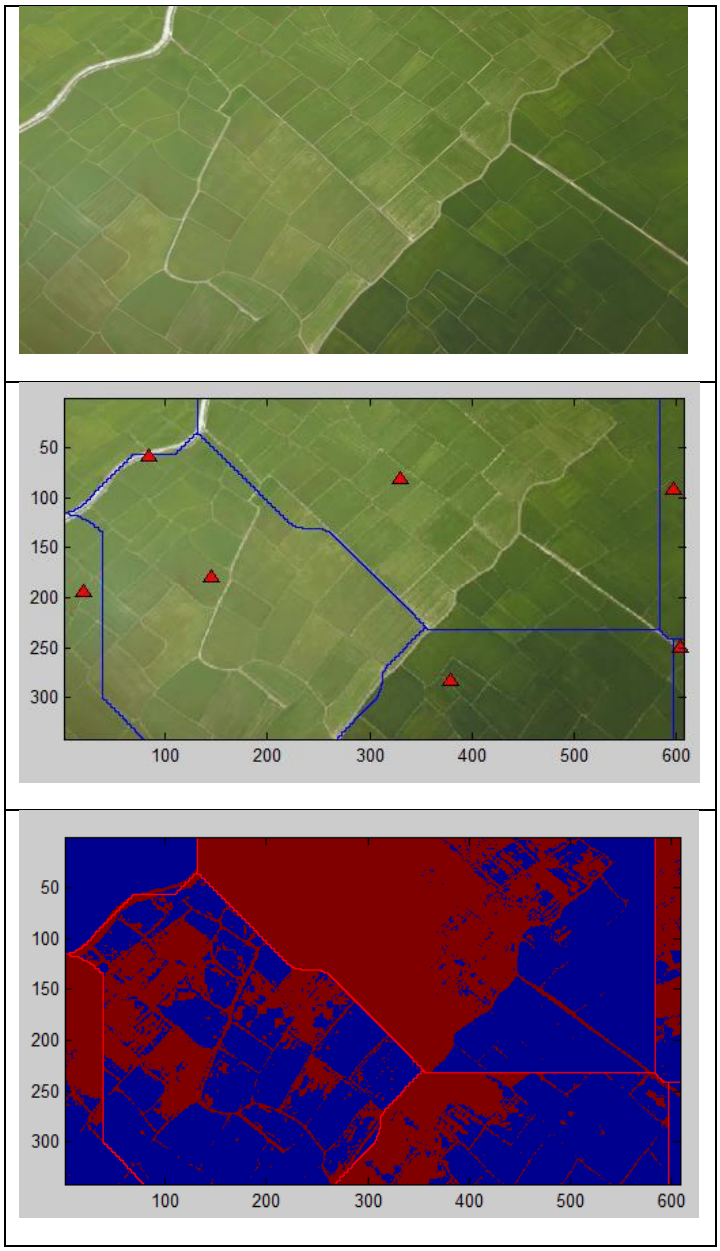

Figure 1.6 land area mapping system

in figure 1.6 is the process of reading data in the area of land that will be carried out the process of identifying plant health, in the picture shows that the plant is in good condition visually displayed in blue and red indicates the plant is lacking water, the system will automatically provide mapping information which will facilitate the next maping process.

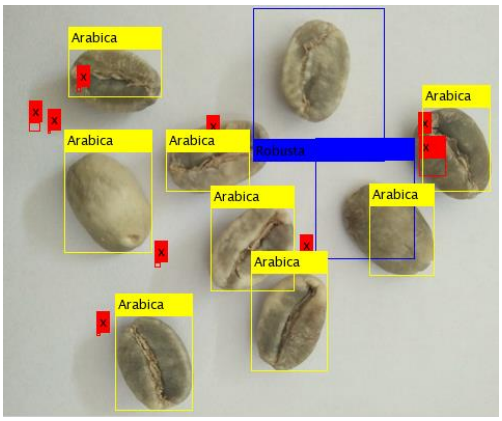

figure 1.7 image recognition

In the picture figure 1.7 besides the process of pattern recognition by a computer, this system gives a marking mark to color to distinguish varieties of coffee samples taken at random. the result is a type of arabica coffee seed that is read by a system with yellow marking and a type of robusta with blue marking.While the difect or defective coffee beans and the presence of foreign objects carried or attached to the seeds are usually broken bean defects or pebbles carried during the drying process the system displays them in a red cross 'x'

CONCLUSION

In the above experimental results it can be concluded that the IoT system used in agricultural land is proven to facilitate and provide precise and accurate information, this information can be in the form of soil condition information, plant health conditions, this system can be used as a management tool and recommendations for the use of water sources the process of preventing harvest failure because the use resources or fertilizer will be more effective. IoT technology also provides an ease in the application of crop sorting systems to maintain crop quality, crop failure caused by weather and pests can be predicted in advance so that damage does not get worse and the causes of plant can be predicted and recognized by the system so that steps prevention more quickly.

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