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Simulation of Precision Agriculture Security Using Enhanced Video Surveillance Mechanism

Parveen Kumari[1], Amit Mahal[2]
[1]*PG Scholar, Dept. of ECE, Indus Institute of Engineering and Technology, Jind, India*
[2]*Professor & HOD, Dept. of ECE, Indus Institute of Engineering and Technology, Jind, India*

***Abstract*—Satellite farming is other name by which Precision agriculture is known. It is also known as site specific crop management. It is an agricultural managing idea. It is occupying by observing, measuring and responding to inter and intra-field changeability in crops. Normally Crop variability depends upon on geographical and chronological factor. Due to which the contribution of statistical/computational treatments is less. Here in this research the working of proposed model has been described. Here each component that has been used in proposed work has been discussed along with relation to another component. The proposed work consists of several activities. These activities may be dependent or independent. The dependent activities are based on previous activities and can be performed only after implementation of previous activities. However the independent activities are not dependent on any other activity. Thus there could be parallel implementation of those activities. The performance of system also depends on whether system could perform task in parallel way or not. If system is capable to perform multiple task parallel then the efficiency of system increases.**

***Index Terms*— Precision agriculture, GIS, Edge detection, GPS, RS**

I. Introduction

Precision agriculture is a management conception or accession to farm. It is an indefinable prescriptive system. It analyzes decisive factors where yield is restricted by controllable factors. It figure out fundamental spatial variability. It is achievable with the use modern technology. It is basically stricter farm management. Recognisation and graphing of variations taking place in crop or soil properties within a field is done. Nonstop evaluation of spatial variability within that field is done in order to provide the necessary management actions. Site-specific management systems using remote sensing (RS), GPS, and geographical information system (GIS) are utilized for nonstop evaluation. Natural spatial variability related with earth characteristics, crop enlargement is noticed by using special tools in Precision agriculture. Suitable management strategy on a site specific basis is also recommend. It offers a probable step change in productive effectiveness. The more appropriate description for Precision Farming in perspective of Indian farming circumstances could be: Precise application of agricultural inputs based on soil, weather and crop requirement to maximize sustainable productivity, quality and profitability. Nowadays farmers are trying to use latest steps to enhance productivity and reduce costs because of growing input costs and falling commodity prices. Effectiveness and output is improved by the use of Precision farming technology.

II. Need and Scope of Research

Security is essential for farms and other agricultural environments at extreme level. Video surveillance can be applicable for this purpose. It is used to make sure the farm operations run smoothly. It makes certain that in the end, clients get a safe quality of product. It provides us several facilities such as protecting animals, equipment and facilities from harm and misuse.

A. Stable and Farm Security Cameras

Monitor for intruders: Images of anyone entering the property will detect in the farm security cameras which are tactically arranged. This facility helps to make sure that only known workers use the farm and its facilities.
Protect water supplies: A well-protected water deliverer is crucial for agricultural activities. In order to protect this highly-sensitive area, security cameras of farm can participate a significant role.
Prevent break-ins: Implementation of farm security cameras all around the property may decide break-ins. It is for the burglars who see past the cameras. Here the observation footage can catch them in the act.
Deter theft: Farm security cameras will help to put a stop to thieves from animals and equipment in sector like as calving pens, holding pens, gates and tool shops.
Monitor daily operations: Security cameras can also make sure the daily activities like as feeding and milking to run smoothly.
Employee monitoring: Employee behaviour can be monitored by using the Video surveillance. It is also used for properly carried out the crucial farm operations.
Remote playback and monitoring: A farm owner can monitor his material goods distantly. It can be done with the help of an IP-based surveillance system. In cases of requiring visual proof, footage can be stored digitally and simply investigating.

III. Challenges

Here several types of surveillance Camera Risks have been

described as below:

Vandalism and tampering: The signal could be lost in case of vandalized or tamper security camera. It considers the inspection-proof housing for cameras situated in high-risk environments.

Weather: Weather-proof cameras must be demanded for some certain position. Farm surveillance causes some challenges for cameras. It is because of security cameras may not be able to deal with low temperature and changing conditions of weather.

A number of factors are considered in the location of a Farm Security Camera System. These are as below:

- What is the history of theft occurred in farm?
- Which categories of services are provided in farm?
- Is the farm having present forms of protection in location?
- Is there any need to monitor the activity of employee?
- Is there any requirement of security cameras?
- Which is the high risk location for security regarding farm?

IV. Proposed Work

Here in this section the working of proposed model has been described. Here each component that has been used in proposed work has been discussed along with relation to another component. The proposed work consists of several activities. These activities may be dependent or independent. The dependent activities are based on previous activities and can be performed only after implementation of previous activities. However the independent activities are not dependent on any other activity. Thus there could be parallel implementation of those activities. The performance of system also depends on whether system could perform task in parallel way or not. If system is capable to perform multiple task parallel then the efficiency of system increases. The working model of proposed work is as follow.

A. Working Model

The working model consists of input phase and 4 processing phases. The result is captured from processing phase.

Input phase: During this phase the continuous frame from agricultural form are detected and passed to procession phase 1. Image frame capturing mechanism has been developed in order to perform this.

Processing phase-1: This phase would reduce the size of image frame by resizing it. The scale of image frame would be minimized. The resolution of image is modified. The image height and width is reduced in proportional ratio. The storage space occupied by that image is reduced.

Processing Phase-2: The edge detection mechanism would be applied on image in order to reduce the size of image frame. This technique retrieve just outline of frame. The edge detection technique that has been applied here is canny edge detection.

Processing phase-3: In this phase the frame n would be compared by frame n-1. In other words the current frame would be compared to the previous frame. Image comparison module would be used to perform this operation.

Processing Phase-4: In this phase the comparison time and size of frame would be considered. Time taken to compress and compare image from previous image would be calculated along with memory space.

Analysis phase: This phase would compare the time and size in case of proposed work to tradition work. The analysis phase would withdraw conclusion how this work is better than tradition work.

V. Implementation

Implementation of camera surveillance of agricultural area has been discussed here. Here we have used MATLAB for implementation purpose. Matlab has been used to capture image using camera and compare current image with previous one in order to detect changes. Following is image capturing module developed in Matlab.

As there is difference between previous and current frame then this entry is made on remote database situated on remote cloud in order to notify farmer about suspicious activity in agricultural area.

Fig. 1. MATLAB environment

As the record is updated the gridview also get updated representing the details of mismatched frame

Following implementation is made in Matlab environment. Here screen shots are captured after some interval. And previous frame is compared with current. In case of mismatch entry is made to file with sequence number of frame.

Fig. 2. Agricultural farm view-1

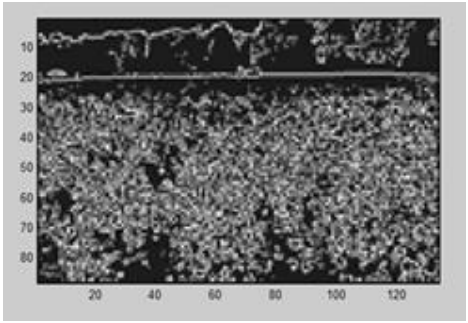


Fig. 3. Edge based agricultural farm view-1

Fig. 4. Agricultural farm view-2

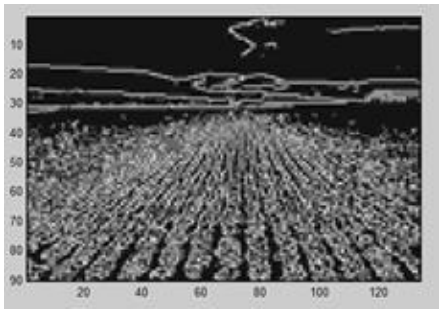


Fig. 5. Edge based agricultural farm view-2

Fig. 6. Agricultural farm view-3

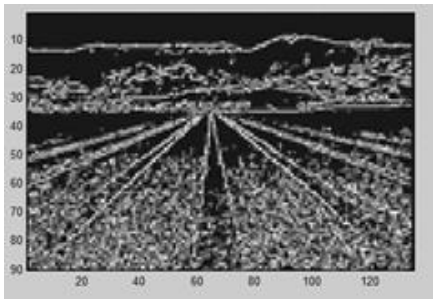


Fig. 7. Edge based agricultural farm view-3

Fig. 8. Agricultural farm view-4

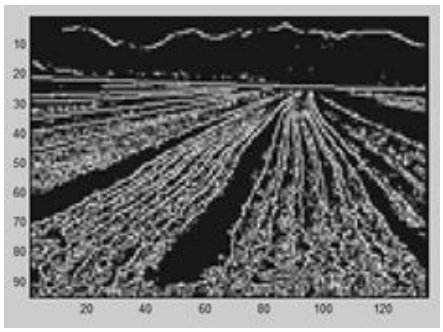


Fig. 9. Edge based agricultural farm view-4

Fig. 10. Matching

Image Capturing Module

Following module capture the image from camera and store on disc in form of .jpg file. Here xx1 store the number of file for comparison purpose

Following code is to capture video using camera

```
Vid = video input ('win video');
Preview (vid);
Start (vid);
```

set(vid, 'ReturnedColorSpace', 'RGB');
after taking video snapshot are taken using this command
im = getsnapshot(vid);
Following code resize the image in order to compress it so that it could take less space
im1=imresize(im,0.20);
imshow(im1);

The captured image is stored in file with its sequence number on disc.
imwrite(im1,strcat('F',x11,'.jpg'));
stop(vid);
delete(vid);

Fig. 11. Frames captured in sequence

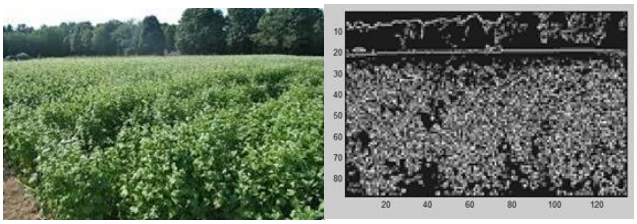
Image Comparison Module

Now in order to compare image stored after capturing using camera are converted to into edges using canny based edge detection mechanism and and compared using ait_picmatch functions to get whether image is same or not.
Following code would read the image In
x=imread(strcat('C', x11 , '.jpg'));

Following code would convert image to edge based version of image using canny technology.
t=canny(x,1,1,1);
Following code would read the image In+1
x1=imread(strcat('C', x11+1 , '.jpg'));
t1=canny(x1,1,1,1);

Compare both edge based version of image using ait_picmatch
rrr1=ait_picmatch(t,t1);
rrr1 variable represent how much image is matching with different image.
If rrr1 mismatches then signal is set to interface.

Fig. 12. Comparison made for frame n with frame n+1



(a) (b)

Fig. 13. (a) Original image (b) Edge based image

Here in above figure frame 1, frame2 are same but frame 3 is different. So result of comparison for frame 2 with frame 3 does not match

Edge based image of frame 2 is compared with edge based image of frame 3 are result in mismatch of frame and signal is sent to interface.
Comparing image: Implementation of Canny Based Edge Detection Module

VI. Analysis in MATLAB

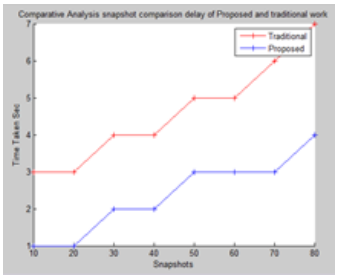


Fig. 14. Comparative analysis of time consumption in tradition and proposed comparison system

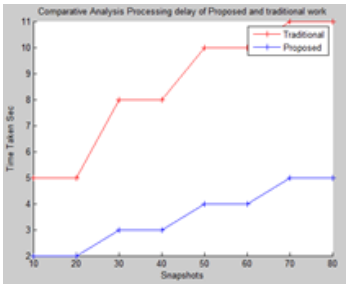


Fig. 15. Comparative analysis of overall time consumption in tradition and proposed comparison system

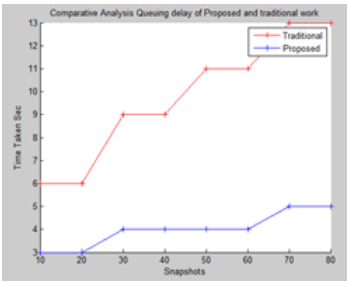


Fig. 16. Comparative analysis of Queuing delay in tradition and proposed comparison system

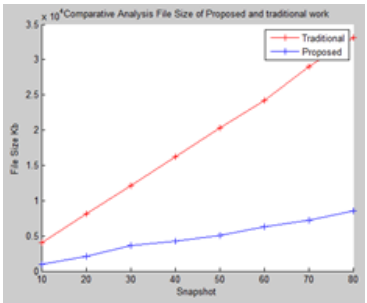


Fig. 17. Comparative analysis of file size in tradition and proposed comparison system

VII. Conclusion

In this research we have explained to set up a camera surveillance system to provide security at remote location to agricultural farm. We have tried to Establishment of environment to host agricultural precision application & Development of Application using web based programming platform. We have integrated web application with camera surveillance in order to implement proposed work. In this research camera captures the external event and sent signal to web system in order to notify farmer about any suspicious activity. If there is suspicious movement then it would transfer signal to web interface that is running on cloud server and connected to a remote database. The event database is updated and actuator is connected to the database. Time by time a clock signal checks the updates in database and responds to actuator. Work done by us has reduced the image matrix comparison time and queuing time.

VIII. Future Scope

This technology had lot of applications with in Agricultural monitoring. Sensor opens the door to a huge variety of new applications, ranging from energy savings in the lighting industry, domestic appliances, safety and security systems, and the medical industry. Further examples include hot-spot detection, human detection inside vehicles for consumer comfort and contactless temperature measurement in industrial applications. The Internet of things could be used to remotely control and program appliances within your home. It could be useful in detecting & avoiding thefts. Automation is process of controlling appliances automatically using various control system techniques. The electrical & electronic appliances at agricultural farm such as drone, water pump, agricultural instruments etc. could be controlled using various control techniques. Sensors allow systems to detect an individual's presence and their direction of movement, including motionless. This technology can be useful in applications in building automation and security.

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