Haritha Tummala, Kalyan Mohan Goli / International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com
Vol. 2, Issue 3, May-Jun 2012, pp.1388-1390

Wireless Sensors & Video Networks (WSVN) For indication of fungus affected plants in an Agricultural Field

Haritha Tummala*[1]
Research Scholar
ECM Department
K L University
A.P., India.

Kalyan Mohan Goli*[2]
Associate professor
ECM Department
K L University
A.P., India.

Abstract:-
This paper proposes a system which can be used for the early indication of fungus affected plants in an Agricultural Field. As the yield of crop depends on the healthy growth of the plants, the status of the plants needs to be monitored continuously. The optimization in terms of plant growth requires knowledge of pests which affects the yield of the crop and also the amount of pesticides to be used at appropriate time, which can be done with the help of this proposed system. It uses a real-time sensor data collection with the help of different types of sensors like CMOS Image sensors, camera sensors, Laser sensors etc to know about the day-to-day updates in an Agricultural Field. The real-time data can be processed and analyzed via Internet for monitoring the fields at any time, from anywhere in the World with the help of PC or internet-enabled mobile phone which is obtained from the WSVN.

Keywords**:** *CMOS Image Sensors, Laser Sensors, Camera Sensors, WSVN.*

I. Introduction

Wireless Sensors & Video Networks (WSVN) are the networks which are formed by integrating Wireless Sensor Networks (WSN) and Video Sensor Networks. The WSN usually collects scalar data such as temperature, pressure, moisture etc which is insufficient for continuous monitoring of fields where as Video Networks collects video information which consists of camera sensors used to capture real-time data in the form of images and video-filming and is capable of providing environmental monitoring activity based on the sensor networks. The proposed system can be cost effective communication system because WSN is low-cost and low-power which allows data acquisition and data transmission using Zigbee technology. The operation involved in this system includes how the real-time data is being captured by using camera sensors and multi-sensor nodes and the transmission involved with in the sensor network. The data transmitted by the sensors will be stored in the database and is available to the farmer by making use of Internet. The database server also consists of pre-loaded images of crop fields which are affected by pests and fungous diseases and also the amount and type of fertilizers required for that particular crop. The host controller may be PDA or PC which is used by the end-user for monitoring of Agricultural fields, if he wishes to know about the current conditions of the field at any time by using Internet. The proposed system uses cellular-networks like GSM to indicate the farmer about the fungus affected crop fields through mobile phone. The farmer who receives the message on his phone can also have the information required about the amount and type of fertilizers needed for that field using Server. The optimization in terms of usage of pesticides can be achieved by using this system and also improves the crop yield when the appropriate fertilizers are provided at proper time. The health of human-beings can be improved using this system.

II. Existing Systems

The basic architecture for remote sensing in precision agriculture is shown in figure 1 [7]

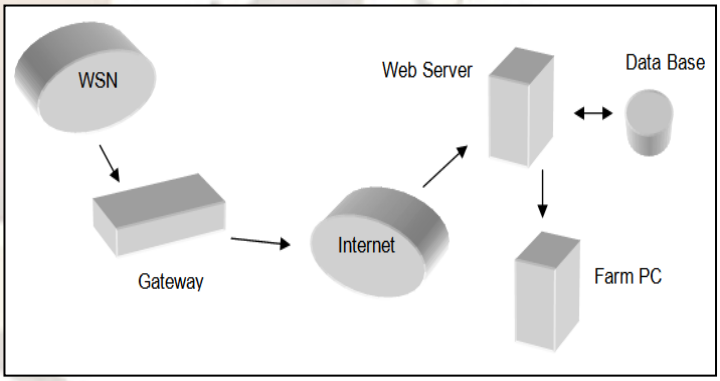

Figure1: Remote Sensing Architecture in precision agriculture [7]

A. Wireless Sensor Network

Wireless Sensor Network is an emerging field of technology which has diversified applications. It is a temporary Ad-hoc network which does not require huge infra-structure. Wireless Sensor Network consists of sensor nodes which are usually being called as motes. Each node contains processing unit and small amount of memory through which the real-

time data can be obtained from the surrounding environments. In WSN, each node is capable of forwarding data to other nodes which are connected using wireless links [6].

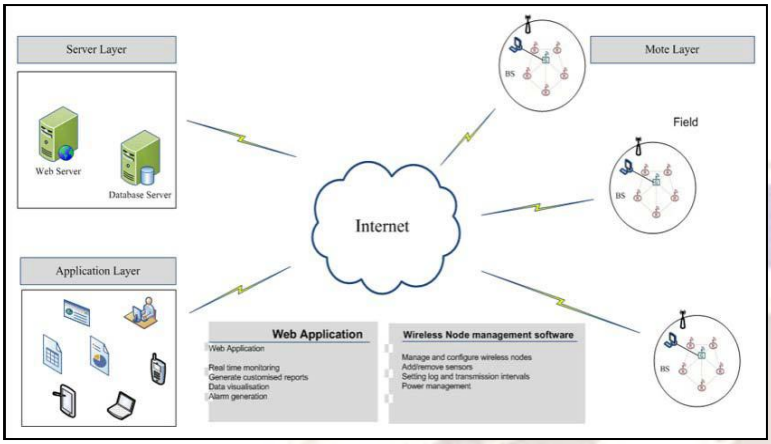

Figure2: Schematic View of WSN architecture [1]

B. Video sensor network

Video sensor network is a distributed sensor network formed by a group of video sensor nodes that have computing, storage and communication capacity.

Video-surveillance in agricultural plots helps the farmers to protect their crops and farm equipment from intruders [9]. Security tasks include intrusion detection and identification. In addition, video surveillance systems may also be used for other functionalities than protection, developing other applications, such as the monitoring of the agricultural process, verification of personnel access or best-practices control, and employees' safety at work [4].

In recent years, the IEEE 802.15.4 standard services form the so called Zigbee system, has been accepted as the de-facto standard for the commercial wireless sensor networks technology. This standard is also denoted as Low-Rate Wireless Personal Area Networks (LR-WPAN) [10]. In the agriculture context, wireless technologies such as Wi-Fi and Bluetooth penalize energy consumption, becoming a major drawback when transmitting images or video sequences, as required by an identification system. However, the low-cost, low-power consumption and similar communication range distances offered by IEEE 802.15.4 technology in comparison with blue-tooth, makes it suitable to be applied to precision agriculture [8].

The integration of video surveillance operation along with monitoring data using IEEE 802.25.4 network and different stand-alone sensors placed between end-to-end and gateway. A cluster tree topology can be used in the IEEE 802.15.4. [3]

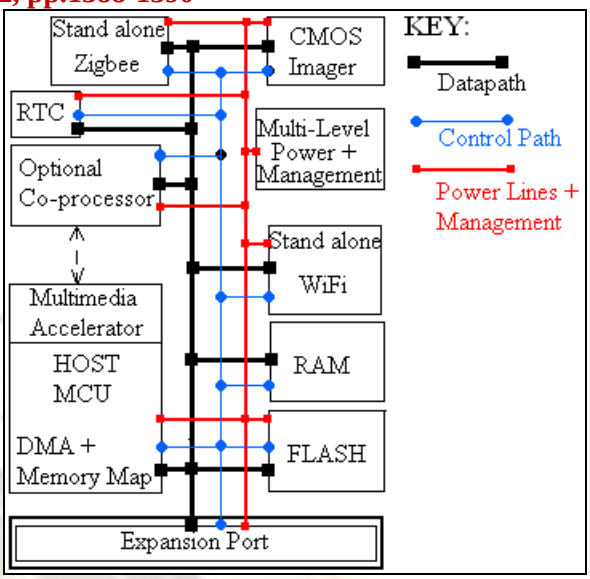

Figure3: Flexi-WVSNP hardware architecture block diagram. [2]

III. Proposed System

The proposed system for integrating wireless- sensor and video sensor networks for the remote monitoring of agricultural fields can be made useful to the farmers to know about the current conditions and can also have an alert to the mobile phone for the indication of fungus when affected through GSM. The system representation of the proposed WSVN is shown in the Figure 4.

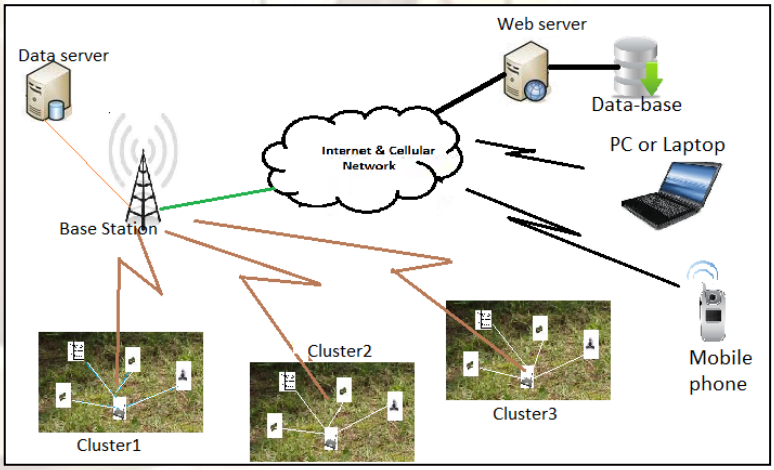

Figure 4: System representation of WSVN

The proposed system of WSVN can be divided into the following sub-systems:- 1.Data collection subsystem 2.Data processing subsystem and 3.Data retrieval system.

A. Data-collection subsystem

The data-collection subsystem consists of components like multi-sensor nodes which are capable of sensing environmental conditions in an agricultural field like temperature, humidity, pressure etc, CMOS Image sensor nodes which are capable of collecting images at pre-defined

regular intervals of time, Video sensor nodes which are capable of capturing videos in all directions of the field at some pre-defined times and finally the gateway node through which the collected scalar data, images and video-films from different nodes which are present in the cluster are forwarded to the base-station.

B. Data processing subsystem

The data processing subsystem consists of the components like the base-station which is connected to the data server and the Internet or cellular network and is also capable of processing the data based on the query generated. The data server consists of the real-time data which is collected from different clusters. The web server is capable of providing services those who are using the Internet.

C. Data retrieval system

The data retrieval system consists of data-base which stores images of affected plants and the type of pesticides and quantity needed for that affected crops. When an agricultural field is affected by fungus then an alert call will be given to the farmer with the help of mobile phone using GSM. The farmer can also have remote-access or remote-monitoring to his fields by using an Internet enabled PC or laptop.

D. WORKING PROPOSAL OF WSVN

The field is divided into clusters depending on the area and each cluster should contain the multi-sensor nodes, video nodes, image sensors and gateway. There should be only one gateway in each cluster. All the information sensed using different sensor nodes are processed and send to the BS only through gateway. The gateway acts as an access point to the external network which consists of mainly 3 modules: gateway controlling module, internal interface module and external interface module. Unlike sensor and actor nodes, the gateway uses ARM Linux as its operation system considering the complexity of the tasks.

The embed TCP/IP protocol stack and relative network tools are used to support router and Internet access [8].

IV. Issues Of Consideration in WSVN

A. Energy saving strategy

As the condition of the WSVN in the field of an agricultural application is not so complicated and may allow for the battery charging in contrast to the traditional sensor node, the issue here is how to extend the life of the whole network which has contemporary reactions because of different types of sensors used.

B. Implementation and Coverage of wireless sensor & video networks(WSVN)

Since these networks consist of video sensor nodes and image sensor nodes, traditional implementation will not be applicable. While coming to capture of images and videos using corresponding sensor nodes have to be made possible especially during night times since it will be dark in the agricultural fields.

C. Network Architecture of WSVN

Traditional wireless sensor networks are not having capability to process large multi-media services including images and video information. In-network processing and retransmission of large multi-media information need to consume a lot of resources. [5]

D. Collaborative processing of data sensed

The formats for scalar data, images and videos are different. Hence processing of sensed data requires collaboration.

V. Applications

- Traffic monitoring.
- Target tracking.
- Smart home architecture and

VI. Conclusion

The proposed system after deployment in the fields will improve the yield of the crop because of the remote access of the fields by the farmer and an alert call to his mobile phone when the plants are affected by the fungus which is possible without usage of extra fertilizers. Hence farmers can lead a luxurious life and also the health of human-beings can be improved simultaneously.

VII. References

[1]. 19th International Congress on Modelling and Simulation, Perth, Australia, 12–16 December 2011 http://mssanz.org.au/modsim2011
[2]. IEEE COMMUNICATIONS SURVEYS & TUTORIALS, VOL. 13, NO. 3, THIRD QUARTER 2011 Adolph Seema and Martin Reisslein
[3]. Chinese Journal of Electronics, Vol.20, No.4, Oct. 2011
[4]. Wireless sensor network deployment for integrating video-surveillance and data-monitoring in precision agriculture over distributed crops: Computers and Electronics in Agriculture 75(2011)
[5]. Computer Science and Information Technology (ICCSIT), 2010 3rd IEEE International Conference Research on The Key Issue in Video Sensor Network Xiaoxia Ren 1 Zhigang Yang2
[6]. Wireless Communications, Networking and Information Security (WCNIS), 2010 IEEE International Conference Design and Implementation of Wireless Sensor and Actor Network for Precision Agriculture Jing Hu, Lianfeng Shen ,Yang Yang, Ruichao Lv
[7]. Sensors **2009**, 9, 4728-4750; doi:10.3390/s90604728
[8]. Lloret et al., 2009
[9]. VideoSurveillance.com website LLC, 2009
[10] IEEE 802.15.4 Standard, 2006