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GSM Based Video Surveillance and Automatic Irrigation Control of Agricultural System

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ABSTRACT: *Agricultural sector is playing avital role in theIndian economy, in which maintenance is the main problem for all farmers. In this technology it is possible to transfer video, themoisture content of soil and temperature of agricultural land to the mobile of theend user. The idea is to set up a computer terminal equipped with a GSM Modem at theagricultural field, which can be used to transmit video/photos and commands to and from the owner. Mobile phones have nearly bowed into an essential piece of human life serving different requirements of people. This technology makes usage of the DTMF decoder feature of mobile phone as a solution for agricultural problems.*

Keywords: *GSM Module, Microcontroller, Video camera,MRF24J40MA transceiver, DTMF decoder.*

I. INTRODUCTION

Today's Indian agriculture is facing several problems due to various reasons like shortening of agricultural land by rapid industrialization, not giving much importance to agriculture by young generation and also ascarcity of labors. Automatic agricultural systems provide asmart way of monitoring the field by real-time transfer of videos, moisture, and temperature to the end user. This innovation can even spare cash and help in water preservation.

At present, labor-saving and water-sparing innovation is a key issue in farming.No such significant technological headways being made in the farming part when contrasted with different divisions.The agricultural system needs to be monitored on a consistent basis. The use of this project is to reduce the wastage by automating the entire agricultural system and also protecting the farming field from animals and unauthorized entries.

The video camera continuously monitors the agricultural field and also labors working at different locations and stores the data in the DVRs. The moisture sensor is put in the field which constantly senses field's moisture content. The microcontroller unit switch on the motor when the field is dry and turn off the motor when the field is wet. The temperature sensor senses the weather conditions.

II. BLOCK DIAGRAM OF THE PROPOSED SYSTEM

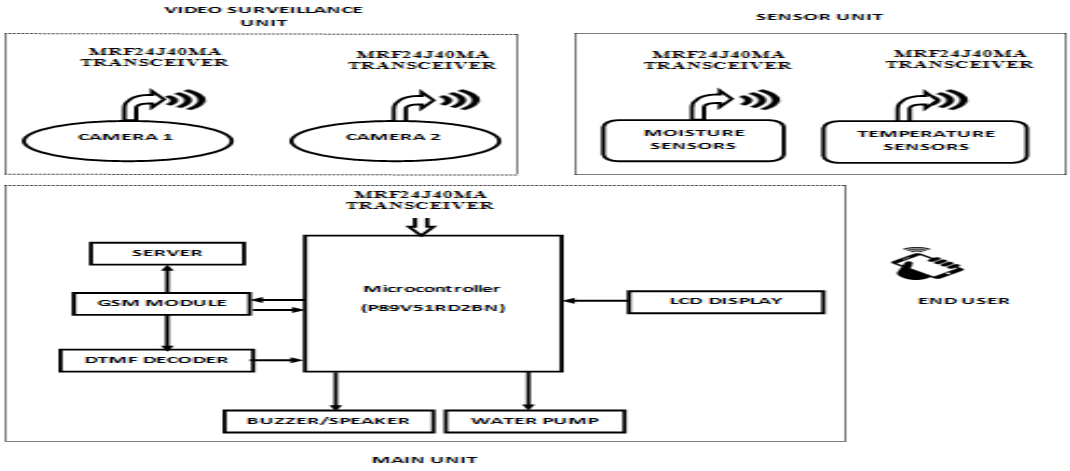

Figure 1. Block diagram of the proposed system

Different surveillance cameras and sensors are placed in thedifferent locations of the field, which is interconnected by wireless technology. All the measured data will be stored in the control station consisting of DVRs, servers, LCD, GSM module. DVRs convert the analog signal from thevideo camera into digital format and store it into inbuilt memory with an option for expanding memory size. An 802.11b module is placed with video cameras for wireless data transmission to control

center. The acquired data of video by the video cameras are sent to the video controlling server through 802.11 links. The streaming video device has 3G Internet support, sends the video stream data through the 3G wireless data link and publishes them on the designated website. When the end-users,who may be a wired Internet user or a mobile user, access the designated website, the required video stream will be downloaded from video control server to every terminal for displaying after the authentication procedures. Authentication must be made before using the website by providing name of user and password given to the specified person.

The block diagram consisting of 3 parts mainly

1. Main Unit
2. Sensor Unit
3. Video Surveillance Unit

Working of the main unit

The main unit consists of 40 pin microcontroller, GSM module, buzzer, MRF24J40MA Transceiver and DTMF decoder, that controls and co-ordinate all the sensors, video surveillance unit, motor, and buzzer system.In this agriculture related surveillance system DTMF decoder is used for controlling buzzer and water pump remotely via mobile phone. When a farmer finds any animals or unauthorized persons entry into the farm in live video stream through mobile phone then farmer calls to the GSM module and presses key 2 which activates the buzzer and sounds pre-programmed noise specific to animals and warning sound for unauthorized entry when key 8 pressed. When a farmer finds inadequate content of moisture in soil then the motor pump activates by pressing key 4 to switch ON motorand key 6 to switch OFF motor when sufficient moisture feedback received from sensing systems.The streamed video can be sent to user mobile through the internet by entering the specific IP address.

Working of sensor Unit

The sensor unit can be implemented in irrigation fields for sensing local soil moisture and the detected information is directed to controller node using MRF24J40MA transceiver. The controller node verifies the moisture content of the soil and if the moisture content of the soil is low then moisture sensor sends the signal to the microcontroller through transceiver and microcontroller will turns on the motor.Once the moisture content becomes high then motor turn off automaticallyand analert message is sent to theregistered mobile. The mobile can be used for transferring arequest to acquire soil moisture of irrigation field and SMS can be sent to turn on or off the motor. The controller node has navigation keys to set the mode of operation and an LCD display to view sensor data. The system operates in 3 modes: manual mode, auto mode, and remote mode. Firstly, in manual mode, system operations are controlled from keypad of mobile by calling remotely placed GSM module which is further controlled by DTMF decoder. Secondly, in auto mode, system operation is reliant on the feedback moisture sensor of soil. Thirdly, in remote mode, system operation is controlled at aremote place by sending SMS from registered mobile phone.

Working of Video Surveillance System

The video wireless surveillance system can be divided into three parts in our design:

1. The video data nodes for data collection
2. Video monitoring nodes
3. And embedded video control server.

The embedded video control server is the central part of the designed video surveillance system, which can be divided into the internal network interface, the external data network interface, and the main control unit. The interface of internal data network is made up of an 802.11 module for receiving data from each of the video data nodes, which is in charge of the video data acquisition and uploading. The external network interface which includes a wireless Internet access module is responsible for the data publishing. In the video control server side, both the internal and the external network interface are all controlled by an embedded microcontroller unit. A video data node consists of a video camera for video data sampling and an 802.11b module for data transmission, an embedded microcontroller unit which could be the same one as the video control server.

The gained information of video is sent to the video control server through 802.11 connections. The server comprising video information having 3G remote web access transmits the video stream information through the 3G remote information connect and publishes them on the assigned site. In instances of reachable wired Internet access, the wired method for Internet access for the video control server is additionally executed.A video checking hub is generally basic in structure. It can be either a PC with wired Internet access or a cell telephone with remote Internet access. At the point when the end users, either a wired Internet users or a cellular telephone user, get to the assigned site, the required video stream will be downloaded from video control server to each of the terminals for showing the confirmation techniques.A little web server on the video controlling server in view of the CGI (Common Gateway Interface) program permits end-users with the working interface which are easy to use, helpful for checking and upkeep. Authentication is made to affirm the identity of the end user. Subsequently, the video information is downloaded in the web program and connected to the media player for showing.

III. FLOWCHART OF THE PROPOSED SYSTEM

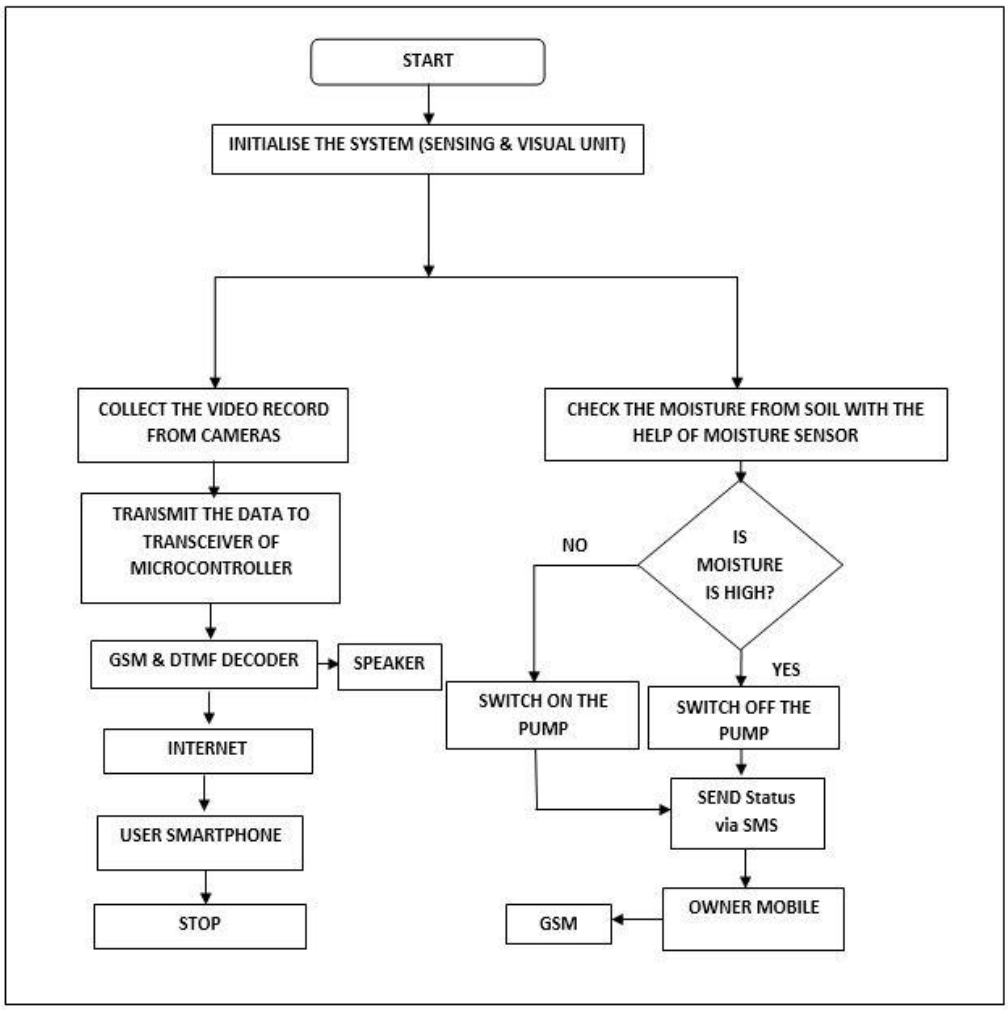

Figure 2. Flowchart of the proposed system

IV. SYSTEM COMPONENTS

4.1.Microcontroller(*P89V51RD2BN*)

It is the 40 pin microcontroller consisting of 80C51 central processing unit, 5V supply voltage and operating frequency of 0 to 40 MHz, four 8 bit input-output ports with three high current ports 1 pins, three 16 bit timer and counters, programmable watchdog timers supports 12-clock or 16 clock mode selection via ISP or software. 64K bytes of onchip flash program memory consists of ISP (In-system programming) and IAP (In Application programming), eight interrupt source with priority levels, serial peripheral interface UART.

Figure 3. P89V51RD2BN Microcontroller

4.2. Soil Moisture Sensor

As shown in Figure 4. Soil moisture sensor includes two soil probes, a 2N2222 transistor, 10Kohm variable resistance pot and 100-ohm resistor . The soil probes can be submerged into the soil under test, which consists of two thin copper wires each of 5cm length. The circuit gives a voltage output corresponding to the conductivity of soil. The soil between the probes acts as a variable resistance and its value depends on upon moisture content present in the soil. The transistor is being used as a common emitter amplifier. To transistor is in theactive region, when the base-emitter junction is forward-biased and collector-base junction is reverse-biased (active region of common-emitter configuration can be employed for voltage or current amplification). The resistance through soil probes can differ from infinity (for completely dry soil) to a very little resistance (for 100% moisture in soil).

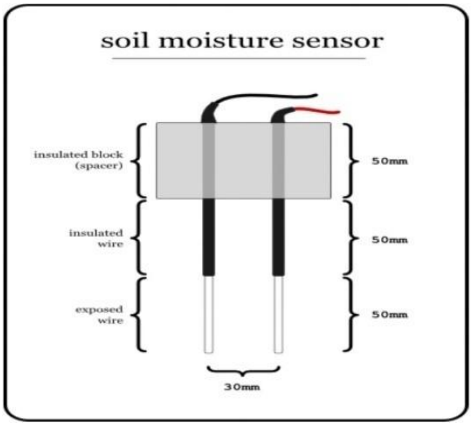

Figure 4. Soil Moisture Sensor

4.3. MRF24J40MA Transceiver

The MRF24J40 is an IEEE802.15 standard compliant 2.4 GHzRF transceiver. A circuit board of an MRF24J40transceiver is shown in Figure 5. It incorporatesvoltage regulator unit, corresponding circuitryand Printed Circuit Board (PCB) antenna. The MRF24J40MA module is used for connecting sensor nodes with controller node since it is a short range, low power, and low data rate wireless technology. It operates on the 2.4 GHz, Industrial, Scientific and Medical (ISM) band and transmission range is up to 400 feet. The peakattainable data rate of this transceiver is 250Kbps.

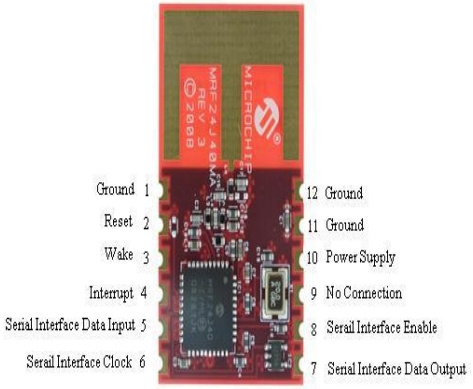

Figure 5. MRF24J40MA Transceiver

4.4. GSM Modem

Wireless GSMmodem shown in Figure 6 works with GSM wireless network for transferring data between controller node and mobile phone. A GSM modem requires a SIM card to operate, which acts as standalone mobile phone. GSM is a circuit operated system and it works in the frequency band of 933 - 960 MHz (for uplink) and 890 - 915 MHz (for downlink). GSM uses Time Division Multiple Access (TDMA) techniques for transmitting signals. It has acapacity to transmit 64 kbps to 120 Mbps of data.

Figure 6. GSM Modem

4.5. Double Tone Multi Frequency (DTMF)

Double tone multi-frequency is utilized to convey between handheld portable with remotely placed GSM module through simple signs in the voice frequency bands. It's likewise called as touch tone. The present phone keypad is organized in 4*4 frameworks. At the point when a numeric on a keypad is pressed which creates a tone comprises of 2 synchronous immaculate sin wave frequencies. Row arrangement demonstrates the low-frequency keys and column arrangement indicates high-frequency tones. This arrangement of DTMF decoder tones has shown in Table 1. DTMF framework comprises of eight tones transmitted in two sets to show sixteen signs, for example, 10 digits, A to D and images "#" and '*'.

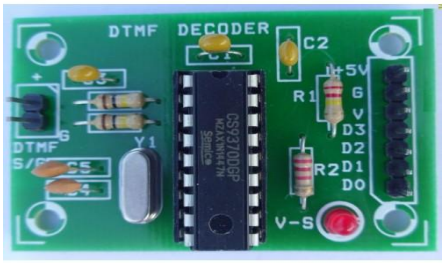

Figure 7.Double tone multi frequency

Table 1. DTMF decoder tones at different frequency

Frequency(Hz)	**1209**	**1336**	**1477**	**1633**
697	1	2	3	A
770	4	5	6	B
852	7	8	9	C
941	*	0	#	D

4.6.LCD display

A low power graphical LCD PCD8544 is used to display sensor values. LCD has 48 rows, 84 column output as shown in Figure 8. batteries are used For a power supply and the motor driver circuit is simply a switch for motor.

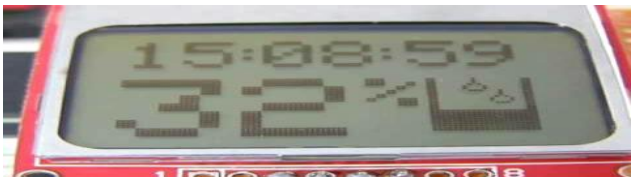

Figure 8. LCD Display

4.7.Speaker

A power rating of 10 watts to 15watts speaker is used to control boundary of operation to alert unauthorized entry of persons or animals.

***Figure 9.*Speaker**

V. BENEFITS OF PROPOSED SYSTEM

- This system allows theuser to view videos even if user is at some remote place. The system provides the functionality of online video streaming so that user can view the videos from aweb browser.
- Entire surveillance can be made remote using this architecture. The user can even control the system through a remote place. User can give commands to switch on/off the system.
- The system provides real-time monitoring of moisture content of thesoil and controls the motor according to the requirement.
- This system provides theability to control remotely using DTMF decoder through amobile phone.
- Surveillance gives theopportunity to view any intrusion in the field and alerted by analarm system.

VI CONCLUSION

GSM based video surveillance system proposed is capable of controlling entire agriculture field at areal time with feedback from different sensors and visual sensing units.Farmers were greatly dependent on climate and weather. In thetraditional agricultural system, the farmer is used to stay at nights in order to ON the motor when thepower comes. Instantly the farmer comes to the field to monitor its condition. Traditional farming has a lot of loopholes where productivity cannot be improved unless these holes are filled and hence this proposed system came into existing to recover the life of farmers and also to sustain their yields in acompetitive market by protecting it all the time. The proposed system uses real-time feedback control system which observers and controls theirrigation system activities efficiently. The results will be displayed on the both LCD panel anduser mobile, for testing the output instantly. GSM and DTMF decoder is accountable for supervisory the irrigation on thefield and sends them to the receiver. The information is sent to the user on request in the form ofSMS.

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