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Automated Irrigation & Security System

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Abstract:-- **Efficient water management and security is an important task in any cropping systems. In the present work an attempt has been made to design and develop a system that automatically monitors the moisture content in the irrigation field and protects the crops by usage of GSM and Microcontroller technology. The system makes use of sensors like humidity, IR and PIR to get the feedback from the irrigation field and initiating the necessary action with the help of Microcontroller. After implementation of this system it is observed that the system was able to detect the insecure condition in the field and give alert message to farmer and also maintain required moisture content was maintained automatically. This system provides an ideal solution to the problems faced by farmer in daily life in their field. The system is adaptable and cost-effective. The system uses embedded technology so all advantages of embedded system present here.**

***Keywords*:Automatic Irrigation; motor-pump; GSM; IR sensor; Embedded system**

I. INTRODUCTION

When water becomes scarce, difficult to managing the demand for water in agriculture, which is the largest user of diverted water, holds the key to water management to meet the demands from competing users. As per some estimates, irrigation in India consumes nearly 500 BCM of water annually. Raising crop water productivity provides a means both to ease water scarcity and to make available water for additional human uses and nature. But the key to appreciative the ways to develop water productivity is in understanding what it resources. Definition of water productivity is scale dependent. Water productivity can be study at the plant, field, farm, system and basin levels, and its price would change with the changing scale of analysis.

In several areas enough rainfall is obtainable for crop growth, but a lot of other areas need irrigation. For irrigation methods to be sustainable, they need right supervision and must not use extra water from their source than is obviously replenish able. Or else, the water source becomes a nonrenewable source. Development in water well drilling knowledge and submersible pumps have made it achievable to frequently achieve high crop yields in areas where trust on rainfall only had before made booming agriculture un predictable

Water management decisions are often taken on the basis of average water productivity estimates. But rather than average water productivity, marginal productivity is more important to make water allocation choices. This is because there are certain optimum levels of crop consumptive use and fertilizer dosage, which yield highest water productivity and for the same irrigation system, crop water productivity can vary according to water application and fertilizer use. Hence, marginal productivity with respect to water and nutrient use is also important, even at the farm level.

But, in most situations in India, the farmers do not have much incentive to maximize the return from unit of water applied, and instead try to maximize yield. Often irrigation dosage corresponds to descending part of the marginal productivity curve, but ascending part of the yield curve. Hence, attempts to improve water productivity through water control would result in reduced marginal yield and income return per unit of land. India is home to many wild animals which is harmful for crop plants. The crop damage is largely happened by “Asiatic elephant, black buck, Bengal fox, bear, monkey, jackal, porcupine, rodents and birds.

The major animals caught up in crop damage were “elephant, gaur, sambar, wild boar, bonnet macaque, common langur, black napped hare and pea fowl.” Among these, “elephants and wild boar” gave maximum damage. The maximum crop damage (30%) was record from the forest ranges coming under the Northern Circle: “pineapple (47%), sweet potato (47%), tapioca (42%), beans (25%) and plantains (23%)” recorded maximum proportion of damage. In the concentrated learning area at Marayur, 28 types of crops were damaged and maximum damage was during in the summer months. At highest damage was done by “elephant (72%) followed by gaur (62%), sambar (17%)

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and wild boar (16%). The attack on the banana form by wild elephants shown in fig 1.1." [5]

Fig 1.1: Wild animal attack on a Banana form

Electric fences can be used to protect farmhouses, farmlands, forest bungalows, etc from animals. In a way, these replicate the job of a cowboy or forest guard

Agricultural community in India is conscious of losses caused by birds to different types of crops during weak stages and stored grains. No individual review of the problem has been made in the country. Only individual studies presents on the economic losses happen by the granivorous birds. 'Plant Protection Adviser' to the Government of India brings out first report on avian pest trouble in 1963. These birds do not spare orchard crops also like apple, grape and Pomegranate with damages at ripening stage going up to 20%. On the other hand, there are birds predating on insect pests and rodents and need to be encouraged and conserved. [14]"

II. OBJECTIVE

This project aims at designing an intelligent monitoring and controlling system for providing a novel protection strategy based microcontroller system, with four main functions.

1. Automatic water supply system
2. Theft detection
3. Protection form wild animals and birds
4. Remote- monitoring

III.SCOPE OF STUDY

1. Designing the monitoring and controlling circuit for automatic irrigation.
2. To provide protection against human, animals, birds and also design a circuit for irrigation field security.
3. Above circuits are interfaced with microcontroller and programming using Embedded C.
4. GSM will send alert message to the assigned mobile number

IV.LITERATURE SURVEY

Monitoring and Management of Agricultural Environment Using Sensors and GSM Alljan Mary George, M.Sindhubala, Jenifer Emely Thilakavathi.International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181,Vol. 2 Issue 6, June – 2013 In this paper the authors discussed on the save the water by using sensor technology. The wireless sensors are placed in the field to monitor the crop field area without human interaction. In this paper the authors sense the temperature and pH values of the field and water level in the well and field using temperature, pH, floating ball type and level sensors respectively. The analog value from the sensors is converted to digital format by the ADC. The micro controller gets the output from the ADC. Sensor Technology and Its use in Drip Irrigation Management Sukhjit Singh, Neha Sharma

International Journal of Engineering Research & Technology (IJERT) Vol. 1 Issue 5, July–2012 ISSN: 2278-018 In this paper the authors has presented the improving Packet Delivery Ratio, Packet Lost Ratio of information gathered from the agriculture field for Precision Agriculture Comparative Analysis of RFID and Wireless Home/Office Automation Manasee Patil, S.R.N. Reddy International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-3, Issue-3, July 2013

In this paper authors has discussed the home/office automation process. Wireless sensors are used to automate the home/office. Different kinds of sensors are used to automate the process. RFID technology is used to door opening and closing. The GSM technology is used to get feedback.

V. IRRIGATION AND SECURITY SYSTEMS

This chapter gives the overview view of the complete systems and block diagram description and brief introduction of the components used and their working principal

A) System Overview

The proposed system structure offers the automatic irrigation and security mechanism with IR sensors, the structured diagram of the complete system is as shown in Fig. (a) and Fig (b) in which the proposed system is divided into three major parts, which are

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automatic irrigation, birds and animals detection mechanism and theft detection mechanism.

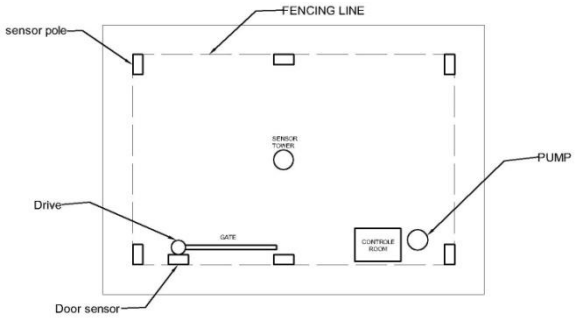


Fig (a): System Overview (top view)

At present, irrigation system has the GSM based feedback system, which means we can get only the present condition of the irrigation field, but in this system we can't manipulate the any process in the system. It is completely controlled by the sensor feedback. The animals and theft control system is done by the solar or electrical fencing. Due to this system the deaths of the animals and human is increased, and the final application of the proposed system is the bird detection system.

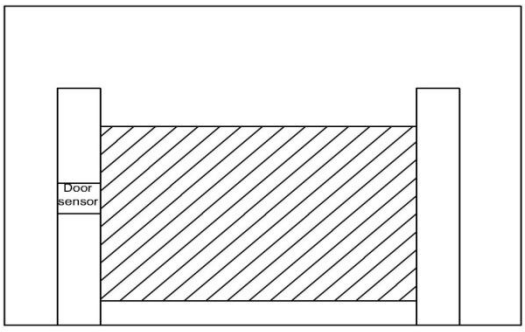


Fig (b): System Overview (Front view)

In the proposed system the irrigation system it contains two modes which are manual mode and automatic mode. If the system is in automatic mode the entire water supply system is controlled by the sensors which are placed on the irrigation field in the different places. The field is dry or water is not in the required level the sensor will get activated and the pump will get on with the help of microcontroller. If the system is in the manual mode the former itself control the water supply system with the help of the SMS. Whenever water is required in the field former send SMS as "Motor ON" to the GSM module. This message is decoded by the microcontroller and pump gets on. After the sufficient water supply to the irrigation filed the pump off is done by sending another SMS as "Motor OFF" to the GSM module.

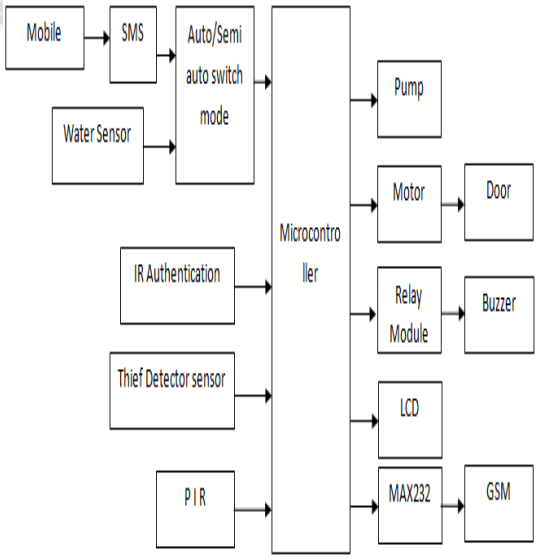
In the security system instead of electrical fencing sensors is placed. Between the each fencing pole a sensor is placed. Whenever signal brake between the poles due to any reason the former will get intimated through SMS. In the case of birds passing over the irrigation field PIR sensor will get activated and as soon it will find interruption in the field it sends a signal to the microcontroller and it will blow the siren as alert.

VI.IRRIGATION AND SECURITY SYSTEMS

The block diagram gives the schematic representation of the overall system and the connection between the components. The block diagram includes all the major components used in the system and shows the connectivity between those components. Fig shows the block diagram of automatic irrigation and security system for the irrigation field. It includes microcontroller, water sensor, IR Sensor, motor, pump, buzzer, PIR, LCD, GSM module and relays.

VII.BLOCK DIAGRAM DESCRIPTION

This section gives the brief description of each component used in designing the automatic irrigation and security system for the irrigation field system and the role of each component in the system



Fig(a): Block diagram of automatic irrigation and security system for the irrigation field.

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A) Power Supply

Power supply system converts a 230V AC mains supply into a regulated 5V DC supply. A transformer to step down high voltage AC to low voltage AC, Rectifier to convert AC to DC, filter to smooth the DC from varying greatly to a small ripple, and Regulator to eliminate ripples to set fixed voltage DC

B) Microcontroller

The main heart of the project is the microcontroller W78E052D which has unique features to transmit, receive, control, and display the data. The main processing is done in the controller which handles all the necessary data.

C) Water Sensor

Water sensor is used to identify the water level in the field and will send the presence of water to the microcontroller. In case of level of water is low the microcontroller turn on the pump, also send SMS to the former assigned mobile number.

D) IR Transmitter & Receiver

IR transmitter will be located & right opposite to the IR receiver, an IR receiver will be kept and transmit high signal all the time to the microcontroller. In the case of disturbance in the signal the microcontroller send SMS to the former assigned mobile number.

E) LCD

The most common type of LCD controller provides a relatively simple interface between a processor and an LCD.LCD is available in single line display, Two-line display, and four line display. Every line has 16 characters. A two line sixteen characters (2X16) display is used in this system. In this system is used to display various alert messages, measured temperature and status of GSM

H) PIR Sensor

Theelementoutputishighwhenevertheremovementdetected.Ifthemotionisuninterrupted,theoutputremainshigh .Aftermotionstops,theoutputremainshighforafewseconds. This is connected to the microprocessor. Whenever the sensor signal is high the buzzer is blows the sound up to several minutes.

I) GSM

The device sends an SMS to the assigned mobile number about the various conditions on the irrigation field.

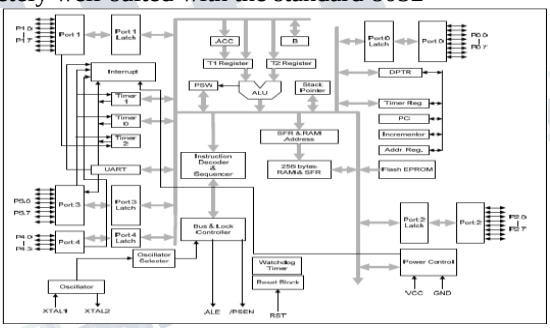
VIII.HARDWARE AND SOFTWARE IMPLEMENTATION

A)Microcontroller

A Microcontroller is a well incorporated chip that contains a CPU, Scratchpad, RAM, Special and general purpose register arrays,

A) W78E052D MICROCONTROLLER

W78E052D is an 8-bit microcontroller which can provide a huge frequency range with very less power utilization. The instruction set for the W78E052D series is completely well-suited with the standard 8052



Fig,b: Block Diagram of W78E052D

IX, CONCEPT AND OPERATION

In the auto mode the water sensors sense the presence of water in the field or not, this message will send to the microcontroller. IR sensors will protect the border of the farm and PIR sensors protect the farm by the wild birds and animals. These sensors are connected to the microcontroller. As per the feedback from the sensor the microcontroller will decide the action to be performed. The buzzer is placed in the system to alert the user and also divert the birds and animals from the field. GSM module will sent the alert message about the motor ON or OFF of the pump, security alert from the North, South, East and West side of the fencing line to the assigned mobile number.

A) LCD Interfacing

The LCD module used is a dot matrix Liquid Crystal Display controller and displays alphanumeric characters. It is a 16x2 display and is interfaced parallel

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with the microcontroller

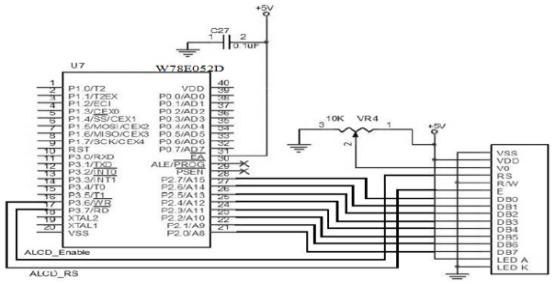
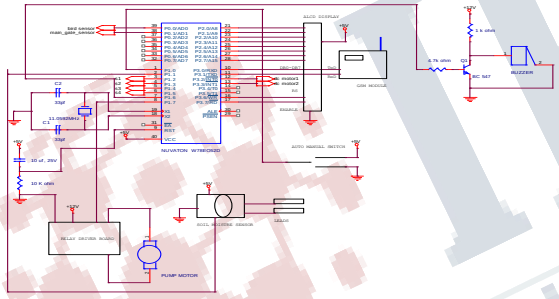


Fig a: LCD Interfacing

B. Water,Sensor,Pump,Relay,Mechanicalswitch,And, Gsm,Interfacing,With Microcontroller

To control the different mode in the system is done by the mechanical switch. This is connected to microcontroller port 1 pin 1.0. The water sensor is chucking the humidity content in the irrigation field. The output the sensor is connected to the microcontroller port1 pin 1.1. The power supply is connected from the power supply terminals. The pump and the motor are connected to the relay driver board. The relay is connected t the



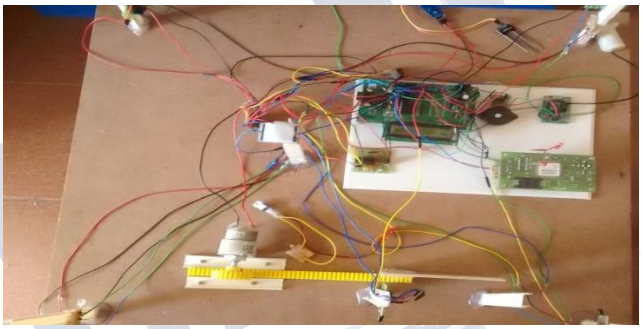
fig,b:Water sensor, pump, relay, mechanical switch and GSM interfacing with microcontroller

C) IR Sensor, Pir Sensor, Gsm, Dc Motor,Andbuzzerinterfacingwith Microcontroller

Four IR sensors placed in the boundary of the system. The input of the sensors is connected to the 5v of the power supply module and the ground. The output of the sensors is connected to the microcontroller port 1 pin 1.2, pin1.3, pin1.4, pin1.5. Another IR sensor is placed in the former identification system i.e. in front of the gate. This sensor input is connected to the 5v of the power supply module and the ground. The output of the sensors is connected to the microcontroller port0 pin 0.1. The input of the PIR sensor is connected by 5v of power supply module and the ground

X. TESTING AND RESULT

The system is designed and the circuit is connected as explained above. After the completion of the design and development the system has to be tested for its exactness. This section describes the testing of the Automatic Irrigation and security system for the irrigation field system prototype. The system is plugged to AC main supply and switched on. The supply to the power supply circuit is given using an adopter. When the system is switched on microcontroller and all the other hardware components are enabled. The testing is shown in fig (a)



Fig(a) : Testing of proposed model

A) Automatic Mode

The proposed system has two modes. The first one is auto mode. A switch is provided for converting into either one mode. In automatic mode the sensors control the entire process. The working principles of the sensors are explained in the previous chapter.

B) Testing For Water Supply System

The system is controlled by sensors. The water sensor is placed in the dry area. When the system is switched on the sensor detect the dryness in the field. The output of the sensor is connected the microcontroller. The results are observed.

C) Testing For Theft Detection Process

In this process four IR sensors are placed around the prototype. When the system is switched on the sensors begin to emit the radiation by emitter and radiation received by the receiver. The output of the each sensor is connected to the microcontroller. Distraction of radiation is done by manually to each sensor independently. The results are observed.

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D) Testing For Bird Detection Process

In this process a PIR sensor is placed in the center of the prototype. When the system is switched on the sensor begin to emit the radiation. A manual obstacle is generated and the results are observed.

E)Testing For Farmer Identification

In this system an emitter of IR sensor is placed in front of the gate. The receiver part is kept separately. Different power supply source provided for the both sensor part. The receiver is placed in front of the emitter part of the sensor and the results are observed.

F) Manual Mode

In this mode the user is control the entire process. In this mode all sensor are get turned off.

G) Testing For Water Supply System

From the operator mobile a massage is sent to the GSM module. The message is "M1" for the GSM module. This message is decoded by microprocessor and corresponding action is taken and the results are observed.

A message from the user mobile is send to the GSM module as" M0". This message is decoded by microprocessor and corresponding action taken and the results are observed.

RESULTS

The test conducted to check water supply system. When the system is working under normal working condition the water sensor is in the on condition. Due to the atmospheric variation in the field get dry. In the prototype the water sensor is placed in the dry area. Sensor detects the dryness in the field.

Results of the test conducted to check theft detection process. The working of IR sensors, circuit connection and the position of the sensors is discussed in the previous chapters. After complete implementation the sensors get turn ON

Results of the test conducted to check theft detection process. The working of IR sensors, circuit connection and the position of the sensors is discussed in the previous chapters. After complete implementation the sensors get turn ON. Whenever a human or animal passes between the sensor

Results of the test conducted to check bird detection process After complete implementation the sensors get turn ON. Whenever a birds passes over the sensor the signal is interrupted

Results of the test conducted to check farmer identification system

Fig(a): result discussion

The door sensor emitter is placed in beside of the gate. The farmer has the receiving end of the sensor

CONCLUSION

Water is the one of the main requirement of the crops growth. Automation helps optimum utilization of water for irrigation. The present system provides an effective way of monitoring of crop field and provides remote access to field conditions. The sensor monitoring helps the farmer by reducing their main work of irrigation. By the sensor control results in uniform water supply to the entire system which reduces the excess usage water in the field.

Another main requirement of the farmers is security. IR technology provides an able solution to control remotely and provide security system for FARMER from wild animals and Birds in the irrigation field. The system involves remote controlling of Animals and Birds. The system has the low cost components and easily available, which cuts down the overall system cost. This system is always connected with farmer and they can know what happens in their crop field.

The farmer homes located far away from the irrigation land, which provides huge benefits to them by providing the remote control using GSM about any abnormal condition. The all above systems are simple and easily to handle. By implementing this system there will be an increase the productivity and profitability of the farmer.

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Advantages

1. Energy and water conservation
2. Protection against wild animals and birds
3. Unique identification system
4. Low cost

Disadvantages

1. IR sensors cannot work on high light
2. Complex design and wiring

Applications

1. This can be used in all kind of irrigation land.
2. This can be used in domestic buildings, apartments and industrial fencing lines.

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