IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 7.047 ⁜ Vol. 10, Issue 2, February 2022

DOI: 10.17148/IJIREEICE.2022.10232

Automatic Irrigation System used in Crop Rotation Control and Bird Predation

Pushpa Rani MK[1], Dr. D Vinod Kumar[2]

[1]Research Scholar, ECE, Vinayaka Mission's Kirupananda Variyar Engineering College, Salem, India

[2]Professor, ECE, Vinayaka Mission's Kirupananda Variyar Engineering College, Salem, India

Abstract: Water saving irrigation system is designed based on the microcontroller. With increasing freshwater demand, it is important to make optimal use of water resources with improved agricultural productivity through objective and accurate information provided by remote sensing. The soil moisture information is collected and data is transmitted to the microcontroller computer network. In this paper we have described an application of a moisture sensor network for low-cost microcontroller based irrigation solution and real time monitoring of moisture content of soil for the purpose of control of valves for irrigation. Also this system provides provisions for controlling the irrigation system for various crops used throughout the season such as Paddy, Sugarcane, Wheat, Millet (Ragi) etc. based on water requirement for each crop which is operated on crop rotation technique. This system is very intelligent to handle three to five crops at a time. The system gets many inputs from the field and there are set of electric valve which are controlled by the system, and the water level in the field can be maintained by this set of arrangements. Along with these the system includes Ultrasonic Bird Scare Devices; a non-lethal tool can be used by farmers to minimize bird predation on crops. These devices emit an ultrasonic noise that frightens birds away from the crop. Specific Irrigation management that allows producers to maximize their productivity while saving water and prevents bird predation on crops. The system can also runs through commands from the GSM module.

Keywords: GSM, Ultrasonic, NANK Soil Sensor

1. INTRODUCTION

The continuous increasing demand of the food requires the rapid improvement in food production technology. In a country like India, where the economy is mainly based on agriculture and the climatic conditions are isotropic, still we are not able to make full use of agricultural resources. The main reason is the lack of rains & scarcity of land reservoir water. The continuous extraction of water from earth is reducing the water level due to which lot of land is coming slowly in the zones of un-irrigated land. Another very important reason of this is due to unplanned use of water due to which a significant amount of water goes waste. In the modern drip irrigation systems, the most significant advantage is that water is supplied near the root zone of the plants drip by drip due to which a large quantity of water is saved. At the present era, the farmers have been using irrigation technique in India through the manual control in which the farmers irrigate the land at the regular intervals.

This process sometimes consumes more water or sometimes the water reaches late due to which the crops gets dried. Water deficiency can be detrimental to plants before visible wilting occurs. Slowed growth rate, lighter weight fruit follows slight water deficiency. This problem can be perfectly rectified if we use automatic microcontroller based drip irrigation system in which the irrigation will take place only when there will be intense requirement of water.

Irrigation system uses valves to turn irrigation ON and OFF. These valves may be easily automated by using controllers and solenoid valves. Automating farm or nursery irrigation allows farmers to apply the right amount of water at the right time, regardless of the availability of labour to turn valves on and off. In addition, farmers using automation equipment are able to reduce runoff from over watering saturated soils, avoid irrigating at the wrong time of day, which will improve crop performance by ensuring adequate water and nutrients when needed. Automatic Drip Irrigation is a valuable tool for accurate soil moisture control in highly specialized greenhouse vegetable production and it is a simple, precise method for irrigation. It also helps in time saving, removal of human error in adjusting available soil moisture levels and to maximize their net profits.

2. METHODOLOGY

Formerly the farmer will possess a farm on which he'll be growing crops, which will be provided with a water tank, motor to pump the water and irrigating lines to the field where the water has to be pumped and certain other basic requirements needed to grow crops as shown in figure 1.

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526
International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering
Impact Factor 7.047 ⁜ Vol. 10, Issue 2, February 2022
DOI: 10.17148/IJIREEICE.2022.10232

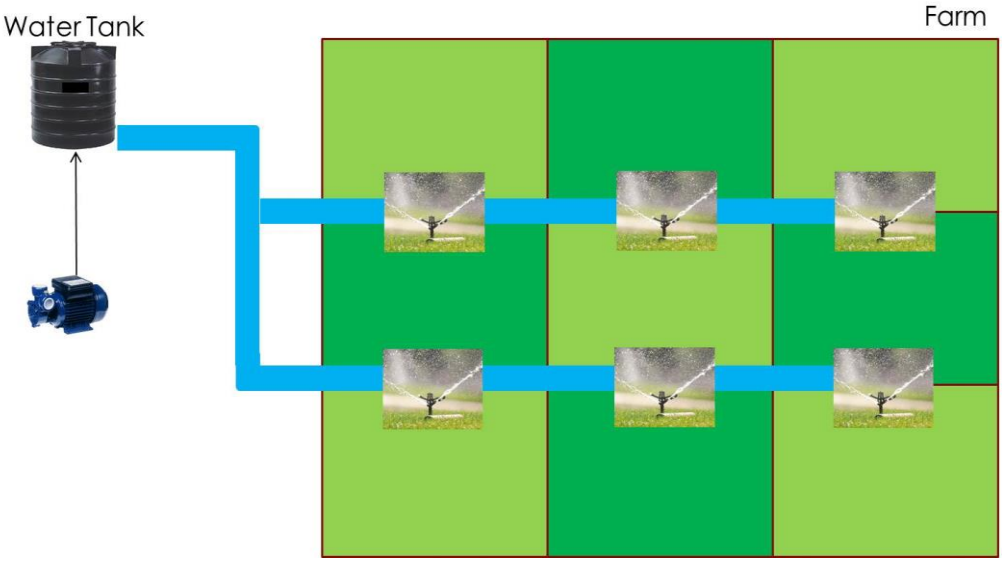

Figure 1. Present System which farmer possess

What we will be adding to this system is, we'll be placing certain amount of Soil Moisture Sensors in the field, which will record the real time soil moisture content and will be passing this information to the microcontroller, where the microcontroller will compare the value from the field and the predefined value for a particular crop that is programmed in the microcontroller and accordingly turn ON and turn OFF the electric valve. Along with this arrangement there are two level sensors placed at the top and bottom of the overhead tank so that in case the water level in the tank crosses these two thresholds above and below these levels respectively then an interrupt will be generated to turn OFF and turn ON the electric valve as shown in figure 2.

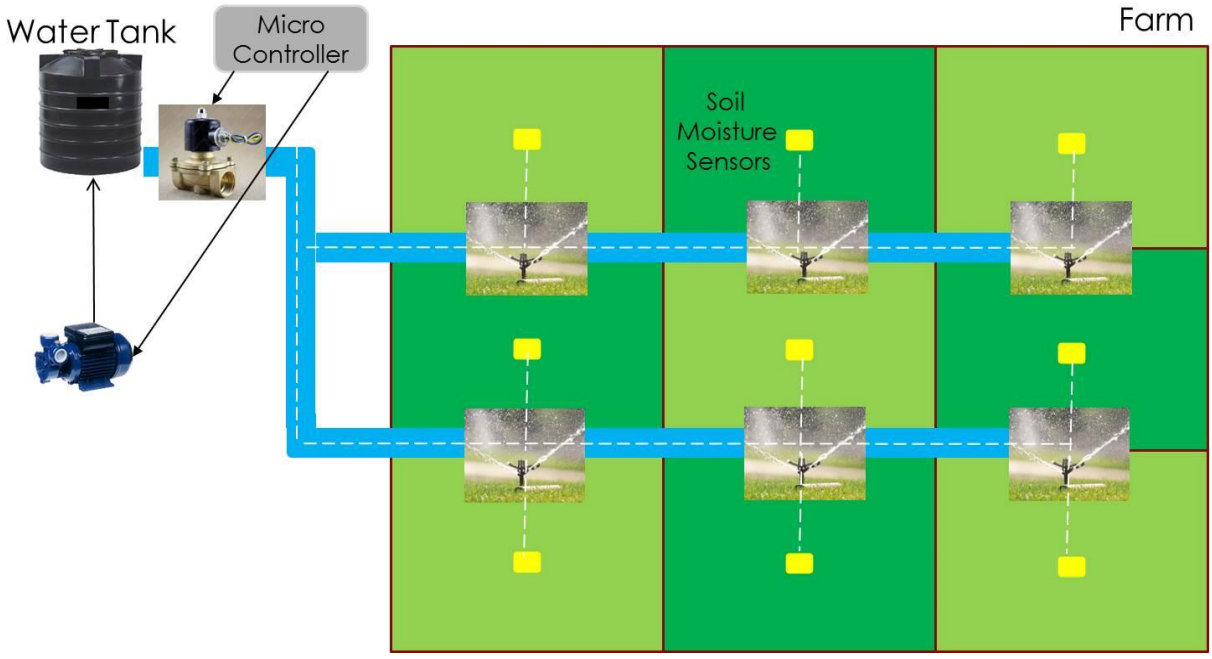

Figure 2. Implementation of the soil sensors and programming of electric valve and level sensors

The system is basically designed for agriculture & is very much useful in saving water & avoiding the predation of birds. The main part of the system is the microcontroller. It runs on a 12V power supply. The microcontroller can be driven by a well-designed solar power circuit.

There will be soil moisture control sensor in the field which senses the moisture level of the soil & passes its output to one of the port of the microcontroller. The microcontroller compares the input with the pre-set value provided by the user through crop rotation control input. If the value being compared is more than the threshold then the pump will be switched

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526
International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering
Impact Factor 7.047 ⁜ Vol. 10, Issue 2, February 2022
DOI: 10.17148/IJIREEICE.2022.10232

off, till then the water will be supplied constantly. Also similar procedure takes place when the value recorded goes below the threshold, the motor turns on and the water is supplied to the farms. The system also has the water tank to supply water to the field through the sprinkler. We adapt liquid sensor to avoid lacking of water in the tank, which is given as an interrupt to the micro controller.

The system also has a bird & animal repellent system which uses controlled ultrasonic sound as a weapon against the birds & animals so that it doesn't harm them. This arrangement is controlled by

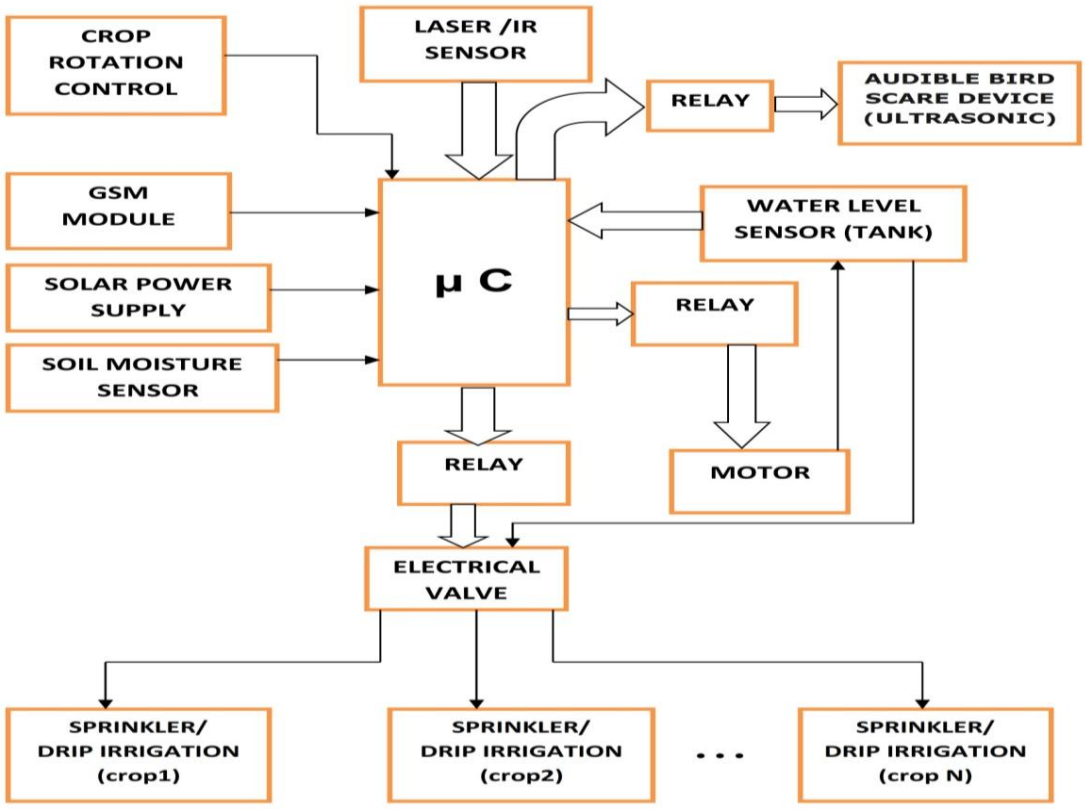

Figure 3. Functional block

a laser detection system which will generate an interrupt to the microcontroller if anyone enters the farm. This system allows crop rotation on a particular field as well as it can provide irrigation control for many crops on a single field.

3. RESULTS AND DISCUSSION

In order to achieve these goals the following steps are followed,

- We have done the list of different crops we are concentrating and the water requirement for the same.
- Theoretical frequencies of sound the birds and animals get irritated.
- The soil moisture sensors are readily available in the market, but they are expensive. We require few numbers of sensors to be installed in field, and the system should be affordable.
- Keeping this problem as an objective we have designed our own soil moisture sensor which could meet our requirement.
- The microcontroller is loaded with the program which could monitor the water level in tank, moisture content in the field soil and also to prevent animal predation.
- The GSM system can keep track of the system, like water consumption per sprinkler, the pH level of the soil and other system logs.
- The farmer will be given a system which gets the status of the system. If the farmer is unaware of the status then he can forward those to KISAN 24X7 help Centre and get help from them.
- If it is found that there is some fault in the automatic system, the system sends an error message to the farmer, and farmer can switch the system off from anywhere in the world in order to avoid the damage.

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 7.047 ⁜ Vol. 10, Issue 2, February 2022

DOI: 10.17148/IJIREEICE.2022.10232

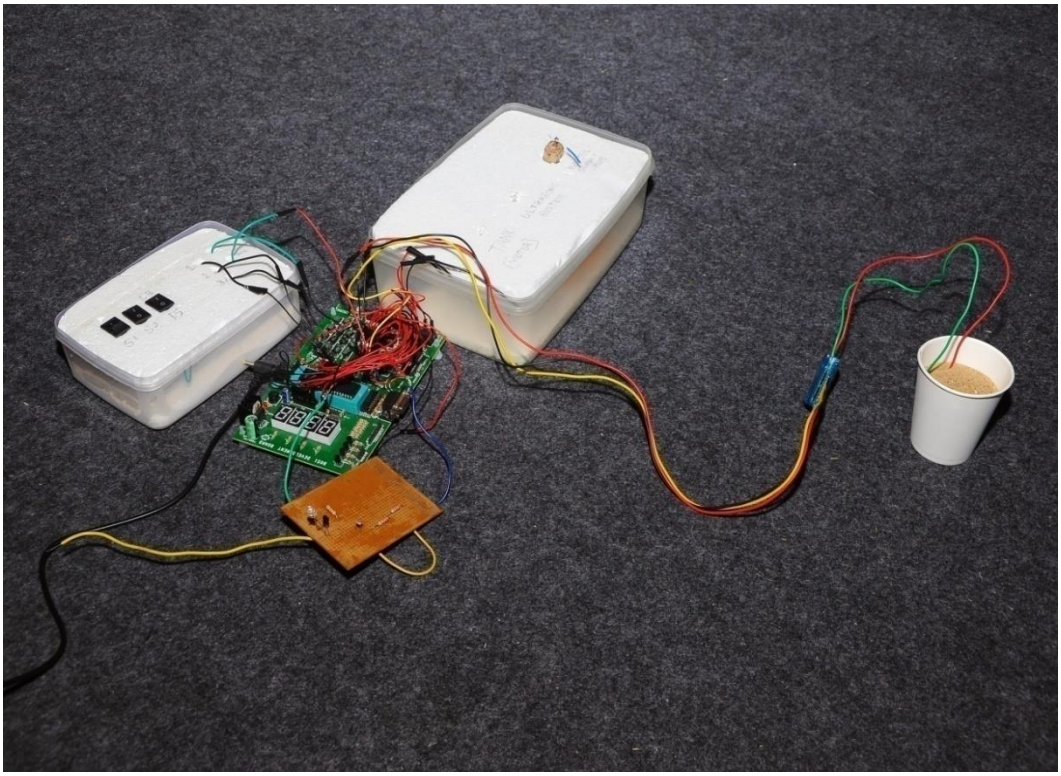

Figure 4. Prototype of the system

Table 1. Sensor Calibration

Soil Moisture Level in ml	Sensor 1 (Built sensor) Output (V)	ADC VALUE SENSOR1	Sensor 2 Output (V)	CROP ASSIGNED
0	2.77	01110111	2.5	
50	2.43	10000111	2.37	RAGI
100	2.26	10010011	2.29	WHEAT
150	2.13	10011011	2.18	PADDY
175	2.05	10011111	2.11	
200	1.98	10100111	2.05	

CONCLUSION

We can conclude that a system for automatic irrigation system along with the crop rotation control input as well as bird predation system is implemented successfully. The results have proven the system to be effective and efficient compared to the conventional automatic irrigation system. It addresses the limitation of currently existing automatic irrigation systems such as inconsistent watering needs and also animal and bird predation. A study on different crops and the water requirement is done and the microcontroller is programmed accordingly.

REFERENCES

1. "Automatic Irrigation Based on Soil Moisture for Vegetable Crops", Presented at University of Florida, Rafael Muñoz-Carpena and Michael D. Dukes.
2. Shock, C.C.; Feibert, E.B.G.; Saunders, L.D.; Eldredge, E.P. 2002. "Automation of subsurface dripirrigation for crop research."In Proceedings of the World Congress of Computers in Agriculture and Natural Resources, F.S. Zazueta and J. Xin eds.13-15 March 2002, Iguacu Falls, Brazil., 809-816.

DOI: 10.17148/IJIREEICE.2022.10232

3. "Microcontroller Based Drip Irrigation System" D.KotaiahSwamy, G.Rajesh, M.JayaKrishnaPooja, A.Rama Krishna, International Journal of Emerging Science and Engineering (IJESE) ISSN: 2319–6378, Volume-1, Issue-6, April 2013.
4. C. D. Perry, M. D. Dukes, and K. A. Harrison, "Effects of variable-rate sprinkler cycling on irrigation uniformity," presented at the ASAE/CSAE Annu. Int. Meeting, Ottawa, ON, Canada, Aug. 1-4, 2004, Paper No. 041117.
5. Iida, C. and C.C. Shock. 2007. "Make polyacrylamide work for you! Sustainable Agriculture Techniques."Oregon State University Extension Service EM 8958-E.
6. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay - "The 8051 Microcontroller and Embedded Systems Using Assembly and C", 2nd edition Pearson Education, Inc., 2006.
7. Sanjay Kumawat, Mayur Bhamare, Apurva Nagare, Ashwini Kapadnis. (2017). Sensor based automatic irrigation system and soil ph detection using image processing, International research journal of engineering and technology, Vol (4) [3673-3675].
8. Babanna, Kumbar, Basavaraj Galagi, Bheemashankar and Naveen Honnalli. (2016). Smart irrigation system using internet of things, Bonfring international journal of research and communication engineering, Vol (6), [4-9].
9. Azim khan Shubham Singh, Shiva Shukla, Atul Pandey. (2017). Automatic irrigation system using internet of things, International journal of advance research, ideas and innovations in technology, Vol (3) [526-529].
10. N Seenu Manju Mohan Jeevanath V S, Android Based Intelligent Irrigation System", In-ternational Journal of Pure and Applied Mathematics Volume 119 No. 7 2018, 67-71
11. Akshay Atole, Apurva Asmar, Amar Biradar, Nikhil Kothawade, Sambhaji Sarode Ra-jendra G. Khope Iot Based Smart Farming System" Journal of Emerging Technologies and Innovative Research (JETIR) April 2017, Volume 4, Issue 04.
12. Nikesh Gondchawar1, Prof. Dr. R. S. Kawitkar IoT based Smart Agriculture" Interna-tional Journal of Advanced Research in Computer and Communication Engineering IJARCCE Vol. 5, Issue 6, June 2016.
13. Drishti Kanjilal, Divyata Singh, Rakhi Reddy, and Prof Jimmy Mathew Smart Farm: Extending Automation to The Farm Level" International Journal Of Scienti c Technology Research Volume 3, Issue 7, July 2014.
14. Dr.N.Suma,2 Sandra Rhea Samson,3 S.Saranya, 4 G.Shanmugapriya,5 R. Subhashri IOT Based Smart Agriculture Monitoring System" International Journal on Recent and Innovation Trends in Computing and Communication IJRITCC February 2017 Volume: 5 Issue: 2 177 181, 177.
15. Vaishali S, Suraj S, Vignesh G, Dhivya S and Udhayakumar S Mobile Integrated Smart Irrigation Management and Monitoring System Using IOT" International Conference on Com-munication and Signal Processing, April 6-8, 2017, India.