International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 6 Issue 7, November-December 2022 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Automatic Irrigation System

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ABSTRACT

In this study, it is desired to prevent irrigation in agricultural and landscape areas and inefficient use of water due to incorrect irrigation systems. This project helps to manage water intelligently, increase irrigation efficiency, reduce costs and use water in the most convenient way. Irrigation systems in agricultural areas are also affected by developing technology. It is aimed to automate irrigation systems with Arduino Uno microcontroller in order to use water efficiently, reduce energy consumption, and increase efficiency in agriculture. Using the Arduino IDE program, the water consumption in the irrigation system will be adjusted. By adding a humidity sensor, irrigation will be carried out as much as the plants need, and unnecessary irrigation will be prevented in rainy weather thanks to the soil moisture information. Manpower will be minimized. Realizing the importance of the drip irrigation system in agriculture, automatic irrigation will be added to this system and irrigation will be made efficient.

KEYWORDS: *Arduino, Sensor, Automatic Irrigation*

How to cite this paper: Abdülkadir Çakir "Automatic Irrigation System" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-6 | Issue-7, December 2022, pp.842-845, URL: www.ijtsrd.com/papers/ijtsrd52408.pdf

IJTSRD52408

1. INTRODUCTION

Water is one of the most important resources for the continuation of life. Plants, like humans and all living things, need water. Water makes up more than 80% of plants. In order for the plants to develop in the most favorable way, water should be given in the amount and time they need. In regions with arid and semi-arid climates, the plants need irrigation water because the rainfall is less. Since our country has an arid, semi-arid climate, irrigation is needed in agriculture (Öztürk, 2006).

The most important purpose of irrigation policies is to increase productivity in agriculture. Accordingly, it is necessary to irrigate all of the areas to be irrigated or to use water effectively. Approximately 70% of the water in our country is used for agricultural purposes. In the coming years, the importance of water management has increased due to the increasing need for water in the industry and service sector. With the realization of the importance of water, methods have begun to be sought for the effective use of water. Efficient irrigation methods have been sought and studies have started in the field of irrigation systems (Turan & Bayraktar, 2020).

There is a lot of water loss in agricultural lands due to the lack of irrigation systems or the wrong choice of irrigation systems. One of the reasons for the excessive use of water is the high water losses in the networks. Due to the distribution losses from the water source to the plant, the amount of water used; more than the plant needs. The ratio of the amount of water distributed to the amount of water needed by the plant is greater than 1. Water is given twice or 3 times the need. The main reason for this is the loss of water on both the network and the field. 2 m3 of water is used to give the plant 1 m3 of water it needs. Irrigation methods; It is divided into two as traditional irrigation methods and modern irrigation methods. Traditional irrigation methods completely include methods used in agricultural irrigation. Among the modern irrigation methods, there are methods used in agriculture, sapling and landscaping. Automatic irrigation systems have become widespread in modern irrigation systems (Kibaroğlu, 2022).

Automatic irrigation systems began to develop after the 1980s. Building gardens, parks, roadsides, etc. As automatic irrigation becomes widespread in irrigation operations in landscape areas, nurseries, greenhouses,

poplar plantations, etc. Semi and fully automatic irrigation systems have started to be used in agricultural areas (Öztürk, 2006).

Automation and control systems that facilitate human life and provide ease of use are becoming widespread today. The amount of irrigation needed by plants is affected by wind, temperature and rain. If these parameters affecting the irrigation process are monitored and controlled, water resources can be used efficiently. As water resources decrease and become polluted, the need for more efficient and less water irrigation systems will increase. In addition, the increase in the production of sensors that detect moisture in the soil makes the commercial presentation of automatic irrigation systems widespread (Çakır & Çalış, 2009).

What is necessary for a correct and appropriate design in irrigation systems;

- How much and when water is needed
- Operating status of the system in weather conditions
- The amount of water that can flow per unit time
- Working condition at suitable depth
- How high the water to be pumped can go
- Troubleshoot water quality issues
- How much storage can be done, the arrangement of the tanks

In this study, it is desired to prevent irrigation in agricultural and landscape areas and inefficient use of water due to incorrect irrigation systems. This project helps to manage water intelligently, increase irrigation efficiency, reduce costs and use water in the most convenient way. Irrigation systems in agricultural areas are also affected by developing technology. It is aimed to automate irrigation systems with Arduino Uno microcontroller in order to use water efficiently, reduce energy consumption, and increase efficiency in agriculture. Using the Arduino IDE program, the water consumption in the irrigation system will be adjusted.

By adding a humidity sensor, irrigation will be carried out as much as the plants need, and unnecessary irrigation will be prevented in rainy weather thanks to the soil moisture information. By using the timer, irrigation will be carried out without the need for human beings at the irrigation time. Manpower will be minimized. Realizing the importance of the drip irrigation system in agriculture, automatic irrigation will be added to this system and irrigation will be made efficient. The drip irrigation system is shown in Figure 1.

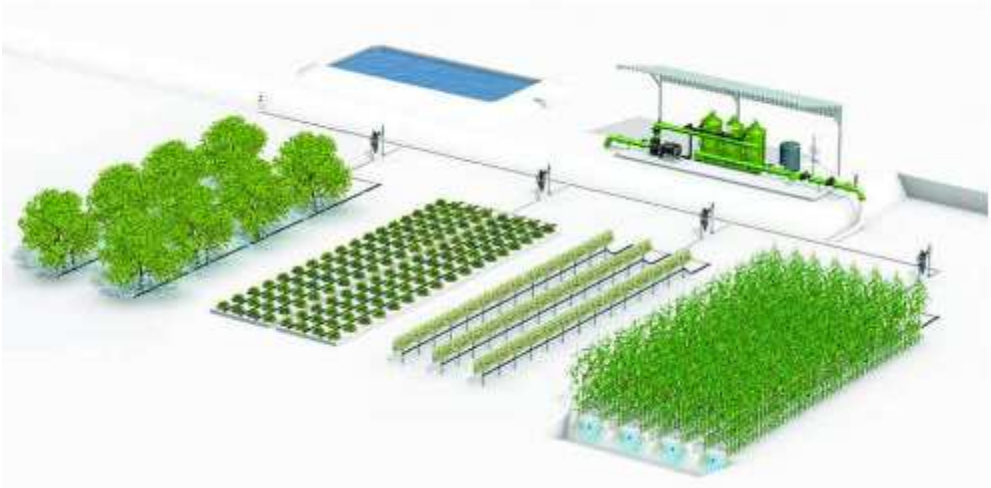

Figure 1. Drip irrigation system

2. RELATED WORK

In automatic irrigation systems, studies have been going on for years in order to ensure the efficient use of water. With the developing technology, these problems have been tried to be prevented in the name of automatic irrigation systems, due to the excessive use of water in the field of agriculture, the need for manpower in the early hours of irrigation, and the use of more water than the plant needs. With the widespread use of microcontrollers and the widespread use of controllers in our lives, irrigation processes have also been affected by these developments. With the supply of energy from photovoltaic systems, these systems have started to be used in automatic irrigation systems (Çakır & Çalış, 2009).

Öter and Bahar (2018), Environmental and climatic conditions such as water level in the water tank and soil moisture variability according to air temperature were controlled according to the product controlled using programmable controllers. An easy-to-use, reliable and traceable irrigation system has been designed with a programmable controller. The aim of this study is to save money and help them develop more powerful, flexible and efficient applications.

Taştan (2019), carried out the study of Internet of Things (IoT) based smart irrigation systems in order to control water use, reduce energy consumption and increase quality in agriculture. The implemented android-based user interface provides the analysis of data such as sensor data, irrigation time, electricity and water consumption, and displaying data such as ideal irrigation and irrigation time. It is used to determine the analysis of the sensor data that can be saved on the cloud system. In addition to the remote control facility, it provides electricity and water savings.

3. AUTOMATIC IRRIGATION SYSTEM

It is seen that the use of water increases linearly with the increase in the world population and the increase in the need for agricultural areas. The decrease in rain rates also increases the use of water. Inefficient use of water and excessive use of water when irrigation operations are carried out in agricultural areas and landscape areas; causes a decrease in water resources. Thanks to the improvements to be made in the irrigation systems, efficient use of water will be ensured. In recent years, developments in energy efficiency and remote control in irrigation areas have been increasing.

People need to spare time for irrigation in agricultural areas. Irrigation is most productive in the early morning hours. As a result, both manpower and excess water are used for the realization of the irrigation process. To prevent this, automatic irrigation systems are used.

In line with my research, I saw that irrigation systems were designed with a microprocessor. As a result of my research, the irrigation process will be carried out using the Arduino Uno microprocessor card.

3.1. Programming the Arduino

An irrigation system program was written using the Arduino IDE program.

Arduino UNO microprocessor will control the irrigation process according to the incoming information. Plant information, humidity information, and the start and end of irrigation can be observed on the LCD shield keypad while the device is operating.

In the initial state, irrigation will be performed according to the humidity information. If the value from the humidity sensor is below the determined value, the mosfet card we connected to the Arduino output will be output and the water will run the motor. The irrigation process will begin. "Irrigation" information will be observed on the screen. When the specified humidity value is achieved, the engine will stop and the irrigation process will end.

When the SELECT button of the LCD shield keypad is pressed, the humidity values of plant 1 and plant 2 will be seen. When humidity values are assigned to plant 1 and plant 2, they will appear as assigned on the screen. The system will stop when the entered humidity value is provided. Humidity values and irrigation information will be observed on the screen. The flow diagram of the implemented system is as in Figure 2. The circuit diagram of the system is as in Figure 3.

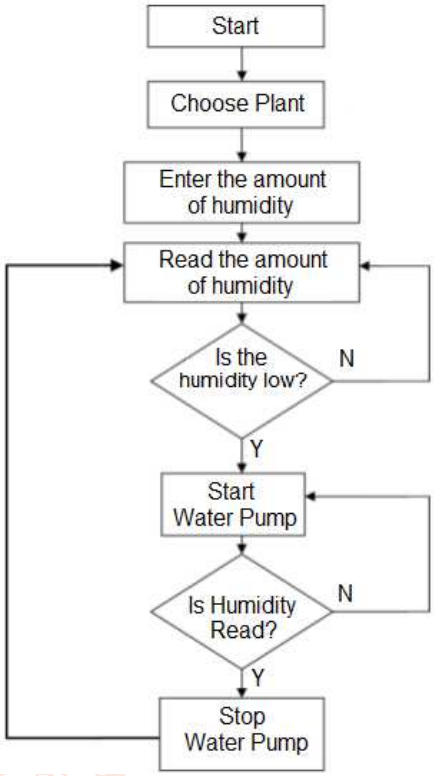

Figure 2. Flow chart of the system

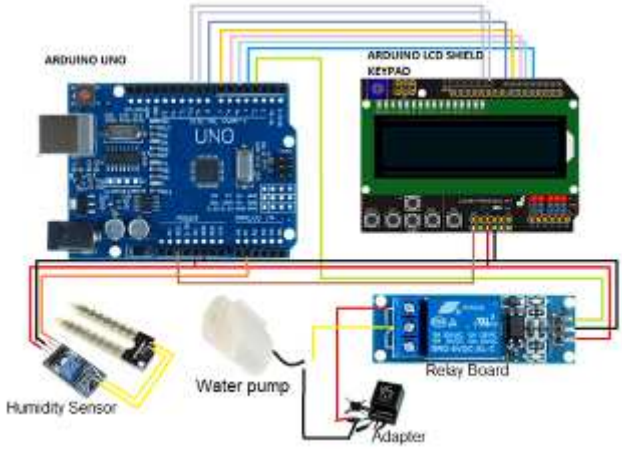

Figure 3 Circuit diagram of the system

4. CONCLUSIONS

The system realized in this study aims to be easy to use, save time and water, and minimize manpower.

It will send the information received from the humidity sensors to the Arduino, watering according to the humidity needed by the plant, and shutting down the system when the humidity value is reached.

The priority in the system is to reduce the use of water, the purpose of irrigation according to the humidity information. By assigning a humidity value to the system, excessive irrigation and time loss are prevented.

Additional water level sensor and other sensors can be added to the application. Thanks to the irrigation system; Irrigation can be performed on various plants. The general view of the implemented system is as in Figure 4.

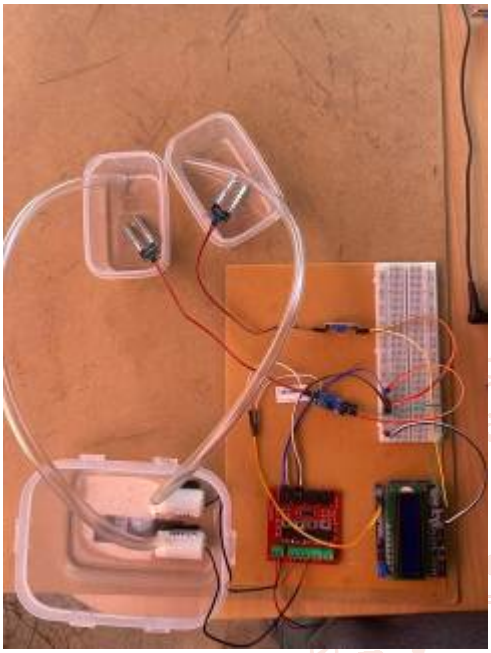

Figure 4 General view of the system

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