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Control and Analysis of Drip irrigation system

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Abstract: In this paper we have design a drip irrigation system that is controlled by Arduino UNO and we also calculate and simulate the pressure drop in pipelines of the drip irrigation system by using Matlab. In last we compare our actual readings that are taken from drip irrigation system and theoretical readings that are taken from conventional method of irrigation .The controlled drip irrigation method is a new method in which water is delivered near to the root zone of plants drop by drop. In this method water drips slowly to the roots of the plants either onto the soil surface or directly onto the root zone through a network of valves, pipes, tubing and.

The results reveals that the controlled drip irrigation system is most efficient, accurate and water saving as compare to the conventional method of irrigation

Keywords: Arduino UNO, Controlled drip irrigation, Matlab, Drippers, Moisture sensor.

I. INTRODUCTION

Generally most of the irrigation systems are manually operated one. These traditional techniques are being is replaced with semi-automated and automated techniques suggested an automated concept of irrigation to use water efficiently and effectively. Now-a-days Pakistan has experiencing a huge wastage of water especially here in Nasarpur. The old methods of irrigation are still being used by the farmer in which the wastage of water is about 50% to 60% of water. In many parts of the world, a new system of irrigation has been introduced called drip irrigation system. In this system waterfalls drop by drop at the position of roots. Water is delivered at or near the root zone of plants, drop by drop. This method can be the most water-efficient method of irrigation. Basically in the drip irrigation system, the humidity, moisture and temperature of plants are monitored and controlled by sensors . The large quantity of fresh water is utilized by the agricultural industry for irrigation purpose. By help of controlled drip irrigation system the water utilization will be minimized. This can done by the help of water maintained at the constant level. In drip irrigation system the water will transfer through proper pipe line, operated by pump and water will be taken from the water tank.

In our paper we design a controlled drip irrigation system for the field placed in Nasarpur city. The aim of this paper is to design an automatic drip irrigation system for the field at Nasarpur then analysis the working of automated drip irrigation system using Arduino. Then we calculate the pressure drops in pipelines using Matlab. In last we have to compare the values of water consumption taking by our controlled drip irrigation system and convention drip irrigation system. Remaining of the paper is organized as follows. Section II, presents related work, Section III, proposed the system development of the project. Section IV proposes Mathematical Analysis. Section V presents the Results and paper is concluded in section VI.

II. LITERATURE REVIEW

Tupe Alok R. [1] says that the intelligent drip irrigation system is remote monitoring as well as controlling. An android mobile sends commands to computer to control drip irrigation system, here different sensors like humidity, temperature, light, and soil-moisture will be use for detection purpose. These sensors send the real time values to micro-controller and micro-controller send these values to computer via serial communication. According to the sensor values graph will show on computer or mobile and by using this graph user can switch on or off drip device. By this system farmer can easily control the drip device form anywhere at any time. According to M. Lincy Luciana [2] the moisture and temperature are used to measure soil condition and weather conditions of agricultural field. The sensor sensed moisture and temperature from the field to the micro-controller and these values are compared with predefined values. The required amount of water is supplied to field on the basis on these values The sensed temperature and moisture values will be displayed on liquid crystal display. The study shows that this automated drip irrigation system can be used for different season conditions and more parameters such as plant growth rate, weather conditions can be taken into account to determine the water requirement for crops.

Anket.H Hade [3] says that in remotely monitored embedded system for irrigation purposes have become a new essential for farmer to accumulate his energy, time and money and will take place only when there will be requirement of water. In this approach, the soil test for chemical constituents, water content, and salinity and fertilizer requirement data collected by wireless sensor and

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processed for better drip irrigation Plan. This proposes an automated monitoring and controlling system model by using Wireless Sensor Network (WSN) which helps the farmer to improve the irrigation.

Dursun [4]85% of the freshwater is used in the agricultural industry for the cultivation of the crops, food and plants. Due to rapid increase in the population growth and food demand this level of freshwater will increase worldwide. Automation technology and its apparatus have provided the optimal usage of water resources. Many problems are faced in the traditional system of irrigation. Best way to control this irrigation problem is provide sensor network for low cost controlled irrigation and real time monitoring of water content in soil. Apparao, C [5] stated in his paper that as compare to manual system, automated drip irrigation can save water, money and time as well as can increase crop profit. Many automated drip irrigation system are available but they are costly. The main purpose of this study is to design low cost automated irrigation system. A simple device functioning under the soil which can assist electronic circuit board to either switch off or switch on the motor as per the required moisture has been developed. Kulkarni, A.[6] States that In the automated drip system, the water is supplied near the root zone of the plants drop by drop. To develop, pilot and promote the use of web-based application tools along with software apps for mobile devices. So that we can have, automatic remote irrigation systems which will help farmers to raise crops with proper knowledge about it and by saving large amount of water. The modern sensor technology is used to get the real time environment values like temperature, moisture and humidity for the particular soil. The system will automatically flow the water to field based on these environment values. Paramewaran [7] states in his paper that the Drip irrigation system helps the farmers to irrigate the farmland in an efficient manner with automated irrigation system based on soil humidity. Humidity sensor is used to find the soil humidity and based on this microcontroller drives the solenoid valve. Irrigation status is updated to the server or local host using personal computer. Java platform is used here for getting information via serial communication from microcontroller and to update in the server.

III. SYSTEM DEVELOPMENT

The system is developed for controlled drip irrigation system is on two ways.

A. System Hardware

The Hardware design layout of the drip irrigation and manual irrigation system for crops consist of the arrangement of the components of the system as shown in fig.1

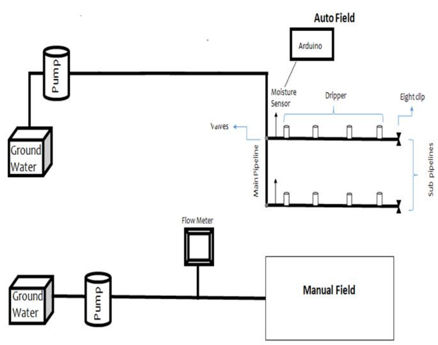

Fig.1 Block Diagram of controlled drip irrigation system

To select the location of the water tank near field and capacity of the water tank according to the need of the crops per day.

To choose the best nearest path between the water tank and the crops to lay down the tubing system in the field. To select the water pump size according to the discharge quantity of the water required for the crops.

To select the location of the moisture level of crops.

1) *A.1 Sensor:* We use in this project the soil moisture sensor YL-69. This is an Electrical resistance sensor. The sensor is made up of two electrodes. This soil moisture sensor reads the moisture content around it .A current is passed across the electrodes through the soil and the resistance to the current in the soil determines the soil moisture. If the soil has more water resistance will be low and thus more current will pass through. On the other hand when the soil moisture is low the sensor module outputs a high level of resistance. This sensor has both digital and analogue outputs. This sensor comes with a small PCB board fitted with LM393 comparator chip and a digital potentiometer.

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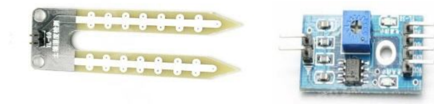


Fig.2 Moisture sensor YL-69

2) *A.2 Arduino UNO:* Arduino is an open-source electronics design platform. The Arduino board is specially designed for programming and prototyping with Atmel micro controllers. An Arduino interacts with physical world via sensors. Using Arduino, electronic equipments can be designed to respond to change in physical elements like temperature, reading a humidity sensor and turning on and off .In our project we used Arduino for taking values from sensor and then read in our computer screen.

B. System Software

The system software we are using in this paper for reading data from Moisture sensor and then we are using Matlab software for calculation of pressure drop in each pipe line of the drip irrigation of the system.

For connection of Moisture sensor to Arduino First connect vcc wire of sensor to the vcc port of the Arduino, then connect ground to the GRD, and pin 3 connect to the pin three port of Arduino. The Arduino is an open source system it allows us to one to write code and then load it to Arduino board's memory. We connect our soil moisture sensor to the Arduino board and then load the program in laptop then write Analog read to the command window, click examples then go in basics and then click analog serial and select com8 port and dip moisture sensor in the field then run program so it will show you the water consumption values.

IV. MATLAB SIMULATION

We have design a sub-system for the Simulation of Drip irrigation system.

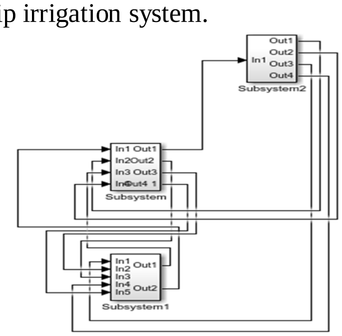


Fig.2 Block-scheme of the Model by Program Simulink Matlab

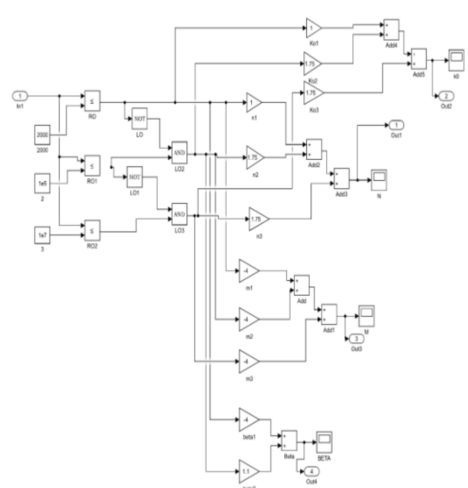


Fig.3 Block-scheme for solving sub-system 1

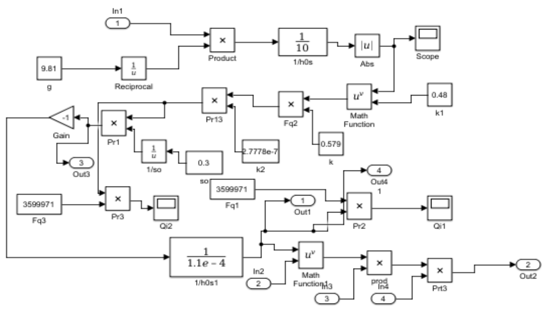


Fig.4 Block-scheme for solving sub-system 2

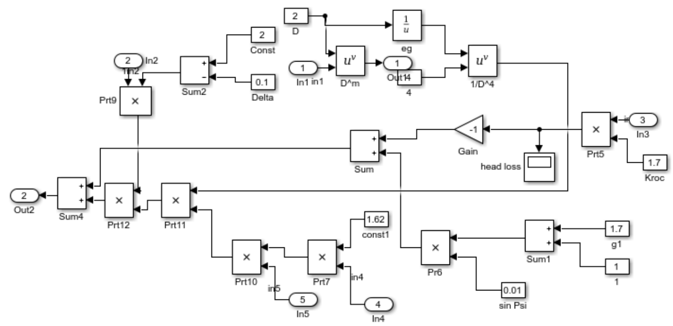


Fig.5 Block-scheme for solving sub-system 3

V. RESULT OF SIMULATION

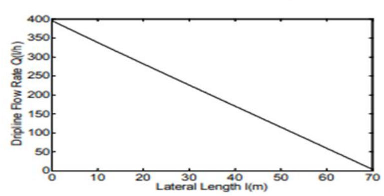


Fig.6. Distribution of pressure head h along

Lateral length l.

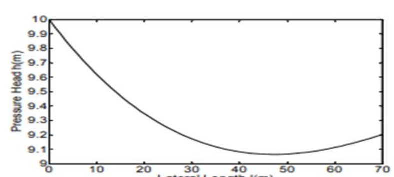


Fig.7. Distribution of drip line flow rate along the lateral length l.

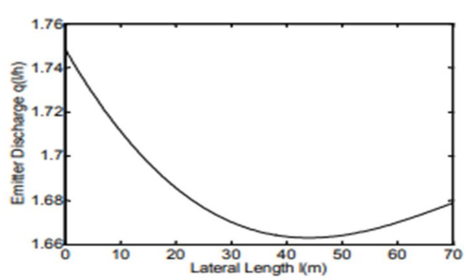


Fig.8. Distribution of emitter discharge along the lateral length l.

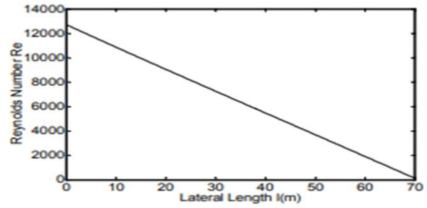


Fig.9. Distribution of Reynolds number along the lateral length l.

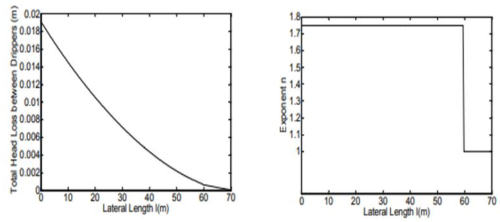


Fig.10. Total head loss h between drippers and distribution of exponent n along lateral length l.

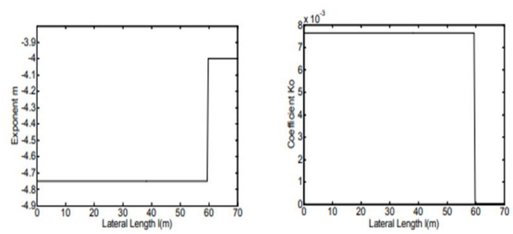


Fig.11. Distribution of m and co-efficient $K_{\circ}$ along lateral length l.

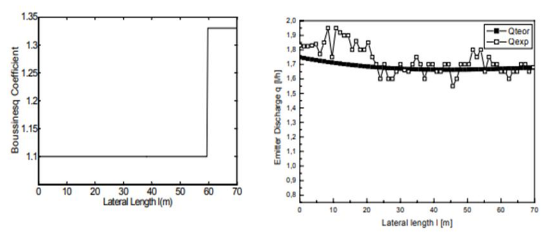


Fig.12. Distribution of Boussinesq co efficient along lateral length l and Correlation between the Model data and the experimental data.

VI. CONCLUSION

A Model of Hydraulic design of a drip lateral on the basis of theory spatially varied flow is derived in this paper. The developed model and the program in SIMULINK-MATLAB give an opportunity for more accurate hydraulic design of trickle laterals. The model is theoretically based and the program is open for substituting with different lateral parameters. The good agreement between the model data and the experimental data prove the suitability of the model in the drip irrigation system practice.

REFERENCES

[1] Tupe Alok, R., Et al. (2015).Intelligent Drip Irrigation system. International Journal of innovative Research in advanced Engineering (IJIRAE) 2(2):120-125.

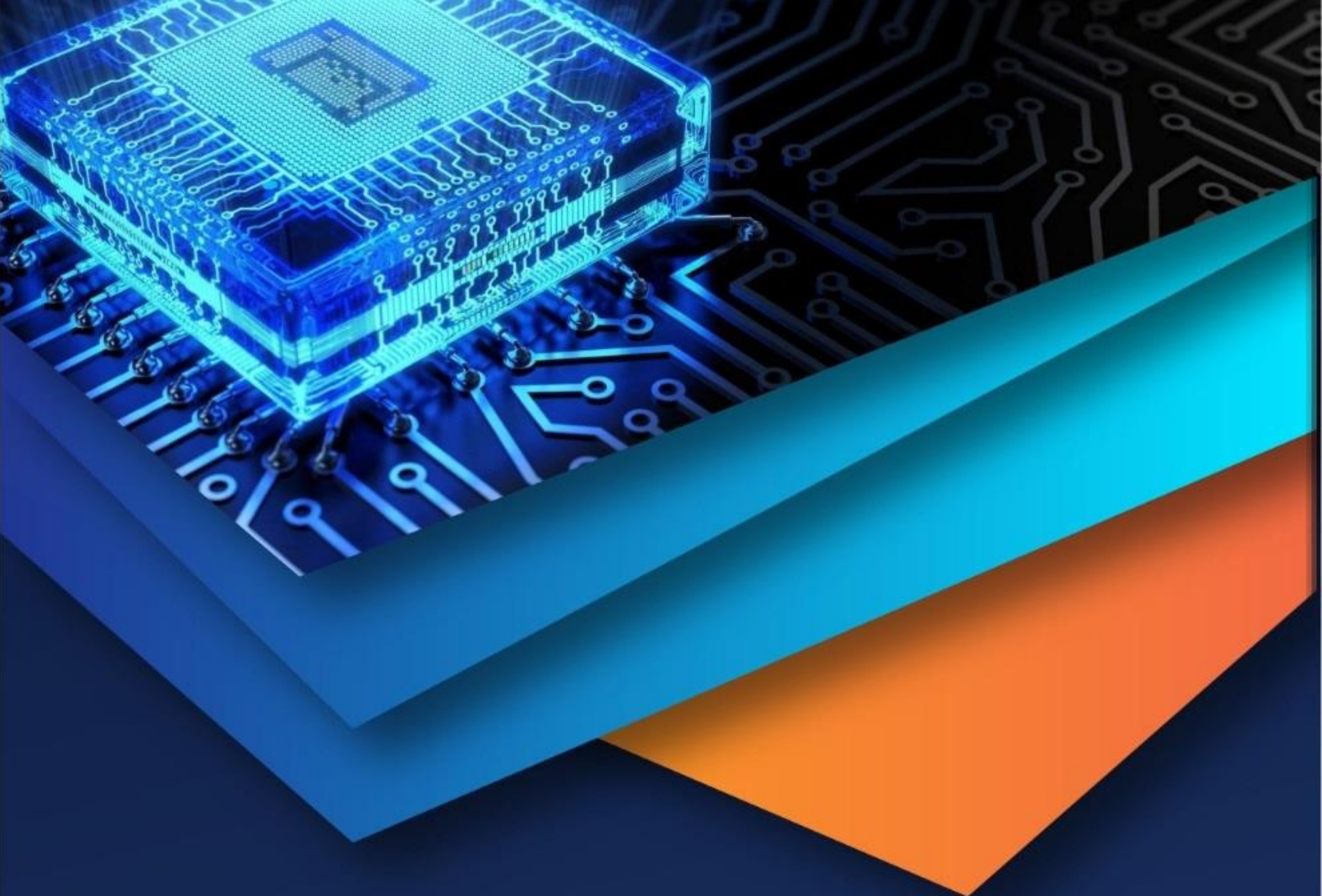
[2] Luciana, M.L., et al. (2013) .Automatic drip irrigation unit using pic controller. International journal of Latest trends in Engineering Technology. 2(3):108-114.

[3] Hade, A. H. and M. k. Sengupta (2014).Automatic control of Drip irrigation system & Monitoring of soil by wireless. IOSR journal of Agriculture and veterinary science (IOSR-JAVS) 6(4):1573-1582.

[4] Dursun, M. and S.Ozden (2011).A wireless application of drip irrigation automation supported by soil moisture sensors. Scientific research and Essays 6(7): 1573-1582.

[5] Apparao, C., et al. (2015). Development of low cost soil moisture sensor for drip irrigation system. International Journal of Advanced Research in Computer Science and Software Engineering 5(9): 714-717.

[6] Kulkarni, A, et al. (2016).Automated Smart Drip Irrigation system using Wireless Medium and Sensors. International Journal of Emerging Technology and Computer Science. 1(2):35-38
[7] Parameswaran, G., K. (2016). Arduino Based Drip Irrigation system using Internet of Things. International Journal of Engineering science, 5518.
[8] Prathyusha, K., & Suman, M. C. (2012). Design of Embedded systems for the Automation of Drip Irrigation. International Journal of Application or innovation Engineering and Management. IJAIEM (2319-4847)
[9] Joaquin Guitierrez, Juan Fransisco Villa – Medina, Alejandra Nieto – Garibay , Automated Irrigation System using a Wireless Sensor Network and GPRS Module, IEEE Transactions On Instrumentation And Measurement , Volume 63, No 1 January 2014.
[10] Er. Sukhjit Singh, Er. Neha Sharma, Research paper on Drip Irrigation Management Wireless Sensors, IRACST, Volume 2, No.4, August 2012.
[11] Intelligent Humidity Sensor For Wireless Sensor Network Agriculture Application. International Journal of Wireless & Mobile Networks (Irwin) (VOL. 3, No.1).
[12] Sandhyasree Thaskani and Rammurthy, Application of Topology under control wireless Sensor Networks in precision agriculture, International Institute of Information and Technology, Page (s): 1-14, April 2010.
[13] Iqbal Singh, Meenakshi Bansal, Monitoring water level in Agriculture using Sensor Networks. International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-1 Issue-5, November 2011.
[14] Evett, S. R, T. A. Howell, A.D .Upchurch, and
[15] D.F.2000.Automatic Drip Irrigation of Corn and soybean. In Proc. Of the 4th Decennial National Irrigation Symp.Robbert G.Evans, Benham, and Todd P.Trooien (eds.) November 14-16, Phoenix, Az. (pp, 401-408).
[16] Gop, 2004. National water policy.
[17] Jyothipriya, A., Dr. Saravanabava. T.P .(2013): Design of Embedded for drip Irrigation automation , University , Chennai , International Journal of Engineering science Invention ISSN 2319-6734,2(4) 34-37.
[18] Agarwal, S., Paney, S., Kumar, S., & Chaudhry, K.(2014).Automatic Irrigation System. International Journal, 2(1), 92-94.
[19] Kim, Y., Evans, R.G., & Iversen, W.M. (2009).Evaluation of closed – loop site specific irrigation with Wireless Sensor Network. Journal of Irrigation and drainage Engineering, 135(1), 25-31.



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