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Micro Irrigation with Priority Driven Scheduling To Utilize Water at Optimum Level

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Abstract: ***All of we know that natural resource conservation and utilization became very important nowadays. We are talking about the "water" which is very important resource for human being and agriculture also. We are observing monsoon's nature is irregular and due to this irregularity ground water level also decreasing. We have to take care of this situation by preventing unnecessary utilization of the water. We have proposed a novel approach in which main emphasis is on saving and controlling the unnecessary utilization of water. In agriculture or garden though either sprinkler or drip irrigation is used to control the utilization of water still optimum level is not achieved. We are observing sprinkler are spraying the water but in an inefficient way i.e. equal surface area is not covered and because of this few region will remain wet and other may be dry. In drip irrigation though drips are used still it cannot control the water utilization at optimum level. What we wish to suggest is that drips are good, but if the particular region holds good moisture level then also it will be irrigated. Proposed system will prove unnecessary utilization of water can be avoided as moisture sensors to be used to sense the moisture from the soil. As per the requirement only that region where moisture level is low, it will be immediately irrigated by using solenoid valves. Along with this proposed system have few more added advantages like identifying pH of the soil, field capacity analysis, and best water utilization for the plants, storing all the parameters like temperature, humidity, moisture and pH for later analysis.***

Keywords: Scheduling, WSN, Moisture Sensors, Smart Irrigation, Volumetric Water Contents, temperature, humidity

I. INTRODUCTION

Climate change is crucial and everyone is responsible for preserving our nature. There is need to adopt some strategies in our day to day life to reduce and manage the risks else next generations won't be survived. Reducing the utilization cost of natural resources is the important challenge and everyone should contribute to climate-resilient pathways for sustainable development. In day to day life, adaptation means to adapt current state and the dynamic evolutionary process which changes periodically that leads to the adaptation. Irregularity of monsoon tends to create limitations on available resources i.e. water – which we considered as important asset to be utilize properly. We have focused this asset – water- to be utilized effectively in agriculture sector where maximum wastage is observed.

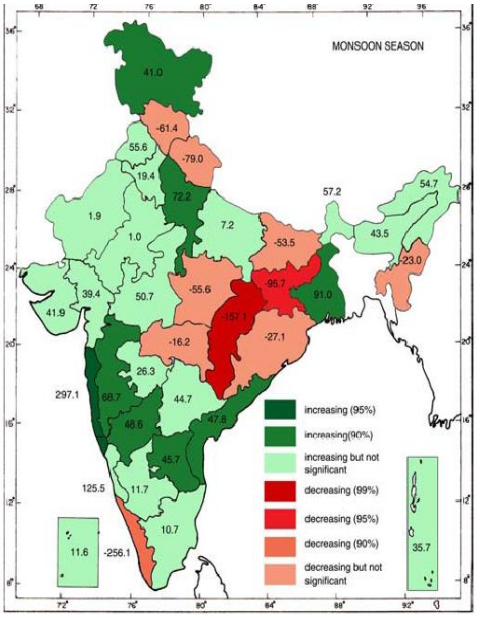

Figure 1 Indian Rainfall Observation

The Earth's climate has always changed and evolved. Some of these changes have been due to natural causes but others can be attributed to human activities such as deforestation, atmospheric emissions from industry and transport, which have led to gases and aerosols being stored in the atmosphere.

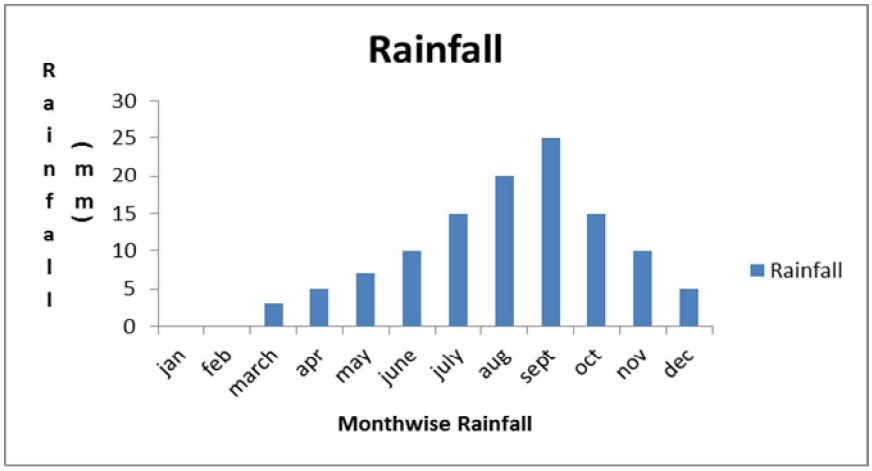

Figure 2 Month wise Indian Rain fall Observation

We have proposed a system which is useful to everyone for soil analysis and water quality analysis. Proposed system is implemented to provide a single GUI to the end user through which user interacts. GUI gives detailed information by providing pH, temperature, humidity and most important moisture at specific node.

II. REVIEW OF LITERATURE

Priority driven approach in Wireless Irrigation System is applicable to a Smart Home Garden or even to a large field. It means priority wise serving the nodes. As we are discussing the priority driven strategy in which using soil moisture sensor values will be collected and if at particular plant moisture level is less than the set threshold then immediate irrigation will be started. Hence, we are suggesting 'water" which is a valuable resource must be preserved and utilize in an effective and efficient way. In our proposed system priority wise serving can be applied. Sensors will sense the real time values and based on this appropriate action will be taken by the coordinator. Ultimate goal is to increase the water level of that place where it is actually required. In the paper Priority Polling Strategy for Wireless Sensor Networks paper author have proposed a queuing system for data to be efficiently received by sensor nodes. In this paper contention free access is also focused which can be a unique characteristic. This paper also describes how polling can be effectively implemented in WSN [1]. Drip irrigation systems operate effectively and can result in high quality production. A daily observation of the soil moisture within the root zone is required. Irrigation systems whether it is drip irrigation or sprinkler systems should be designed and managed to assist a farmers from planting through harvest but utilization of the water should be in effective manner. Author also suggest too much water can destroys the soil aeration and cause as much trouble as not having enough water or very less water situation [2]. Effective irrigation scheduling which is nothing but not applying too much and too less water helps optimize profit while minimizing inputs such as water and energy cost. The factors that affect irrigation scheduling include the type of crop, stage of development, soil properties, soil-water relationships, availability of water supply, and weather conditions [3]. Crop water requirements must be accurate and it refers to the actual water needs for evapotranspiration which also depends up on the temperature and wind flow in that region. These are nothing but the climatic factors which are closely related to climatic demands.

Irrigation requirements are primarily determined by crop water requirements, but also depend on the characteristics of the irrigation system, management practices, and the soil characteristics in the irrigated area [4]. Climate change will increase existing risks and will create new one for natural and human systems which we day to day experiencing. Risks are unevenly distributed as already we have discussed utilization of the natural resources unevenly and in random way are generally higher therefore people at all levels are being suffered. As it is not happened suddenly, rather it is a continuous process in which human being is interfered since many years and already started disturbing the frame work of nature and these factors contributed in climate change process which is not good for human being [5]. Wireless Sensor Networks have attracted much attention in recent years especially with the agriculture sector. The potential applications of WSNs are immense and WSN is combined with the numerous fields agriculture, banking, weather, health management etc. WSN components are used for collecting, storing and sharing sensed data [6]. Priority scheme is required to allow some selected nodes' packets to reach the base station / sink node for computing something. In this paper author evaluates the performance of priority packet in a congested traffic, sensor network traffic has been defined as event-based considering the traffic pattern i.e. how many nodes are sending data towards the sink node is mainly correlated to phenomena which have been observed in a sensor network [7].

III. PROPOSED SYSTEM WITH RESULTS DISCUSSION

We are observing Water availability at the root zone and the schematic representation of the root zone is categorized into few regions / parts such as Excess water region. Then water contents will be decreased as we move downwards through the root zone. Therefore placing the sensors to get the moisture values from root zone is very important.

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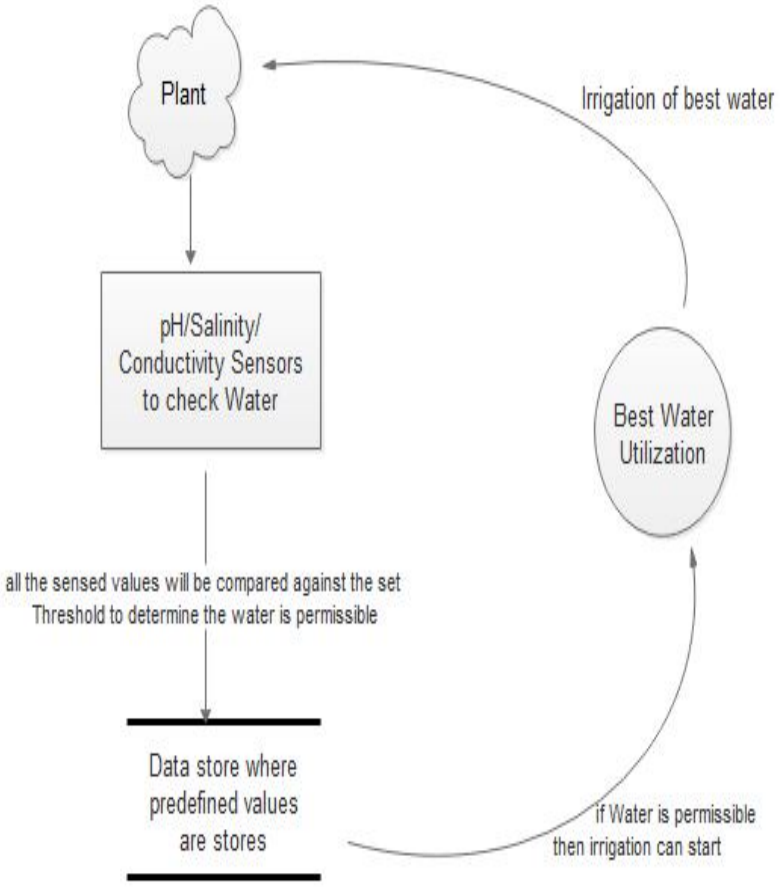

Figure 3 Best Water to be Use

We are focusing on the calculation of the weekly, monthly, bi-monthly utilization of the water, these sensed and calculated values must be stored somewhere. In database we will store those values and at any time for analysis purpose we can fetch from the database. In computing, priority driven scheduling is the act of serving the most important task on priority basis. Algorithm for handling Events Priority Based Scheduling in Wireless Applications will be as follows: Scheduling of the sensing real time values pH, Temp, Moisture, and Humidity towards the sensors is significant task in our proposed system based on these values our proposed system works. There are many scheduling algorithms available which are based on First-Come First-Served (FCFS), non-pre-emptive priority, and pre-emptive priority scheduling.

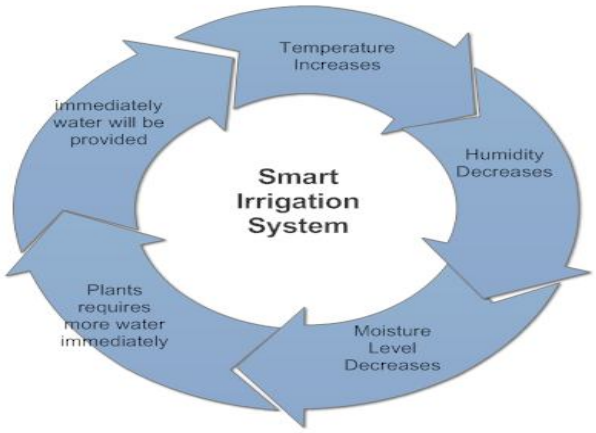

Figure 4 Irrigation Cycle

WSN applications can be divided in two categories: Event Detection and Spatial Process Estimation. In the first case, the aim of deploying the sensor nodes is to detect and inform about an event to the sink nodes. The emphasis is on deploying the nodes with simple signal processing capabilities and to keep the number of sensor nodes to be sufficient to detect an event but they must avoid the false alarms. The examples of event detection applications are detection of fire in a forest or an earthquake. In spatial process estimation the main aim is to estimate a physical phenomenon which can be modeled as bi-dimensional random process.

Data Set and Analysis

TABLE I DATA SET ANALYSIS

NODE	TEMPERATURE	HUMIDITY	MOISTURE	pH	DATE
NODE1	27	54	65	10	17/07/2017
NODE2	28	59	60	9	17/07/2017
NODE3	26	73	55	8	17/07/2017
NODE1	28	28	54	6	21/07/2017
NODE2	29	55	78	4	21/07/2017
NODE3	28	71	75	6	21/07/2017
NODE1	29	54	65	10	21/07/2017
NODE3	28	69	70	7	21/07/2017
NODE2	29	54	80	6	21/07/2017
NODE1	29	29	69	9	10/08/2017
NODE2	29	42	86	6	10/08/2017
NODE3	28	58	54	8	10/08/2017
NODE1	29	29	69	10	10/08/2017
NODE2	29	42	86	7	10/08/2017
NODE3	28	57	54	7	10/08/2017
NODE1	29	29	68	9	10/08/2017
NODE2	29	42	86	8	10/08/2017
NODE3	28	57	11	7	10/08/2017
NODE1	29	29	68	9	10/08/2017
NODE2	29	42	86	9	10/08/2017
NODE1	29	29	67	9	10/08/2017
NODE2	29	42	32	10	10/08/2017
NODE3	28	56	80	7	10/08/2017
NODE1	29	29	66	9	10/08/2017

NODE1	29	29	32	9	10/08/2017
NODE2	29	42	72	5	10/08/2017
NODE3	28	56	78	7	10/08/2017
NODE1	29	29	33	10	17/08/2017
NODE2	29	41	85	4	17/08/2017
NODE3	28	56	78	6	17/08/2017
NODE1	29	29	86	10	17/08/2017
NODE2	29	41	35	6	17/08/2017
NODE3	28	55	78	6	17/08/2017
NODE1	29	29	86	10	17/08/2017
NODE1	29	29	85	10	17/08/2017
NODE2	29	40	87	8	17/08/2017
NODE3	28	54	53	6	17/08/2017
NODE1	29	29	85	10	17/08/2017
NODE2	29	40	87	8	17/08/2017
NODE3	28	54	52	7	17/08/2017
NODE1	29	29	85	10	17/08/2017
NODE2	29	40	87	9	17/08/2017
NODE3	28	54	90	6	17/08/2017
NODE1	29	29	85	10	17/08/2017
NODE2	29	40	86	8	17/08/2017
NODE3	28	54	52	7	17/08/2017
NODE1	29	29	85	10	17/08/2017
NODE2	29	40	86	7	17/08/2017
NODE3	28	54	46	7	17/08/2017
NODE1	29	29	85	10	17/08/2017
NODE2	29	40	86	8	17/08/2017
NODE3	28	54	46	6	17/08/2017
NODE1	29	29	85	10	17/08/2017
NODE2	29	40	86	7	17/08/2017
NODE3	28	54	36	7	17/08/2017
NODE1	29	29	85	10	17/08/2017
NODE2	29	40	86	6	17/08/2017

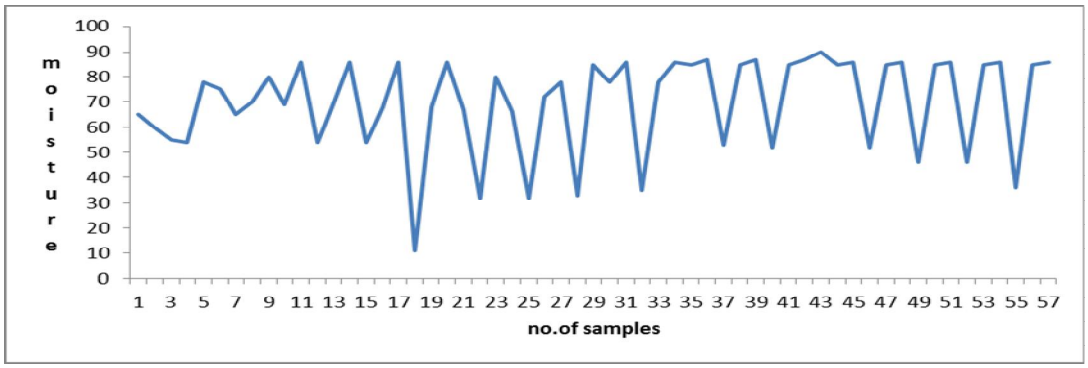

Figure 5 Moisture observation and data analysis

A. F Test Analysis

Applying the F test on Temperature and moisture:

The null and alternative hypothesis - In order to undertake hypothesis testing you need to express your research hypothesis as a null and alternative hypothesis.

TABLE II F-TEST TWO-SAMPLE FOR VARIANCES

temp and moisture		
F-Test Two-Sample for Variances		
	MOISTURE	TEMPERATURE
Mean	70.05263158	28.59649123
Variance	356.7650376	0.387844612
Observations	57	57
df	56	56
F	919.8659128	
P(F<=f) one-tail	3.73901E-68	
F Critical one-tail	1.557933374	

B. Similarly regression analysis will be as follows

TABLE III REGRESSION STATISTICS

Summary output					
Regression Statistics					
Multiple R	0.969523				
R Square	0.939974				
Adjusted R Square	0.920701				
Standard Error	18.08553				
Observations	57				
ANOVA					
	df	SS	MS	F	Significance F
Regression	2	281709.3	140854.6	430.6346	6.5E-34
Residual	55	17989.74	327.0862		
Total	57	299699			

IV. CONCLUSIONS

Utilization of natural resources is the important challenge and everyone should contribute to climate-resilient pathways for sustainable development. It is nothing but utilizing the natural resources in an effective way. With this regard we have proposed a system which is based on priority driven approach which proves that in wireless sensor network environment can be a better option for better crop yielding.

V. ACKNOWLEDGMENT

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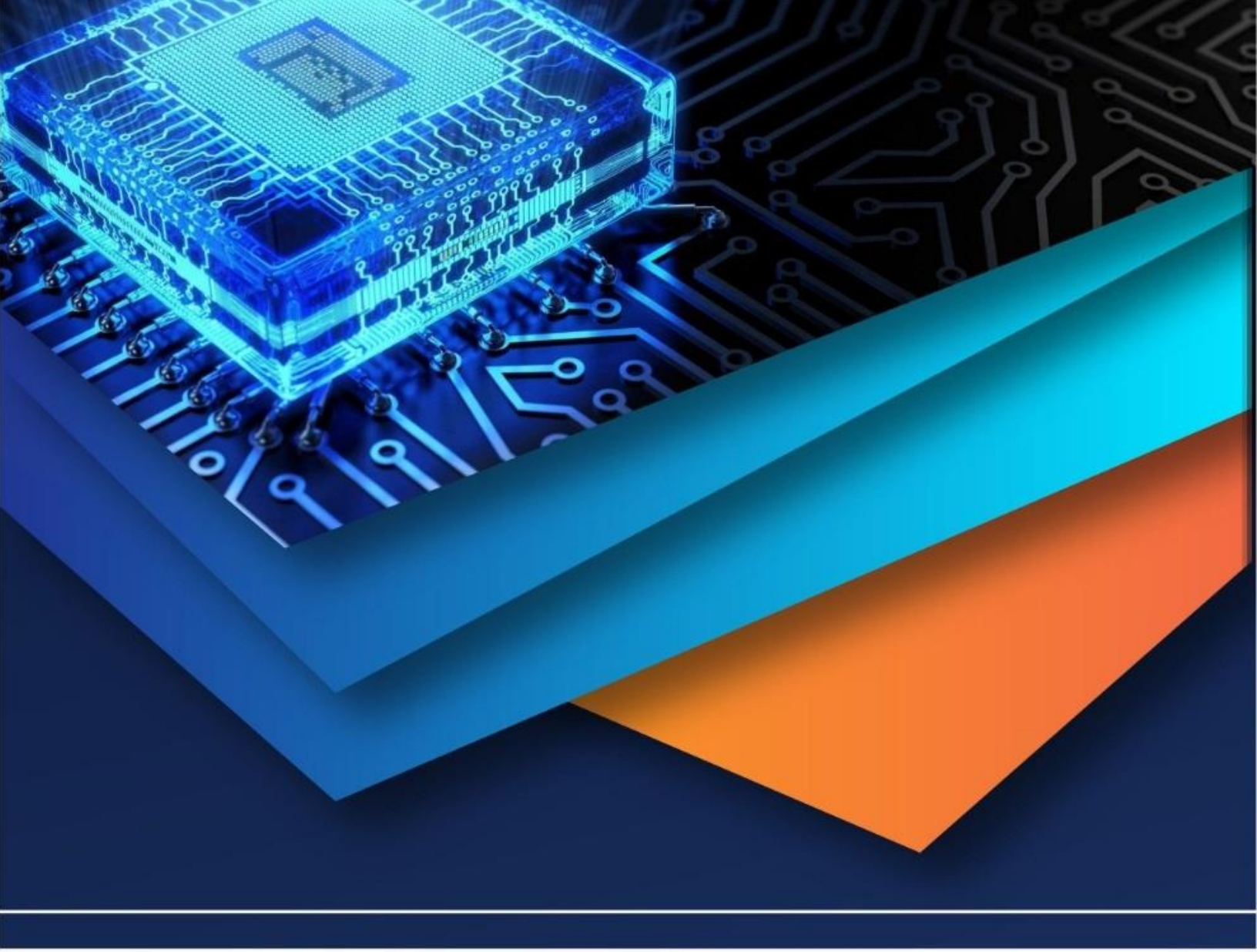

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