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Smart Agriculture Scrutinizing System based on Wireless Sensor Networks

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Abstract: ***The farming sector is changing quickly indicating the fate of robotized and installed frameworks with a variety of sensors to screen and control the developing plants in an approach to secure laborers, the earth and benefits related with it. The continuous monitoring and controlling of distantly located plants is labor intensive and technically challenging business. In modern agriculture, a Wireless Sensor Network (WSN) provides a simple cost effective solution to monitor and control. The basic parameters to be monitored are temperature, humidity, light, soil moisture, soil type, rain and wind speed etc. The paper helps to deal with an emerging technology with a concrete problem of world-wide dimensions, the sustainability of farming for land-holders living in rural area.***

Keywords: Smart Agriculture, wireless sensor network, Environmental impacts, agriculture Parameters

I. INTRODUCTION

In India, the agriculture sector plays a key role in demand driven economy. The agriculture industry is drastically changing and there is a need to develop automated systems to monitor and control the growing plants [1]. In agricultural and environmental sciences, it is important to be able to easily monitor filed and gather environmental information over long periods of time, but such monitoring is difficult and requires much effort [2]. WSN is entering another stage. Late advances offer immense open doors for innovative work. WSN is a standout amongst the most critical advancements in the 21st century [3]. WSN is utilized for an assortment of utilizations, including remote information procurement, machine observing and upkeep, keen structures and expressways, natural checking, site security, robotized on location following of costly materials, wellbeing administration, and in numerous different regions. The development of these applications in precision agriculture has attracted considerable research efforts lately [4]. In modern precision agriculture, a Wireless Sensor Network (WSN) provides a simple cost effective solution to monitor and control. Employing the WSN would enable the users to monitor and control the environmental parameters influencing the plant growth. The paper provides System design, implementation and operation guidelines including wireless sensor networks. The study helps to overcome the environmental challenges faced by farmers in the rural area and the collaborative design of a decision-support tool for rural agriculture parameter control using wireless sensor networks. The experimental results are used to identify potential use cases for an environmental monitoring system for agriculture, and to make decisions for agriculture parameter control.

II. ENVIRONMENTAL IMPACTS AND AGRICULTURE PARAMETERS

The ecological effect of farming differs dependent on the wide assortment of rural practices utilized the world over. At last, the natural effect relies upon the generation practices of the framework utilized by agriculturists. The association between emanations into nature and the cultivating framework is backhanded, as it likewise relies upon other atmosphere factors, for example, precipitation and temperature [5]. Horticulture crops influences on different condition.

A. Environmental Impacts

The agriculture environment is mostly based on soil and water. The water related problem linked with the use of fertilizers, pesticides and irrigation and soil are the major environment challenges of agriculture [6]. The following table illustrates the environmental impacts of agriculture system,

Table1. Environmental impacts

S.NO	Environmental impacts of agriculture
1	Water Issues
2	Air Pollution
3	Land Degradation
4	Loss of Biological Diversity
5	Climate Effect

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The following factors are the reasons of the low productivity in India which affects the agriculture,

1) The normal size of land possessions is little and is liable to discontinuity because of land roof acts.
2) Selection of current horticultural practices and utilization of innovation is insufficient, hampered by numbness of such practices, high expenses and difficulty on account of little land property.
3) The absence of education, general financial backwardness, moderate advancement in executing land changes and lacking or wasteful fund and showcasing administrations for ranch deliver.
4) Conflicting government arrangement.
5) Water system offices are insufficient.

B. Agriculture Parameters

The advancement technique in Wireless Sensor Networks made it conceivable to use in checking and control of farming parameters in the rustic region. Because of uneven characteristic conveyance of rainwater, it is extremely vital for agriculturists to screen and control the equivalent dissemination of water to all products in the entire ranch or according to the necessity of the yield. There is no perfect water system technique accessible which might be appropriate for every single climate condition, soil structure and an assortment of harvests societies. It is observed that farmers have to bear huge financial loss because of wrong prediction of weather and incorrect irrigation method to crops [7]. The parameters of agriculture is as follows,

1) Soil
2) Water
3) Crops
4) Irrigation
5) Chemical and fertilizers issues

III. WIRELESS SENSOR NETWORKS

Now days there are lot of problems in farm due to absence of technology for farm. The control and monitoring of the agricultural parameters is very essential. A WSN comprises of spatially conveyed self-sufficient sensors to screen physical or ecological conditions, for example, temperature, sound, weight, and so forth and to helpfully go their information through the system to the fundamental area [8]. The more present day systems are bi-directional, additionally empowering control of sensor movement.

Each such sensor arrange hub has regularly a few sections: a radio handset with an inner reception apparatus or association with an outer recieving wire, a microcontroller, an electronic circuit for interfacing with the sensors and a vitality source, ordinarily a battery or an installed type of vitality collecting. A sensor hub may shift in size from that of a shoebox down to the span of a grain of residue, albeit working "bits" of certifiable minute measurements still can't seem to be made. The expense of sensor hubs is also factor, extending from a couple to several dollars, contingent upon the multifaceted nature of the individual sensor hubs. Size and cost imperatives on sensor hubs bring about relating limitations on assets, for example, vitality, memory, computational speed and interchanges transfer speed. The topology of the WSNs can change from a straightforward star system to a progressed multi-bounce remote work arrange. The spread procedure between the bounces of the system can be steering or flooding. The qualities of a WSN [9]:

1) Power utilization obliges for hubs utilizing batteries or vitality gathering
2) Ability to adapt to hub disappointments
3) Mobility of hubs
4) Communication disappointments
5) Heterogeneity of hubs
6) Scalability to vast size of sending
7) Ability to withstand unforgiving natural conditions
8) Ease of utilization
9) Power utilization

A. WSN in Agriculture

Utilizing remote sensor organizes inside the agrarian business is progressively normal; utilizing a remote system liberates the agriculturist from the upkeep of wiring in a troublesome domain. Gravity feed water frameworks can be observed utilizing weight transmitters to screen water tank levels, pumps can be controlled utilizing remote I/O gadgets and water utilities can be estimated and remotely transmitted back to a focal control community for charging [10]. Water system mechanization empowers more

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productive water to utilize and decreases squander. Remote sensor systems are additionally used to control the temperature and dampness levels inside business nurseries. At the point when the temperature and dampness dip under particular levels, the nursery chief must be told by means of email or phone instant message, or host frameworks can trigger moistening frameworks, open vents, turn on fans, or control a wide assortment of framework reactions. To monitor the environment conditions it is necessary to design and implement the Wireless sensor Multi meter [11]. The sensors are listed as follows,

1) Soil pH Sensor
2) Soil Moisture Sensor
3) Temperature sensor
4) Light Sensor
5) Humidity Sensor
6) Wind Speed Sensor
7) Rain Sensor
8) Relay Circuit

The following block diagram illustrates the Wireless Sensor Multi meter on agriculture Farm.

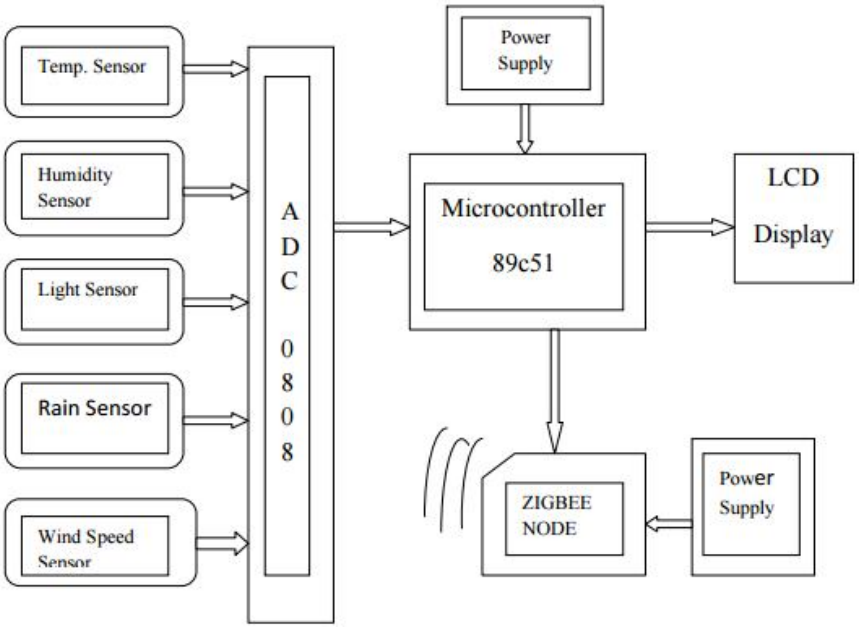


Fig.1. Block Diagram of Wireless Sensor Multi meter

ZIGBEE is particular for remote individual territory systems (WPANs) working at 868 MHz, 902-928 MHz, and 2.4 GHz. A WPAN is an individual zone arrange (a system for interconnecting a person's gadgets) in which the gadget associations are remote. Utilizing ZIGBEE, gadgets in a WPAN can impart at rates of up to 250 Kbps while physically isolated by separations of up to 50 meters in a run of the mill conditions and more noteworthy separations in a perfect situation [12].

The prototype system is designed and implemented successfully using Wireless Sensor module. The sensors designed, it is ready for agriculture parameters control and monitor using wireless sensor networks. The System is reliable and economic. Now it is necessary to take field readings on various agriculture stages.

IV. METHODOLOGY

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A systematic approach was considered for the overall design of the system and two parameters were monitored. The node is designed for the increased battery life and the ZigBee technology supports the same. The deployment of WSN nodes in agriculture [5] is shown in Fig.1.

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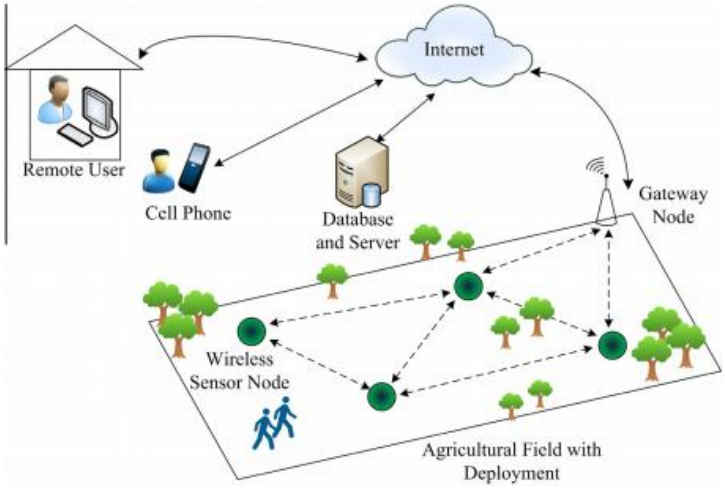


Fig.2.WSN application in Agriculture

Fig. 1 depicts a typical wireless sensor network deployed on field for agricultural applications. The field consists of sensor nodes powered with application specific on-board sensors. The nodes in the on-field sensor network communicate among themselves using radio-frequency links of industrial, scientific and medical radio bands (such as 902–928 MHz and 2.4–2.5 GHz). Typically, a gateway node is also deployed along with the sensor nodes to enable a connection between the sensor network and the outer world. Thus, the gateway node is powered with both RF and Global System for Mobile Communications (GSM) or GPRS. A remote user can monitor the state of the field, and control the on-field sensors and actuator devices. For example, a user can switch on/off a pump/valve when the water level applied to the field reaches some predefined threshold value. Users carrying mobile phone can also remotely monitor and control the on-field sensors. The mobile user is connected via GPRS or even through Short Message Service (SMS). Periodic information update from the sensors, and on demand system control for both type of users can also be designed.

V. RESULT AND DISCUSSIONS

This section deals with discussion on experimental results. Before 10 to 15 years fertilizers are promoted to agriculture field to take more yields. There are types of fertilizers organic as well as chemical fertilizers. Use of chemical fertilizers should have the proper planning as well as proper knowledge or guidelines. The case study showed that they are using excess chemical fertilizers which have the negative impact on soil. The farmers have more price burden of chemical fertilizers than yield. There is negative strong impact on human health due to excess use of chemical fertilizers on vegetable crops. The WSN system showed that without using chemical fertilizers the crop yield by monitoring and controlling agriculture parameters.

To control and monitor the agriculture parameters such as temperature, humidity, rain sensor, sun shine and wind speed must be monitor. The wireless sensor multi meter showed the readings. The following table shows the Soil pH Sensor Measurement,

Table3. Soil pH Sensor Measurement

Sr. No.	V_{out} (V)	pH
1	54.55mV	3.01
2	168.8mV	4.00
3	100mV	5.18
4	4.06V	7.01

The soil pH recorded by soil moisture sensor 7 to 8 was neutral soil and it was good for plant yield. The soil pH is will not change immediately. So, we recorded soil pH before crop yield and after crop yield. In two months duration crops the field which was used chemical fertilizers the soil pH slightly degrades and soil pH for normal method without using chemical fertilizers and WSN method remains the same. The soil pH before crop was 7.01. The soil pH for field using chemical fertilizers was 6.87. The soil pH measurement using this method is easy and time saving and variety of samples can be possible to take and predict for crops.

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Soil Moisture shows the water content in soil. This system designed the Soil moisture sensor which was less costly and it will record in depth up to 1 feet. The following table shows the Soil Moisture Sensor Measurement,

Table 4 Soil Moisture Sensor Measurement

Sr. No.	V_{out}	Soil
1	0 V	Soil is dry
2	2.5	Soil moisture at deep 2inch
3	2.7	Soil moisture at deep 3inch
4	3.3	Soil moisture at deep 5inch
5	3.7	Soil moisture at deep 7inch
6	4.0 V	Soil moisture at deep 9inch
7	> 4 V	Slurry soil

The growth of Cilantro for normal method without use of chemical fertilizers was less compare to both methods. The soil required for this is 6 to 7 pH. Water required is less because roots are not going in more than 1 Feet long in soil.

Table 5 Cilantro Readings

Sr. No.	Day	Height (Normal Method- using chemical fertilizers) cm	Height (Normal Method- without using chemical fertilizers) cm	Height (WSN method- without using chemical fertilizers) cm
1	1st	0	0	0
2	3rd	0	0	0
3	5th	0.3	0	0.5
4	7th	2.2	0.2	2.8
5	9th	6	1	5.7
6	11th	10	4	11.6
7	13th	14	6	15.3
8	15th	19.3	10	21.4
9	17th	22	12	22.5
10	19th	24	13	24.5
11	21th	26	15	27

Table 6 Tomato Readings

Points	Normal Method- using chemical fertilizers	Normal Method- without using chemical fertilizers	WSN method- without using chemical fertilizers
Plant Average Height	3 meter	2 meter	2.5 meter

Table 7 Lady Finger Readings

Points	Normal Method- using chemical fertilizers	Normal Method- without using chemical fertilizers	WSN method- without using chemical fertilizers
Plant Average Height	4feet	4feet	4 feet
Fruit length	9cm	7cm	11cm
Average No of Fruits in every Plant	3	2	4

The experimental results showed in table 6.11 and fig .no. 6.13. The WSN method showed the best results for all kind of vegetables without chemical fertilizers, which avoids the so many dieses. From the experimental results we observed that the WSN method is good compare to other methods. The results showed that without using chemical fertilizers agriculture parameters are controlled and take more yield.

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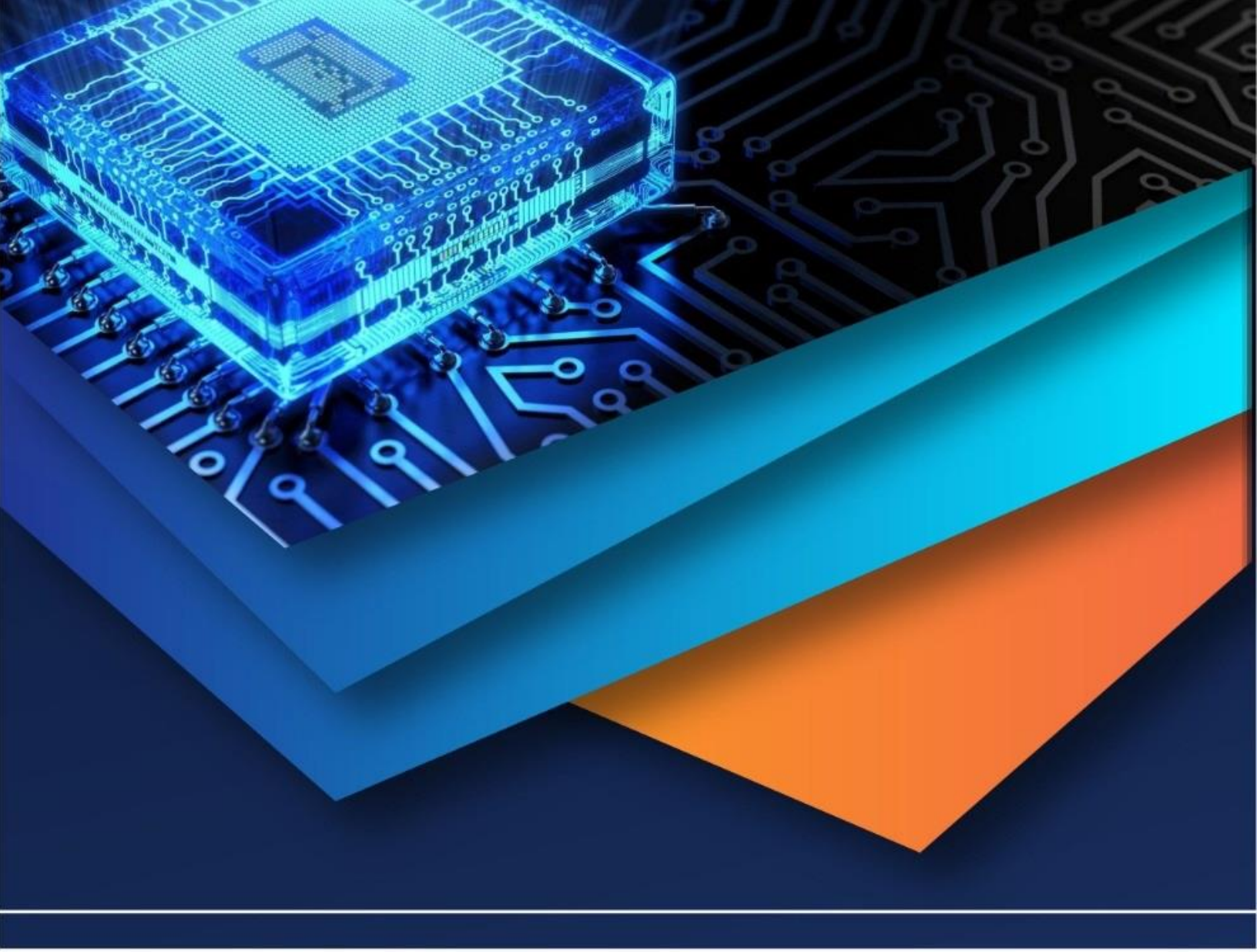
VI. CONCLUSION

The applications of wireless sensor network for agriculture parameter control system are designed and tested successfully. The experimental readings are taken for small duration crops. The readings are taken without use of chemical fertilizers which avoids the side effects of chemical fertilizers on human being, environment, soil and water also. The comparative results are taken with normal method without use of chemical fertilizers and method with use of chemical fertilizers. The experimental results showed that the WSN method is good compare to other methods. The results showed that without using chemical fertilizers agriculture parameters are controlled and take more yield. The low cost, low power WSN node is developed to monitor the agriculture farm. The main contribution of this paper is the development of the WSN system to monitor the agriculture farm.

REFERENCES

[1] Santoshkumar, C. Kelvin, and S. Chavhan, "Development of wireless sensor node to monitor poultry farm', Communications in Computer and Information Science, vol.296, pp.27-32, 2013.
[2] Luis Ruiz-Garcia, Loredana Lunadei, Pilar Barreiro,Jose Ignacio Robla. "A Review of Wireless Sensor Technologies and Applications inAgriculture and Food Industry",State of the Art and CurrentTrends. Sensors, vol. 9,pp. 4728-4750,(2009).
[3] Santoshkumar, V Hiremath, K Rakhee," Smart Sensor Network System based on ZigBee Technology to Monitor Grain Depot", International Journal of Computer Applications, Vol.50, no.21,pp. 0975 – 8887, 2012.
[4] A.Baggio. "Wireless sensor networks in precision agriculture" Workshop on Real-World Wireless Sensor Networks (REALWSN05), Stockholm, Sweden, June (2005).
[5] Alka Thapliyal, Padma Vasudevan, M.G. Dastidar, Mamta Tandon, Seema Mishra, "Irrigation with domestic wastewater: Responses on growth and yield of ladyfinger Abelmoschus esculentus and on soil nutrients", Journal of Environmental Biology, Vol. 32, pp. 645-651, 2011.
[6] Genady N. Golubev, Igor A. Shvytov and Oleg F. Vasiliev, "Water-Related Environmental Impacts of Agriculture at the Field Level", Environmental Problems of Agriculture, pp.1-30, 1978.
[7] Hilde Vernieuwe, Niko E. C. Verhoest, "Possibilistic Soil Roughness Identification for Uncertainty Reduction on SAR-Retrieved Soil Moisture", IEEE Journal of Geosciences and Remote Sensing, Vol.49 No.2, pp.628-638, 2011.
[8] Ian F. Akyildiz, Tommaso Melodia, Kaushik R. Chowdhury, "A survey on wireless multimedia sensor networks", Elsevier, Computer Networks 51, pp.921-960, 2002.
[9] Hosny M. Ibrahim, Nagwa M. Omar, Ali H. Ahmed, "Improving Wireless Sensor Networks Performance by Using Clustered Virtual Rings", International Journal of Ad hoc, Sensor & Ubiquitous Computing, Vol.3, No.3,pp.47-65, 2012.
[10] Fahimeh Doremami, Hamid Haj Seyyed Javadi and Ahmad Farahi, "A New Distributed Weighted Multidimensional Scaling Algorithm for Localization in Wireless Sensor Networks", International Journal of Computer Science & Engineering Survey, Vol.2, No.1, pp.65-76, 2011.
[11] Padmavathi, D. Shanmugapriya, "A Survey of Attacks, Security Mechanisms and Challenges in Wireless Sensor Networks", International Journal of Computer Science and Information Security, Vol. 4, No. 1 & 2,pp.1-9, 2009.
[12] K. Vijay Chandra, G. Mamatha, "Design of Remote I/O Data Acquisition System with ZigBee", International Journal of Electrical and Electronics Engineering, 2011, Vol. 1, No. 2, pp.73-77, 2011.

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