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Design Wireless Sensor Networks for Monitoring Application.

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Abstract
This project proposes the designing a wireless sensor network (WSN) to monitor the Light levels and the temperature of the environment and humidity through the sensor and send these grades wirelessly to the control unit to solve the problem of geographical dimension and control of places where human intervention is difficult to use three points using Arduino and GSM Arduino is a small computer that can interact and control the center around it is better than the desktop computer , GSM is used to send data to the control unit and results are extracted in the form of curves using the matlab program and the grades are stored in the database of the excel file in the control unit .

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I. Introduction

The world is moving towards micro and Nano-scale devices, and Wireless communication technologies are replacing its wired counterparts. Wireless sensor network (WSN) is a field that can encompass both these technologies and bring out the best in them. WSN's are decentralized and its nodes specialize in gathering information, processing it and delivering results without a backbone network for support. Also, more importantly it is capable of self-organization Environment monitoring has been around for centuries and is one of the most widely used Applications of a WSN. There are growing concerns over environmental issues like global warming, energy conservation, efficient energy use etc. Wireless networks have developed greatly over the last decade. Communication technologies over small distances have developed immensely. For ex: Bluetooth, Wi-Fi,ZigBee networks etc. are always improving and moving towards lower-power, faster data speeds technologies. The remainder of this research describes a possible way to use Ardunio and Raspberry Pi for remote weather monitoring, describing advantages of doing so and how to implement it efficiently [1].).

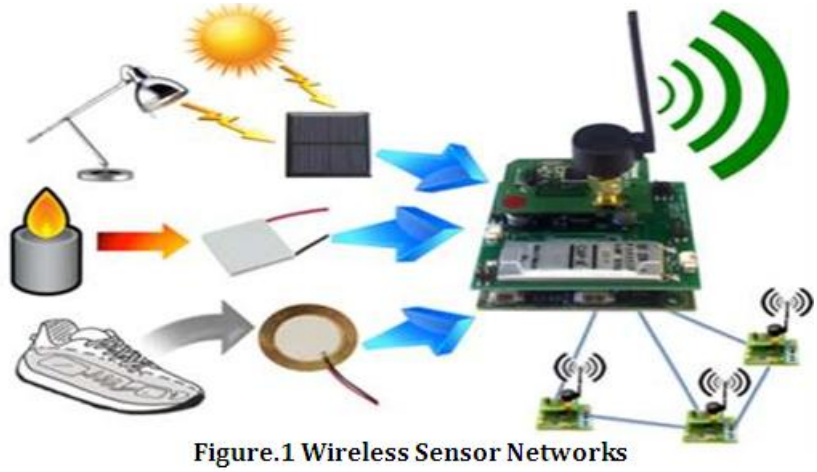


Figure.1 Wireless Sensor Networks

A Wireless sensor network can be defend as a network of devices that can communicate the information gathered from a monitored field through wireless links. The data is forwarded through multiple nodes, and with a gateway, the data is connected to other networks like .

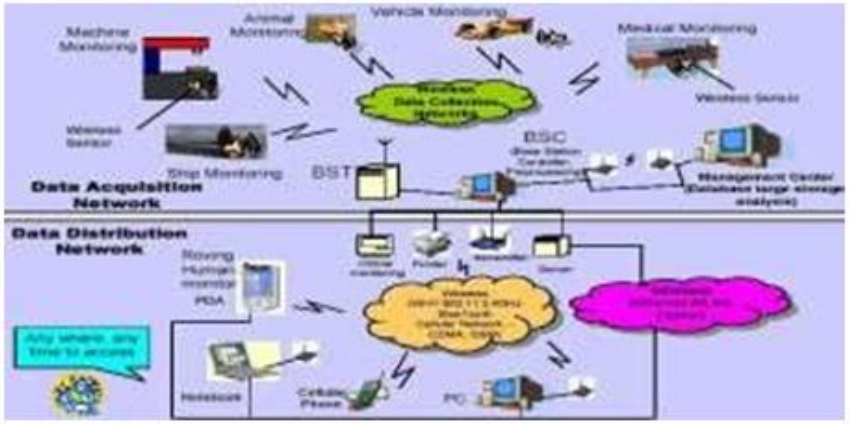


Figure2: WirelessSensor Networks

WSN is a wireless network that consists of base stations and numbers of nodes (wireless sensors). These networks are used to monitor physical or environmental conditions like sound, pressure, temperature and co-operatively pass data through the network to amain location as shown in the figure**.**

II. WSN Network Topologies

For radio communication networks, the structure of a WSNincludes various topologies like the ones given below.

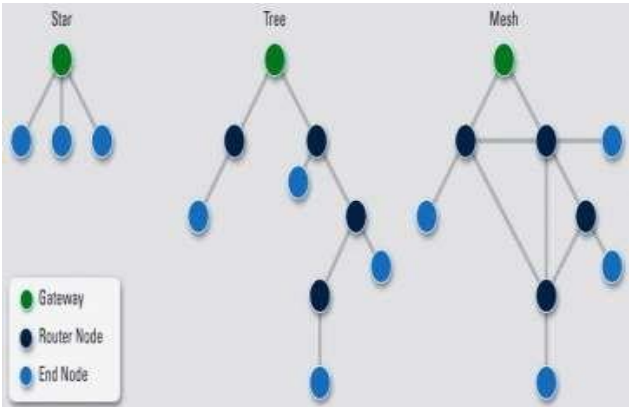


Figure3: Wireless Sensor Networks

III. Star Topologies

Star topology is a communication topology, where each node connects directly to a gateway. A single gateway can send or receivea message to a number of remote nodes. In star topologies, the nodesare not permitted to send messages to each other. This allows low- latency communications between the remote Node and the gateway (base station). Due to its dependency on a single node to manage the network, the gateway must be within the radio transmission range of all the individual nodes. The advantage includes the ability to keep the remote nodes' power consumption to a minimum and simply under control. The size of the network depends on the number of connections made to the hub.

IV. Tree Topologies

Tree topology is also called as cascaded star topology. In tree topologies, each node connects to a node that is placed higher in the tree, and then to the gateway. The main advantage of the tree topology is that the expansion of a network can be easily possible, and also error detection becomes easy. The disadvantage with this network is that it relies heavily on the bus cable; if it breaks, all the network will collapse.

V. Mesh Topologies

The Mesh topologies allow transmission of data from one node to another, which is within its radio transmission range. If a node wants to send a message to another node, which is out of radio communication range to the desired node. The advantage with thismesh topology includes easy isolation and detection of faults in the network. The disadvantage is that the network is large and requires huge investment.

VI. Types of WSNs (Wireless Sensor Networks).

Depending on the environment, the types of networks are decided so that those can be deployed underwater, underground, on land, and so on. Different types of WSNs include:

1. Terrestrial WSNs
2. Underground WSNs
3. Underwater WSNs
4. Multimedia WSNs
5. Mobile WSNs

VII. Methods And Materials

In this Project is proposed to design an embedded system which is used for wireless sensor network by using Global system for mobile communication (GSM) Instead of zigbee and Wi-Fi shield because they are expensive and not available in Sudan on this basis wsn designed based on GSM , Ardunio, Humidity – Temperature Sensor DH1, LCD, and Computer. In this project Microcontroller Atmaga32A and Ardunio are used for interfacing to various Hardware peripherals. The current design is an embedded system application in wireless sensor network (WSN), which will continuously monitor environment and Report the status of the environment.

The design uses for serial communication between microcontroller and computer.

The Block diagram of wireless sensor network system is shown in Figure.

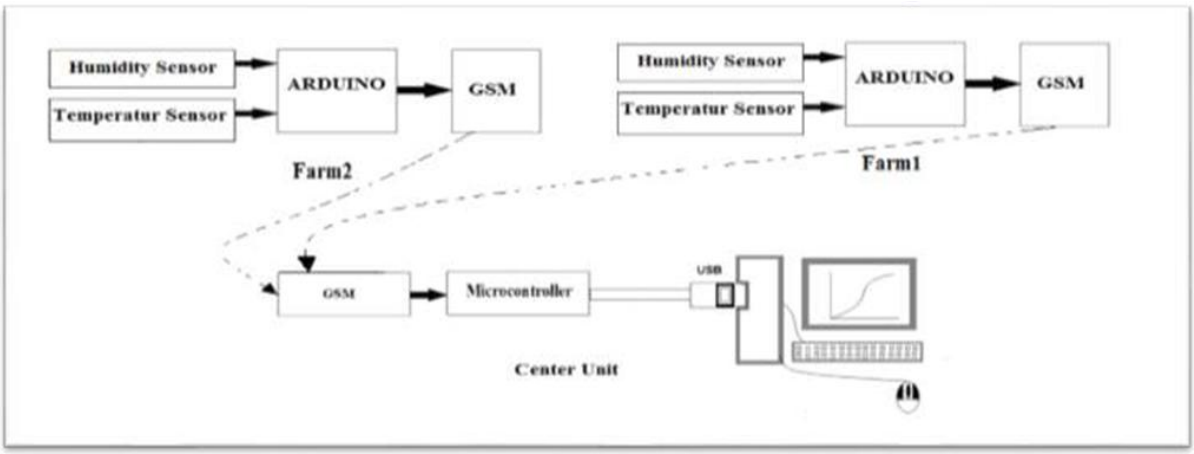


Figure4: Block Diagram of the Proposed System

VIII. Description of Block diagram

1. Power Circuit:

We need a 5V DC Supply as the operating voltage for the Microcontroller Unit, Gsm modem and arduindo module used 12 voltage.

2 . Reset Circuit:

All microcontroller require a clock (or an oscillator) to operate, usually provided by external timing devices connected to the microcontroller. In most

Cases, these external time devices are a crystal plus two small capacitors. In some cases they are resistor – capacitor or an external resistor – capacitor pair. Some microcontrollers have built-in timing circuit and do not require external timing components.

Temperature and humidity are programmed in the Arduino by sensors. These grades are sent to a GSM module. This GSM module sends these grades to the GSM module in the control unit.

3 . Simulation

PROTEUS ISIS is used to create circuit design and simulate it. Also PROTEUS ARES is used to create PCB layout. The circuit design using PROTEUS given below shows the entire Simulation for the system.

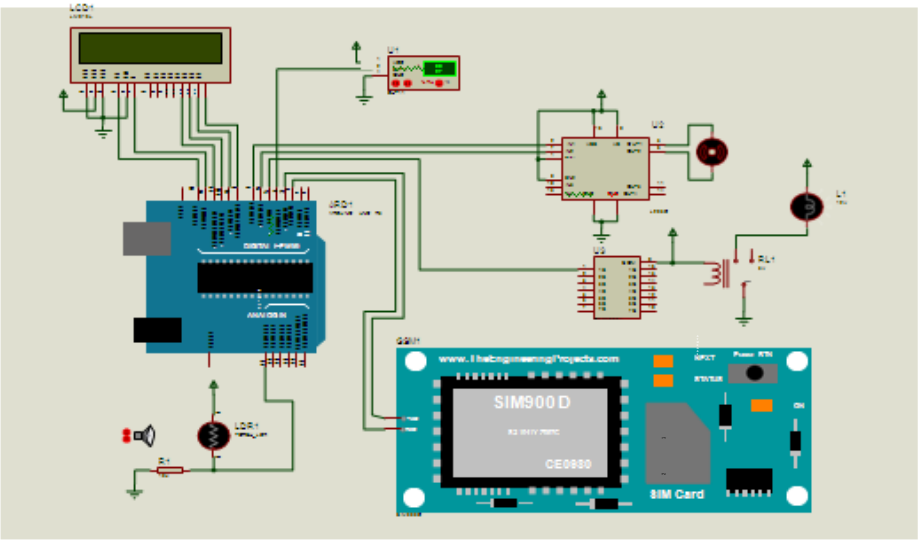


Figure 5: Simulation of node1 using Proteus

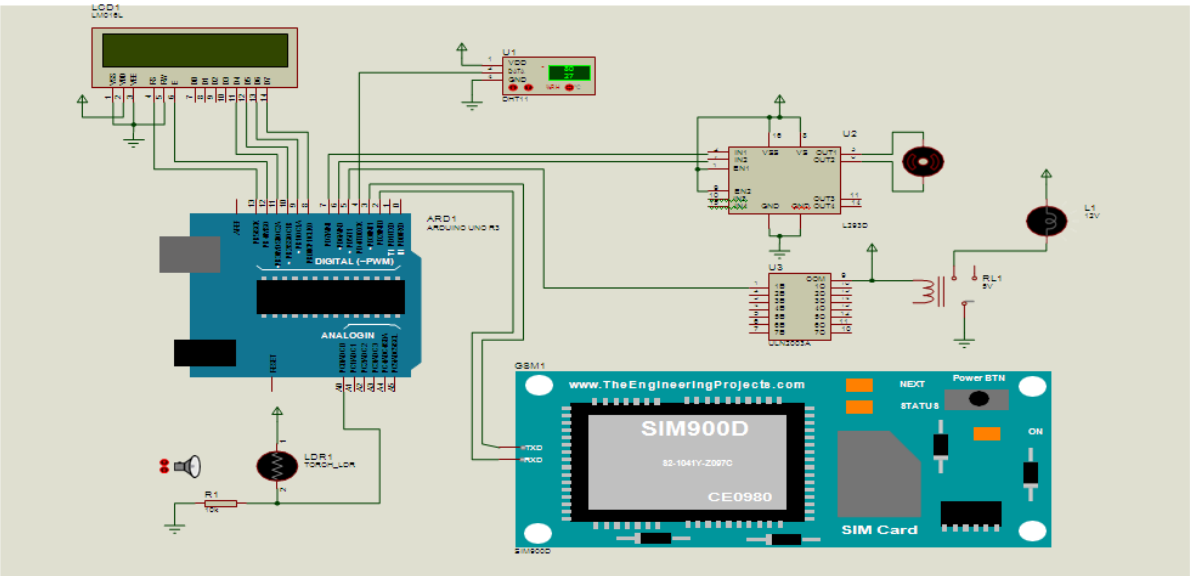
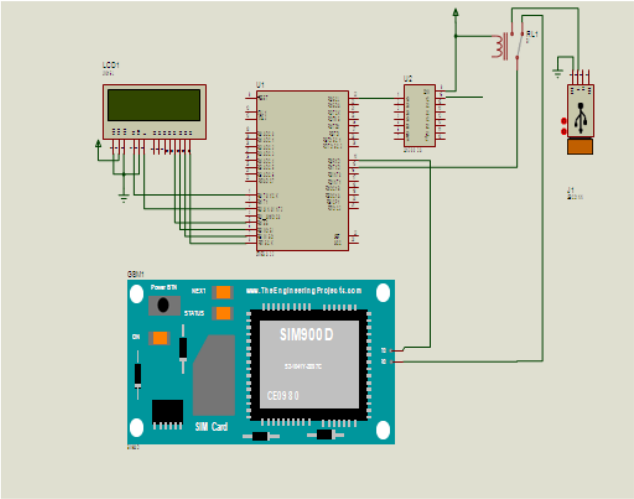


Figure 6: Simulation of node2 using Proteus



1 . Software program

The software of programming is done in C language. Data (co- ordinates) received by GSM is defined in software. Decoding the NMEA (National Marine Electronics Association) protocol is the main purpose of developing this software. The mobile number of the user should be included in the software programming in orderto receive the location values from the SIM card which we are using in GSM modem.

IX. Results

The following curves show the results of the research which are the temperature, humidity and light of the environment these curves are designed Matlab the following tables represent the database in which the grades are stored and designed by the excel program . The temperature and light are sent in the form of a SMS message and access time is estimated at 5sec.

- The following table contains the set of reading database for node1 and node2 , where (A) Temp represents a temperature reading for node1 and (A) light represents the light node1 either

(B) Temp represents the temperature of node2 and (B) light represents Illumination of node2 .

Fig 8: Table Node1 and node2 Database (A)

Figure 7: Simulation of Center Using Proteus

	A	B	C	D	E
	ATemp Number	ALight Number		BTemp Number	BLight Number
1	A Temp	A Light		B Temp	B Light
2	26 C°	79 LUX		29 C°	72 LUX
3	27 C°	79 LUX		29 C°	73 LUX
4	27 C°	80 LUX		29 C°	72 LUX
5	27 C°	79 LUX		28 C°	72 LUX
6	26 C°	80 LUX		28 C°	73 LUX
7	26 C°	80 LUX		28 C°	71 LUX
8	26 C°	80 LUX		28 C°	72 LUX
9	27 C°	79 LUX		28 C°	73 LUX
10	26 C°	80 LUX		28 C°	72 LUX
11	26 C°	79 LUX		28 C°	72 LUX
12	26 C°	79 LUX		28 C°	72 LUX
13	26 C°	79 LUX		28 C°	17 LUX
14	26 C°	79 LUX		28 C°	9 LUX
15	27 C°	80 LUX		28 C°	12 LUX
16	27 C°	79 LUX		28 C°	74 LUX
17				28 C°	73 LUX
18				28 C°	73 LUX
19				28 C°	73 LUX
20				29 C°	72 LUX
21				29 C°	73 LUX

The following readings show the increase and decrease in temperature and illumination within 5 seconds in node1and node2

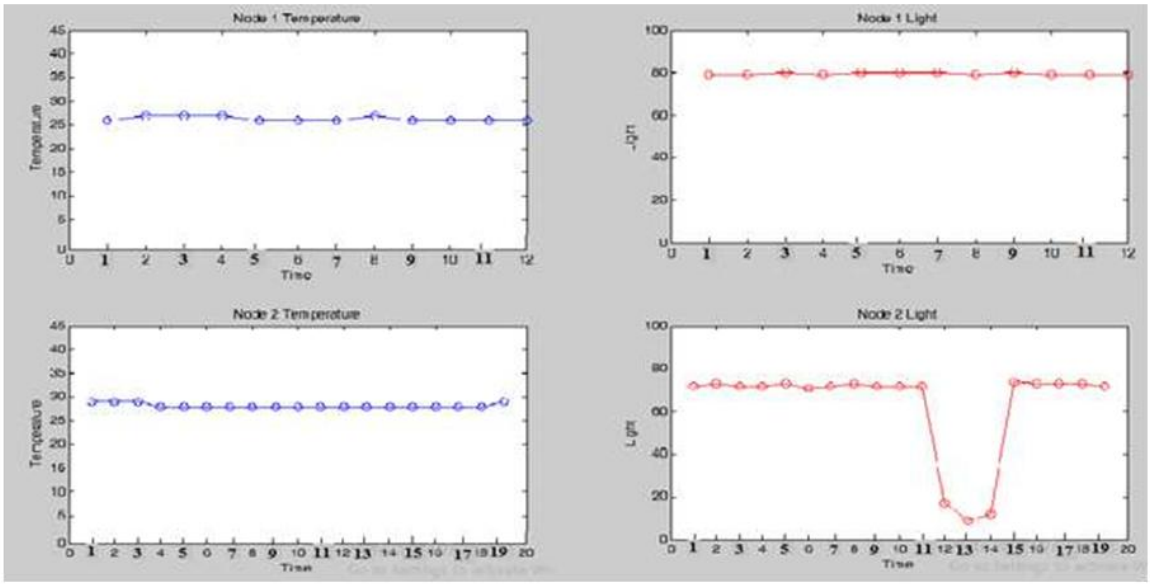


Figure9: Node1 and node2 Curves (A)

The following table contains the set of reading database for node1 and node2 , where (A) Temp represents a temperature reading for node1 and (A) light represents the light node1 either (B) Temp represents the temperature of node2 and (B) light represents Illumination of node2 . The scores were read in this table a day after the previous table.

	B	C	D	E
	ATemp	ALight	BTemp	BLight
	Number	Number	Number	Number
1	A Temp	A Light	B Temp	B Light
2	27 C⁰	34 LUX	29 C⁰	73 LUX
3	26 C⁰	78 LUX	29 C⁰	71 LUX
4	26 C⁰	78 LUX	29 C⁰	73 LUX
5	26 C⁰	77 LUX	29 C⁰	73 LUX
6	27 C⁰	79 LUX	29 C⁰	19 LUX
7	27 C⁰	7 LUX	29 C⁰	44 LUX
8	27 C⁰	80 LUX	29 C⁰	20 LUX
9	27 C⁰	79 LUX	29 C⁰	73 LUX
10	27 C⁰	80 LUX	29 C⁰	73 LUX
11	27 C⁰	80 LUX	30 C⁰	73 LUX
12	27 C⁰	80 LUX	30 C⁰	72 LUX

Figure 10 : Table Node1 and node2 Database (B)

The following readings show the increase and decrease in temperature and illumination within 5 seconds in node1and node2.

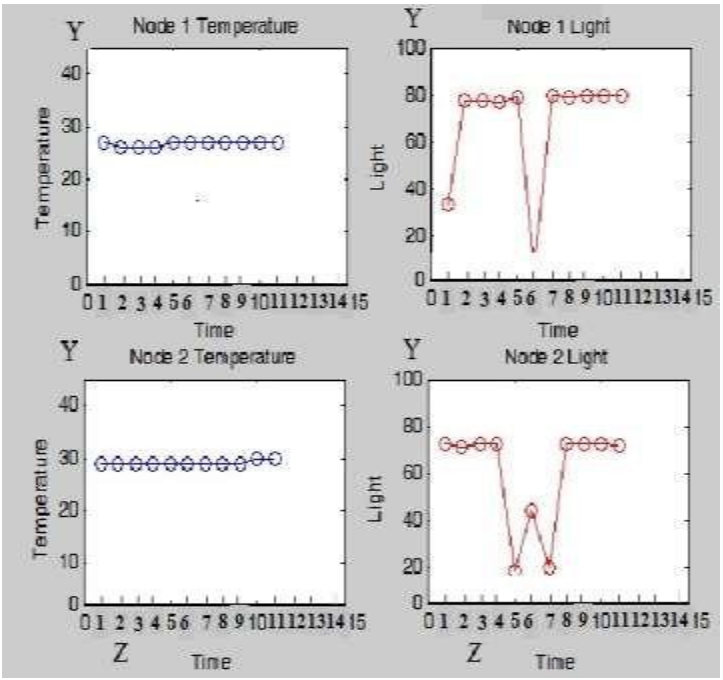


Figure 11: Node1 and node2 Curves (B)

X. Discussion

23. Shio Kumar Singh, M P Singh, and D K Singh, "Routing Protocolsin Wireless Sensor Networks" –A Survey, International Journal

The project could be mode more convenient and secure with the use of Wi-Fi shield or ZigBee instead GSM whichuses a long distance is used over the SMS Network it is expensive to consume the balance.

This design can be mode more enhanced in future to support camera, website, and also PC based stand-alone software**.**

1. Support sensor development research in industries.
2. Link such research to the internet.
3. Designing a website and linking the results via the website to follow up on farms through the internet.

XI. Conclusion

The project has proposed wireless sensor network design used to monitoring Temperature and light in environment by using Ardunio, microcontroller and GSM technology. The simulation of circuit design and implementation is done usingPROTEUS, Micro C, and MATLAB software.

The system is designed to improve remote control and accessibility, especially in hard to reach places.

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