

Wireless Sensor Network For Industrial Monitoring

Divya Sharma¹, Manojmishra², Jyoti³, Jyotigurav⁴, Mohan Kumar⁵

^{1,2,4,5} (Department Of Electronics And Telecommunication, Atharva College Of Engineering, India)

³(Department Of Electronics And Telecommunication, Vembsys Technovation Private Limited, India)

Abstract : During Industrial Operations, Many By Products Are Generated Which Can Be Hazardous To The Health Of Workers Working There. Very Few Industries Setup Such Wireless Sensor Networks (Wsn) In Their Workshops As The Cost Of These Systems Are High. The Purpose Of This Concept Is To Provide A Low Cost Integrated Sensor System Consisting Of Various Sensors. This Device Would Collect The Data And Send It To The Main Database Via Api Where The Information Would Be Analyzed And Necessary Measures Can Be Taken To Avoid Mishaps.

Keywords- Wireless Sensor Network (Wsn), Application Protocol Interface (Api).

I. Introduction

A Wireless Sensor Network Consists Of Spatially Distributed Randomly Sensors. Wsn Consists Of 'Nodes' - From A Few To Thousands, Where Each Node Is Connected To One (Or Sometimes Several) Sensors. Each Sensor Node In Network Have Several Parts I.E.- A Microcontroller, Interfacing Of Electronic Circuit With The Sensors And A Battery Or An Embedded Form Of Energy Harvesting I.E. An Energy Source, With An Internal Antenna Radio Transceiver Or Connection To An External Antenna. Autonomous Integrated Sensor Systems Would Be Placed In Different Parts Of The Industry. These Systems Would Act As Client Devices Which Would Collect The Data Like Gas Levels, Temp, Etc. And Send It To The Server System. The Server System Would Receive And Analyze The Data And Log It The Internet Database. In The Network Infrastructure, If Value Of Data In Beyond The Safety Limits, The Necessary Systems Could Activated Bring The Values Back To Normal. This Would Help In Preventing Issues Like Explosions Etc.

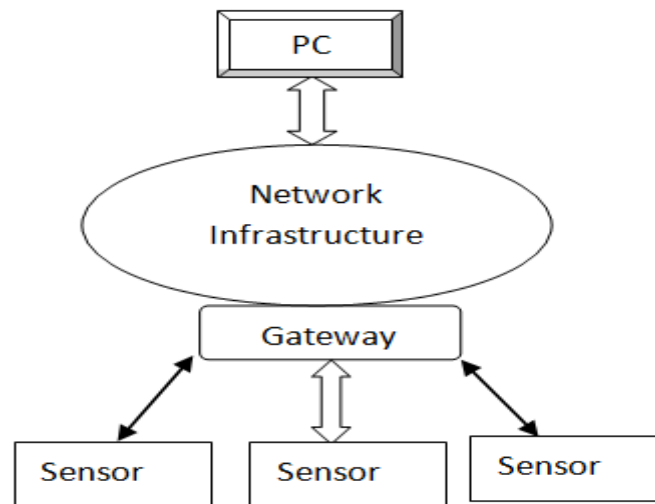


Fig.1 Block Diagram

II. Experimental setup

Client Section Comprises Of Microcontroller, Sensors And Transmitter Module And Initiates The Data Collection Which Would Send The Sensor Data Which Will Be Received By The Server Section. The Server Section Comprises Of Microcontroller, Ethernet Adapter.

The Server Section Will Log The Data On Cloud Database Via Temboopi. If Any Abnormal Activities Are Sensed In The System Then It Would Notify Via An Alarm System Or Sms Service To The Concerned Person.

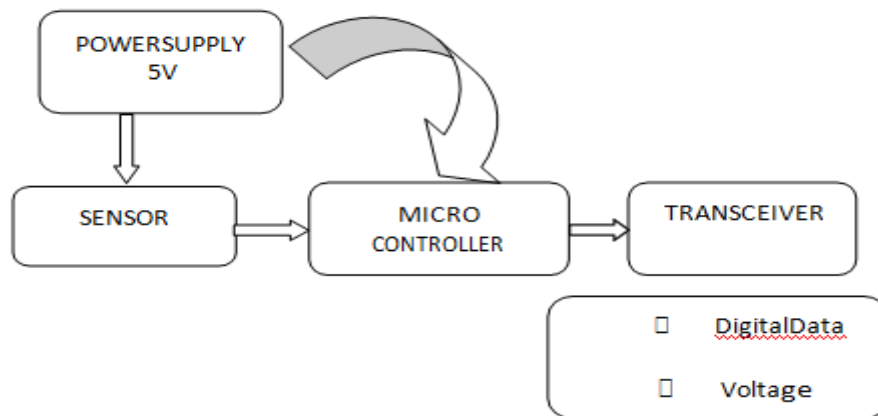


Fig.2 Block Diagram Of Client Section

1. Client Section- The Client Side Includingtx (Transmitter) I.E. 2.5 Ghz, Micro Controller, And Sensors Required Measuring The Desired Parameters. The Data From The Sensors Is Collected By The Micro Controller And Data Packets Are Formed Which Are Finally Sent To Server. The Transceiver Is Collected By The Micro Controller Via Spi (Serial Peripheral Interface). The Spi Bus Specifies Four Logic Signals-

1. Serial Clock (Sclk) -Output Frommaster.
2. Master Input, Slave Output (Miso)-Output Fromslave.
3. Ss: Slave Select (Ss)-Active Low, Output Frommaster.
4. Mosi: Master Output, Slave Input (Mosi)-Output Frommaster.

When Communication Starts, Clock Is Configures By Bus Master, Using A Frequency Supported By The Slave Device. Then On The Select Line Slave Device Is Selected By Master With A Logic Level 0. Such As For Analog To Digital Conversion, If A Waiting Period Is Required, The Master Must Wait For At Least That Period Of Time Before Issuing Clock Cycles. A Full Duplex Data Transmission Occurs During Each Spi Clock Cycle. On Mosi Line The Master Sends A Bit And The Slave Reads It, On The Miso Line While The Slave Sends A Bit And The Master Reads It. This Sequence Is Maintained Even When Only One-Directional Data Transfer Isintended.

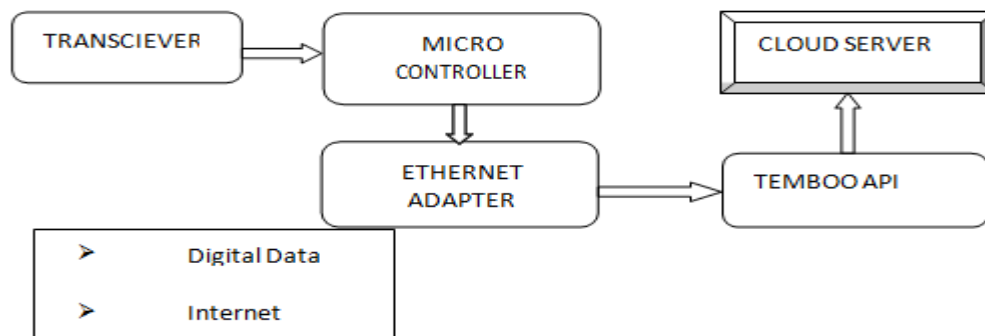


Fig. 3 Block Diagram Of Sever Section

2. Server Section- Server Consists Of Micro Controller With Ethernet Shield/ Adapter. The Ethernet Shield Is Connected To A Local Router Through Ethernet Cable. This Enables The Controller To Accessinternet And Upload The Server Side Data On Cloud. The Cloud Service Called Google Drive Is Being Used In The Project. Google Drive Allows

Storing Of Sensor Data In Form Of Row And Columns In The Excel Sheets. The Micro Controller Communicates To Transceiver And Now Works As A Receiver To Receive Sensor Data Packets. The Data Is Collected Into Variable In String Format.

Temboowhich Is An Application Program Interface Service Which Is Used To Upload Data To The Google Drive. These Are Certain Algorithms, A Script That Directly Uses Google Authentication Services And Updates Rows And Column With Sensor Data. The Communication Between Microcontroller And Transceiver Is By The Spi Protocol. Using Tcp/Ip And Https Protocol, Internet Access Is Given To Server Section. Using Standard Ftp Protocol Changes In The File Are Made Constantly When Sensor Data Getsupdated.

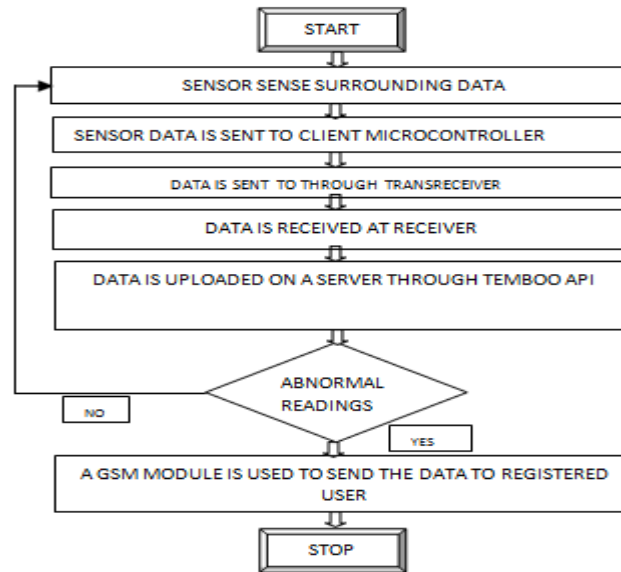


Fig. 4 System Flow

Advantages

1. Lowcost
2. Low Powerconsumption.
3. Good Accuracy Ofdata.
4. Use Of Open Source Hardware Andsoftware.
5. Monitoring Can Be Done From Remote Areas Via Internet.
6. Easy Adaptability As Per Requiredapplication.

III. Applications

1. Area Monitoring- In The Network Of Sensors, They Have A Common Application I.E. Area Monitoring In Which Sensors Are Deployed Over A Region Where Some Phenomenon Is To Be Monitored. Take An Example Of Military And Civilian In Which Enemy Intrusion Is Detected Through Sensors In Military, Geo-fencing Of Gas Or Oil Pipelines In Civilianrespectively.
2. Intelligent Buildings/Bridges- In These Measurements About Temperature, Energy Wastageand Monitoring Of Mechanical Stress Levels.
3. Air Pollution Monitoring- In Several Cities (Like Stockholm, London And Brisbane) There Is A Deploymentof Sensor To Monitor The Concentration Of Dangerous. Over Wired Installation, Adhoc Wireless Links Have The Advantage, Which Helps More In Mobile For Testing Readings In Different Areas Of Acountry.

IV. Conclusion

Thus We Would Be Able To Design Sensor Network Systems Which Are Capable Of Sensing Different Parameters I.E. Temperature, Pressure, Humidity Etc. This Sensed Data Is Interfaced Via Transceiverto The Server Node. These Sensed Values Are Processed By The Microcontroller. The Designer Can Observe The Sensed Data Globally If The Sensor Nodes Are Connected To The Api's Like Temboo.

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