ISSN:0975-9646
Sundar Kumar. S et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 6 (5) , 2015, 4456-4458

Analysis on Employment of Wireless Sensor Networks

Sundar Kumar. S[1], Bharathi. B[2]

[1] *Assistant Professor,Department of Computer Science,*
[2] *Assistant Professor,Department of Information Technology,*

[1,2]*Karpagam Academy of Higher Education, Eachanari, Coimbatore, Tamilnadu, India-641021.*

Abstract- **In current scenario automation is needed everywhere from home to office. From the devices we use to the places we go the system is needed to be automatic. And the most important field today being basic for any other operations is data collection. Being manual the collection of data was hard due to the need to employ more persons. Sometime the accuracy might be missing while passing the data for consolidation or other purpose. When the data collection is made automatic accuracy was improved very much and the actions to be taken were done at time. Former one is time consuming and latter one is energy consuming. To implement latter the key available here is wireless sensor networks (WSNs). This article mainly spotlights on analysis of employment of wireless sensor networks, their advantages and disadvantages and a justification in that application.**

Keywords **– employment of wsn, apps of wireless sensor networks, wsn application areas.**

I. INTRODUCTION

Wireless Sensor Network (WSN) has become a well used kind of network in the current scenario. This network is mainly used to sense activity. The activity mainly refers to the changes that happen physically or in an environment. Main process that is carried out in Wireless Sensor Network (WSN) is data collection via nodes and passing it to a main location. The applications of wireless sensor networks were at basic level during the stage of origination but as the years rolled on numerous developments were launched a lot. The main characteristics of wireless sensor network are power consumption and ease of use. Wireless Sensor Network (WSN) is applied in wide variety of areas like forest fire monitoring, traffic control, surveillance systems in various government and private sectors, factories, patrol systems etc. Being wireless there is advantages and disadvantages in this kind of networks. This article mainly spotlights on analysis of applications of wireless sensor networks, their advantages and disadvantages and a justification in that application.

II. ARCHITECTURE OF WIRELESS SENSOR NETWORKS

The typical architecture of a Wireless Sensor Network (WSN) is depicted in Fig. 1.

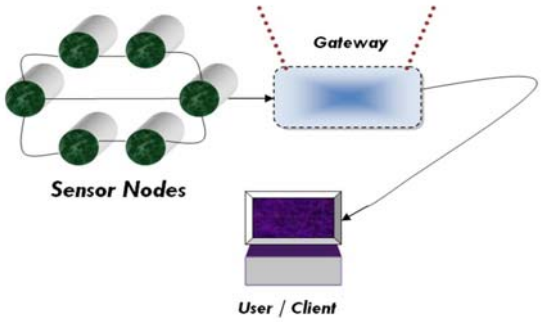

Fig. 1 Sample diagram for a wireless sensor network

As per the Fig. 1 typically a WSN contains 3 parts. One part is the network of sensor nodes. The second one is gateway and finally the User or Client. The main function of a sensor node is to collect data about changes in environment, does processing on that data and send it to the accumulator node or to the gateway. The gateway passes the information collected from the sensor node network to the client system. The sensor node will look like Fig 2.

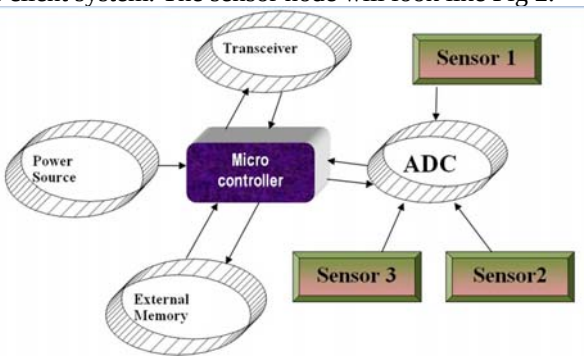

Fig. 2 Look of a sensor node

Microcontroller is like the brain and heart to a sensor node. It does controlling operations in a node like controlling the tasks performed and controlling other components in a node. Additional to the above operations processing of collected data is also done in this microcontroller. According to the purpose of application the type of micro controller varies in a sensor node. Data is collected via the sensors / hardware devices which produce the data as response according to the change in the environment. Those sensors might be Omni directional, passive, active or of narrow beam type. The response or data collected by

them is sent to the micro controller using Analog-to-Digital Converter (ADC). To store data and program external memory is used in a sensor node. A sensor node communicates the data using a transceiver. Power Source is mainly required for the continual operation of a sensor node and it's mostly affected by various factors in environment.

III. APPLICATIONS OF WIRELESS SENSOR NETWORKS

A. Forest Fire Detection System [FFDS][1]:

The forest fire detection WSNs contains TIP50CM sensors in each node. These nodes are operated by Tiny OS which is an event based operating system. The routing on this kind of network is done using Minimum Cost Forwarding (MCF) method and the protocol used here is similar to other flat routing protocol. Impending to the hardware, the processor of FFDS (Forest Fire Detection System) is 8 MHz in speed. As the sensors communicate via radio, such frequency is 2.4 GHz. The sensor node here is made to monitor the change in temperature, humidity and illumination. Each and every sensor does it and finally sends the sensed data to the sink node. The sink node collects all those data and sends it to the transceiver. Here the transceiver is the key; an administrator can connect to it via middleware program which is been made as a web application and analyze the data received. The analysis produces a statistics which can be used by the admin to take corrective actions.

B. Air Pollution Monitoring [APM] [2]:

In air pollution monitoring 24 – 26 sensors was used around the city with 10-12 routers. Here the main things monitored are temperature and humidity as the pollutants may damage these things. A network capable application processor is used to download the pollutants level data into a personal computer for further processing. The name of software used in the point of clustering is Clementine. Moreover Google Maps were also used supportively to collect and display real-time pollutants in metropolitan cities. The collected data is sent to the server using a Bluetooth controller.

C. Border Patrol[3]:

The border patrol systems are largely employed using wireless sensor networks in concern of national security. Such kind of employment is done to reduce the deployment of more soldiers in long borders and the human loss. In this system each sensor nodes will be of same physical capabilities and can interact only with the adjacent nodes. The network in border patrol system has a three level architecture. The first layer contains ground and underground sensors which collect the vibration data and sends it to the sink node or the hub. The mobile / stationary surveillance towers in the second layer will collect and send the multimedia data. These mobile sensors are aided by the third level sensors including unmanned helicopters, robots etc will be doing out a complex task for collecting multimedia data. This kind of implementation is affected by several factors and the one among them is cost. Due to that factor the first level sensors will be more than the higher level sensors. The way of sending data to the server is same as the one represented in Fig. 1.

D. Traffic Light Control System[4]:

The traffic light control system is made up of wireless sensors and intersection control agents (ICA). The sensor nodes are made up of one or more sensors, a processor, radio and battery. The intersection nodes/agents are responsible for collecting data from the sensor nodes and take appropriate action like adjusting traffic signal then and there. The processor of sensor node is Atmel containing 512KB of flash memory. Like in the FFDS Tiny OS is used here in each sensor. The frequency of radio attached to sensor node is 46kbps. A magnetometer sensor is used to detect the motion of vehicles in traffic because of presence of ferrous in those vehicles. Protocol used for this traffic light control system operates on four phases and it's named as PEDAMACS. The messages here are transferred in four modes. One from sensor to sensor, two from sensors to intersection control agents (ICA), third and fourth from Greedy ICA to ICA and ICA to ICA with coordination. Since the ICA solves lighting problems there is no need of a server or a web application or any other software in this system.

E. Railway Track Surveillance System [RTSS] [5]:

In current scenario railway transportation system is used all over the world because of low cost and an approximate guaranteed delivery. There is also a set of accidents occurring in it due to lack of defect monitoring. This RTSS solves almost that problem. The modules used here consist of an Infrared Sensor for infra red radiation. This IR sensor is used with a photodiode. A robot is used here to scan the tracks for any defects. GSM with GPS technology is used in this RTSS. In railway track the IR sensor is fitted at one side of the track and photodiode is fitted at the other side of the track. The robot starts moving over the track for defect detection using the infra red rays. Those rays are been sensed by the IR sensors. Whenever there is a crack in the track the IR ray loses its resistance. The robot stops there and collects information about defect along with GPS information. This data is sent via GSM modem with pictures of defect taken with a camera to the necessary place for corrective actions to be taken.

IV. CONCLUSION

All along the analysis knowledge about the architecture of wireless sensor networks (WSNs) are gained. Even though there are many more implementation formats of WSNs. This analysis is mainly done to find out the advantages and disadvantages of wireless sensor networks in various streams. The advantage to be concluded is automation in the implementations that reduces human effort and increases the efficiency in data collection. The disadvantage to be conveyed here is energy efficiency. Because if automation is getting larger and larger the energy spent will be more. This might reduce the efficiency of the data collection later in the process. If a total overhaul is done to maintain power of the nodes in the above

application areas the resultant effect will be a disaster. A perfect planning and execution is needed to maintain power backup of the sensor nodes. So the main area to be focused on implementation of wireless sensor networks is energy efficiency for good data collection.

ACKNOWLEDGEMENT

We hereby acknowledge that this is an analysis paper based on the works done by the people specified in references section. Even though the references are based on several research works, those are been cleanly analyzed and the gained knowledge is produced here in unique way. We thank the people who have done their research works and helped us indirectly to gain some knowledge about employment of wireless sensor networks.

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