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WSN BASED HOME AUTOMATION SYSTEM

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Abstract— Now, a day's Wireless Home Automation (WHA) are used for new home and renovation projects because as it increases the quality of life, it also provides ease for home users, facilitating energy saving and efficient home management. Generally WHA networks consisting of wireless embedded sensor and actuators that interconnect with each other through a suitable wireless network intelligently. In this paper, we propose a system of home automation which will be based on Wireless Sensor Network (WSN).

Index Terms— Wireless Home Automation, Wireless Sensor Networks

I. INTRODUCTION

In recent years, wireless sensor and actuator networks are receiving significant attention from academia, industry and standards development organizations. Nowadays, home automation using wireless communication is used instead of wired system because it is difficult to setup. Wireless sensor networks (WSNs) have been used all over the world. Wireless Sensor Networks (WSNs) have been used in several areas, such as home automation, industrial automation, security systems, military sensing and tracking, medical emergency response, pollutant detection, data collection, power management, and weather analysis. There are a number of studies which say that Wireless sensor networks are a cost effective resolution for collecting, receiving and transmitting data. To understand methods and technology required for the design of a home or office automation based on WSN, many varieties of monitoring and control systems for home applications have been studied. The primary change was in the application area, the communication link used for the exchange of monitoring and control information and the hardware, software platform used for the implementation. Home automation can be found in many applications such as security, safety, heating, environmental, lighting, appliance control, and energy management. A WHAN typically consist many types of severely constrained embedded devices, which may be battery-operated and having low-power radio frequency (RF) transceivers. The use of RF communication permits flexible addition or deletion of devices to or from the network and decreases installation costs since wired solutions require wired cables. However, the dynamics of radio transmission, resource restrictions, and the motion of some devices challenge the design of WHANs. In home automation systems, the sound identified by the system becomes the basis for performing certain tasks related to home activity. However, if a target source is mixed with another sound due to simultaneous occurrence, the system would make poor identification results, leading to inappropriate responses. To handle such problems, we propose a WSN based home automation system using Convolutive Blind Source Separation (CBSS) Algorithm.

II. LITERATURE REVIEW

In [2], Jia-Ching Wang, Hsiao-Ping Leeet al, design and implement a robust environmental sound identification system for home automation. Exact home automation services can be triggered based on recognized sound classes. The main techniques used in design system include signal enhancement and sound recognition. The sound classifier module separate out non-speech signal such as ringing telephones, knocks on doors, babies crying, windows breaking etc and speech signals.

In [3], Hairong Yan, Hongwei Huo, et al, proposed wireless sensor based E-Health system. The design used for 24 hour continous monitoring of elder person without disturbing daily regular activities of elderly people and their caretakers. In the design system, both fixed and body (mobile) sensors are used. Since it is not essential to attach the wireless sensor board to elder person or in many cases, he/she may not bring the sensor; even if the home sensor network autonomously would have the capability to monitor the health status and living environment based on data provided by the wireless sensor network. To determine location of elder person, a mixed positioning algorithm is used which is helpful for the system to determine the person's activities and make decisions about his/her health status. The system could take care of two types of the simple requirements of an old person: emergency alarms to doctors and caretakers through telephone, SMS and e-mail regarding abnormal events and day to day requirements such as taking of medicine, having lunch, turn off the microwave oven, and so on.

In [1], Chris R. Baker, Kenneth Armijo et al, proposed home health care system based on wireless sensor network. This system will provide early detection for adverse disease and improve communication gap between doctor and patient. This paper presents five prototype design for child monitoring, notifying partly or totally unable hearing persons, blood pressure checking and monitoring fire fighter vital signs.

III. WIRELESS SENSOR NODE

A sensor node is a node in a sensor network that is capable of execution some processing, get-together physical data and interacting with other associated nodes in the network.
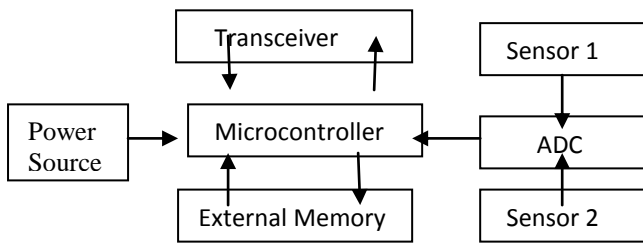
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Fig. 1 Wireless Sensor Network

Controller-
The controller performs tasks, processes data and controls the operation of other components in the sensor node. While the most common controller is a microcontroller, other substitutions that can be used as a controller are general purpose desktop microprocessor, digital signal processors, FPGAs and ASICs.

Transceiver-
Sensor nodes make use of ISM band, which provides free radio, spectrum distribution and worldwide availability. WSNs use license-free communication frequencies such as 173, 433, 868, and 915 MHz; and 2.4 GHz. The operation of both transmitter and receiver are common into a single device known as a transceiver.

External memory-
From an energy view, the most appropriate kinds of memory are the on-chip memory of a microcontroller and Flash memory—off-chip RAM which is rarely used.

Power source-
A wireless sensor node is a well-known solution when it is difficult or impossible to attach a mains supply to the sensor node. Since the wireless sensor node is normally located in a hard-to-reach position, substituting the battery regularly can be costly and problematic. The sensor node consumes power for sensing physical data, communicating and data processing in microcontroller. More energy is necessary for data communication than any other process.

Sensors
Sensors are hardware devices that generates electrical signal to a variation in a physical quantities such as temperature, pressure, humidity and so on. The continual analog signal generated by the sensors is converted into digital form by using analog-to-digital(ADC) converter and send to controllers for further processing.
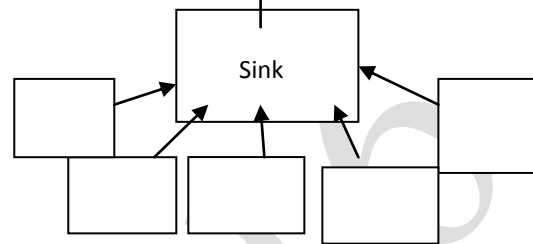
IV. ARCHITECTURE OF PROPOSED SYSTEM

Fig.2 Architecture of the Proposed System

Fig. 2 shows the architecture of the proposed system which contains several wireless sensor nodes and a sink for mixed sound event verification. The wireless sensor nodes capture simultaneously generated sound in a room. Each sensor node is equipped with a small microphone array. The microphone array at each sensor node receives and transmits the mixed signals to the sink. The sink will perform sound separation and sound verification and the predefined home automation services can be activated with associated sound.

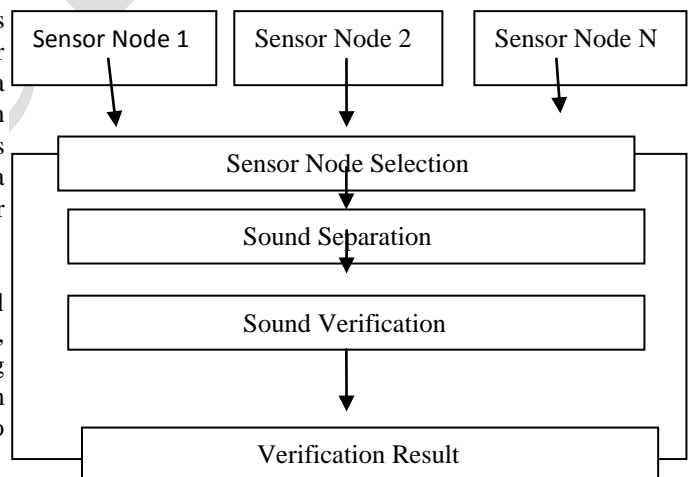## V. BLOCK DIAGRAM OF PROPOSED SYSTEM

Fig.3 Block Diagram of Proposed System

VI. SYSTEM DESCRIPTION

Sound Detection Phase:
As shown in fig.3 three or more nodes will capture mixed sound waves through microphone. All the nodes capture simultaneous generated sound in surrounding and each node will send mixture of sound to sink for further processing.
Sink Node performs following tasks:
Sensor Node Selection Phase-

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In this phase, particular one sensor node for further processing will be selected on the basis of Direction Of Arrival (DOA) estimation of unknown signal that received from each sensor node.

Sound Separation Phase:

In this phase, extraction of interested sound or desired sound from mixed sound is carried out using Convolutive Blind Source Separation (CBSS) algorithm.

Sound Verification Phase:

In this phase, event verification is done by comparing the desired separated sound and predefined desired sound which are maintained in separate database

VII. CONCLUSION

In this paper, we have proposed WSN based home automation system. Wireless Sensor Node makes the system easy to install and in addition, the nodes in the system can easily be expanded to cover more space. The importance of WSN based Home Automation system is to improve the living standard of people. The expected output will be flexible, reliable, low cost and powerful wireless home automation system. However, there are many challenges that need to be solved in sensor network.

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