Implementation of the Digital Integrated Public Address System Based on Network

Jung-Sook Kim'

Division of IT, Kimpo College
' 97, Gimpodaehak-ro, Wolgot-myun, Gimpo-si, Gyeonggi-do, Korea
kimjs@kimpo.ac.kr

Abstract. A public address system is an electronic amplification system with a mixer, amplifier and loudspeakers, used to reinforce a sound source. In this paper, we developed a digital, minimized and integrated public address system with speech recognition and sensor connection based on IP with an ID. It has facilities such as an external input, a microphone and a radio for a public address system and has speech recognition. In addition to that, many sensors, such as temperature, humidity, and infrared, etc., can be connected to the public address system and can be integrated with the context awareness which contains many types of information about internal statuses.

Keywords: Digital Integrated Public Address System, Speech Recognition, Sensors, Network, IP

1 Introduction

A public address system is an electronic amplification system with a mixer, amplifier and loudspeakers, used to reinforce a sound source e.g., a person giving a speech or a DJ playing prerecorded music, and distributing the sound throughout a venue or building [1]. There are two kinds of public address systems (PA systems), which are an analog PA system and a digital PA system. The digital PA system has more communication quality than the analog PA, and there are a variety of digital PA systems made by many companies. A Digital PA system is utilized in all public places attended by vast crowds of people. In daily operation, such systems are not only used for public information or for promotional advertising, but also for musical entertainment or for internal purposes like the communication among staff in widespread buildings (by live announcements or by intercom operation). In cases of emergency, such systems become particularly important: reliable alarming and acoustical guidance of crowds with people being directed to certain targets is absolutely necessary for the prevention of chaos and panic, so that organization of a scheduled evacuation can proceed as planned. PA system over IP refers to PA paging and intercom systems that use an Ethernet or GSM-R network instead of a centralized amplifier to distribute the audio signal to all paging in a building or campus. Network-attached amplifiers and intercom units are used to provide the communication function [2]. In this paper, we developed an intelligent digital, minimized and

integrated PA system with speech recognition and sensor connection based on IP with an ID. It has facilities such as an external input, a microphone and a radio for a PA system and has speech recognition. If "fire" is spoken to the PA system then it can recognize the emergency situation and will broadcast information to the appropriate agency immediately [3]. In addition to that, many sensors, such as temperature, humidity, and infrared, etc., can be connected to the PA system and can be integrated with the context awareness which contains many types of information about internal statuses. For example, if the humidity sensor sends information that humidity is high, then the PA system can intelligently unicast an adaptable response, such as the following: 'turn off a heater', or 'open a window', at a certain place, through a network based on IP with an ID. Also, developed the digital integrated PA system will make it possible to broadcast the message to adaptable places using network IP based on IDs. Finally, the digital PA system is designed for operation from a PC, which makes installation and setting of operating parameters very simple and user-friendly.

The structure of this paper is the following: Section 2 describes the digital integrated PA system, and section 3 presents the implementation details of the digital integrated PA system. Finally, conclusions are drawn and future work is discussed in section 4.

2 Development of the Integrated Public Address System

Figure 1 shows the digital integrated PA system structure. The digital PA system range of equipment has multiple functions combined in a single unit. This feature drastically reduces the number of different types of equipment used in the system. This makes the overall system highly cost-effective.

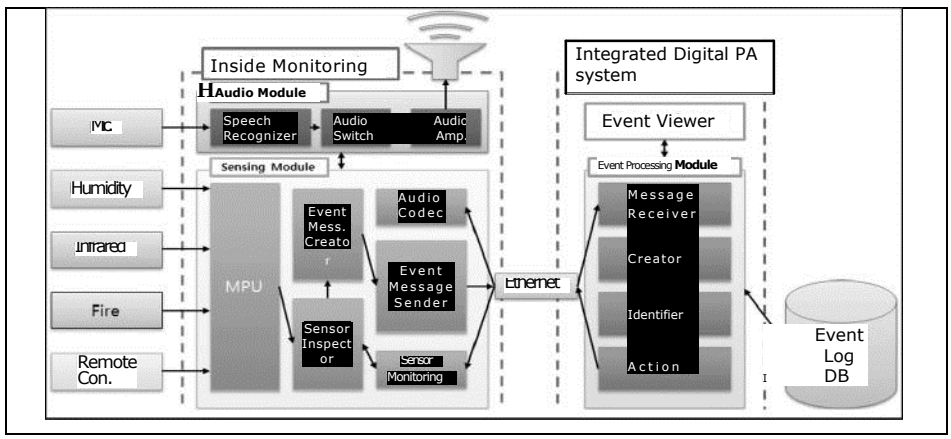

Fig. 1. System structure

2.1 Design of an ID

The ID object is used to identify object. It can be expressed in hierarchical structure with its Hierarchy property. Also it can be used duplicately with its Unique property. It basically uses a string of mixed characters and integers. The hierarchical structure is expressed by the literals "@" and ".". The literal "@" distinguishes device and where device is. The literal "." represents the hierarchical structure of the device itself or the location. The schema definition for the ID is as follows: <element name="UserID" type="ID" Hierarchy="false" Unique="True"/>, <element name="DeviceID" type="ID" Hierarchy="true" Unique="false"/> and the usage example is as follows: <UserID>Hong Gil Dong</UserID>

<DeviceID>Monitor123.MyCom@MyOffice</DeviceID>

2.2 Sensing and Speech recognition

This PA system can provide context awareness of various events occurring in a building or a house. Also, it is able to recognize both speech and sounds, such as a fire bell and disaster bell, which signal to escape in emergency situations, and it can sense information which is sent from various sensors. If "fire" is spoken to the PA system then it can recognize the emergency situation and will broadcast information to the appropriate agency immediately. In addition to that, many sensors, such as temperature, humidity, and infrared, etc., can be connected to the PA system and can be integrated with the context awareness which contains many types of information about internal statuses. For example, if the humidity sensor sends information that humidity is high, then the PA system can intelligently unicast an adaptable response, such as the following: 'turn off a heater', or 'open a window', at a certain place, through a network based on IP with an ID.

3 Implementation and Result

We have implemented a digital PA system with the design presented in the previous section using C and C# language on Windows. The system is supplied with user-friendly software for system operation. The software is based on Windows, which gives users easy and simple use of operation. For speech recognition, we use the RSC-4128 processor which represents Sensory's next generation speech and analog I/O mixed signal processor [4, 5]. Figure 2 shows the fire emergency situation. The left frame represents a position of fire emergency and you must push the "[1]1[1]4" button on the right frame to inform the residents of the emergency

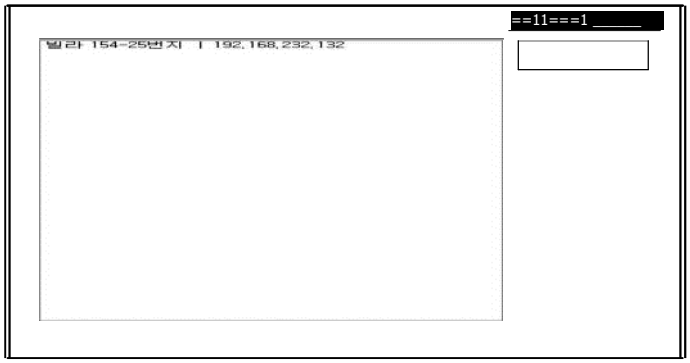

Fig. 2. Fire emergency

4 Conclusions and Future Work

Network-attached amplifiers and intercom units are used to provide the communication function. In this paper, we developed an intelligent digital, minimized and integrated PA system with speech recognition and sensor connection based on IP with an ID. It has facilities such as an external input, a microphone and a radio for a PA system and has speech recognition. If "fire" is spoken to the PA system then it can recognize the emergency situation and will broadcast information to the appropriate agency immediately. In addition to that, many sensors, such as temperature, humidity, and infrared, etc., can be connected to the PA system and can be integrated with the context awareness which contains many types of information about internal statuses. Also, developed the digital integrated PA system will make it possible to broadcast the message to adaptable places using network IP based on IDs. Finally, the digital PA system is designed for operation from a PC, which makes installation and setting of operating parameters very simple and user-friendly. In the future work, we will extend the digital PA system that has one more function. That function operates like this: if you are in darkness of emergency, then you can move according to an escape path, listening a sound

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