Work in Progress - Laboratory Learning System for Simultaneous Multi-point Environmental Factors Measurement

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Abstract – The authors explore a new laboratory learning system for the simultaneous measurement of some environmental conditions such as temperature, noise and light by using wireless LAN system in a wide range of areas. The system contains a Control PC and Control Module which is comprised of voltage supply, communication part and measuring module. This research intends to develop software which controls the whole system, and it also plans to introduce the system into “Basic Experiments of Information Engineering on Environment Measurement.” This system is beneficial to educational institutions because it will provide students opportunity to learn both software and hardware that include analogue and digital technology as well as wired and wireless system. In addition, students will be able to do programming, setting and measuring by themselves giving them a strong foundation not only in the basics of electronics, circuits and communication but also in the application of information technology.

Index Terms - environment measurement, laboratory learning, luminous classroom environments, simultaneous multi-points measurement

INTRODUCTION

The authors have previously developed several teaching and learning methods -CAI, CMI and CAM (Computer Assisted Measurement) in engineering education using personal computers (PC). The authors have evaluated the visual environment such as illuminance in classroom with liquid crystal projectors. In a large classroom, however, it takes a long time to measure illuminance. Therefore, improvement of process is necessary. Using a wireless technology, we can develop the new system which makes more speedy and effective measurement in a large classroom possible.

HARDWARE AND SOFTWARE CONFIGURATION

The Visual Environment Evaluating System consists of two major systems; the measuring system and the PC system. The measuring system provides data with a wireless for the illuminance distribution of different seats (multipoint) in a large classroom. While the measuring system collects data simultaneously, the PC system analyzes the data.

Figure 1 shows the concept of the entire system. Figure 2 shows the main unit which is composed of sensor module, control module and PC. The maximum number of the sensor attached to sensor module is four. The sensor module contains illuminance, temperature and sound meters. The control module contains measuring and communication modules. The former controls the sensors and the latter controls sending and receiving data. The control module and the PC are connected with RS-232C cable. The maximum unit is composed of one main unit and seven sub units. Each unit is connected through SS wireless communication with 2.4 GHz signal.
MEASURING PROCEDURE

Figure 3 is a flow chart of the measuring procedure. The following is a measuring process. Each meter of the sensor outputs analog signal maximum 200 mV. The signals are transferred to the control module through wire cable. Here the maximum number of the sensor and the control module is 30 and 8 respectively. The control module has maximum five sensors. Wireless signal transfers data between the main and sub control modules.

We use Windows 2000 as an operating system for computers to collect data. Database software is Microsoft’s SQL 2000. Visual Basic 6.0 is currently used for controlling whole system, and Visual Studio #.NET (C#.NET) is now under development for the purpose of use on the Internet.

The numbers from 1 to 5 are designated to the sensors on CAN bus. All equipments are also numbered from 1 to 89. For example, the main communication module which connects to the PC is numbered 1. This PC collects whole data. A cross-cable is used as RS-232C cable. Each meter of the sensors outputs analog signal. The signal is transferred to the control module through wire cable. Then, a data collected to the main control module can be transferred to the control PC via RS-232C. Data is monitored remotely and stored into SQL sever, and it can be transferred to another computer.