A New Design of an Automated Remote Lecture System in Japanese 18 Universities in 2015

Takeshi Sakurada(✉), Kazuhiro Mishima, and Yoichi Hagiwara

Information Media Center, Tokyo University of Agriculture and Technology,
2-24-16, Naka-cho, Koganei-shi, Tokyo, Japan
{take-s,three,hagi}@cc.tuat.ac.jp

Abstract. In this paper, we describe a new design of an automated remote lecture system in Japanese national 18 universities. Our current high-definition automated remote lecture system that was constructed in 2009 has many life-expired hardware. Thus we design a new remote lecture system for replace current system. In our design, new system controls room equipment automatically by reservation, connects rooms and mobile environment seamlessly. The designed system is expected to build actually with the goal of full-scale operations in 2016.

Keywords: Remote lecture system · Teleconference system · System automated · Mobile environments connection

1 Introduction

Since 1997, most Japanese universities have performed a remote lecture using SCS (Space Collaboration System) [1, 2]. SCS used satellite link, satellite link was often down and equipment had many failures in aging. In Addition, SCS did not support to the full HD resolution videos. Therefore, we decided to design and build a new system.

Thus we build a remote lecture system [3] in 2009. In 2009 system (hereinafter referred to as "current system"), we connected 18 national universities in Japan (Obihiro University of Agriculture and Veterinary Medicine, Hirosaki University, Iwate University, Yamagata University, Ibaraki University, Utsunomiya University, Tokyo University of Agriculture and Technology, Gifu University, Shizuoka University, Tottori University, Shimane University, Yamaguchi University, Ehime University, Kagawa University, Kochi University, Saga University, Kagoshima University, University of Ryukyu). These universities constitute six of the United Graduate School of Agricultural Science jointly. Remote lectures connecting several universities are always performed. Additionally, in June and November every year, 3 days remote lectures connected all universities are performed.

Equipment of the current system also failure began to occur in aging. Thus we have decided to update the system.

In this paper, we first describe design and operation of a current remote lecture system for Japanese 18 national universities. Then we describe a new system design of remote lecture system.

C. Stephanidis (Ed.): HCII 2016 Posters, Part II, CCIS 618, pp. 261–265, 2016.
DOI: 10.1007/978-3-319-40542-1_42

2 Current System

Because operation of the videoconference system equipment is very difficult, the current system is controlled automatically from a reservation system. The previous system requirements in design are as follows:

- Many universities (more than 18 universities/23 rooms) can join same lecture
- Multi-directional communications at the same time
- Simple machinery operation
- Interoperability with the other videoconference systems
- Supported two screens with high-definition
- Provide high quality videos and sounds (HD 720p)
- Support large room (Resolve sound loop)

To connect plural videoconference devices at the same time, MCU (Multipoint Control Unit) are necessary. Internal MCU of videoconference devices is only accepting 4–6 connections. We must connect over 20 rooms, we should use outside MCU device. Equipment at each rooms and MCU are controlled by reservation system. In the current system, a user can make a reservation through the web and each room is connected automatically by the system at reservation time. Figure 1 shows overview of current system.

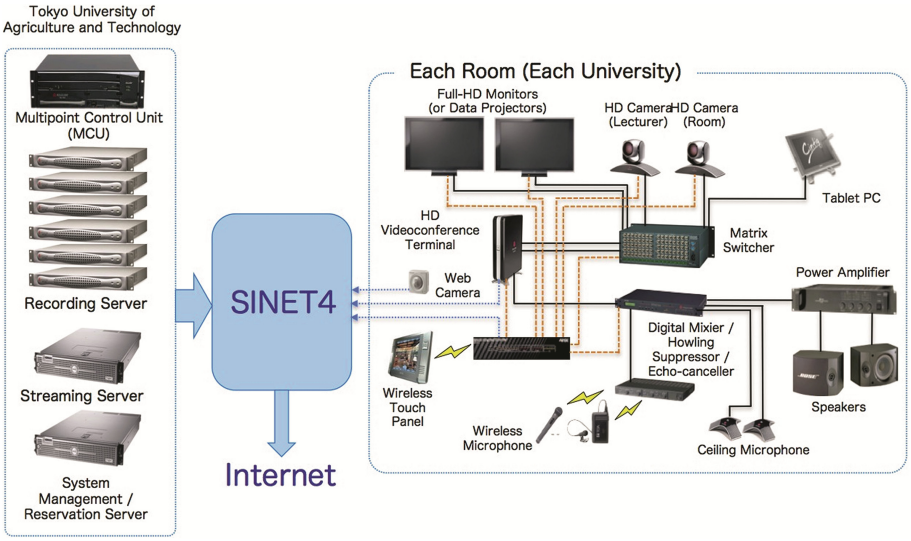

Fig. 1. Current system diagram

This automation mechanism is a good reputation from users. Lectures and meeting have been held 2 times per day in average. The system is also used in admissions as well as remote lectures and meetings. In addition, it has been well utilized to create a virtual room to connect the nearby room (Fig. 2).

Fig. 2. Connecting nearby room

3 Problems of Current System and a New System Design

3.1 Problems of Current System

Equipment of the current system began to failure in aging. In addition, dissatisfaction of the system had been out of the user:

- Not Full HD, PC screen is support XGA/15fps resolution. Cannot support digital input.
- Cannot connect from out side of the room. (Can not connect from mobile environments)
- Network is not stable in some universities, distance learning is sometimes cannot be held stable.
- Often occur charging out of the wireless touch panel.
- Higher equipment maintenance fee.
- User wants to watch the screen that user oneself is taken.

3.2 Requirements of a New System

Based on the feedback from users of the current system, we decide the requirements of the new system. Since the budget is not enough with the new system, it will replace the 23 rooms that were initially built in the current system.

- Support a digital input (HDMI)
- Support 3 screens (instructor video, PC video, local feedback video)
- Support Full HD resolution and high frame rate (Dual streams: 1080p/30fps + 1080p/30fps)
- Participation from the mobile devices
- Reduction of maintenance costs
- Easy to use

- To continue the mechanism of reservation and automation
- Control the room of current system (not replaced) with the new system.

3.3 Design of a New System

To realize the first three items of above requirements, replace to the new videoconference device. Since the maintenance costs are high it cuts the unnecessary functions. As an example, it cuts a small MCU with a built-in videoconference terminal of each room. MCU of purchase costs and maintenance costs are expensive. Connection from the mobile shall not use a dedicated software. It is a new system to allow connections from Android and iOS as well as from the notebook PC.

Figure 3 shows a design of a new system. Reservation system also controls mobile connection not only room connection at the same time. Thus the reservation system will be built from scratch.

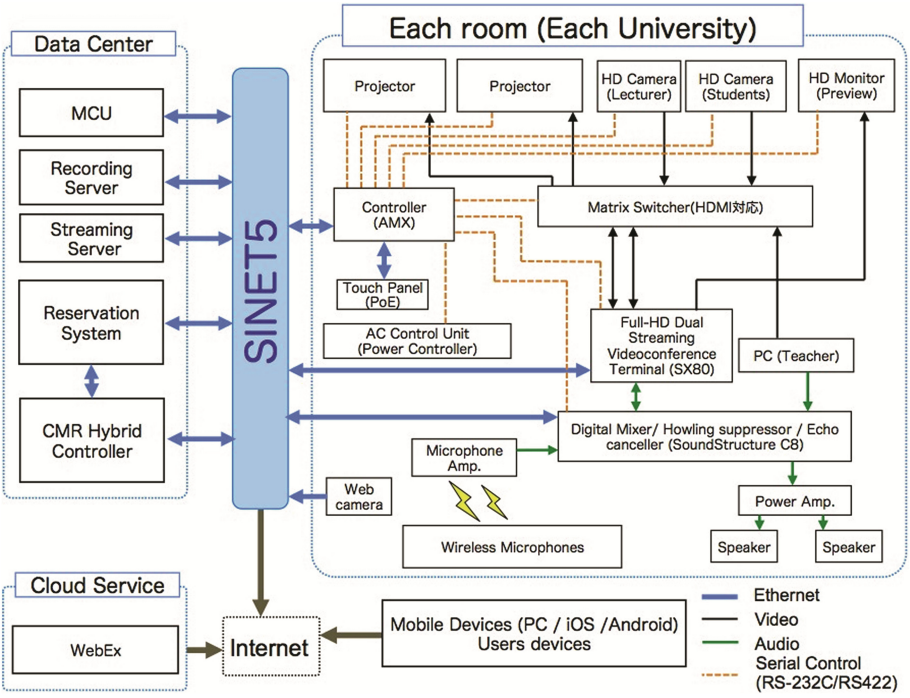

Fig. 3. Overview of a new system

4 Conclusion

In this paper, we described the new automated remote lecture system. This new system is going to build and test towards the running of spring, 2016. In the new system, we realize the high resolution and high frame rate of the video transmission. The user can

only make a reservation from the Web, the new system is the same as performed in the automatic control of the equipment as before. For this reason, it is an easy-to-use system for users who are not familiar with the equipment operation.

Normal videoconference system at a room and mobile environments assumes the few participants from each room. It is possible to connect a large classroom (several hundred students) and a small number of mobile environments seamlessly in this system. This style would go become common. In the future, we hope that the new teaching style using this system appeared.

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