A Development of Classroom Design Simulator
for Interactive Video Teleconference

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Abstract

"Visual Field Record System" is aim to support participant's behavior analysis in distance education using interactive video teleconference system. An examination of the eye camera position is important to use the system effectively. Because the camera's angle and zoom rate is considered participant's behavior in this system. Actually, there are some problems that it originates in the camera position at the system. We approached these problems by developing the eye camera install-simulator including arrangement of the classroom equipments. This simulator is called Classroom Design Simulator.

In this paper, it describe about functions and operations of the simulator. After that, the system is evaluated by the application to a case. It was shown that this system was useful for a distance education planner as a result.

1. Introduction

In the broadband network age, participants such as students or teachers are able to join in a distance classroom by interactive video teleconference system individually. The system is usually composed from video monitor and eye camera that is remote controlled via network.

On the evaluation of the educational effectiveness using these educational systems, participant's behavior is important. The evaluation can be analyzed from records of the participant's behavior.

In Figure 1, Participant's visual field is equivalent to the eye camera's view. In other words, the visual field is the combination with the two functions. One of the functions is recording eye camera's status such as current zoom rate, pan, and tilt. Another function is recording eye camera's linear video image.

On above philosophy, "Visual Field Record System" has already proposed and developed [1]. The system has following functions.

- Display change of the visual field graphically.
- Enumerate watching time of each visual field.
- Calculate total watching time at the selected visual field range.
- Automatic pick-out visual fields by pattern such as a change of pan, tilt, and zoom.
- Search and show a video image corresponding to visual field from recorded linear image.

Using this VFR system, some problems are pointed out. One of the problems is relationship between classroom equipment's location and a camera's position. For example, a participant such as a teacher who has to look at student's expression will want to take a close-up of their faces. Only when the relationship is appropriate, the participant is able to start the action.

Therefore, a simulator that is able to install a camera in consideration of the classroom equipment's location is necessary. It is called Classroom Design Simulator. Using this simulator, the relationship between equipments and eye camera can be confirmed in advance.
2. Classroom Design Simulator

Classroom Design Simulator is composed by the following two sub-systems. A relationship between two sub-systems is shown in Figure 2.

Classroom authoring sub-system is able to arrange classroom equipments including eye camera in the 3D virtual space. Screenshot is shown in the figure 3. A designer (distance education planner) has to arrange a distance classroom with this system firstly. A designer is able to install an eye camera with confirming its view range at this stage. In the same way, multiple cameras can be installed in one classroom.

Secondly, The designer evaluates a camera position by using the camera control simulator sub-system. By evaluation from camera view, we can discover problems such as objects out of range, objects override at same range, and etc. The designer arrange again back to the classroom authoring sub-system if necessary. Though this system is usually controlled by the control device, it has the function which inputs recorded camera's status data by Visual Field Record System, too. That is, a problem can be discovered quickly in the design of the classroom which in distance education has already been done.

Outline of each sub-system's function is following.

Classroom authoring sub-system
- An arrangement of the classroom equipments such as deck, chair, laboratory table and etc.
- Building of the wall, the ceiling, and etc.
- A setting of the camera position.
- Viewpoint is freedom.
- Load presetting class style such as Japanese hi-school, hi-school laboratory, and etc. And customize it.
- Import 3D Model data by Other Modeling tools.

Camera control simulator sub-system
- Authoring classroom can be evaluated from camera view, by calling the view change function of classroom authoring sub-system.
- Loading and setup performance information of the eye camera such as maximum zoom rate, move range, controlled latency and etc.
- Camera control with a controller to use in Visual Field Record System
- Camera control from recorded eye camera's status data by Visual Field Record System

3. Conclusion

We have already been analyzed pre-service teacher training using Visual Field Record System at the distance hi-school science laboratory. There were some problems that it originated from the eye camera's position. For example, a part of the chemical apparatus couldn't be watched by a limit of the eye camera range.

Using Classroom Design Simulator at this classroom, it is discovered that a camera's direction is not suitable for analysis aim. In addition, an improvement plan that is able to watch a detail of the apparatus could be re-designed.

From the above result, this system is effective in the design of the distance classroom. It was more effective with the case that many cameras were installed in the distance classroom.

References