
Research and Development of Video Conferencing

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Abstract

We propose a new video conferencing system that uses an array of cameras to capture a remote user and then show the video of that person on a spherical display. This telepresence system can capture a near-correct image for any potential observer viewing direction because the cameras surround the user horizontally; and with view-dependent graphical representation on the spherical display, it is possible to tell where the remote user is looking from any viewpoint, whereas flat displays are visible only from the front. As a result, the display can more faithfully represent the gaze of the remote user. We evaluate this system by measuring the ability of observers to accurately judge which targets the actor is gazing at in two experiments, And try to research and develop the necessary Video Conferencing so as to improve the management and teaching quality of this university with its advantage.

Keywords

Video Conferencing; terminal; MCU (Multipoint Control Unit);research and development.

1. Introduction

Nowadays, with the rapid development of information technology, the globalization of the internet makes network and people go together very naturally. Hence, It is possible to research and develop Video Conferencing, the Video Conferencing is a teleconferencing and visual device attached to the internet which can make conferees see each other's expression, body language and reaction to the talk. The conferees can share the file on the same data list or any other PC[3-4]. It makes conferees in different places feel like having meeting in the same room, working face-to-face with each other.

Video Conferencing can make conferees communicate more effectively, because visualization is the most natural way for communication. It can strengthen the participants' understanding and memory of what they have talked at the conference, especially when the topic itself is a very vivid one with pictures and words as well as actions.

Some Video Conferencing are designed for several groups people in different places to participate in the same meeting, while others only permit several people to discuss the project on their tabletop. In any case, they can see each others' omni-directional activity pictures and hear what others said clearly to let conferees feel that they are working together[5-6]. In this way, the Video Conferencing has created such an environment: to help conferees to make much quicker decisions; to strengthen their team spirits, and to spread the idea, knowledge, and encouraging advance from one colleague to another colleague. In addition, the more prominent advantage is ---Needn't go on business.

2. The use and necessity of video conference

Video Conferencing makes conferees in different places affect each other no matter how far they are away from each other, 10 minutes' walk or even 10 hour's flight. This will let conferees in different places communicate at the same time without spending time waiting for E-mails, Faxes, Expresses etc.

In short, video conferencing makes conferees in different places “sit” together. Three advantages can be found in Video Conferencing[7]. The advantage in “hardware” is clearly seen, but those of the “software” and the “strategy” are hardly measured because the investors must weigh between the cost and benefit of this system. The advantages of the system are as follows:

- Less cost in travel, accommodation and entertainment;
- Less time on the way, more time in work;
- Easier access to the important persons and key information;
- More frequently gathering of the people, more effectively sharing of the information;
- A more comfortable working environment;
- Less harm from the gases given off by the autos and planes;
- Quicker decisions of the leaders and more suggestions from the participants;
- Quicker measures to the crisis;
- Less time used to assemble wherever the person in charge is

3. The Technology and Composition of Video Conferencing

In brief, the Video Conferencing consists of a video conference terminal, a Multipoint Control Unit (MCU), network management software and a transmitting media. Because of the users’ diverse network state and hardware facility, the requirements to the video terminal system, MCU, and the network management software are different too.

3.1 Multipoint Control Unit(MCU)

Multipoint Control Unit (MCU) can also be called a data processing unit. It can also join a lot of terminals to form the physical frame of Video Conferencing. When there are three or more meeting terminals to communicate, it needs one or more signal gathering configurations to make sure a lot of terminals communicate at a meeting so as to achieve the mixing of the video and audio and guarantee the video and audio working well continuously. One MCU can offer 16 E1 interfaces to link the next MCU or terminal device[8-9]. MCU is managed by the workstation; the administrator can configure and test MCU through the workstation to arrange the meeting schedule as well as to count and record the charging information.

MCU is the key equipment of the Video Conferencing, it is equivalent to the function of an exchanger, but it distinguishes with the exchanger of the general telephone network to some extent. It may switch over the video, audio and data signal, that is to switch over the dataflow correctly, but not switch over the model signal. Its working rate of speed is 64kbit/s its 2Mbit/s, and it is working at one speed in each meeting. Generally, all terminals are always using the same speed. It can also be regarded as the bridge for different network meetings. For its different usage of communication network, it is not the same MCU in interactive video conferencing.

MCU will assign the video signal directly and broadcast the data signal widely. It can be divided into two kinds of situations to spread the audio signal: If there is only one meeting-place to make a speech, MCU will switch over the video signal to other no speech meeting-places[10]. If several meeting-places make speeches at the same time, MCU may configure the audio signal blend and choose the maximum volume of the audio signal, then switch over it to all the other meeting-places.

The main component of MCU is as follows, network interface module, audio processor, video processor, controlling processor and data processor.

3.2 Terminal Types of Video Conferencing

No any two organizations are employing the same methods, ideas and communication ways that are why Video Conferencing supplier can offer many kinds of solutions and service. The series of Video Conferencing terminal in many classes can offer the ordered Video Conferencing solution. There are

three kinds of main Video Conferencing terminals: desktop type, roof box type and the meeting- room type.

3.2.1 Desktop Type Terminal

Desktop type terminal is made up of a strong desktop type or a lap-top computer and a high-quality camera (inside or outside) as well as an ISDN card or a network card and Video Conferencing software exquisitely. It is helpful for the person by the desk in the office or the person in traveling to participate in the meeting and to communicate with the conferees face to face[11].

Mainly employability: desktop type Video Conferencing terminal is usually provided for the special individual in the office or the person on business. It may be used in multipoint meeting (for example, the meeting includes more than 2 meeting websites), but it is used in point-to-point meeting mainly (for example, a meeting of a person and another person).

3.2.2 Roof Box Type Terminal

The roof box type terminal is famous for being succinct. All the hardware and software are included in one unit and put it on the television, it is simple and convenient to install, and the apparatus is light and handy. It only needs an ordinary television, an ISDN BRI thread or LAN to offer Video Conferencing service. The Video Conferencing terminal may also load some ancillary equipment, for example, the projector of the file and white board to enhance its function.

Mainly employability: It is usually a shared resource between every department and is suitable for all different scale organizations from trans-corporation to the small-size enterprise.

3.2.3 Meeting- room Type Terminal

The meeting-room type terminal can nearly offer any needed solutions for any Video Conferencing, generally integrate it in a meeting room. The meeting-room type terminal usually makes a large number of attachments, such as the audio system, the adding camera, the projector of the file and the PC file communication. It is the top-class and comprehensive product with twofold screen, abundant communication interface and hypertext. Mainly employability: the meeting-room type terminal was mainly designed for medium and large-size enterprise.

3.3 The Accessory Equipment of Video Conferencing Terminal

Table 1. Shows the different kinds of terminal with the suitable accessory equipment

	Desktop type	Roof box type	Meeting- room type
Projector of the file	√	√	
Scanner and printer	√	√	
Cabinet	√	√	
Monitor / television		√	√
Large-scale megaphone	√	√	√
Microphone	√	√	√
Large-scale camera	√	√	√
DVD broadcaster	√	√	√
Video recorder	√	√	
Outside remote controller		√	√
Word pad	√		
Central control		√	√
Memory card		√	√
Projector		√	√
Plasma screen	√	√	√
Monitor	√	√	√

4. The Using Condition of Video Conferencing

4.1 The Lamplight Design and the Light Requirement in the Meeting-room

4.1.1 Illuminance

The illuminance of the light is a basic requirement for the Video Conferencing room, for its holding time has randomness, so the artificial cold light source should be employed in the meeting room to avoid the natural light. The doors and windows of the meeting room need to shelter from dark curtain. This kind of light source does not have harmful effects to the vision of human eye. Choosing three-base-color light (Color temperature is 3000-3500K) is comparatively suitable, the requirement regulation of the illuminance is as follows:

- In order to guarantee correct picture tone and camera itself balance, the reflecting light on conferees' face must be even, the illuminance should not be lower than 500lux, and the illuminance near monitor, projection television is 50-80lux to avoid shining directly;
- The direction of light is even more important than the illuminance. If installing the diffusion lens for the light, it can enable the abundant diffusion of the illumination and make conferees have even illumination on the face.

4.1.2 The Installing Site Requirement

Three- base -color lamp is generally installed on the ceiling of meeting room, and the ceiling should install the Model L frame on it, then the lamp is installed at the corner of the Model L frame to make sure the light not shine the object and conferee directly, but rely on the ceiling reflecting and scattering of the light to illuminate the meeting room. Besides two points described above, we need to pay attention to the following points in order to reach much better result:

- To avoid the sun shining on the object, background and lens directly, this will cause the dazzling strong contrast situation;
- To propose adopting the light of assisting when the light is weak, but should avoid firing directly;
- to propose using the sunlight type light when using the light of assisting, and forbid using the color lamp and avoid using the flashing source;
- To avoid the light shining from the top or window outside or sidelight directly, it will cause the shade directly;
- To propose using the comparatively soft light that reflects from the indirect light source or the flat wall.

4.2 The Influence of Overall Arrangement of the Meeting-room on the Light and Lamplight

Overall arrangement principle: to make a video recording guarantee to achieve the goal of reproducing the clear picture. The requirement of overall arrangement:

- In order to prevent the "Light deprived" and "reflecting" effect that color produces when recording the characters with a video camera, the background wall should be designed separately. It's better to apply the light colors evenly such as cream-color and gray color. It's not proper to use pictures, and confused colors with strong contrast should be forbidden so as to set the lens of the video camera conveniently;
- The colors of the other three walls, floor and the ceiling of the conference room should match with that of the background wall. Black and bright colors should be avoided, and such light colors as blue and light gray are always preferred. The complicated patterns and pictures should not be hung on the wall to avoid the fuzzy phenomenon produced when the moving or changing the lens of the video camera, thus increasing the encoding expenses at the same time. It's better to seal the windows or install the brown-colored glass in the windows, and thick curtain can be another option to prevent the sunlight from penetrating the equipment directly;

- The lens of the video camera should not aim at the door directly. If the door is set as the background, the object behind the Len will be exposed for people's in and out;
- Tables of the conference: it's better to arrange the desks in rows. Meanwhile, the light-colored tables or table-clothes are preferred to reduce the shadows on the faces of the participants' faces.

5. The Budget of The-video Conferencing

The price of the desktop type equals to a chair of an office. The cost of the meeting- room type terminal equals to a photogravure press. After you have got all the modernized office equipment, you will get more convenience and more benefits with more spending. The price of the system ranges from ¥5000- ¥6000 for the desktop type to ¥8000- ¥9000 for the roof box type to more than ¥30,000 for the meeting- room type. The specific price is decided by the users' situation and their practical need. The main operation cost is the use of ISDN wire. The cost of ISDN wire equals to that of the telephone line. For example, the fee of the distance telephone is 0.07 per second, that is to say, the cost of the conference equals to ¥42 per hour. The price of ISDN differs in different provinces and countries, but generally speaking, the cost of the three functions can be listed as follows.

The installing cost: ¥310 is needed to install one ISDN line of 128kb only once. The monthly rent cost: ranging from ¥35 per month for an ISDN line of 128kb to ¥105 per month for an ISDN of 384kb. The cost for basic use: in china, the cost of ISDN telephones is the same with that of the ordinary telephone, and the cost of connecting to the internet is ¥0.07 per minute for a line of 128kb. The comparison between 128kb and 384kb: An ISDN BRI line (128kb) is enough to meet the need of most Video Conferencing, but the result will be better if 2(256kb) or 3(384kb) ISDN lines are installed. The service contract has guaranteed the operation of the Video Conferencing at any time. Some suppliers also set up a series of telephone hotline to offer changing and repairing of the equipment in 24 hours a day. A simple example Figure 1 is shown as follows.

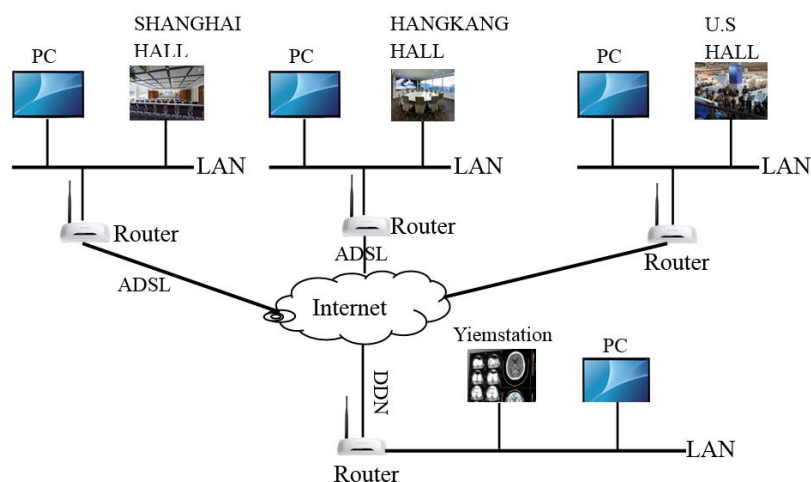


Figure 1. The schematic diagram of remote Video conferencing

6. Conclusion

The paper is devoted to a video conferencing applications embedded in a graphical user interface designed for a robotic system intended to support a remote medical examination. The proposed solution is presented against the background of user requirements and user evaluation. The software technology used for the implementation of MCU with the video conferencing application was assumed to be fully open source. Video conferencing applications were successfully integrated with worldwide system using the software auto-operating System. The teleconferencing applications implement specific functionalities, that are derived from the requirements of a Huiwei staff. They were tested and verified by remote site environment.

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