Aalborg Universitet

The Usability Laboratory at Cassiopeia

Kjeldskov, Jesper; Skov, Mikael; Stage, Jan

Publication date:
2008

Document Version
Publisher's PDF, also known as Version of record

Link to publication from Aalborg University

Citation for published version (APA):
Kjeldskov, J., Skov, M. B., & Stage, J. (2008). The Usability Laboratory at Cassiopeia. Department of Computer Science, Aalborg University. (HCI Lab Technical Report; No. 1).

The Usability Laboratory
at Cassiopeia

January 2008

Jesper Kjeldskov, Mikael B. Skov, Jan Stage
Department of Computer Science, Aalborg University

The Usability Laboratory
at Cassiopeia

January 2008

Aalborg University, Denmark

Jesper Kjeldskov, Mikael B. Skov, Jan Stage
Department of Computer Science, Aalborg University

Preface

This report describes Aalborg University, Department of Computer Science's new usability laboratory facilities at "Cassiopeia", Selma Lagerlöfs Vej 300. The new laboratory was designed in early 2007, built in July/August 2007, and configured in September 2007. The laboratory represents the third iteration of usability laboratories developed and used by the HCI group since 2000 at NOVI and at Fredrik Bajers Vej 7E. The new setup replicates well-functioning features from the lab at Fredrik Bajers Vej, such as the ability to observe two separate test rooms at the same time, but also introduces a number of new features that the group has observed a need for over the years, such as a larger observation room and direct access to and between all test rooms.

The lab has been sponsored by Nokia, Siemens, The Obel Foundation and Noldus.

The layout of the laboratory

The new usability laboratory consists of 4 rooms connected by a central corridor:

- Test room 1
- Test room 2
- Control room (containing equipment for video and audio recordings)
- Observation room

The layout of the laboratory has been designed to facilitate usability evaluations with one or more users interacting with one or more computer systems in the same or separate rooms while being video recorded and observed through one-way windows. From the control room it is possible to look into test room 1 and 2. From the observation room it is possible to look into test room 1.
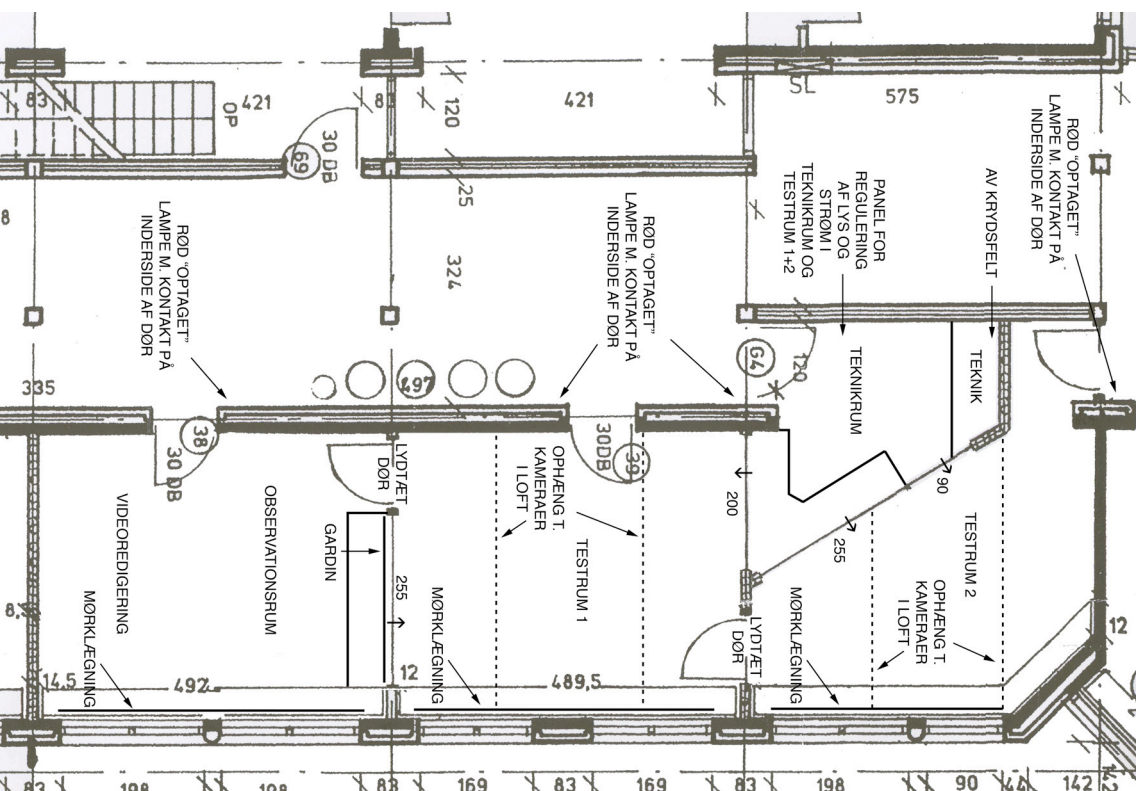
The layout of the new usability laboratory

The test rooms have been designed to include a large primary room (test room 1) and a smaller secondary room (test room 2). The size of the secondary room was increased from the last lab to allow for space for a treadmill for evaluation of mobile devices. Both test rooms are now directly accessible from the corridor rather than through the control room. The two rooms are now also connected with a doorway improving the possible flow of people through the laboratory before or during an evaluation.

Test room 2   Test room 1

The control room has been made smaller in size in order to make the size of test room 2 as large as possible and has been organized differently. The control room now features two primary areas. In one area, observers can be seated at a v-shaped table overlooking test room 1 and 2 through the one-way mirrors and monitoring the evaluation on flat-screens monitors displaying the video being recorded and replicating the PC screens in the two test rooms. In the other area, an AV operator can control all the video and audio recording equipment of the laboratory.

The control room: AV operator area and observational area

The observation room has been increased significantly in size and now has a larger view of the adjacent test room. It has also been equipped with new flat-screen monitors displaying the video being recorded and replicating the PC screens in the two test rooms. This facilitates a better teaching environment as well as better environment for external clients observing a test. Rather than sharing the space of test room 2, the observation room is now combined with the laboratory's room for video editing. It has been

equipped with a separate key (office key), which allows the room to also be used for storage of the laboratory's portable and spare equipment.
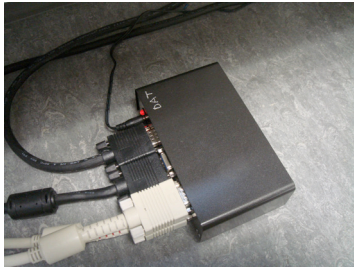

The observation room with area for video editing

Test room 1

Test room 1 is the largest of the two test rooms. It is configured with a standard desktop PC with a 17" monitor. It is also equipped with two motorized Panasonic cameras mounted on rails in the ceiling (cameras 1 and 2). The VGA signal from the desktop PC is run through a 4-way splitter, and routed to monitors in the control room and the observation room. For recording the screen of the PC on video, the VGA signal to the computer monitor is also looped through a Sony scan converter (Hedco x-field source ch. 5). For audio recording, there is a new and improved table-stand Sennheiser microphone. Finally, the room has a 14" Sony monitor on a wheel-stand for monitoring a video signal during a test or for setup purposes (Hedco x-field destination ch. 3). Test room 1 also has a speaker mounted in the ceiling for talk-back from the control room and the observation room.

The basic setup in test room 1

| VGA splitter | Sony Scan converter | Speaker for talk-back |

The light can be turned on and off near the door, and on the central panel in the control room. Power for the outlets without a switch above it is turned on and off on the central panel in the control room.

Test room 2

Test room 1 is the smallest of the two test rooms. It is configured with a standard desktop PC with a 17" monitor. It is also equipped with two motorized Panasonic cameras mounted on rails in the ceiling (cameras 3 and 4). The VGA signal from the desktop PC is run through a 4-way splitter, and routed to monitors in the control room and the observation room. For recording the screen of the PC on video, the VGA signal to the computer monitor is also looped through a Canopus scan converter. For audio recording, there is a new and improved table-stand Sennheiser microphone. Finally, the room has a 14" Sony monitor on a table for monitoring a video signal during a test or for set-up purposes (Hedco x-field destination ch. 4). As in test room 1, there is a speaker for talk-back from the control room and the observation room. Finally, test room 2 has a treadmill for simulating walking during evaluations of mobile devices.

The basic setup in test room 2
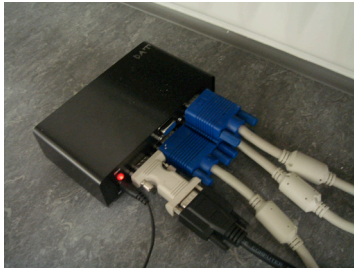
| VGA splitter | Canopus Scan converter | Treadmill |

The light can be turned on and off near the door, and on the central panel in the control room. Power for the outlets without a switch above it is turned on and off on the central panel in the control room.

Observation room

The observation room overlooking test room 1. It has two main areas. One area is for observation. The other area is for video editing.

The observation room

Observation area

In the observation area, there is a 20" Samsung flat screen monitor, which can display any video signal from the evaluation. The source for this screen is selected in the control room (Hedco x-field destination ch. 5). As default, this monitor displays the video signal being recorded on DVD in the control room. On the right hand side of the observation area, there are two 17" flat screen displays, which replicate the PC monitors in test room 1 and 2 respectively. Between the video and the PC displays, there is a Sennheiser microphone allowing the observer to talk back to test room 1 and 2. The microphone is turned on and off on a small button close to the stand. A red light indicates that it is on. The volume of the microphone for each of the two test rooms is set in the control room. Finally, audio from the test rooms is played back through two speakers. The audio source is set in the control room but volume can also be controlled on the speaker. Be aware of audio feedback to test room 1 when opening the door.

Video being recorded on DVD

PC screens in test rooms

The light level in the observation room is controlled on a knob near the door. The best see-through effect into test room 1 is reached when the light is bright in test room 1 and off in the observation room. It also helps to roll down the black-out curtains in the observation room. Power for the outlets without a switch above it is turned on and off on the central switch with a red light near the door.

See-through with and without light dimmed in observation room

Video editing area

In the video editing area, there is a rack with a DVD recorder, a DV recorder, a Kramer 8x8 AV x-field, an analogue to digital AV converter, and a large video monitor. On this rack, it is possible to select what video source is sent to the video-editing computer (iMac), and it is possible to copy between DVD and DV tapes.

The x-field is fed with three different video signals from the control room and the signals from the DV recorder and the DVD recorder in the rack. In terms of sound, the x-field is fed with an audio signal from the control room on audio input channel 1.

The video monitor on the rack is displaying the video signal being sent to the iMac via the Canopus analogue-digital AV converter. The source is selected on the x-field (video and audio output ch. 1).

The speakers in the control room are also connected to the x-field. They are connected to audio output ch. 2. This means that the x-field must be switched on, and audio output ch. 2 be set to input ch. 1 in order to have audio playback in the control room.

Rack in observation room.

When using the default channel configuration 1 1 0 5 4 0 0 0 for both video and audio, the speakers in the control room will play back audio from the test rooms, and the iMac will receive video as well as sound. You will also be able to copy from video and sound from DV video to DVD and vice versa.

The Kramer 8x8 x-field is wired up like this:

Video input:
1. Hedco x-field destination ch. 6 (default set to video mixer out, source 9)
2. Quad display with camera 1, 2, 3 and 4
3. Quad display with camera 1 and 3 plus PC screens from test room 1 and 2
4. DV recorder out
5. DVD recorder out

Video output:
1. Video monitor and loop through to Canopus A/D converter (video to iMac)
2. n/c
3. n/c
4. DV recorder in
5. DVD recorder in

Audio input:
1. Control room out on main sound mixer
2. n/c
3. n/c
4. DV recorder out
5. DVD recorder out

Audio output:
1. Canopus A/D converter (sound to iMac)
2. Speakers in observation room
3. n/c
4. DV recorder out
5. DVD recorder out

Control room

The control room is overlooking both test room 1 and test room 2. It has two main are-as. One area is for observation. The other is for controlling the laboratory's video and audio equipment.


Observation area

AV control area

Observation area

In the observation area, there is a 15" flat screen monitor, which can display any video signal from the evaluation. The source for this screen is selected in the control room (Hedco x-field destination ch. 2). As default, this monitor displays the video signal being recorded on DVD in the control room. On each side of the video screen, there is a 17" flat screen display, which replicate the PC monitors in test room 1 and 2 respectively. In front of the video and PC displays, there is a Sennheiser microphone allowing the observer to talk back to test room 1 and 2. The microphone is turned on and off on a small button close to the stand. A red light indicates that it is on. The volume of the microphone for each of the two test rooms is set in the AV control area. The slightly smaller Monacor microphone is used for talkback to a wireless earpiece worn by the test monitor
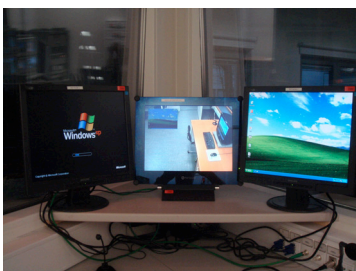
PC and video screens

Talkback to earpiece

Talkback to test room 1&2

Audio from the test rooms is played back through two speakers. The audio source is set in the AV control area but volume can be also controlled on the speaker.

AV control area

In the AV control area, there is a rack with various video and audio equipment, a number of video monitors, a remote control for the motorized cameras, and a video mixer. Using this equipment, it is possible to route video and audio around the lab and make recordings on DVD, DV or VHS. The equipment in the AV control area includes:

1. Video mixer
2. Input selector for video mixer
3. DVD recorder
4. Camera remote control
5. Video x-field
6. DV and VHS recorders
7. Audio mixer for recording
8. Wireless microphone receiver
9. Audio mixer for talk-back

Video mixer

Using the video mixer, it is possible to select what video sources are being recorded during an evaluation. The mixer has four inputs, which can be configured on the P-169v x-field. On the four 10" monitors in front of the video mixer, you can always see what sources are currently sent to the inputs of the video mixer.

   The video mixer has two primary modes for transitions between video signals: wipe or mix (set on the button on the top left). In wipe-mode, it is possible to make a picture-in-picture effect, by which two video sources can be merged into one. The location of the inserted image on the screen can be controlled with the joystick. In mix-mode (light flashing), it is possible to fade from one source to another.

| The video mixer | P-in-P on program monitor |

On the 14" monitor labelled "Preview" you can select which source to fade to next. On this monitor you can also control the more advanced configurations of the video mixer, such as configuring the wipe-mode to be Picture-in-Picture. Refer to the video mixer manual more details. The Preview monitor requires the Hedco x-field to have destination ch. 1 set to source ch. 10.

   On the 14" monitor labelled "Program" you can see the output signal from the video mixer being recorded on DVD. In order to avoid situations where no video signal is being recorded, the Program monitor has been wired up so that it shows the *output* from

the DVD recorder rather than the *input* sent to it from the video mixer. In this way, if the DVD recorder is not configured correctly, or imply not turned on, there will be no image on the Program monitor! The image on the program monitor is the one being recorded! This setup also means that the different functions of the DVD can be operated through on Program monitor – such as finalizing a disc. In order to get an image on the Program monitor, the DVD recorder must be set to input ch. AV4.

Input selector for video mixer

The four input sources for the video mixer are selected on the P-169v x-field in the rack in the left. It has 4 outputs and 8 inputs. The 8 inputs are the same as on the Hedco x-field listed below. The four outputs A, B, C, D are connected to the video mixer's four inputs 1, 2, 3, 4. The x-field is operated by the 8 buttons on the 4 dials to the left. Clicking these buttons, the numbers on the dials and in the display changes accordingly.

The input selector for the video mixer

The table below show the default settings of the x-field and possible alternatives.

Output ch.	Default set to	Alternatives
1	1	5, 6, 7, 8
2	2	5, 6, 7, 8
3	3	5, 6, 7, 8
4	4	5, 6, 7, 8

IMPORTANT NOTE: There is only one thing to be aware about when configuring the input selector for the video mixer. Although any of the 8 input signals can be routed to any of the 4 inputs on the mixer, if in use for a particular evaluation, camera 1 should always be routed to output 1, camera 2 to output 2, camera 3 to output 3, and camera 4 to output 4 as listed in the table above. Otherwise, they will become out of sync with the numbering on the remote-control selector. This is because of the way the motorized cameras are controlled remotely. Because the control-signals from the joy-stick sent to the cameras over the video cable are suppressed by electronic x-fields, the manual selector has to be the first item on the video signal chain from the cameras to the video mixer. Hence, camera 1 is hardwired to be camera 1 etc. If, for example, camera 1 is routed to channel 3 on the video mixer, it will still work, but you will have to select "1" and not "3" on the camera remote control selector in order to control it. This is usually a bit difficult to remember during an evaluation.

DVD recorder

The default format for recording an evaluation in the new usability laboratory is DVD. The DVD recorder is placed on top of the 4 monitors displaying the input sources for the video mixer.

The DVD recorder. Input should be set to AV4

As default, the DVD recorder's input should be AV4, which is the direct s-video output from the video mixer. The DVD recorder can also be used to copy from DV or VHS tapes through the AV1 and AV2 inputs, which are connected to the outputs on the DV and VHS machines in the rack.

Video and audio inputs in DVD recorder:
1. DV out
2. VHS out
3. n/c
4. Video mixer out (s-video)

The output of the DVD recorder is connected to the Program monitor (through an s-video cable) *and* to the Hedco x-field source ch. 9. This means that you can control the menu functions of the DVD reorder on the Program monitor (with the remote control).

It is great to record on DVD because it is easy to play back parts from an evaluation on a PC or DVD player. However, this requires that you *finalize* your discs. This is don't through the remote control for the DVD recorder:

1. Press "functions"
2. Chose "to others"
3. Chose "disc management"
4. Chose "finalize"
5. Chose OK
6. Chose OK
7. Wait for process to finish

For more details about the operation of the DVD recorder refer to the manual.

Camera remote control

One of the nice and extremely useful features of the old and the new usability laboratory is the ability to remotely control the four motorized cameras in test room 1 and 2. This is done on the joystick unit next to the video mixer. On this unit, it is possible to control the pan and tilt of each camera (joystick), as well as the zoom and focus (four green buttons). The joystick-unit works in conjunction with a camera selector box, on which you chose what camera to control. The selector box is located just in front of the joy-stick-unit, under the four 10" monitors.

Camera remote control

Camera selector for remote

Video x-field

The new usability laboratory has a number of video monitors around the lab. The video signals are sent to these monitors are controlled on the Hedco x-field. It also controls what signal is being recorded on the DV recorder and the VHS recorder. It has 8 destination (output) channels and 16 source (input) channels. It is operated by selecting a destination channel (on the left) and the selecting the source wished for (on the right). Make sure that the panel is enabled (button on far left).

Hedco 8x16 video x-field

The table below show the sources and destinations connected to the Hedco x-field as well as the default settings.

Input	Source	Output	Destination	Default
1	Camera 1	1	Preview monitor	10
2	Camera 2	2	Control room monitor	7, 8, 9
3	Camera 3	3	Test room 1 monitor	7, 8, 9
4	Camera 4	4	Test room 2 monitor	7, 8, 9
5	PC in test room 1	5	Observation room monitor	9
6	PC in test room 2	6	Observation room X-field ch. 1	9
7	Quad: 4 cameras	7	VHS recorder in (set input to "A1")	9
8	Quad: 2 cameras and 2 PCs	8	DV recorder in (set input to "Video")	9
9	Video mixer Program			
10	Video mixer Preview			
11	DVD recorder out			

DV and VHS recorders

Apart from recording on DVD, it is also possible to record on DV or VHS tapes. You can also record on more than one format at the same time if you wish.

DV and VHS machines in the rack

Recording onto DV or VHS requires that the Hedco x-field destination ch. 8 (DV) or 9 (VHS) is set to the desired video source, which can be any camera (1-4), scan converter (5-6), quad splitter (7-8), or the output from the video mixer (9). The output from the DV and VHS machines are connected to the DVD recorder's AV1 and AV2 inputs. Hence, in order to see what is being recorded on either the DV or VHS machine, you need to set the DVD recorder to AV1 (DV) or AV2 (VHS). This will then display the image from the DV or VHS machine on the Program monitor. Setting the DVD recorder to input AV1 (DV) or AV2 (VHS) also allow you to copy from these formats to DVD.

Audio mixer for recording

The sound recording, and playback in the control room and the observation room, is controlled on a small mixing desk in the rack on the left.

The audio mixer for recording

The audio mixer is wired up with 3 inputs:
1. Table microphone in test room 1
2. Table microphone in test room 2
3. Wireless microphone

The table microphones require phantom power through the microphone cable, so the +48v button must be pressed down.

The main thing to be aware of with this mixing desk is to be sure that the correct audio is sent to the video recorders. This is done by only turning up the microphone you are actually using. This is done on the three white knobs to the left. The DVD recorder, DV recorder, and VHS recorder are all connected to the main output from the mixing desk. This means that the audio volume of your recording are controlled on the grey "master volume" knob on the far right. As an indication of sound level, the LEDs on the mixing desk should react to speech in the test room without going into the red area.

The sound level of the speakers in the control room (and in the observation room) is controlled on the grey "control room" knob left of the master volume. If the sound is too loud in the control room, you should turn this one down a bit – and not the master volume! You can also control the volume directly on the speakers.

Wireless microphone receiver

The usability laboratory has one wireless Sennheiser microphone. The portable transmitter "lives" on top of the rack, and has a small microphone on a clip connected to it. The receiver is also on the top of the rack. It is connected to the audio mixer's input ch. 3. The transmitter and receiver needs to be set to the same channel. Default is 809.400.

The receiver for the wireless microphone

Audio mixer for talk-back

As a new feature, the usability laboratory now has facilities for talkback from the control room and the observation room to test room 1 and 2. This is a feature, which we have missed greatly in the previous lab, allowing us to instruct test subject without being in the room, an also helping us communicate before and during an evaluation.

The setup is very simple. It consists of a separate audio circuit with an active speaker in each of the test room, and two table microphones, with on/off switches, located in the control room in the observation room. A red light on the microphone indicates that it is on.

The audio mixer and mono distribution unit for talkback

The individual audio level of the two microphones is controlled on a small mixing desk next to audio mixer for recording. The control room microphone comes through on ch. 1 and the observation room microphone comes through on ch. 2. The mixing desk also provides the microphones with phantom power (the +48v button must be pressed down). The main audio levels of the talkback speakers in test room 1 and 2 are controlled on the mono distribution unit below the mixing desks. This unit needs to be set to ON and LIVE.

Manual x-field configuration

Under the rack in the control room, there is a locked, manual x-field with patch cables. This x-field controls the routing of audio and video signals between plugs around the lab. It is important that the configuration of this x-field is correct, as the rest of the documentation of what signals are sent where depends on this. However, if, for example, a camera or monitor video cable is moved from one plug to another, the corresponding patch cable in the manual x-field will have to be moved accordingly.

As default, the manual x-field is patched up like this:

Video
Teknikrum, video 1 ⇔ testrum 1, video 6
Teknikrum, video 2 ⇔ testrum 1, video 5
Teknikrum, video 3 ⇔ testrum 2, video 6
Teknikrum, video 4 ⇔ testrum 2, video 5
Teknikrum, video 5 ⇔ testrum 1, video 3
Teknikrum, video 6 ⇔ testrum 2, video 1
Teknikrum, video 7 ⇔ testrum 1, video 4
Teknikrum, video 8 ⇔ testrum 2, video 2
Teknikrum, video 9 ⇔ n/c
Teknikrum, video 10 ⇔ teknikrum 1, video 11
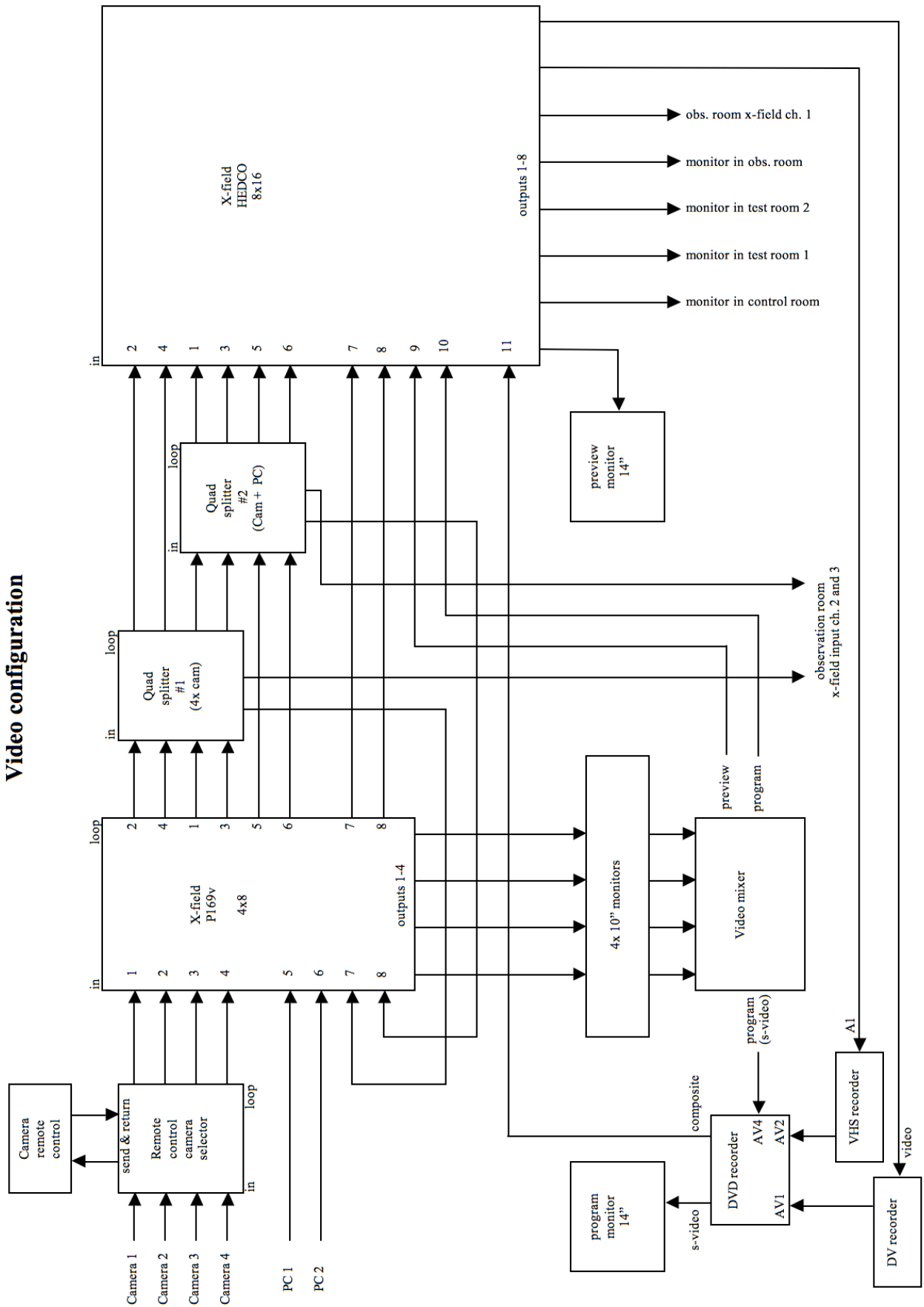Teknikrum, video 12 ⇔ n/c

Obs-rum, video 1 ⇔ direct input from Hedco x-field output ch. 5 (green cable)
Obs-rum, video 2 ⇔ n/c
Obs-rum, video 3 ⇔ direct input from Hedco x-field output ch. 6 (green cable)
Obs-rum, video 4 ⇔ direct input from Quad split (4x cam) (green cable)
Obs-rum, video 5 ⇔ direct input from Quad split (cam+PC) (green cable)
Obs-rum, video 6 ⇔ n/c

Audio
Teknikrum, audio 1 ⇔ Obs-rum return 3 AND teknikrum return 6 (split cable)
Teknikrum, audio 2 ⇔ testrum 1, return 1
Teknikrum, audio 3 ⇔ testrum 2, return 2
Teknikrum, audio 4 ⇔ n/c
Teknikrum, audio 5 ⇔ n/c
Teknikrum, audio 6 ⇔ teknikrum, return 3

Teknikrum, return 1 ⇔ testrum 1, audio 1
Teknikrum, return 2 ⇔ testrum 2, audio 1
Teknikrum, return 3 ⇔ teknikrum, audio 6
Teknikrum, return 4 ⇔ obs-rum audio 1
Teknikrum, return 5 ⇔ n/c
Teknikrum, return 6 ⇔ teknikrum, audio 1 AND Obs-rum return 3 (split cable)

Video configuration

Audio configuration

Microphone 1 → Audio mixer (recording)
Microphone 2 →
Wireless mic. →

Audio mixer (recording)
Control room L+R

Tape out L+R → DV recorder → AV1 / DVD recorder
VHS recorder → AV2
AV4

Main out L+R → Control room speakers AND observation room speakers

DVD recorder:
AV1 → left out → 10" monitor #1
AV2 → right out → 10" monitor #2
AV4

Control room mic. → Audio mixer (talk-back)
Obs. room mic. →

Audio mixer (talk-back)
Main out L+R → Live in → Mono distribution unit

Mono distribution unit:
1 → Speaker in test room 1
2 → Speaker in test room 2