inside installations

Guidelines for documenting (video) installations on video

by Sami Kallinen

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Inside Installations: Preservation and Presentation of Installation Art
Research area: Documentation strategies
Special study: Video documentation of installations

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Ramon Coelho, Ward ten Voorde and Gaby Weijers

Netherlands Media Art Institute
Keizersgracht 264
1016 EV Amsterdam
sami@montevideo.nl

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Preface

This paper is one two which together make up a guide for good practice for video documentation of installations and other artistic events. It is an update of the ongoing practice and research into (video) documentation of installations carried out by the Netherlands Media Art Institute, Montevideo/Time Based Arts (further referred to as Montevideo).

Created within the framework of the European research project Inside Installations: Preservation and Presentation of Installation Art (2004-2007) the guide is the result of collaborative research within a special study into video documentation of installations under one of the five project research areas: Documentation Strategies.

The guide is based on extensive literature research and an evaluation of around 200 video recordings of installation works. Participants of the Inside Installations project kindly provided their video recordings so this good practice reflects today's resources and expertise. Although the research focussed mainly on media or video installations, the same knowledge can easily be applied to other types of installations.

Each installation is different. Therefore, it seems inappropriate to suggest that a definitive set of recommendations for video documentation of installations could be provided. These guidelines thus must be seen as a collection of instructions and issues to consider for those who plan to make a video recording of an installation.

The two papers in this guide for good practice are:
Video Documentation of Installations by Gaby WIJERS
Guidelines for documenting (video) installations on video by Sami KALLINEN

The first paper is more theoretical and can be seen as the context for second paper, the more practical and technical guideline.

Both have been adapted for the web and are available as an online course titled *Video documentation of Installations*. The course includes numerous clips of example video recordings as well as links to further reading and a test to assess your knowledge. It can be accessed via the project website http://www.inside-installations.org/

Contents

Introduction

Creating video documentation of installations, exhibitions, performance art and events all require different strategies for acquisition and post-production. This paper deals with problems and considerations when embarking on such productions and has been created with a focus on how to document video installations using video. Despite this focus, the same knowledge can be applied to other types of installations.

Video installations are usually displayed in controlled situations and are therefore somewhat simpler to record than live events. Often located in galleries where light and other variable remain static, they therefore constitute a fixed-site scenario. Documenting build-ups of exhibitions and installations fall somewhere in between live and non live documentation as the action is not live in front of an audience and unstoppable but still requires more narrative documentary techniques in the production. The fixed-site scenarios are usually filmed with one camera and both sound and image are often recorded by the same person. Whereas events and performances might require fieldwork, multiple cameras with several operators and sound recordists and/or a studio set up.

This paper provides an introduction to technical issues around video aimed at people who need to make decisions about budgets, productions and buying services, but have no personal experience with the practicalities of video. Technicians who are expanding their field to video documentation should also find the text useful. For video professionals much of the information relayed here is on a basic level, but if read carefully one can find some useful tips and thoughts about issues that are specific to these types of productions. Sometimes event documentation and documenting performance art are indeed also mentioned, but these kinds of productions follow mostly the same principles as documenting dance and theatre performances, which have been covered extensively elsewhere, and are therefore not dealt with in depth here. Consult the guides listed at the end of this document for links to more information.

Divided into three sections the paper starts with ‘Pre-production’ in which issues relating to preparation and decision making are discussed. The second section, ‘The Shoot’ is a hands-on look at how the documentations are made and includes instructions on how to set up the cameras. The last section, ‘Post-production’ addresses in short some main issues to consider in the last phase of producing a video document of an installation.

Also, a lot of additional information has been provided including technical aspects to be aware of while choosing equipment and acquisition formats as well as lists for further reading and links to other online courses. The module also contains a glossary of terms.

Pre-production

Define purpose

Before you start to the plan and organise the production, it is important to determine the purpose of the documentation that you will be creating. Who is going to use the documentation and for what purpose?

There are two main categories of video documentation of installations which can be split into 4 sub-categories depending on their purpose:

A. How to experience an installation?
    1. Purpose: to record the installation for the audience; to give an impression for publication or education.
    2. Purpose: (artist) documentation; to document or promote the work.

B. How to re-install an installation?
    3. Purpose: 'art historical' documentation; for professionals, research, knowledge exchange.
    4. Purpose: re-installation

Once you have determined the purpose of your production, you will also need to think about the following:

- What format will the production be delivered in and how will it be stored and preserved? What happens to the source footage and the document files from post-production? Who is responsible for archiving them and are there considerations regarding the acquisition formats (format that is used to record the video) and kind of file documents?
- What information needs to be collected? What is important to capture through filming and what can be added later in post-production with texts and titles?
- What kind of metadata needs to be collected and how will it be integrated to the presentation?
- Have the rights to the production been cleared and arranged? Who will own the rights to the final product (or products)?

Determine budget and quality

The next step is to consider the level of complexity and quality that you wish to achieve and to determine a realistic budget. The competence of the crew and the quality of the equipment used has more or less direct consequences for the budget.

Examples of pricing: (= approximate prices in The Netherlands 2006)

- A professional video crew, cameraman, recordist and director plus editors and producers will charge prices between € 350 up to € 1000 per day, per crew member. Excluding the costs for equipment.
- A professional high definition camera can cost € 800 per day to rent, with accessories the price can be around € 2000.

With the rise of digital video and desktop production, companies and freelancers have appeared who specialise in event and exhibition documentations. They are often more affordable than general film and video crews. In high-end productions different tasks are usually subcontracted to a variety of companies that specialise in the certain fields. Film crews are freelance and equipment is rented from specialised companies, editing is done in one company

whereas post-production work (such as adding audio and/or visual effects) are done in another, colour correction and DVD authoring in another again.

Specialists who work with event and exhibition documentation produce and deliver the production in its entirety and often operate as small companies, groups of freelancers or “one man shows” who do all the work from camera and sound to editing and DVD authoring. The quality these freelancers can deliver can vary, from amateurish to professional, and the credentials should be carefully assessed before any decisions are made about hiring people.

Good communication between the commissioning institution and the film crew that is producing the video is essential. The institution needs to be clear about how much can be spent and the crew has to make clear what possibilities the different budgetary frameworks allow for. Staff without direct experience of video production can rarely imagine how much time a seemingly simple and easy production can take.

Categories of Quality

The quality of a production can be roughly divided into three categories:

- amateur or consumer
- semi-professional or ‘prosumer’
- professional

These categories are derived from the quality of the equipment used, on the presumption that the hired talent will have sufficient experience and knowledge to use the equipment properly. There have also been attempts to categorise according to the acquisition format:

- MiniDV for consumer level
- DVCAM/DVCPRO, prosumer
- Digibeta, professional

However these categories are arguable as some miniDV cameras can produce a better image quality and have more professional controls than some DVCAM cameras. With the introduction of various tapeless and high definition (HD) acquisition formats, the format landscape is fast changing, making it difficult to define categories and make judgments about what kind of equipment to use. Furthermore it is not completely unlikely that the format developments will continue to accelerate and even remain unfixed (similar to the computer industry). There are constant engineering advances; what was considered to be very good quality only a few years ago might today be seen as mediocre. This could be an argument not to invest in your own ' in house' equipment but to hire as needed.

Another measure to go by is the price of the equipment. For example:

- consumer: for productions that use camera equipment that cost less than € 3000
- prosumer: between € 3000 and € 15 000
- professional: above €15 000

One more thing to consider is how to invest the budget you have. For example, a skilled cameraman can get relatively good results out of inexpensive equipment and an unskilled cameraman can ruin material on the most expensive equipment. Whatever quality you opt for, ultimately the most important issue to consider is why the videos are being made. Also, how they are going to be preserved and in which format is important discuss and take into account.

Choice of formats & camera equipment

Sometimes institutions decide to produce their own documentation 'in house'. This often means that they decide to invest in camera, sound and editing equipment. Decisions must be made about acquisition formats and cameras. It is also important to remember that good equipment needs good people to use them. So investing not only in equipment but also in training of personnel or hiring competent people is recommended. It can also make sense to buy services from third party providers.

When hiring, it is a good idea to have some understanding about formats and equipment to be able to make the right choice. Especially today where the selection of formats and resolution is in midst of an accelerated transition as the old standard definition is increasingly being replaced by high definition (HD). See Appendix A for more information on video acquisition formats. If you are considering investing in camera equipment see Appendix B: Choosing a camera.

A point to consider is that most professionals have, for some time already, been commenting that standard definition is disappearing at least as a production format. This trend is mainly driven by television as most broadcasters require that the programmes they acquire today are high definition. This of course drives the business and will have spill over effects to other fields. So ensure your documentation is 'future proof' of it would be advisable to make them in HD. With that said, the 40 years of production in standard definition will obviously not be obsolete very soon.

Write script

Once you know the technical limitations and possibilities of the production, it is time to make a script. Start by considering which elements you would like to include in the documentation; while taking your resources into account.

Basic elements

Possible elements of a video document of an installation:

- An impression of the installation in the space, with visitors.
- Configuration. In the case of a video installation, the different video channels collected in one for preview. Sometimes this element consists of the entire loop of the work.
- Interview. Voiceover or commentary track with the technician and/or the artist. Depending on the project there might be other possible commentators.
- Inventory of all the elements that the installation consists of detailing how they were installed and for what purpose.
- The building- up process. Following the different steps of putting the installation together.
- Graphics. For example a connection diagram illustrating how the equipment is connected together.
- An animation of a 3D model of the installation.
- Textual information. Meta-data, credits, rights etc.

Note: Most video documents only consist of the first and the last element.

A script in this context can quite simply be a shot list. This is also the time to consider any special problems that the installation you are about to film might have. If you are trying to film an installation with twelve channels of audio and three channels of video it obviously is quite a challenge to interpret this onto one channel video with a stereo audio track. Perhaps the solution for this can be achieved in post-production; however it might require a specific approach while recording the installation.

While writing the script you will need to determine any explanatory texts, graphics and/or still images that might be needed to be added in post-production. Try to avoid the use of a excessive amounts of text on screen as it will test the viewer's patience. However, with some types of installations a lot of text might be unavoidable. When done cleverly the combination of text and image/sound can be very illuminating.

Interviews and commentary

In more comprehensive video documents you might want to interview the artist about different aspects of the installation. Usually your job will be to document a specific instance of an installation, i.e. how it was installed in that exact location. Each artist has their own ideas about how precisely the installation needs to be recreated in other locations and which elements of the installation are important to replicate more exactly than other. Some artists develop the work further each time it is installed so it can be useful to get a comment from him or her regarding the future of the installation.

This type of content can be presented as a separate interview sequence in the production as a voiceover or alternatively as an optional commentary track on a DVD.

Another person that can be useful to interview is the technician who built the installation. He or she can give a good description of the different elements (or inventory) in the installation, challenges of the build-up and reasons for specific solutions.

Configuration (for video installations)

An important decision to be made is how original source material from the video channels will be presented in the documentation. Sometimes the documentation part can be a shorter impression of the installation followed by a "many in one" video track, where all video channels and audio are collected to one screen. Then the whole loop of all the channels can be played. This can be a good approach especially in the more narrative installations.

Documenting the build-up

In some cases it can be useful to record the building up process for research and re-installation purposes. There are different ways to do this. Some institutions install, or use already installed surveillance equipment to record the entire build-up. While this in some cases may be considered better than not having any material at all, it is not a precise form of documentation. Most details can, and indeed do get lost.

Proper documentation follows the building up process much like a documentary. If done thoroughly, this approach is cumbersome in the sense that it delays the building up process. Technicians building the installation have to wait for the camera to be set up in different positions and as there is always the possibility that some retakes need to be done. Moreover, it also is a documentation process that takes long time because the documentation crew needs to wait for the building crew. In effect both crews slow each other down resulting in a more expensive build-up and a comparatively expensive shoot also.

Different installations require and allow for different documentation tactics. When documenting the build-up of a sculptural installation that is independent of the space where it is installed and where the installation is more

assembled than built up, it can be quite easy to make a recording of the process. This can in some cases even be done by the technician building it up.

On the other hand, a site-specific installation can take more time and improvisation to build-up and as such the process is much more complex to record. These kinds of installations usually need a separate documentation crew and specific arrangements with the team building up the installation.

If the installation of the work consists of straight forward practices used by (video) technicians, it is perhaps not worth putting all the effort of filming the build-up. Instead a text (and photo) based instruction manual, including a clear inventory of the elements of the work and details on specific aspects to consider during the build-up can be sufficient as a guide for future re-installation. All these different approaches mentioned should be discussed with the curator and/or the artist.

Versioning

Different institutions have different reasons for creating video documentation of a (video) installation or exhibition. The most common purposes are for public relations and marketing or for art historical research and re-installing. Below are some examples of versions (some of which might be the same):

- Short teaser for a website 20 seconds
- One minute impression of the installation.
- Three minute clip for presenting the work to the public.
- Three minute clip for presenting to curators and/or students.
- Eight minute clip that tries to capture every detail for art historical research.
- 15 minute clip that show every detail and the loop in its entirety.
- 25 minute clip that shows how the installation is built step by step with a commentary tracks or voiceovers.

Documentation might be required to present an installation or exhibition on a website. For this purpose a two-minute clip or shorter might be needed. A clip like this should be easily digested and contain very little detail. Other types of documentation need to be meticulous and thorough. Different versions are often edited from the same raw footage. Whatever you decide to produce careful planning and good preparation is essential.

Prepare the shoot

Try to prepare the production well. Here is a check list:

- Arrange the shoot with the institution in time. Date, time and other arrangements need to be decided. You will have to check as far as possible that there will not be any unnecessary noise or other distractions. Building work next door can ruin a shoot. Check that you really have the budget and time you need.
- You should not be filming when the exhibition is open for public unless this is part of the assignment. You will disturb the public and everything will be much slower when you have to take the visitors into account. Furthermore you might want to shut down some neighbouring installation for sound and other purposes.
- You will need models to act as visitors to give a realistic feel to the documentation. Book the people well in advance, remind them before the shoot and take care that they have the necessary comforts while waiting. If possible have some help. An assistant/runner can save the day even in “one person shoots”.
- Have your work flow figured out before the shoot. When working with new formats, cameras and other systems,

take the time to test them properly before going on an actual job. If you are using a completely new technology, new for you or new in general, it might be a good idea to bring the old set up as backup.

- If you are going to film a build-up it needs to be planned with the producer of the build-up. Some extra resources are needed not only to film the thing, but also for the build-up. Most build-ups are done on tight schedules and the filming will delay the building up if it isn't a very simple installation.
- Prepare the equipment in advance. See that you have enough of batteries and that they are fully charged. If you are renting the equipment, reserve enough time for the logistics of picking up and returning it.

The Shoot

Setting up the equipment

Calibrating the camera(s)

If you are using several cameras remember to calibrate them. Where possible use the same brand and model cameras as it simplifies matters. Before you start shooting make sure you compare the images on an external monitor and see to it that the settings match. Also see to it that the chroma and luma are correctly set on the monitor and use a professional video monitor. Film the same thing with all of the cameras, compare the images and adjust accordingly. Look at format, colour, saturation, luminance, white balance and so forth. This will help the editing process greatly. Colour correction is time-consuming extra work especially if it has to be done on a clip-by-clip basis.

White balance

Remember to set the white balance correctly. Cameras usually have pre-sets for interior lighting and exterior lighting. Most often one needs to do white balancing manually. But the lighting conditions of video projections and screens can be peculiar so remember to check on a monitor how the images look in terms of what is most important in your shoot. You might need to repeat the white balancing several times and to find the right settings through trial and error. If the lighting conditions change drastically within one shot you can try the automatic function in the camera to see what kind of results you will get, but as a rule one should avoid it. One useful feature in some cameras is that you can save several custom white balance settings and attach them to buttons on the camera.

Focus

Try to avoid automatic focus. You will get into trouble for example if somebody walks in front of the image or the focus starts to ‘breathe’, meaning the camera is searching for focus back and forth. This easily happens in dim lit situations like when filming video installations. In dim light the aperture needs to be wide open to allow enough light into the camera. A wide aperture means that the depth of field (=the area which is in focus) is narrower making focus even more critical in such low light conditions. There are situations where manual focus pulling is not possible and when auto focus might be an option. The auto focus function varies significantly in different cameras and some are much better than others, so experiment first before making your final footage.

If you are in controlled circumstances and you have the time, zoom in on the object, take focus and re-frame the image. If you have to take focus in the middle of the shot avoid disrupting the shot by heavy movements on the focus ring but employ a slow tweaking focus instead. Some cameras have the possibility to stay on manual focus and push a button to get the camera to focus automatically for an instant. The camera focuses as long as the button stays down and goes back to manual mode when released. This can, in many situations be useful. If in doubt, keep the frame as wide as possible as it is then not so obvious that the image is slightly out of focus.

Keep in mind most of the cheaper HD cameras have rather poor focusing tools. The displays do not have enough resolution to show the focus properly and as the definition is so much higher focus becomes more critical. Using an external monitoring is almost always necessary.

Exposure & lighting

Most exhibitions and events tend to be rather dark for cameras. Documenting video installations can for this reason be an extra challenge. Light sensors on cameras have become much more sensitive in the last few years, however it is still important to choose a camera that performs well in low light circumstances.

The eye can detect contrast ratios of 2000:1 whereas video cameras can only detect about 20:1. This number refers to maximum sensitivity. Often the actual useful ratio is much lower. So it is clear that a visitor will experience the space differently from the viewer of the documentation. It remains difficult to capture the nuances and textures of the space on video.

If you are working in a fixed light situation, measure the light correctly and see to it that it captures everything from dark to light and leave it fixed. Be careful that there is not too much contrast between any projections (monitors or screens) and the space itself. In many cases it is good to flood the space with a little bit of light to bring out the space, which is seen and experienced by the viewer but not caught by the camera.

Another tested tip is to use a small, not very strong, camera light (the kind that Sony sells for example) to add a little light to details while filming them. Remember to correct the light with filters. Usually a daylight filter (blue gels) does a good job. You might also need some diffusion filter to soften the light. The same goes for any light you will flood the space with.

Whilst operating the camera use zebra patterns to judge exposure. Remember, if the image turns white (=is overexposed), it cannot be corrected afterwards. The best method is to work carefully to get the right exposure during the shoot; meaning less work in post-production and a better result. If in doubt, underexpose a bit rather than overexposing. Try avoiding too much aperture adjustment mid shot. Usually the aperture changes in steps and this ‘jumping’ can render the image unusable. Also avoid using gain to increase the level of an image. Electronic gain is usually noisy, although the level of noise can vary considerably in different cameras.

If recording in a fixed situation there are tools to monitor the levels of the image while recording. OnLocation (formerly DV Rack) is software that can be run from a laptop and connected via FireWire to the camera and functions as a waveform monitor, vectorscope monitor, a field monitor (that you can calibrate), video analyser, and digital video recorder. This is a useful tool that can also deal with HDV and DVCPRO HD. DV Rack works only on PCs but lately a number of early versions of similar software for Apple Macintosh most notably Scope Box.

Shutter speed

In low light situations use 50 as shutter speed for SD (standard definition) PAL. Lower than that will smear the image unnecessarily. In the worst case scenario and when the camera is not moving too much it can be worth trying 25, but avoid this if possible. Also avoid fast shutter speeds as they look strange and create a strobe effect.

A problem one might encounter while documenting video installations with monitors is the discrepancy between PAL and NTSC. As the former is 50 Hz and the latter is 60, or 59.94 to be exact, and trying to film a NTSC on a PAL camera will give a flickering and striped image. The best solution is to change the source discs to PAL versions if possible. Otherwise one has to experiment with the shutter speeds to try to get rid of the problem.

Recording audio

'Audio is 70 percent of what you see' – as the saying goes and there is a lot to it. In 'one man productions' assess the situation and choose the correct audio recording technique. Try to avoid auto gain by ensuring the camera you work with has manual gain options and as well as options to gain the channels separately.

Experience shows the best sound is usually achieved by recording it from the position of the camera with a directional microphone. When you move with the camera, the microphone moves too, providing a realistic effect.

Sometimes it can be useful to record source sound to one channel on the camera so that you can mix the levels in post-production between the source and the sound and the space. The source sound of a video projection could be from a DVD-player for example. This method can be useful in spaces where the acoustics are challenging. Sometimes when doing this it can be useful to use a wireless transmitter, although they are usually designed for voice and might sound a bit thin if used for other sounds. Avoid the trap of convincing yourself that you can take the source sound (from the DVD) and synchronise it with the video footage later. This means a lot of extra work and success is not guaranteed.

Another tip for creating realistic sound is to attach a wireless microphone to a model. Follow the model with the camera from a fixed position and record the sound that the viewer hears. This is especially useful when documenting installations that change acoustically as the viewer moves in the space.

Always leave the level low enough so that the highest peak will be under 0 decibels (db). Digital recording does not forgive errors. Keep the normal level at -12 db maximum. That leaves enough 'headroom' for sudden peaks.

Remember to use headphones to monitoring the sound while filming. Choose ear-enclosing headphones that prevent you hearing the room sound.

In exhibitions with several pieces on display it makes sense to turn down the volume of a neighbouring work that usually can be heard from the other space. But check this with the artist and curator. Some artists plan the exhibition in the manner where this spill of sound is taken into account and is meant to be there.

Whenever possible use a separate professional recordist.

Bars & tone

Prepare the tape with one minute of bars and tone at the start. Professional and many semi-professional cameras have the function for doing this.

Start filming

It cannot be stressed enough that you need to plan carefully how you will shoot each installation and space. It helps if you do a pseudo edit already in camera. Think about transitions between shots while shooting as it will save unnecessary work later. Some experienced makers of video documentation have next to nothing to edit, when documenting a familiar type of installations, because the shots have been so well planned before shooting.

Nevertheless you may prefer to shoot more material than needed to be archived for possible later research.

Remember always film a pre-roll before each shot, five to 15 seconds of extra material before each shot as well as a tail of similar length. This is crucial for editing and also to avoid some errors that might happen in the first frames of a shot.

Shooting in sequence

It is important to plan the shots so that they will cut together well. The most conventional text book way is to think in sequences while shooting. For camera operators with little experience, it can be useful to stick to classic continuity editing. Continuity editing was developed in Hollywood, and is editing that is not supposed to be noticeable. It includes techniques such as:

- ‘establishing shot’: a shot at the beginning of the scene that establishes the space
- ‘shot-reverse-shot’: way of shooting dialogue between two characters that can be applied to depict audience viewing a work
- ‘180 degree rule’ always stay on one side of a space and action so as not to confuse the sense of direction of the viewer
- ‘30 degree rule’: always change the angle by at least 30 degrees but stay within the 180 degree rule to make next shot different enough to cut well with the previous shot.
- ‘eye-line-matches’: in continuity editing the idea is that the audience wants to see what the character sees. Eye-line match is in other words a shot of a character looking at something followed by to a shot of what he/she is looking at.

There are a lot more techniques, but this is a subject that has been widely covered and therefore easy to come by to study further. Be careful not to make your sequences too stylised or fiction-like because that will break the perceived realism of the documentation.

Lenses & camera positions

Although it is often tempting because of the lack of space, try to avoid wide lenses as they distort the perspective and create a different feel of the space. At the same time, a focal length that is close to normal perception is not always very good when trying to film small spaces as the field of view might not be wide enough to make out the perspective of the space. It is a matter of finding the balance between showing enough of the space and keeping a natural perspective.

In still camera terms, the focal length that creates perspective considered to be ‘normal’ is 50 mm, while with the human eye it would actually be something more like 42 mm. These numbers refer to lenses on 135 system (=classic still camera). The corresponding focal lengths change according to the size of the sensor. So if you are using 1/3 inch CCD then the focal length that corresponds to a 50 mm lens on a 35 mm 135 still camera would be 7.0 mm, and 14 mm when using 2/3 CCD cameras.

Close-ups made with a tele lens (zoomed in shots) are more suggestive, more 'poetic' with a narrower depth of field. They can also be less work to shoot as you can do more shots from the same position. The drawbacks with close-ups like this can be that you might need a lot of space between the camera and the subject/object and that the perspective

it renders as a result isn't realistic. Close-ups achieved by going close with the camera have the advantage that they can have a more realistic feel to them with normal perspective, but they mean more work as you need to set up the camera in a different position for each image.

Composition

Composing a balanced image is important. Be aware of the lines, framing and mergers. Basic techniques such as the 'rule of the thirds' are also good to be aware of. Please refer to the abundant literature on the subject. Look here for an old Kodak manual on composition. http://asp.photo.free.fr/Composition/photoProgramCompMainClass.shtml

Movement

To get a feeling of the space it is good to use camera movement. Make sure to take enough time for your pans and tilts. With film cameras, pan slowly so as not get a stuttering effect as the frame rate is 24 frames per second (fps). With video cameras, if you are shooting in interlaced footage this is not so much the problem as effectively you have more than double the frame rate. So, although from a technical point of view it is no longer necessary to use very slow pans, from esthetical point of view it is a good idea to follow the old conventions.

The following chart tells how long a 90 degree pan should be if the frame rate is 24 originally quoted from American Cinematographer's Manual.

Zoom*	
4.2 mm	15 seconds
6 mm	18 seconds
6.5 mm	21 seconds
8 mm	23 seconds
10 mm	36 seconds
15 mm	50 seconds
20 mm	60 seconds
30 mm	80 seconds
40 mm	90 seconds
55 mm	120 seconds

* Going from the wide to tele. The focal length has been calculated for a 1/3 inch camera.

Pans and tilts are good but actual movement even better. When the angle and the position changes it gives a more comprehensive feel of the space. Avoid hand-held movement if you are not an experienced stable camera operator with a shoulder-mounted camera. If the budget allows for the use of a dolly and/or a crane, take this opportunity as these tools are very effective in giving a good sense of the space. Another option is to use one of the many steady-cam options available these days. When choosing a filming style it can work well to use camera movements that simulate the movement of a viewer in the space. But keep in mind, shaky footage will not work. So if in doubt use a good quality tripod and do smooth pans with it. Whether the camera movements should be slow and static or a bit quicker and mobile depends also on the subject that you are documenting.

Closed for public

It is best to document an installation/exhibition when it is not open for the public because you are going to be setting up equipment and might be changing the light slightly. However, do remember to use people in your compositions. Models help to give a sense of scale in the frame and can illustrate any interactivity of an installation.

Avoiding mistakes

The most common reasons for not being able to use footage are uncontrolled movement, poor framing and bad focusing. Here is a list of a few hard learned lessons to think about during the shoot to avoid mistakes:

- Avoid altering the shot too quickly. If filming in a controlled environment, take some time to review the footage outside the space where you are working. If you are filming an event that cannot be stopped and you know the action is important but your image is wrong, then quickly readjust it so some portion of the shot is usable. Another tactic is to correct the frame slowly so the change is less obvious. Focusing works much the same way. A short moment of bad focus does not necessary ruin the shot.
- Reserve more time than you think you need. Especially before any models arrive.
- Always check when in doubt. And if in doubt after checking, do a retake. A beautiful three minute pan can be ruined by a little shake in the last second. Review the material thoroughly!
- If you can, record directly to a hard disk and do a quick sketch edit immediately on set. You might find that a certain pan absolutely doesn't cut with the following shot and you still have the opportunity to re-shoot.
- When problems arise STOP everything you are doing and troubleshoot the issue properly. Take all problems seriously as you may not have another opportunity to shoot the scene again.
- If recording to solid state, do not delete bad scenes during the shoot. There is always a risk you will delete the good scene by mistake when working under stressful conditions. If you have to delete, take utmost care that you actually are deleting the correct file.

Post-production

Post-production of video documentation of (video) installations can be straight forward if the filming has been well planned and executed. Cuts should be straight and simple. Excessively fast editing and effects do not belong here, as they only disturb the process of conveying the work that is being documented. The most post-production work usually comes from having to try to correct colour or level to match shots with each other.

In less controllable and more ‘narrative’ productions, such as video documents of events and performances, more traditional editing work is required. This is purely because during filming you do not have the same opportunities to stop, review the material and where necessary adjust shots. In narrative productions you need to ‘sculpt’ the event from the material you have and you will often need to make more corrections in post-production than you could have anticipated from the start.

Editing is also required if you want to fuse different elements within the film material, such as explanatory graphics, other film fragments (such as artist interviews), texts and credits. These should be also well planned in advance. Picture-in-picture (two or more channels or images showed in one screen) is another technique used in post-production to explain action or installation processes better.

Remember to reserve enough time for versioning and authoring of the DVDs and for making masters. Make clear from the beginning what the institution needs and calculate this in the budget and the time plan. It can sometimes take much more time than anticipated.

Take care to make clear arrangements about the footage and materials. They should be taken care of well, stored in a secure setting with the right conditions.

Too many post-production techniques should be avoided unless absolutely necessary. Such things often end up looking gimmicky or generally unprofessional, and they age quickly. It is important to determine how much manipulation is necessary or desirable. This should have been done in your original plan, before the shoot and will depend on the intended purpose of the production as well as the available budget.

Appendix A Video acquisition formats

Until recently we have been dealing with almost only Standard Definition formats. In terms of PAL (European) system this means 625-line/50 hertz (Hz) image or translated usually to resolution of 720 x 576 pixels in computer terms, if we are talking about 4:3 aspect ratio image. The traditional digital acquisition formats for SD (standard definition) would be, going from less quality to more, miniDV (DV), DVCAM, DVCPRO (and DVCPRO 50), DigiBeta. These are all tape based formats and differ in the encoding and colour subsampling the camera uses. All of these formats use intra-frame compression, which means compression is only done within individual frames. Although it is clear that there are qualitative differences in these formats it has to be said that, the most important factor is the quality of the camera, the optics and the conditions for filming and the resourcefulness and talent of the operator. Most video documentation of (video) installations are traditionally done on miniDV and DVCAM formats.

Note: There are examples where miniDV has been used as an acquisition format for documentaries that have been blown up to 35 mm with stunning results.

High definition
With the introduction of high hefinition (HD) formats we will encounter many new questions and formats. If one disregards such high end high definition formats as 4K and 2K formats that are used in the film industry, the most common HD presentation formats are 1080i, 1080p, 720p and 720i. The number indicates vertical resolution and the letter ‘i’ indicates interlaced whereas ‘p’ means progressive. This refers to the manner in which the lines are drawn in the image. SD was always interlaced and, to simplify excessively, is most suitable for CRT based display technology whereas progressive works better for LCD based technology. Viewing situations are slowly becoming less and less CRT based. Film has always been ‘progressive’ (technically not an applicable term but lets call it that for simplicity), and if a film transfer is planned then it definitely makes more sense to film progressive. This is one reason why progressive has become so popular with independent filmmakers lately. Progressive also survives much better high compression ratios. All of these HD formats have the 16:9 aspect ratio.

The most common acquisition formats for HD today are HDV, DVCPRO HD, XDCAM HD and HDCAM. HDV is an mpeg based format and the only one that is intended for the consumer market, but is also the de facto standard for semi-professional market at this moment. Although whether it will continue as the standard, remains to be seen. It is a tape based format. DVCPRO HD is the Panasonic tapeless format for semi-professional and professional, XDCAM is also an mpeg based format that is recorded on optical discs that are based on Sony’s Blue Ray technology. It is low end professional whereas HDCAM is Sony’s high end tape based professional format. What is of most interest for us regarding documentation of video and media art are the HDV and DVCPRO HD formats.

HDV
HDV is directed towards the consumer and semi-professional market and is used by such manufacturers as Canon, Sony and JVC. It is the most common HD acquisition format and is tape based and uses the same cassettes as miniDV does.

HDV can be 1080i/p 720i/p that is usually recorded 1440x1080 and respectively 1280x720 is based on the Mpeg-2 compression, which is inter-frame, meaning that besides of compressing the image within individual frames it also compares and compresses frames with each other. The frames are analysed and compressed in specific “packages of frames”, or GOPs (Group of Frames), beginning with an I frame where a complete frame has been stored and

following with B and P frames that record changes in comparison to the I frame. It has 4:2:0 colour subsampling.

Again as with any codec and format it still depends on the camera what kind of image quality it gives. The technical challenge of HD is that the increased resolution requires massively more data capacity to process and to be stored. Increasing resolution increases exponentially the need for bandwidth. That is why heavy compression is required. Most HDV formats, the format has slight differences depending on the manufacturer, use a bit rate of 19 Mbps or 25Mbps, compared to the 25Mbps of miniDV, which is SD. But the compression ratio of HDV is everything between 47:1 and 27:1, compare to DV which is 5:1. So there is little information left in the data, yet it can look astoundingly good. Where problems usually arise with heavy compressed formats is when you want to start manipulating the results. There isn't enough information to be manipulated, but for documentaries and documentation this doesn't need to be a problem if it the work is shot well from the beginning and doesn't require a lot of correction afterwards. Especially exposure is critical with HDV. While the format seems to hold quite well if it needs to be colour corrected later, it quickly breaks down when you start adjusting the levels in post-production. But good exposure is anyway sign of a cameraman who knows what he or she is doing. So, if the project is shot well from the start, there is no real reason why HDV wouldn't be a good enough format for documenting art on video, or even become the next standard for it.

DVCPRO HD

Panasonic have gone another route with their semi professional equipment and introduced their DVCPRO HD which is a versatile tapeless format using intra-frame compression 4:2:2 colour sub sampling and high bitrate of 100Mbps. It down-samples native 720p/1080i signals to a lower resolution. 720p is down-sampled from 1280x720 to 960x720, and 1080i is down-sampled from 1920x1080 to 1280x1080 for 59.94i and 1440x1080 for 50i. Compression ratio is approximately 7:1. DVCPRO HD is usually recorded on Panasonics own flash memory based P2 cards or different third party hard drive solutions. As a format DVCPRO HD is technically superior to HDV. The advantages of DVCPRO HD are relatively low compression rate and a tapeless work flow that in theory can simplify post-production. It is a solid state technology, with no mechanically moving parts, which gives you the advantage that it operates quietly and is in theory maintenance free. The drawback today is that P2 cards have a relatively small capacity at the moment and that the whole technology is still somewhat experimental with regards to work flow, although these difficulties are being ironed out. The tapeless principle also raises questions about preservation and infrastructure, as it means that there isn't a physical master for the material. Infrastructure for storing the material on servers with sufficient backup processes would be required. Although it is quite certain that the initial hiccups will be ironed out pretty quickly and that it is quite likely that the tapeless paradigm will be the future paradigm for video production, it is still early days to see how things will develop in reality.

Follow the links below for more information:

- Inter frame compression: http://en.wikipedia.org/wiki/Video_compression
- HDV format: http://en.wikipedia.org/wiki/HDV
- SD and HD acquisition formats: http://en.wikipedia.org/wiki/DV
- Betacam and digibeta: http://en.wikipedia.org/wiki/Betacam
- Compression issues and technical questions about the cameras: http://www.adamwilt.com/
- HD delivery formats http://en.wikipedia.org/wiki/High-definition_video
- Image formats for HDTV http://www.ebu.ch/en/technical/trev/trev_299-ive.pdf

Appendix B Choosing a camera

When choosing camera equipment, consider and compare the following:

- The quality and ease of use of the acquisition format.
- The quality of the lens.
  - Optical properties of the lens. A wider lens gives the camera more flexibility especially when it is a fixed lens; especially if the wide image is not too distorted.
  - Controls for the lens. Mechanical zoom is usually preferable to the servo driven zoom as it usually grants more subtle control over it. Some servo zooms are quite ok though.
  - Quality of the “glass” i.e. how fast it is and how much distortions the lens makes. In full tele, for example, or in full wide positions you will often see the drawbacks of cheap lenses.
  - Quality of the image stabiliser if there is one.
- The possibility to change lenses.
- The sensor.
  - Most modern cameras need three chips for best results. Although the developments in CMOS chip field might change this fact soon.
  - The physical size of the chip. The performance of the chip is usually directly connected to the physical size of the device. The less dense the pixels are on the sensor the easier it is to technically get better sensitivity. Another reason for bigger surface is the optics. For depth of field, i.e. the possibility to manipulate depth of field to separate an out of focus foreground, the object in focus and a blurred background, you want as big an imager as possible. This means that the results can be more what is considered ‘photographic’ or ‘cinematic’, and you can emphasise different elements in the frame with focus. Professional video cameras have traditionally been equipped with 2/3 inch sensors, semi-professional and low end professional cameras have had 1/2 inch chips whereas consumer and semi-professional cameras have traditionally had 1/3 inch sensors. In past years 1/4 and even 1/6 inch sensors have become more common in cheap consumer cameras.
  - The native resolution of the imager is important. Beware that some cameras produce higher resolution image than the native resolution of the sensor by using so called pixel shift technology. This does produce an image that seems higher in resolution but is not as good as one with a resolution with higher native resolution.
- Quality of the EVF (electronic viewfinder).
  - Pixel count or resolution is important for focusing.
  - High-resolution monochrome viewfinders have been, and continue to be, the standard image-checking tool throughout the broadcast and professional videography field. Colour tends to confuse the eye when judging focus and contrast.
- Quality of LCD (liquid crystal display)
  - Pixel count (resolution)
  - Colour calibration possibilities. Note: A useful feature to have both EVF and LCD on at the same time.
- Audio
  - Whether the camera has balanced audio inputs (XLR)
  - If it can record and adjust the level separately on audio channels.
  - How much camera noise, such as the motor noise and so on, is picked up by the built in microphone.
- Ergonomics
  - How does the balance of the camera feel? If it is front or back heavy it is heavier to use over longer periods.
  - How easily one can reach and operate the different buttons on the camera while filming?
  - A shoulder mount camera with good balance is much more stable and easy to operate than a hand held.

The affordable HD cameras discussed in the links below are also sometimes called half HD as the de-facto resolution of the images usually amount to half of the high end HD camcorders. These are likely going to replace the miniDV, DVCAM, DVCPRO line of cameras, which has since the end of the 90ies been the standard for documentations. One thing to remember when going for a HD camera is that progressive is much better than interlaced when compressing the documentation to a distribution format. With the current compression algorithms and capacity of hardware 1080i25 looks much worse than 720p50 when the bandwidth starts to come close to 10 Mbps, even though it in theory should have more resolution.

For current information on cameras follow the link to the Digital Video website http://www.dv.com/index.php

Appendix C Further reading & links

Online courses	http://www.bbctraining.com/onlineCourse.asp?tID=5914&cat=2781 http://www.bbc.co.uk/learning/subjects/media_studies.shtml
Lighting	http://www.efplighting.com/
Composition	http://asp.photo.free.fr/Composition/photoProgramCompMainClass.shtml
Digital asset management	http://www.internet2.edu/arts/files/digital-asset-management(v09).doc
Capturing live performance events	http://www.internet2.edu/arts/files/performance-capture(v09).pdf
Camera information and forums	http://www.dvinfo.net/conf/ http://www.dvxuser.com/V6/ http://www.dv-forums.com/ http://www.reduser.net/
Videography resources	http://www.dv.com/ http://www.adamwilt.com/ http://www.cinematography.com/ http://www.videography.com/
Production technology	http://www.digitalproductionbuzz.com/ (podcast) http://www.theschubinreport.com/ (podcast)
Manuals and technical information	http://emrl.com/resources/film/technical.html

Appendix D Glossary

Many of the following definitions are excerpts from articles on Wikipedia or are slight rewrites from them. For more information look up articles there as Wikipedia is getting comprehensive also with regards to terms of video technology and production.

Acquisition Video acquisition is generally understood to be the period of filming, gathering video, footage and so forth.

Aspect ratio The aspect ratio of an image is its displayed width divided by its height (usually expressed as "x:y" or "x×y," with the joining colon or multiplication symbol articulated as the preposition "by" or sometimes "to"). For instance, the aspect ratio of a traditional television screen is 4:3, or 1.33:1 http://en.wikipedia.org/wiki/Aspect_ratio

Authoring See 'DVD authoring'

Bars and tone Colour bars are a type of television test pattern, a reference, used to calibrate or trouble shoot, connections, monitors and other video equipment. 'Tone' is a continuous 1000 Hz audio tone also used as a reference to adjust the equipment or to assert ownership of the transmission line or medium. It is common to record approximately 30 seconds of bars-and-tone in the beginning of a tape.

Bitrate In digital multimedia, bitrate is the number of bits used per unit of time to represent a continuous medium such as audio or video after source coding (data compression). In this sense it corresponds to the term digital bandwidth consumption, or 'goodput'. http://en.wikipedia.org/wiki/Bitrate

CCD A charge-coupled device (CCD) is an image sensor used in most video cameras today, consisting of an integrated circuit containing an array of linked, or coupled, light-sensitive capacitors. This device is also known as a Color-Capture Device. http://en.wikipedia.org/wiki/Charge-coupled_device

Chroma Short for chrominance, the signal used in video systems to carry the colour information while luma or luminance is the signal used to carry the brightness the image. http://en.wikipedia.org/wiki/Chrominance

Compression A process of encoding the image information using less data than an un-encoded, or "uncompressed", sample would use. Compressions are used to save bandwidth and storage space.

Crane The device to make crane shots; a shot taken by a camera on a crane. The most obvious uses are to view the actors from above or to move up and away from them, a common way of ending a movie. But some filmmakers like to have the camera on a boom arm just to make it easier to move around between ordinary set-ups.

CRT The cathode ray tube (CRT), invented by German physicist Karl Ferdinand Braun in 1897, is an evacuated glass envelope containing an electron gun (a source of electrons) and a fluorescent screen,

usually with internal or external means to accelerate and deflect the electrons. When electrons strike the fluorescent screen, light is emitted. CRTs are used to refer to traditional televisions and monitors, i.e. pre flat screen type of monitor. http://en.wikipedia.org/wiki/Cathode_ray_tube

Directional microphones can be built to register more sound from specific directions. This is called directionality or the polar pattern of the microphone. A 'shot gun' microphone is often used because they are most significantly sensitive in the frontal direction, i.e. the direction of the lens in the camera. For more on microphones follow this link: http://en.wikipedia.org/wiki/Microphone

Dolly In film and video production, a camera dolly allows a films camera to move on wheels while filming.

Downsampling (or subsampling) is the process of reducing the sampling rate of a signal. This is usually done to reduce the data rate or the size of the data. http://en.wikipedia.org/wiki/Downsampling

DVCPRO HD A video recording format by Panasonic for high definition video. The bitrate is approximately 100Mbps.

DVD authoring describes the process of creating a DVD video that can be played on a DVD player. http://en.wikipedia.org/wiki/DVD_authoring

Electronic gain See 'gain'.

Field of view The field of view (also field of vision) is the angular extent of the observable world that is seen at any given moment. In photography, angle of view describes the angular extent of a given scene that is imaged by a camera. It parallels, and may be used interchangeably with, the more general visual term field of view.
http://en.wikipedia.org/wiki/Field_of_view

FireWire is Apple Inc.'s brand name for the IEEE 1394 interface (although the 1394 standard also defines a backplane interface). It is also known as i.Link (Sony's name). It is a personal computer (and digital audio/digital video) serial bus interface standard, offering high-speed communications and isochronous real-time data services. FireWire has replaced Parallel SCSI in many applications, due to lower implementation costs and a simplified, more adaptable cabling system. What FireWire does is similar to what USB does, but FireWire is in practise faster. Because of the speed and capacity many amateur and semi professional digital video camcorders use the FireWire interface to connect to a computer. There are two variations of FireWire. The first one is now known as FireWire400, the number referring to the speed of the interface and a newer interface called FireWire800 which is twice as fast as its predecessor.

Focal length The focal length of an optical system is a measure of how strongly it converges (focuses) or diverges light. The focal length determines the angle of view, and the size of the image relative to that of the object. The longer the focal length the closer the subject appears. In practice in this context focal length determines how wide or how tele the lens is, or how "zoomed in" the image is.

Format Video format refers to several storage formats for moving pictures: digital video formats, including

DVD, QuickTime, and MPEG-4; and analogue videotapes, including VHS, Betamax, U-Matic and Digital Betacam.

Gain In electronics, gain is a measure of the ability of a circuit to increase the amplitude or power of a signal. It is usually defined as the mean ratio of the signal output of a system to the signal input of the same system. It may also be defined as the decimal logarithm of the same ratio.
Audio gain on a video camera: In practise when one controls the audio gain of a camera one adjusts the recording level of the audio.
Image gain on a video camera: By increasing video gain in a camera one makes the image brighter, but only by pushing the levels “artificially” up, which means that only a small portion of the range of the sensor is being used and amplified electronically more. This results in a less exact and therefore a more grainy image. The more gain you add the more noise you add to the image.

Gain the channels separately In this context ‘gain the channels separately’ means setting the recording level separately on the left and the right channels that are being recorded with the camera.

HDV High Definition Video is a video format designed to record compressed HDTV video on standard DV media (DV or MiniDV cassette tape). http://en.wikipedia.org/wiki/HDV

High definition (HD) is a generic term for format and standards for displaying moving images that have significantly higher resolution than traditional television formats such as PAL and NTSC which are referred to as SD or standard definition. http://en.wikipedia.org/wiki/High_Definition

Interlaced footage Interlaced refers to the scanning method of the video system. With progressive scan, an image is captured, transmitted and displayed in a path similar to text on a page: line by line, from top to bottom. The interlaced scan pattern in a CRT (cathode ray tube) display completes such a scan too, but only for every second line. This is carried out from the top left corner to the bottom right corner of a CRT display. This process is repeated again, only this time starting at the second row, in order to fill in those particular gaps left behind while performing the first progressive scan on alternate rows only.
http://en.wikipedia.org/wiki/Interlaced

LCD A liquid crystal display (commonly abbreviated to LCD) is a thin, flat display device made up of any number of colour or monochrome pixels arrayed in front of a light source or reflector. It is prized by engineers because it uses very small amounts of electric power, and is therefore suitable for use in battery-powered electronic devices.
http://en.wikipedia.org/wiki/Liquid_crystal_display

Luma Short for luminance. As applied to video signals, luma represents the brightness in an image (the "black and white" or achromatic portion of the image). Luma is typically paired with chroma.
http://en.wikipedia.org/wiki/Luma_%28video%29

Manual gain See ‘gain’

NTSC A colour encoding system used in broadcast television systems in many parts of the world including

USA and Japan.

OnLocation (formerly known as DV Rack) Software by Adobe for PC used to monitor amongst other things waveforms, vectorscopes and to record video onto the computer from a camera. It is mostly used in the field, hence the name. http://www.adobe.com

PAL A colour encoding system used in broadcast television systems in large parts of the world including most of Europe.

Pans Panning refers to the horizontal movement or rotation of a film or video camera, or the scanning of a subject horizontally on video or a display device. http://en.wikipedia.org/wiki/Panning_%28camera%29

Post-production occurs in the making of audio recordings, films/movies, photography and digital art, videos and television programs. It is the general term for all stages of production occurring after the actual recording and ending with the completed work. http://en.wikipedia.org/wiki/Post-production

Progressive or non-interlaced scanning is any method for displaying, storing or transmitting moving images in which the lines of each frame are drawn in sequence. This is in contrast to the interlacing used in traditional television systems. http://en.wikipedia.org/wiki/Progressive_scan

Saturation In colour theory, saturation or purity refers to the intensity of a specific hue. A highly saturated hue has a vivid, intense colour, while a less saturated hue appears more muted and grey.
http://en.wikipedia.org/wiki/Saturation_%28color_theory%29

Scope Box Software, similar to OnLocation, for Macs that includes a Preview Monitor, Waveform, Vectorscope, Audio Meters, Direct Disk Recorder, Luminance Histogram, RGB Histograms, and RGB Parade.
http://www.scopebox.com/

Shot list A shot list is a continuous sequence of video uninterrupted by edits, created of a series of frames. While planning a filming session it can be useful to write a list of shots describing each shot that needs to be filmed.

Solid state The term solid state was introduced in the 1960s to describe electronic devices whose circuits contained neither vacuum tubes nor mechanical devices such as relays, as transistors replaced vacuum tubes in most consumer electronics. In the context of this paper it refers to data storage such as flash cards that contain no moving parts as opposed to for example hard drives.
http://en.wikipedia.org/wiki/Solid_state_%28electronics%29

Standard definition Refers to the traditional television systems such as PAL and NTSC which are not HD or High definition. http://en.wikipedia.org/wiki/SDTV

Subsampling See ‘downsampling’

Versioning is the process of making multiple versions of the same video programme. The versions can for example differ in lengths and resolution.

Waveform monitor A waveform monitor is a special type of oscilloscope used in television applications. It is typically used to measure and display the level, or voltage, of a video signal with respect to time. It is used as a reference to measure the attributes of a video image, for making adjustments. Today waveform monitoring is often done with a computer and not with an actual oscilloscope.
http://en.wikipedia.org/wiki/Waveform_monitor

White balance Different light sources emit light that have different colours. The brain compensates for this by making a white surface look white in most lights, but a device like a video camera that captures the image technically does not know what white is so it needs to be told that. By manually or automatically indicating what is white, the camera will calibrate all the colours according to that reference point.

Zebra patterning is a feature found on some prosumer and most professional video cameras to aid in correct exposure. When enabled, areas of the image over a certain threshold are filled with a striped or cross-hatch pattern. Often, two thresholds are available: 80% and 100%. The former is useful for correctly exposing skin tones, while the latter is used to ensure overall scene exposure is correct.